



GREATER NEW HAVEN Water Pollution Control Authority

Standard Specifications

September 2017

Greater New Haven Water Pollution Control Authority

STANDARD SPECIFICATIONS



September 2017

Greater New Haven Water Pollution Control Authority

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Any individual, firm or corporation formally submitting a Proposal for any Authority Project must have in their possession a copy of the Greater New Haven Water Pollution Control Authority Standard Specifications dated September 2017. This document can be obtained upon payment of One Hundred Dollars (\$ 100.00) from the Office of the Director of Finance and Administration located at 260 East Street, New Haven, Connecticut 06511.

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SECTION 101

DEFINITIONS AND TERMS

Wherever in these specifications or in other Contract Documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

ABBREVIATIONS wherever the following abbreviations are used in these specifications or on the Plans, they are to be construed the same as the respective expressions represented. Some of these abbreviations may be acronyms and may appear without periods.

A.A.R	American Association of Railroads
A.A.S.H.T.O.	American Association of State Highway and Transportation Officials
A.C.I.	American Concrete Institute
A.D.A.	Americans with Disabilities Act
A.G.C.	Associated General Contractors of America
A.I.A.	American Institute of Architects
A.I.S.C.	American Institute of Steel Construction
A.I.S.I.	American Iron and Steel Institute
A.N.L.A.	American Nursery and Landscape Association
A.N.S.I.	American National Standards Institute
A.R.E.A.	American Railway Engineering Association
A.R.T.B.A.	American Road and Transportation Builders Association
A.S.C.E.	American Society of Civil Engineers
A.S.L.E.	American Society of Landscape Architects
A.S.M.E.	American Society of Mechanical Engineers
A.S.T.M.	American Society for Testing & Materials
A.W.W.A.	American Water Works Association
A.W.S.	American Welding Society
B.O.C.A.	Building Officials and Code Administrators International
ConnDOT.	State of Connecticut, Department of Transportation
C.F.R.	Code of Federal Regulations
C.G.S.	Connecticut General Statutes
C.S.I.	Construction Specifications Institute
M.U.T.C.D.	Manual Of Uniform Traffic Control Devices
N.E.M.A.	National Electrical Manufacturers Association
O.S.H.A.	Occupational Safety and Health Administration
S.A.E.	Society of Automotive Engineers

ADDENDA: Written instruments issued prior to the opening of bids which clarify, correct or change the Contract Documents.

AUTHORITY: When used, means the Greater New Haven Water Pollution Control Authority represented by the Executive Director.

AUTHORITY COUNSEL: The Legal Department or Attorney of the Greater New Haven Water Pollution Control Authority or its authorized representative.

AWARD: The Greater New Haven Water Pollution Control Authority's acceptance in writing of the Proposal of the lowest responsible Bidder for the Work, subject to the execution and approval of a satisfactory contract therefore; the provisions of proper bonds to secure the performance thereof, and full payment to all suppliers of labor and materials therefore and the fulfillment of such other conditions as may be specified or otherwise required by law.

BID DEPOSIT: The security furnished by the Bidder with their Proposal for a Project, as guaranty that they will enter into a contract for the Work at the price bid if their Proposal is accepted. Also referred to as Bid Bond.

BIDDER: An individual, firm or corporation formally submitting a Proposal for the Work contemplated, acting directly or through a duly authorized representative.

BOND: The approved form of security in favor of the Authority, executed by the Contractor and their Surety or Sureties, guaranteeing complete execution of the Work specified in the Contract and all supplemental agreements pertaining thereto and the payment of all legal debts pertaining to the construction of the Project. Includes Performance Bond, Labor and Materials Payment Bond and Maintenance Bond.

CALENDAR DAY: Every day shown on the calendar, Sundays and holidays included.

CFR: Code of Federal Regulations published by the U.S. Office of the Federal Register, written TT CFR PPP.SS. TT refers to the Title, PPP refers to the Part and SS refers to the section. For example: 29 CFR 126.1 refers to Title 29, Code of Federal Regulations, Part 126, Section 1.

CONTRACT: The written agreement specifying the terms and conditions for the performance of the Work and the furnishing of labor and materials in connection with a specific Project. Also referred to as "Agreement".

CONTRACT DOCUMENTS: The Contract Documents shall include the advertisement for bid or Proposal; the Contractor's bid or Proposal response; extracts selected by Authority; the written agreement including all bonds and insurance certificates; the Greater New Haven Water Pollution Control Authority Standard Specifications; technical and special specifications; the Project Plans; State Labor Department minimum wage rates (if applicable); any Addenda to specifications if the same are issued prior to the date of receipt of bids; and all provisions required by law to be inserted in the Contract whether actually inserted or not.

CONTRACT ITEM (Pay Item): A specifically described unit of Work for which a price is provided in the Contract Documents. Also known as Pay Item.

CONTRACTOR: The individual, firm or corporation undertaking the execution of the Work under the terms of the Contract and acting directly or indirectly or through any agents, representatives or employees.

EMPLOYEE: Any person working on the Project mentioned in the Contract of which these specifications are a part, and who is under the direction or control, or receives compensation from the Contractor or Subcontractor.

ENGINEER OR ENGINEER-IN-CHARGE: The Engineer representing the Greater New Haven Water Pollution Control Authority, having direct supervision of the execution of the Contract under the direction of the Executive Director.

EQUIPMENT: All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the Work.

EROSION CONTROL: Erosion control is any action taken or item used as part of a project or as a separate action to minimize the destructive effects of wind or water on surface soil. The use and placement of berms and dams, fiber mats, grasses, sod, mulches, slope drains, sediment basins and drainage systems may be temporary and used throughout construction or permanent and installed for the anticipated life of the facility.

EXTRA WORK: An item of Work not provided for in the intended scope of the Contract as awarded but found essential to the satisfactory completion of the Project.

FEDERAL-AID: Joint cooperative construction or reconstruction with monies contributed to the Greater New Haven Water Pollution Control Authority by the Federal Government.

FINAL AGREEMENT: Written agreement between the Greater New Haven Water Pollution Control Authority, and the Contractor, stating the total amount of Work done by the Contractor and the total value of such Work under and according to the terms of the Contract. The Final Agreement includes the Final Estimate as an attachment.

FINAL COMPLETION: Final acceptance of all component parts of the completed Work as determined by the Authority and at which stage the Authority may arrange for the release of retention monies.

FINAL ESTIMATE: A certified listing of final quantities, amounts of each item and total cost of the completed Work specified in the Final Agreement, the amounts paid to the Contractor under the Contract, any deductions not included in the Final Agreement and the amount of the final payment due the Contractor.

FORM 817: State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 817, 2016, as amended.

HIGHWAY: The whole strip of land bounded by the Right-of-Way lines.

INSPECTOR: The Authority duly authorized representative detailed to inspect methods and Materials relating to Work both on and off the Site of the contract.

LAYING LENGTH OF PIPE: Feet (laying length) of pipe, shall be measured by multiplying the number of whole units, by the nominal length of each unit, and adding thereto, the length of any fractional units incorporated in the Work. The nominal length of a unit or fractional unit shall be the inside measured length from butt end to butt end and exclusive of the bell or groove on the female end.

MANUFACTURER: A Manufacturer operates or maintains a factory or establishment that produces, on the premises, materials or supplies of the general character described by the specifications.

MATERIAL: Any approved material acceptable to the Greater New Haven Water Pollution Control Authority and conforming to the requirements of the specifications.

MATERIAL SUPPLIER: A Material Supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the Materials or supplies required for the performance of the Contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A Material Supplier is a firm that engages in, as its principal business, and in its own name, the purchase and sale of the products in question. A Material Supplier who deals in bulk items such as steel, cement, gravel, stone and petroleum products need not keep such products in stock, if it owns or operates distribution equipment. Packagers, brokers, manufacturer's representatives or other persons who arrange or expedite transactions are **NOT** Material Suppliers.

NOTICE OF AWARD: The written notice by the Authority to the apparent successful Bidder stating that upon compliance with the conditions precedent enumerated therein, within the time specified, the Authority will sign and deliver the Agreement.

NOTICE TO PROCEED: A written notice given by the Authority to the Contractor fixing the date on which the Contractor shall start to perform their obligations under the Contract Documents and from which date the Time for Completion is based.

ORDER ON CONTRACT: Written order issued by the Authority covering contingencies, Extra Work, deductions, increases or decreases and additions, alterations or omissions to the Plans, specifications, or other provisions of the Agreement. Also, referred to as "Change Order".

PARTIAL OR MONTHLY ESTIMATES: Payments to the Contractor for Work satisfactorily performed.

PAYMENT LIMIT: A Payment Limit defines the boundary beyond which no quantities will be measured for payment. Whenever Payment Limits are indicated, only the Work which is actually directed and completed within these limits will be measured and computed for payment. Payment Limits may be revised in writing by the Engineer prior to performing the Work.

PAYMENT LINE: Defines the exact line from which Work quantity will be computed. Whenever Payment Lines are indicated, quantities representing Work will be computed from these lines only. No other lines or locations will be used to compute quantities. Payment Lines may be revised in writing by the Engineer prior to performing the Work.

PLANS: All official drawings, sketches or reproductions of drawings pertaining to the Work or to any structure connected therewith.

PROJECT: The Work to be performed under this Contract including all labor, materials equipment, supervision and all incidentals necessary to complete the construction work identified in the Contract Documents, Plans and Specifications.

PROPOSAL: The offer of the Bidder for the Work, when executed and submitted on the prescribed form.

PROPOSAL FORM: The approved form on which the Authority requires formal bids to be prepared and submitted for the Work.

PUNCH LIST: A formal list of deficiencies in the Work prepared by the Contractor at the request of the Engineer pending Final Completion of the Work.

REASONABLY CLOSE CONFORMITY: Reasonably Close Conformity means compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, Reasonably Close Conformity means compliance with such working tolerances. Without detracting from the complete and absolute discretion of the Engineer to insist upon such tolerances as establishing Reasonably Close Conformity, the Engineer may accept variation beyond such tolerances as Reasonably Close Conformity where they will not materially affect the quality or utility of the Work and will be in the best interests of the Greater New Haven Water Pollution Control Authority.

RIGHT-OF-WAY or R.O.W.: A general term denoting land, property or interest therein, acquired for or devoted to a Utility installation or a highway, street, road, etc. Property upon which or within which the Project is to be constructed.

ROADBED: The graded portions of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulders.

ROADWAY: The portion of highway included between the outside edges of the shoulders.

ROAD SECTION: That portion of a highway included between the top of slope in cut and the bottom of slope in fill.

SHOP DRAWINGS: All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a manufacturer, fabricator, supplier or distributor and submitted by the Contractor to illustrate material or equipment for some portions of the Work.

SHOULDER: The portion of the Roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

SITE: The specific area adjacent to and including the area upon which construction of the Work is to be performed. Generally such area may be considered as defined by the right of way or property made available to the Contractor for construction operations.

SPECIAL NOTES: Special directions, provisions, or requirements peculiar to the Project under construction.

STANDARD SHEETS: The standard drawings approved for repetitive use, showing details to be used where appropriate.

STANDARD SPECIFICATIONS: The body of directions, requirements, etc. contained in this present volume, together with all documents of any description and agreements made (or to be made), pertaining to the methods or manner of performing the Work or to the quantities and quality as shown by the test records of accepted materials to be furnished under a contract.

STATE AID: Joint cooperative construction or reconstruction with monies contributed to the Greater New Haven Water Pollution Control Authority by the State of Connecticut.

STRUCTURES: Bridges, culverts, catch basins, drop inlets, retaining walls, manholes, end-walls, buildings, sewers, service pipes, under-drains, foundation drains and other features which may be encountered in the Work and not otherwise classed herein.

SUBCONTRACTOR: Any individual, firm or corporation to whom the Contractor, with the written consent of the Authority, sublets any part of the Contract Work.

SUBSTANTIAL COMPLETION: That stage of a Project when the construction is substantially complete and/or ready for occupation and/or use at which the Engineer allows the Contractor to prepare its final Punch List of outstanding and/or incomplete

items pending preparation of final Project closure documents.

SURETY: The corporate body bound with and for the Contractor, for the full and complete performance of the Contract, and for the payment of all debts, pertaining to the Work.

UTILITY: Person, corporation, municipality or public authority engaged in the distribution of electricity, gases, petroleum products, water, steam, the collection wastewater, the operation of traffic control systems, or the provision of telecommunication services. For the purposes of these Standard Specifications, the term Utility will apply to organizations that operate utilities owned by others.

WORK: Work shall be understood to mean the furnishing of all labor, materials, equipment and other incidentals necessary or convenient to the successful completion of the Project and the carrying out of all the duties and obligations imposed by the Contract.

WORK DAY: A Calendar Day, exclusive of Sundays and Authority-recognized legal holidays, on which weather and other conditions, not under the control of the Contractor, will permit construction operations to proceed for the major part of the day on the principal item or items of Work which would normally be in progress at that time.

SECTION 102

BIDDING REQUIREMENTS AND CONDITIONS

§ 102-01 LOCATION OF OFFICES

Persons desiring to make a Proposal shall use the Proposal blank prepared by the Authority for each individual contract. The Standard Specifications dated September 2017 (except as modified on the Plans or in the itemized Proposal) by the Greater New Haven Water Pollution Control Authority are to be considered as and shall form a part of the Agreement. The time for which Proposals will be received will be found in the published notice calling for Proposals. Any Proposal received after the hour specified in the published notice shall not be accepted. Detailed Plans of the Work and Proposals may be examined at the Office of the Director of Finance and Administration, Greater New Haven Water Pollution Control Authority, 260 East Street, New Haven, CT 06511 or where indicated in the published notice calling for Proposals.

§ 102-02 PROPOSALS

Each Proposal must be submitted on the official form which is furnished by the Authority directly to the Bidder. All blank spaces in the Proposal Form must be filled in as noted, and no change shall be made to the Proposal Form or in the items mentioned therein.

Proposals that are illegible or that contain any omissions, erasures, alterations, additions, or items not called for in the itemized Proposal or that contain irregularities of any kind, may be rejected at the discretion of the Authority as non-responsive.

The Bidder shall sign in the space provided in the Proposal Form, with their usual signature. An officer of a corporation or a member of a partnership signing for the Bidder shall place their signature and title after the word "By" under the name of the Contractor. The same procedure shall apply to the Proposal of a joint venture by two or more bidders; however, if the signature is by an agent or attorney-in-fact for the joint ventures, then the Proposal shall be accompanied by four (4) authenticated copies of the evidence of the signatory's authority to act on behalf of all of the joint venturers.

If the Proposal is made by a firm, the name and place of residence of each member of the firm shall be given. If made by a corporation, the names of the president, secretary and treasurer shall be given. If made by a partnership, the names of the partners shall be given.

The Authority is responsible for providing Addenda only to those persons or firms having purchased Plans and/or Proposals from the Authority, and those that made a specific request of the Authority for Addenda. Persons or firms that obtain Plans and/or Proposals from sources other than the Authority bear the sole responsibility for obtaining any Addenda issued by the Authority for the subject Project.

The envelopes containing the bids must be sealed, addressed to the Office of the

Director of Finance and Administration, Greater New Haven Water Pollution Control Authority, 260 East Street, New Haven, CT 06511 and shall be plainly marked on the outside with the Contractor's name and title of the bid. If forwarded by mail or other service, the sealed envelope containing the Proposal, and marked as directed above, must be enclosed in another sealed envelope addressed in the same manner and shall preferably be sent by Registered Mail. The prospective Bidder is solely responsible for the sealed bid arriving to the appropriate location in advance of the time designated in the published notice.

§ 102-03 PROPOSAL SHALL SPECIFY GROSS SUM

Each Proposal shall specify the correct gross sum, in the manner hereafter described for which the Work will be performed according to the Plans and specifications and any Addenda to the specifications, together with a unit price for each of the separate items as called for. The lowest responsive bid shall be determined by the Engineer on the basis of the gross sum for which the entire Work will be performed, arrived at by a correct computation of all the items specified in the Proposal at the unit prices stated in the Proposal. The Engineer reserves the right to reject any Proposal in which any of the bid prices are significantly unbalanced to the potential detriment of the Authority. An unbalanced bid is considered to be one containing lump sum or unit bid items which do not reflect reasonable actual costs plus a reasonable proportionate share of the Bidder's anticipated profit, overhead costs, and other indirect costs which are anticipated for the performance of the items in question. The Authority reserves the ultimate authority to assess and determine the responsiveness of all Bidders.

Any Proposal may be deemed non-responsive which does not contain prices set opposite each of the several items for which there is a quantity exhibited in the itemized Proposal or which shall in any manner fail to conform to the conditions of the published notice inviting Proposals. The unit prices and gross sum bid shall be indicated in words and figures. In case the amount shown in words and its equivalent in figures do not agree, the written words may, in the discretion of the Authority, be considered binding upon the Contractor.

The Bidder's attention is directed to the fact that it cannot exceed two (2) decimal positions in the cents column under unit bid price.

Some of the items may be designated as Fixed Price Items. When this is the case, the fixed prices are published in the Proposal. They can be identified in the Itemized Proposal by the words, "Fixed Price - § 102-03" appearing beneath the description of the item. In addition, the "Unit Bid Price" and "Amount Bid" columns have preprinted entries in them. The Bidder shall not change these entries. Should the amount shown be altered, the altered figures will be disregarded and the preprinted price and amount will be used to determine the total amount bid for the Contract.

Some Fixed Price Items indicate the price that will be paid for certain work. These have been prepared taking into account the cost of all labor, materials, and equipment

necessary to complete the Work including an allowance for overhead and profit. Other Fixed Priced Items indicate an estimate of payments, with actual payments to be based on actual costs and provision of the controlling specification. In either case, payments made under Fixed Price Items shall be in accord with the provisions for the specification for that item.

Similarly, one or more items may be designed as MINIMUM PRICE ITEMS or MAXIMUM PRICE ITEMS. When this is the case, the minimum (or maximum) prices are published in the Proposal. Those items can also be identified in the Itemized Proposal by the words "Minimum Bid ____" or "Maximum Bid ____" appearing beneath the description of the item. The price bid for Minimum Price Items shall not be less than the minimum price shown in the Itemized Proposal, but it may exceed that price. Conversely, the price bid for Maximum Price Items shall be less than, or equal to, the maximum price shown in the Itemized Proposal. In the event a bid is less than the Minimum Price (or more than the Maximum Price) indicated in the Itemized Proposal, the Authority will substitute the appropriate minimum (or maximum) price and make the necessary adjustments to determine the total amount bid.

§ 102-04 NO MISUNDERSTANDING

The Bidder shall review all information provided by the Authority regarding the Project, all existing site and other related conditions. The Bidder is advised that, while such information is given in good faith by the Authority, the Authority cannot ensure its sufficiency and accuracy and that such information is intended solely for reference purposes. The Bidder is responsible to verify the status of all existing structures, equipment, systems and site conditions to obtain all information needed to properly perform the Work under the Project. The Bidder shall examine the Contract Documents and the Site of the Work and shall fully inform himself from their personal examination of the same regarding the quantities, character, location and other conditions affecting the Work to be performed, including the existence of poles, wires, pipes, ducts, conduits, and other facilities and structures of municipal and other public service corporations on, over, or under the Site. The Bidder will make no claim against the Authority by reason of reliance upon any such estimates, tests or other representations made by any officer or agent of the Authority with respect to the Work to be performed under the Contract. Particular attention is called to special notes and special specifications in the Proposal which may contain contract requirements at variance with standard plans and specifications and may include information concerning the existence of poles, wires, pipes, ducts, conduits and other facilities and structures of municipal and other public service corporations on, over or under the Site.

The Bidder shall notify the Authority in writing, upon discovery, of any and all omissions, errors or discrepancies that the Bidder discovers within or among the Plans, specifications and other Contract Documents.

§ 102-05 STATEMENT OF NON COLLUSION

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

- A. The prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other Bidder or with any competitor.
- B. Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to opening, directly or indirectly, to any other Bidder or to any competitor; and
- C. No attempt has been made or will be made by the Bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

§ 102-06 SUBSURFACE INFORMATION

Boring logs and other subsurface information made available for the inspection of Bidders were obtained with reasonable care and recorded in good faith by the Authority.

The soil and rock descriptions shown are as determined by a visual inspection of the samples from the various explorations unless otherwise noted. The observed water levels and/or water conditions indicated are as recorded at the time of the exploration. These levels and/or conditions may vary considerably, with time, according to the prevailing climate, rainfall and other factors.

The locations of utilities or other underground man-made features were ascertained with reasonable care and recorded in good faith from various sources, including the records of municipal and other public service corporations, and therefore the location of known utilities may only be approximate.

The subsurface information shown was obtained by the Authority for design and estimating purposes. It is made available to the Bidders so that they may have access to the same information available to the Authority. It is presented in good faith, but as with all subsurface information it represents only a fraction of the total volume of material at the Site. Interpolation between data points may not be indicative of the actual material to be encountered. Such information is not intended as a substitute for personal investigations, interpretations and judgment of the Bidder. Rather, each Bidder is responsible for verifying such information and obtaining all additional information necessary to properly perform the Work under the Contract Agreement. The Contractor shall be responsible for determining the existence and location of all

subsurface utilities, lines, cables and pipes that may affect performance of the Work. The Contractor shall undertake such further investigations, analyses, tests and studies as may be necessary and useful to determine all surface, subsurface or concealed conditions. If conditions are encountered at the Project Site which are subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, then notice by the observing party shall be given to the other party no later than five (5) days after first observance of the conditions. If the Authority and the Engineer verify such differing site condition, then the Contract Sum and the Project Schedule will be reasonably adjusted. However, in no event will any adjustment be permitted in connection with a concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably should have been disclosed by the Contractor's prior inspections, tests, and reviews performed by the Contractor, or which the Contractor had the opportunity to perform, in connection with the Project.

§ 102-07 INTERPRETATIONS AND ADDENDA

All questions about the meaning or intent of the Contract Documents shall be submitted to the Authority in writing. In order to receive consideration, questions must be received by the Authority at least ten (10) days prior to the date fixed for the receipt of bids. Any interpretations of questions so raised which in the opinion of the Authority require interpretations, will be issued by Addenda mailed or delivered to all parties recorded by the Authority as having received the Proposal blank prepared by the Authority for the individual contract no later than three (3) days prior to the date fixed for opening of Bids. The Authority will not be responsible for oral interpretations or clarifications which anyone presumes to make on its behalf.

In addition, the Authority may issue such Addenda as may be necessary to clarify, correct or change the Contract Documents.

The Bidder shall acknowledge receipt of the Addenda in the space provided in the Proposal Form and further acknowledge that the provisions of each Addendum have been included in the preparation of the bid.

§ 102-08 MODIFICATION OR WITHDRAWAL OF PROPOSAL

No modification to or explanation of any Proposal or bid in any form, shall be accepted after the Proposal or bid has been deposited with the Authority. No Proposal shall be withdrawn or cancelled before the time designated for publicly opening, except upon such conditions as the Authority may deem to be necessary. No Proposal shall be withdrawn or cancelled after the time designated for opening such Proposals publicly.

§ 102-09 BID DEPOSIT

Every Proposal must be accompanied by a certified check or bank cashier's check or bid bond payable to the Greater New Haven Water Pollution Control Authority in the amount of ten (10%) percent of the total bid amount. Said checks or bid bonds will be returned to the unsuccessful Bidders upon execution of the Contract Agreement.

§ 102-10 CONTRACT CLAUSES REQUIRED FOR PUBLIC PROJECTS

The execution of the Contract by the Contractor binds him to the following specific agreements required by law:

- A. This Contract may not be assigned, in whole or in part, by the Contractor or its rights, title or interest assigned, transferred, conveyed, sublet or disposed of without the previous consent, in writing of the Authority.
- B. It is understood that the Authority is dependent upon receiving authorized appropriations or budgeted funds for this Project. The Contract for Work on the Project therefore, shall be deemed binding only to the extent of money being made available to the Authority for the performance of the Work there under. No liability on account of such Work shall be incurred by the Authority beyond monies available for the purpose thereof.
- C. It is hereby agreed that all applicable provisions of the Labor Laws of the State of Connecticut shall be carried out in the performance of Work under the Contract.
- D. The relationship of the Contractor to the Authority is that of an independent Contractor. Accordingly, said Contractor covenants and agrees that it will conduct itself consistent with such status, that it will neither hold itself out as nor claim to be an officer or employee of the Authority by reason hereof, and that it will not make any claim, demand or application to or for any right or privilege applicable to an officer or employee of the Authority, including, but not limited to worker's compensation coverage, unemployment insurance benefits, social security coverage, or retirement membership or credit.
- E. The Contractor and anyone employing services for work in connection with this Project shall not discriminate in any employment or work related practices.

§ 102-11 OTHER CONTRACTS

The Authority reserves the right to let other contracts in connection with the Work to be performed on the Project. Therefore, the Contractor may not have exclusive occupancy of the territory within or adjacent to limits of the Site.

The Contractor will be required to cooperate with all other contractors and the owners of the various utilities in and around the Site and to coordinate and arrange the sequence of their work to conform with the progressive operations of such other work. Cooperation and adjustments with the Contractors already engaged and to be engaged upon the Site is essential to properly coordinate the construction efforts of all Contractors, Utility Owners, and Subcontractors engaged in the Work within and adjacent to the construction area of this Project.

In case of interference with the operations of any private Utility owners or other Contractor, the Authority will be the sole judge of the rights of the Contractor and each Contractor and the sequence of work necessary to expedite the completion of the entire Project. The Authority does not warrant the performance of other contractors to the Contractor. In all cases, the Authority's decision shall be accepted as final.

§ 102-12 FORMS

The form of contract and bond, if given, shall be that provided by the Greater New Haven Water Pollution Control Authority.

§ 102-13 ENGINEERING CHARGES

When the Work embraced in the Contract is not completed on or before the date specified, engineering and inspection expenses incurred by the Authority upon the Work, including engineering and inspection expenses incurred on the Work by railroad companies, from the completion date originally fixed in the Contract to the actual date of completion of the Work may be charged to the Contractor and may be deducted by the Authority from the final monies due the Contractor. Consideration of any Extra Work or Order on Contract added to the original Contract amount, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the Authority before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where the Work has been unduly delayed by the Contractor without acceptable reasons, or due to inefficient operations, or any other reason for which the Authority determines the Contractor liable.

§ 102-14 EXEMPTION FROM TAX

Purchases made by the Greater New Haven Water Pollution Control Authority are exempt from payment of Federal Taxes, and State of Connecticut Sales and Use Taxes. Such taxes must not be included in the bid price of any item or materials permanently incorporated into the Work or furnished to the Authority under the Contract.

§ 102-15 CHANGES IN AMOUNT OF BID

All unit prices, lump sums, etc. listed in the bid Proposal, are firm and not subject to change for ninety (90) days from the day bids are opened, unless noted otherwise.

Extensions may be agreed to by the Authority and the Bidder.

§ 102-16 SPECIAL SPECIFICATIONS AND NOTES

The schedule of liquidated damages, scope of work, the list designated by the Authority as "Specialty Items" and specific Contract Special Notes and Requirements, will be listed in this location of the Specifications.

§ 102-17 PREQUALIFICATION

To the extent applicable, all bidders must hold a current State of Connecticut DAS prequalification certificate as required by the DAS Contractor prequalification program (See Connecticut General Statutes §4a-100) and shall submit a current certificate and DAS Contractor prequalification update statement at the time of bid. However, DAS prequalification does not preclude the right of the Authority to independently evaluate and make determinations regarding the responsibility of the bidders.

Greater New Haven
Water Pollution Control Authority

INVITATION

for Constructing

PROJECT: XXXX-XX (SHORT TITLE)
STATE PROJECT NO:
FEDERAL PROJECT NO:

Sealed bids will be received at the Office of the Director of Finance and Administration of the Greater New Haven Water Pollution Control Authority located at 260 East Street, New Haven, CT 06511 for **PROJECT: XXXX-XX (LONG TITLE)** until **(TIME) on (DAY) (MONTH) (DATE) (YEAR)** at which time and place said bids will be opened publicly and read aloud.

The information for Bidders, Proposal, Form of Contract, Plans and Specifications may be examined at the Office of the Director of Finance and Administration at the above address. Any one submitting a bid for this project must have in their possession a copy of **THE GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY STANDARD SPECIFICATIONS dated September 2017**. The document can be obtained upon payment of One Hundred Dollars (\$100.00). The Plans and a "bid package" containing the Invitation; Labor Rates; Proposal; Special Specifications and Notes can be obtained upon payment of _____ (\$_____).

A certified check or bid bond in the amount of ten percent (10 %) of the total bid amount must accompany the bid. Said checks or bid bonds will be returned to the unsuccessful bidders upon Award of the Contract to the selected firm and execution of the Agreement. If any bid is not accompanied by a bid bond or check at the specified time for the bid opening, the incomplete bid will not be read and this action will constitute automatic rejection of the bid.

The successful bidder will be required to furnish a performance bond and a labor and materials payment bond in the form as attached to the Bid Documents for the amount of the total bid. A certified check cannot be substituted for either bond. The Greater New Haven Water Pollution Control Authority reserves the right to alter quantities and to accept or reject any or all bids or any portion of any bids, for any or no reason, including unavailability of appropriated funds as it may deem to be in its best interests.

All bidders are to note that the award of this Contract is subject to the following conditions and contingencies:

1. The approval of such governmental agencies as may be required by law.
2. The appropriation of adequate funds by the proper agencies.

Gabriel Varca
Director of Finance and Administration

§ 102-19 PREVAILING WAGE RATES

Project specific prevailing wage rates will be obtained from the Connecticut Department of Labor, Wage and Workplace Standards Division.

These rates are to be the minimum paid to workers employed in these occupations on this Project and shall remain in effect until completion, unless adjusted prior thereto. The Contractor remains fully liable for the increase in any prevailing wages rates which may be made during the course of the Project.

Please direct any questions pertaining to this matter to the Wage and Workplace Standards Division, Telephone No. 860-263-6790

§ 102-20 SAMPLE FORM OF PROPOSAL

ITEMIZED PROPOSAL

For Constructing

PROJECT: XXXX-XX (LONG TITLE)
STATE PROJECT NO:
FEDERAL PROJECT NO:

The Work proposed herein must be completed by (MONTH) (DATE) (YEAR).

Greater New Haven
Water Pollution Control Authority
260 East Street
New Haven, Connecticut 06511

To Whom It May Concern,

In submitting this bid the duly authorized undersigned declares that the entity on behalf of which this bid is made is, or they are, the only person or persons interested in the said bid; that the bid is made without any connection with any person making another bid for the same contract; that the bid is in all respects fair and without collusion, fraud or mental reservation; and that no official of the Greater New Haven Water Pollution Control Authority, or any person in the employ of the Authority is directly or indirectly interested in said bid or in the supplies or work to which it relates, or in any portion of the profits thereof.

The undersigned also hereby declares that they have, either for themselves or on behalf of the entity they represent, carefully examined the Plans, specifications, and form of Contract for this Project, have personally inspected the actual location of the Work and have considered potential local sources of supply, and are satisfied as to all the quantities and conditions, and understands that in signing this Proposal they or the entity that they represent waives all rights to plead any misunderstanding regarding the same.

The undersigned further understands and agrees that they are to furnish and provide for the respective item price bid all the necessary material, machinery, implements, tools, labor, services, and other items of whatever nature, and to do and perform all the Work necessary under the aforesaid conditions, to complete the improvements of the Project, which Plans and specifications it is agreed are a part of this Proposal, and to accept in full compensation therefore the amount of the summation of the products of the approximate quantities multiplied by the unit prices bid. This summation will hereinafter be referred to as the gross sum bid.

The undersigned further agrees to accept the aforesaid unit bid prices in compensation

for any additions or deductions caused by any variation in quantities due to more accurate measurement, or by any changes or alterations in the Plans or specifications of the Work and for use in the computation of the value of the Work performed for monthly estimates.

Every Proposal must be accompanied by a certified check or bank cashier's check or bid bond payable to the Greater New Haven Water Pollution Control Authority in the amount of ten percent (10%) of the bid.

Accompanying this Proposal is a certified check or bank cashier's check or bid bond payable to the Greater New Haven Water Pollution Control Authority in the amount of \$_____. In case this Proposal shall be accepted by the Authority, and the undersigned shall fail to execute the Contract, the monies represented by such certified check or bank cashier's check or bid bond shall be regarded as liquidated damages and shall be forfeited and become the property of the Authority. The undersigned understands and accepts:

- A. When Work is required in which no specific payment item is listed on the Proposal Form, the cost of such Work shall be included in the unit prices bid.
- B. All unit prices, lump sums, etc. listed in the bid Proposal are firm and not subject to change for ninety (90) days from the day bids are opened.
- C. Within ten (10) days from the date of a notice of acceptance of this Proposal, the undersigned agrees to execute the Contract and to furnish to the Authority a satisfactory "Faithful Performance Bond" and "Labor and Material Payment Bond" in the amount of one hundred percent (100%) of the Contract price.
- D. Time is of the Essence. All Work to be performed under the Contract shall be completed within the time stated in the Agreement for the Project or within such extended time for completion as may be granted by the Authority.
- E. As a condition of the Contract Award, the successful Bidder shall provide proof, from the Connecticut Secretary of State's office, of its current authorization to do business in Connecticut. All Connecticut corporations must provide a Certificate of Good Standing from the Secretary of State's Office. All foreign (out of State) corporations shall provide a valid license to do business in Connecticut, in the form of a current Certificate of Authority from the Secretary of State's office and evidence of compliance with the bond

requirements of the Connecticut Department of Revenue Services. These documents must be presented within thirty (30) days from the date of the bid opening.

Bidder acknowledges receipt of the Addenda listed below and further acknowledges that the provisions of each Addendum have been included in the preparation of this bid.

Addendum No.	Date Received	Addendum No.	Date Received
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

COMPANY NAME (BIDDER): _____

Address of Bidder: _____

Phone Number: Area Code (_____) _____

E-mail Address: _____

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

Signature of Bidder: _____ **Dated:** _____

Name and Addresses of Members of the Firm:

§ 102-21 SAMPLE FORM OF AGREEMENT

**GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY
CONTRACT FOR CONSTRUCTION SERVICES**

CONTRACT NO:

This Agreement ("Agreement") entered into this _____ day of _____ 20__, by the Greater New Haven Water Pollution Control Authority, hereinafter referred to as "AUTHORITY", acting by and through _____, its Executive Director, duly authorized and _____, a corporation organized and existing under the laws of the State of Connecticut and having offices at _____, acting herein by _____, its _____, duly authorized, hereinafter called the "CONTRACTOR".

WITNESSETH: That the Authority and Contractor, for the consideration hereinafter named, agree as follows:

ARTICLE 1 WORK TO BE DONE

The Contractor shall (a) furnish all the materials, machinery, implements, tools, labor, services, and other items of every kind required to perform and complete in the most substantial and workmanlike manner, the Project generally identified and shown on: _____ (hereinafter the Project) in accordance with the **Greater New Haven Water Pollution Control Authority Standard Specifications, dated September 2017**, the general specifications and conditions of contract, materials of construction, and payment items, and all requirements of the Contract Documents as defined herein.

The AUTHORITY will pay to the Contractor for the satisfactory completion of the Project, the total sum of \$ _____ ("Contract Sum") in the manner as set forth in the Standard Specifications and the Contract Documents.

No increase in the Contract Sum shall be allowed on account of any escalation in the price of material, equipment or wages during the performance of the Work.

The Contractor acknowledges that the Contract Plans and specifications may not be fully developed and the Contractor agrees to perform all Work which may not be specifically mentioned in these documents, but which is required to make the Work complete, functional, and operational as determined by the Engineer and the Authority.

The Contractor shall assume sole responsibility for and shall perform, or cause to be performed, all special inspections and testings required by the Connecticut Building

Code, or any other applicable code or regulation, or the relative Contract Documents. To the fullest extent permitted by law, the Contractor shall be liable to Authority for any and all liability, costs, expenses, fines, penalties and attorney's fees resulting from its failure to perform such duties.

ARTICLE 2 ADMINISTRATION BY AUTHORITY

The Work to be performed under this Contract shall be administered on behalf of the Authority by _____, or their designated representative, hereinafter referred to as the "Engineer."

ARTICLE 3 DOCUMENTS FORMING THE CONTRACT

The Contract Documents shall be deemed to include the advertisement for bid or for Proposals including all General Provisions; the Contractor's bid or Proposal response or extracts thereof as selected by the Authority; this written document, including all bonds and insurance certificates; the Greater New Haven Water Pollution Control Authority Standard Specifications; technical and special specifications; the Project Plans; minimum applicable labor wage rates; any Addenda to specifications if the same are issued prior to the date of receipt of bids; and all provisions required by law or required by external source of funding to be inserted in the Contract, whether actually inserted or not.

This Contract will supersede any agreement or contract form that may have been included in the bid specifications.

While the intention is for all Contract Documents to be read together, to the extent there is any conflict and ambiguity between the terms of this Agreement, and any other Contract Document then the terms of the Agreement shall have priority and prevail.

ARTICLE 4 EXAMINATION OF DOCUMENTS AND SITE

The Contractor confirms that it has in its possession a copy of the Greater New Haven Water Pollution Control Authority Standard Specifications; that it has carefully examined all the Contract Documents, together with the Site of the Project, as well as its surrounding territory; it is fully informed regarding all existing conditions, both natural and man-made, as well as all such above grade, at grade and subsurface conditions that may in any way affect the Work to be done and labor and materials to be furnished for the proper completion of the Project, including, by way of example, the existence of poles, wires, pipes, ducts, conduits and other facilities and structures of municipal and public service corporations on, over or under the Project Site; that it has secured such information by personal investigation, research, and inquiry into all reasonably available data concerning the actual Site and has not relied upon the estimates or records of the Authority; and that it will make no claim against the Authority by reason of reliance on any such estimates, tests, information, data or representations made by any officer, agent, representative or employee of the Authority, or for costs incurred as a result

thereof.

The Authority makes no representations or warranties as to the accuracy of as-built conditions indicated on the drawings or other documents pertaining to existing facilities including, but not limited to, information on piping, sewers, wiring, ducts and structural members. The Contractor shall independently verify the location of all existing physical conditions and improvements before proceeding with the Work and will provide the access line and benchmarks, layout or line and grade work necessary for proper execution of the Work.

ARTICLE 5 DATE OF COMPLETION

Time is of the Essence. The Contractor further agrees that it will begin the Work herein described within ten (10) days of the effective date hereof, unless written instruction to the Contractor is given to begin at a different date. The Contractor shall prosecute the same so that the Project shall be entirely completed no later than _____.

No extension beyond this date of completion shall be effective unless in writing signed by the Authority. Such extension shall be for such time and upon such terms and conditions as shall be fixed by the Authority, which may include a charge for engineering and inspection expenses actually incurred upon the Work, including engineering and inspection expenses incurred by railroad companies on contracts which affect a railroad right of way. Notice of application for such extension shall be filed with the Engineer at least fifteen (15) days prior to the date of completion fixed by the terms of this Contract.

ARTICLE 6 ALTERATIONS AND OMISSIONS

The Work shall be performed in accordance with the true intent and meaning of the Contract Documents without any expense of any nature whatsoever to the Authority exceeding the consideration named in Article 1.

The Authority reserves the right, at any time during the progress of the Work hereunder; to alter the Plans therefore or omit any portion of the Work as it deems to be in the interest of the Project. In such event, allowances for additions and/or deductions to the prices listed in the Proposal will be made commensurate with such changes in the scope or extent of the Work. Any such action by the Authority shall not constitute grounds for a claim by the Contractor for damages, loss of anticipated profits, or for costs resulting from any variations between the approximate quantities and quality of work contemplated in the Proposal and as built.

ARTICLE 7 CONTINGENCIES, EXTRA WORK, AND CHANGES

Whenever the Engineer determines that, from any cause not foreseeable at the time of this Contract, the scope of Work contemplated hereunder should be altered to provide for changes, deletions, contingencies, or additional or Extra Work, they may issue an Order on Contract to the Contractor who shall forthwith commence the Work necessary to comply with the specifications of such Order on Contract. No Extra Work shall be commenced or undertaken nor shall any be deleted until the Engineer has issued and signed a written Order on Contract in the Authority's standard form.

Payment for any unforeseen work and/or changes shall be made as provided for in the Standard Specifications.

Pending resolution of any claim, dispute, change or other controversy, nothing shall excuse the Contractor from proceeding diligently with prosecution of the Work.

ARTICLE 8 NO COLLUSION OR FRAUD

The Contractor hereby agrees that the only person or persons interested as principal or principals in the bid or Proposal submitted by the Contractor for this Project are named therein; that this Contract has been secured without any connection with any person or persons other than those named; that this Contract was secured without collusion or fraud; and that neither any officer nor employee of the Authority, nor any member of the immediate family of any such person, has or shall have a financial interest in the performance of this Contract, in the supplies, work or business to which it relates, or in any portion of the profits thereof, except as permitted by the Code of Ethics of the Greater New Haven Water Pollution Control Authority.

ARTICLE 9 PAYMENT OF ESTIMATES

As the Work progresses in accordance with the Contract and in a manner that is satisfactory to the Authority, the Authority hereby agrees to make payments to the Contractor therefore, based upon the Proposal attached hereto and made a part hereof, as follows: The Engineer shall once in each month and on such days as it may fix, estimate the quantity of Work done and Material furnished in accordance with the terms and conditions of this Contract during the preceding month, and, subject to receipt of an acceptable application for payment and all supporting documentation, which shall include, without limitation, a partial release and waiver of liens in the form as shown in **§ 102-22, Sample Form of Conditional Partial Release and Waiver of Liens** and which has been executed by Contractor, shall pay to the Contractor ninety-five (95%) percent of such amount.

Commencing with the second application for payment and continuing thereafter, as a condition to receipt of any progress payments the Contractor shall also submit partial releases and waivers of lien as executed by all subcontractors and material suppliers which have furnished any labor, material or equipment on the Project and which shall be

effective through the immediately preceding application for payment. The five (5%) percent retained shall be held by the Authority until Final Completion and acceptance of all Work covered by this Contract and compliance by the Contractor with all of its responsibilities hereunder including the posting of a twenty-five percent (25 %) maintenance bond in a form acceptable to the Authority by the Contractor ensuring the Project for a period of two (2) years from the date of final acceptance and the making of all payments due all subcontractors and material suppliers in connection with the Project. Nothing herein shall modify or limit detailed payment provisions contained in the Contract Documents and approved by the Engineer.

It is further agreed that so long as the Contractor fails to comply with any lawful or proper direction concerning the Work or Material given by the Engineer, the Contractor shall not be entitled to have any estimate made for the purpose of payment. No such estimate shall be rendered until the Contractor fully and satisfactorily complies with all such directions.

The Contractor shall not apply for payment of any sums on account of Work performed by any subcontractor or vendor unless it intends to immediately pay such sums to them. All monies paid to Contractor on account of Work performed by any subcontractors, vendors or laborers shall be deemed to be trust funds for the benefit of such entities.

The Authority may withhold from any payment, including final payment, such amount as the Authority, in its discretion, deems reasonably necessary to protect itself against any actual or potential liability (including attorney's fees and costs) or damage directly or indirectly relating to the Contract arising from, or alleged to arise from, any act or omission by Contractor.

The Authority shall have the right to set off against amounts otherwise due to the Contractor under this Contract or under any other contract or arrangement that the Contractor has with the Authority, any costs that the Authority has incurred due to the Contractor's non-compliance with this Contract and any other amounts that are due and payable from the Contractor to the Authority. Any sum taken and set off from the Contractor shall be deemed to have been paid to the Contractor for purposes of payment obligations under Article 9.

ARTICLE 10 UNCOMPLETED WORK

If, in the judgment of the Engineer, the Work to be performed under this Contract is "substantially", although not entirely, completed, and in its judgment the withholding of the retained percentage would be an injustice to the Contractor, the Engineer may, provided that it receives certification that the essential items in the Contract have been completed in accordance with the terms of the Contract, include in the final account such uncompleted items. The Engineer will pay the Contractor therefore at the item prices in the Contract upon the Contractor's depositing with the Engineer a certified check drawn upon a legally incorporated bank or trust company equal to at least double the value of such uncompleted work. The deposit may be used by the Engineer to complete the uncompleted portion of the Contract and any unused portion shall be returned to the Contractor upon its

satisfactory completion of the uncompleted work within a specified number of working days after it has been notified to proceed.

ARTICLE 11 FINAL ACCEPTANCE OF WORK

When, in the opinion of the Engineer or, if applicable, the Authority's representative, the Contractor has fully performed the Work under this Contract, the Engineer, or the Authority's representative, shall recommend to the Authority the acceptance of the Work so completed. If the Authority accepts the recommendation, it shall thereupon by letter notify the Contractor of such acceptance, and copies of such acceptance shall be sent to other interested parties.

ARTICLE 12 FINAL PAYMENT

Final payment shall be made only after acceptance of the Work performed hereunder, approval of the final determination of such Work by the Engineer, the Contractor's execution of a final release and waiver of liens in the form as shown in **§102-23, Sample Form of final Release and Waiver of Liens**, and the Contractor's having posted a satisfactory two (2) year maintenance bond with the Authority. The Engineer, or the Authority's representative, shall prepare the final determination of the Work done from actual field measurements and computations relating to the same, shall compute the value of such Work under and according to the terms of this Contract, certify as to the correctness of such determination, and submit the same to the Authority for final approval. The right is hereby reserved to the Authority to reject the whole or any portion of the final determination, should it be found or known to be inconsistent with the terms of this Contract or otherwise improperly given. All certifications, upon which partial payments may have been made, being merely estimates, are subject to correction in the final determination or upon final payment.

ARTICLE 13 ACCEPTANCE OF PAYMENT

Acceptance by the Contractor, or anyone claiming by or through it, of any interim or final payment hereunder shall constitute and operate as a release of the Authority from any and all claims of any liability or responsibility to the Contractor for anything done to, furnished for, relating to or in connection with the Work hereunder, and for any act, neglect, default on the part of the Authority or any of its officers, agents, or employees unless the Contractor serves a detailed and verified statement of claim upon the Authority prior to the acceptance of such payment. Such statement shall specify the items and details upon which the claim is based and any claim shall be limited to such items. The Contractor's refusal to accept the final payment as tendered shall constitute a waiver of any right to interest thereon.

ARTICLE 14 LABOR AND EMPLOYMENT REGULATIONS

Pursuant to Connecticut General Statutes, §31-52, all contracts for the construction, remodeling or repairing of any public building are required by law to contain the following

provisions:

“In the employment of labor to perform the Work specified herein, preference shall be given to citizens of the United States, who are, and continuously for at least three months prior to the date hereof have been, residents of the labor market areas, as established by the Labor Commissioner of the State of Connecticut, in which such work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in the county in which the work is to be performed for at least three months prior to the date hereof, and then to citizens of the state who have continuously resided in the state at least three months prior to the date of this contract.”

In no event shall these provisions be deemed to abrogate or supersede, in any manner, any provision regarding residency requirements contained in any collective bargaining agreement to which the Contractor is a party.

Pursuant to Connecticut General Statutes, §31-52a, the following provision shall be incorporated into this Contract and each subcontract hereunder insofar as this Contract or any such subcontract concerns a public works project, including, but not limited to, construction, remodeling or repairing of any public facility or structure except public buildings covered by §31-52, site preparation or site improvement, appurtenances or highways, or the preparation or improvement of any land or waterway on or in which a structure is situated or to be constructed are required by law to contain the following provision:

“In the employment of mechanics, laborers or workmen to perform the work specified herein, preference shall be given to residents of the State who are, and continuously for at least six (6) months prior to the date hereof have been, residents of this State, and if no such person is available then to residents of other states.”

Nothing herein shall abrogate or supersede any provision regarding residence requirements contained in any collective bargaining agreement to which the Contractor is a party.

The Contractor shall include the foregoing provisions in all subcontracts and sub-agreements entered into pursuant to this Contract or related to this Project.

Pursuant to Connecticut General Statutes, §31-53, the following provision shall be incorporated into each contract for work relating to new construction of a public works project where the total cost of all work to be performed in connection with such project is Four Hundred Thousand Dollars (\$400,000) or more, and each contract for work relating to the remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project where the total cost of all work to be performed in connection with such project is One Hundred Thousand Dollars (\$100,000) or more:

“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 contribution paid or payable on behalf of each such employee to any employee welfare fund described in §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 in which such public works project is being constructed. Any Contractor who is not obligated by agreement to make a payment or contribution on behalf of such employees to any such employee welfare fund shall pay to each employee as part of their wages the amount of payment or contribution for their classification on each pay day.”

NOTE: Prevailing wage rates are fixed by the State Labor Commissioner.

The most recent wage rate schedule will be obtained and attached to the Contract.

In the event that the Authority determines that any mechanic, laborer or workman employed by the Contractor or any subcontractor directly on the Site for the work contemplated hereunder has been or is being paid a rate of wages less than that required to be paid, as stated herein, the Authority may, by written notice to the Contractor, terminate the Contractor's right to proceed with the work hereunder or such part of the work for which there has been a failure to pay the required wages. In the event of such termination, the Authority may prosecute the work to completion by contract or otherwise and the Contractor and its Sureties shall be liable to the Authority for all costs incurred thereby in excess of the compensation to be paid under this Contract.

ARTICLE 15 RIGHT TO SUSPEND WORK OR TERMINATE CONTRACT

If, at any time, the Engineer or the Authority determines that the Work hereunder is not being performed according to the Contract Documents or in the best interests of the Authority, the execution of the Work by the Contractor may be temporarily suspended by the Engineer or the Authority, who may then proceed with the Work under its own direction in accordance with the Contract specifications and in such manner as determined to be in the best interests of the Authority; or the Authority may terminate the Contractor's employment under this Contract while it is in progress, and thereupon proceed with the Work in such manner and by such process as determined to be in the best interest of the Project and the Authority. All costs, expenses, losses and damages, including attorney fees, and all other charges incurred by the Authority for the Project as a result shall be charged to the Contractor and deducted by the Authority from any monies due or payable or to become due or payable hereunder. If the cost of completing the Contract exceeds the amount stated herein, such amount shall be charged to and promptly paid by the Contractor to the Authority. In computing the amounts chargeable to the Contractor, the Authority shall not be held to a basis of the lowest prices for which the completion of the Project or any part thereof might have been accomplished, but the Contractor shall be liable for all sums actually paid or expenses actually incurred in affecting prompt completion of the Project Work hereunder. The rights described herein are in addition to any other rights and remedies provided by the law.

Should the Authority reactivate the performance of services covered by this Contract, in whole or in part, within one (1) year from the time of suspension, any fees paid to the Contractor pursuant to this Contract shall be applied as payment on the fees as set forth in the Contract at the time of reactivation. Should reactivation occur after a period of suspension exceeding one (1) year, the Contractor and the Authority may renegotiate the Contract based upon current conditions or may unilaterally elect to terminate the Contract.

Termination under this section shall not give rise to any claim against the Authority for damages or compensation in addition to that provided hereunder.

No person shall have any right or claim by reason of the Authority's failure or refusal to withhold monies. No interest shall be payable by the Authority on any amounts withheld under this provision. This provision is not intended to limit or in any way prejudice any other right of the Authority.

If the Engineer determines to suspend or stop Work, or if the Authority determines to terminate or cancel this Contract, a written notice sent by mail to the Contractor at its address and to the Sureties at their respective addresses shall be sufficient notice of its action. In the event of termination, no further payment to the Contractor shall be made until the Work is completed and the Authority determines the additional costs, expenses, losses and damages due and owing by the Contractor to the Authority.

If it is subsequently determined that Authority has wrongfully terminated Contractor for default under this Article 15, then the termination shall be deemed to be a termination for convenience as provided under **§105-07, Termination for Convenience Clause** of the General Provisions.

ARTICLE 16 INTERPRETATION OF PLANS

Any ambiguity in, or difference in interpretation of the Plans, specifications or other Contract Documents, or between or among any of them, must be immediately submitted to the Engineer, who shall resolve the same, and its decision in relation thereto shall be final and conclusive upon the parties.

ARTICLE 17 REJECTED WORK AND MATERIAL

In the event the Engineer finds that the Materials furnished, the finished Project or the Work performed hereunder by the Contractor does not conform with the plans and specifications and has resulted or will result in an inferior or unsatisfactory product, the Materials or Work shall be removed and replaced or otherwise corrected, to the satisfaction of the Engineer, by and at the expense of the Contractor.

The Contractor agrees that it shall at once remove from the Site at its own expense all Work or Material which may be rejected by the Engineer and replace the same with Work or Material satisfactory to the Engineer. All Work shall be in a first class and satisfactory condition at the time of final acceptance.

ARTICLE 18 PAYMENTS TO SUBCONTRACTORS AND SUPPLIERS

- A. The Contractor shall, within thirty (30) days after its receipt of payment from the Authority, pay any amounts due any subcontractor, whether for labor performed or Materials furnished hereunder, when the labor or materials have been included in a requisition submitted by the Contractor and paid by the Authority.
- B. The 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 receives payment from the general Contractor which encompasses labor or materials furnished by such subcontractor.

ARTICLE 19 LAWS, PERMITS, AND LICENSES

The Contractor shall observe all federal, state, and local laws and regulations and agrees to procure all necessary licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the Work hereunder.

ARTICLE 20 EQUAL EMPLOYMENT OPPORTUNITY

The Contractor agrees and warrants that in the performance of this Contract it 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, sexual orientation, mental retardation or physical disability, including, but not limited to, blindness, unless it is shown by the 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. The Contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated in a nondiscriminatory manner.

The Contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the Commission concerning its employment practices and procedures.

The Contractor will cause the foregoing provisions to be inserted in all subcontracts for any Work covered by this Contract so that such provisions will be binding upon each subcontractor.

ARTICLE 21 SUCCESSORS AND ASSIGNS

This Contract shall bind the successors, assigns and representatives of the parties hereto. Notwithstanding the foregoing, this Contract may not be assigned by the Contractor nor shall the Contractor's rights, title or interest herein or hereto be assigned, transferred, conveyed, sublet, or disposed of without the previous written consent of the Authority.

ARTICLE 22 LIQUIDATED DAMAGES

It is understood by the parties that timely completion of the Project is essential. If the Contractor fails to satisfactorily complete the Work hereunder within the time specified or within any extra time that may have been allowed by way of an extension, there shall be deducted from any monies due or that may become due the Contractor, the sum of _____ Dollars (\$) for each and every Calendar Day, including Saturdays and Legal Holidays, that the Project remains incomplete. This sum shall not be imposed as a penalty, but as liquidated damages due the Authority from the Contractor by reason of the inconvenience to the public and other problems incurred by the Authority as a result of the delay thereby occasioned, including, but not limited to, the added cost of engineering and supervision, maintenance and other items which involve the unanticipated expenditure of public funds.

ARTICLE 23 INSURANCE AND INDEMNIFICATION

The Contractor agrees to obtain at its own cost and expense all insurance required by the Contract Documents and to keep the same in continuous effect until the Authority indicates the termination of the Contractor's responsibilities hereunder. Before commencing the Work, the Contractor shall furnish the Authority a certificate of insurance, and shall thereafter provide renewal certificates, as appropriate, evidencing such coverage written by a company or companies acceptable to the Authority. Each insurance certificate shall be endorsed to name the Greater New Haven Water Pollution Control Authority as an additional insured party and shall provide that the insurance company shall notify the Authority by certified mail at least thirty (30) days in advance of termination of or any change in the policy. No change shall be made without the prior written approval of the Authority Counsel.

To the maximum extent permitted by law, the Contractor expressly agrees to at all times indemnify, defend and save harmless the Greater New Haven Water Pollution Control Authority, the Engineer and their respective officers, agents and employees ("Indemnitees"), on account of any and all demands; claims; damages; losses; litigation; financial costs and expenses, including counsel fees; and compensation arising out of personal injuries (including death), any damage to property, real or personal, any economic loss and any other loss, expense or aggrievement directly or indirectly arising out of, related to or in connection with the Project and the Work to be performed hereunder by the Contractor, its employees, agents, subcontractors, material suppliers, or anyone directly or indirectly employed by any of them, subject only to the exception that this indemnification obligation excludes any liability arising out of bodily injury or property damage caused by the negligence of the Indemnitees, their employees and agents. The Contractor shall and does hereby assume and agree to pay for the defense of all such claims, demands, suits, proceedings and litigation. The provisions of this paragraph shall survive the expiration or early termination of this Contract and shall not be limited by reason of any insurance coverage.

The Contractor hereby assumes the entire responsibility and liability for all Work, supervision, labor and materials provided hereunder, whether or not erected in place, and for all plant, scaffolding, tools, equipment, supplies, and other things provided by Contractor until a final acceptance of the entirety of the Work by the Authority. In the event of any loss, damage or destruction thereof from any cause, the Contractor shall be liable therefor, and shall repair, re-build and make good such loss, damage or destruction at Contractor's cost and expense, subject only to the extent that any net proceeds are payable under any Builder's Risk property insurance that may be maintained by the Authority.

ARTICLE 24 SUBCONTRACTING

The Contractor shall not subcontract any portion of the Work to be performed hereunder unless the prior consent of the Authority is given for both the Work to be subcontracted and the subcontractor to perform the same.

The Authority shall be an express third party beneficiary of all subcontracts, purchase orders, and other agreements entered into between the Contractor and third parties with respect to the Project.

ARTICLE 25 GENERAL PROVISIONS

- A. This Contract shall be deemed binding only to the extent that money is available and appropriated to the Authority for payment in accordance with the terms hereof and no liability on account of this Contract shall be incurred by the Authority beyond such moneys as are properly made available and appropriated for the Project.
- B. The relationship of the Contractor to the Authority is that of an independent Contractor. The Contractor covenants and agrees that it will conduct itself consistent with such status; that it will neither hold itself nor any of its employees or agents out as nor claim to be an officer, agent, or employee of the Authority by reason hereof; and that it will not, neither for itself nor on behalf of any of its employees, agents, or subcontractors, by reason hereof, make any claim, demand or application to or for any right or privilege applicable to an officer or employee of the Authority, including, but not limited to, workers' compensation coverage, unemployment insurance benefits, social security coverage, or retirement membership or credit.
- C. The Contractor hereby certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal or state department or agency. Should the Contractor be unable to certify the above statement, it shall attach a certified statement explaining such to this Contract. The Contractor further agrees to include the foregoing certification in any subcontract or purchase order which it may enter into in furtherance of the Work contemplated hereunder.

- D. No member of the governing body of the Authority, and no other officer, employee, or agent of the Authority, shall have any personal interest, direct or indirect, in this Contract, except as permitted by the Code of Ethics of the Greater New Haven Water Pollution Control Authority; and the Contractor covenants that no person having such interest shall be employed in the performance of this Contract.
- E. This Contract shall be construed in accordance with the laws of the State of Connecticut, and any action at law in connection herewith shall be brought in a Connecticut state court in New Haven, Connecticut.
- F. The Contractor shall comply with all applicable laws, ordinances and codes of the State of Connecticut and the Greater New Haven Water Pollution Control Authority and of any municipality wherein the Work is to be performed, and shall commit no trespass on any private property in performing any of the Work embraced herein.
- G. This Contract incorporates all the understandings of the parties hereto, supersedes any and all agreements and negotiations reached and all commitments made by the parties prior to the execution of this Contract, whether oral or written, and shall not be released, amended or modified in any way unless by a written instrument signed by the parties hereto.
- H. If any provision of this Contract is held invalid, the balance of the provisions of this Contract shall not be affected thereby if the balance of the provisions of this Contract would then continue to conform to the requirements of applicable laws.
- I. Each and every provision and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though such provisions and clauses were included herein. If, through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon written consent of the parties, this Contract shall forthwith be physically amended to make such insertion.
- J. All notices of any nature referred to in this Contract shall be in writing and sent by registered or certified mail, postage prepaid, to the respective addresses set forth below or to such other addresses as the respective parties hereto may designate in writing:

To the Authority: **Executive Director
Greater New Haven
Water Pollution Control Authority
260 East Street
New Haven, Connecticut 06511**

To the Contractor: **Address**

- K. The Contractor expressly waives its right to notice of hearing under Connecticut

General Statutes §52-278a through §52-278q, inclusive, relative to prejudgment remedies, and agrees that the Authority may issue a writ for prejudgment remedy (attachment, foreign attachment, garnishment or replevin) by its attorney without securing a court order.

- L. The Contractor and its subcontractors shall not employ anyone to perform any portion of the Work whose employment may be objected to by the Engineer or the Authority. It is understood that contracts to be awarded by the Authority and labor will be employed on the Project without discrimination without as to whether employees, agents, suppliers or subcontractors of the Authority or any subcontractor including those that may be employed by the Contractor, are members or non-members of any labor or collective bargaining organization, and the Contractor accepts this Agreement with this understanding. There should be no manifestations on the Project of any dispute between any labor organization and the Contractor. The Contractor agrees to employ workers, agents, suppliers, and subcontractors who will perform the Work under this Agreement whether or not such employees and mechanics on the Project are members or non-members of any labor or collective bargaining organization. Should any workers perform any portion of the Work, engage in a strike or other work stoppage or cease to work due to picketing or a labor dispute of any kind, said circumstances shall be deemed a failure to perform the Work on the part of the Contractor subject to the conditions and terms set forth in Article 15 of the Agreement.
- M. The Contractor shall waive all claims against the Authority for consequential or special damages of any kind whether arising under a theory of breach of contract, tort, breach of warranty, or otherwise.
- N. In accordance with Section 108.04 of the General Provisions, Contractor shall not be entitled to any payment of costs, expenses or damages on account of delay on the Project.

[THE NEXT PAGE IS THE SIGNATURE PAGE]

IN WITNESS HEREOF, this agreement has been executed in four (4) counterparts by the Authority, acting by and through its Executive Director, who has caused the seal of their office to be affixed hereto, and the Contractor has duly executed this agreement on the day and year first above written.

Signed, Sealed and Delivered in the Presence of:

**Greater New Haven
Water Pollution Control Authority**

.....

By
(NAME)
Its Executive Director
Duly Authorized

(CONTRACTOR)

.....

By
(OFFICER) (POSITION)
Duly Authorized

(affix corporate seal of Contractor, if a corporation)

APPROVED AS TO FORM:

By:
Authority Counsel

**APPROVED AS TO
AVAILABILITY OF FUNDS:**

By:
Director of Finance & Administration

§ 102-22 **SAMPLE FORM OF CONDITIONAL PARTIAL RELEASE AND WAIVER OF LIENS**

CONDITIONAL PARTIAL RELEASE AND WAIVER OF LIENS

The undersigned, _____ (**"Releasing Party"**) located at _____, having performed or furnished, or having caused to be performed or furnished, labor, services or materials in the design, construction, alteration or improvement of that property of _____ (**"Authority"**) described as:

the "Project", which term includes the real property on which construction is taking place) hereby certifies that upon receipt of the Releasing Party of a check from, or credit to the Releasing Party's account of an electronic payment from the Authority in the amount of \$_____ (**"Payment"**), pursuant to a contract with Authority/Trade Contractor (**the "Contract"**), such Payment shall constitute all the monies due the Releasing Party for all labor, materials or services performed on or furnished to the Project up to and including the date of _____ [**date payment is made through**] (**referred to hereinafter as the "Release Date"**); except for claims for extra work in the amount of \$_____ as expressly identified below:

EXCEPTIONS:

[Itemize or Insert "None"]

The Authority has contracted with _____ to be engineer for the Project (**"Engineer"**).

[FOR TRADE-SUBCONTRACTORS] [Contractor], as principal and _____ as surety (**"Payment Bond Surety"**) have furnished a payment bond no. _____ (**"Payment Bond"**) to secure the payment of all labor, materials and services furnished on the Project.

Subject only to the receipt of the Payment and the Extras identified above, the Releasing Party, for itself and its successors, up through and including the Release Date, does hereby remise, release and forever discharge, the Authority, Payment Bond Surety, Engineer, [Contractor], Payment Bond Surety and their respective directors, officers, officials, employees, boards, committees, and agents, and the aforementioned successors, heirs, executors and administrators (**"Discharged Parties"**), of and from all manner of actions and actions, cause and causes of actions, suits, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, agreements, promises, variances, trespasses, damages, judgments, extents, executions, claims and demands whatsoever in law, in admiralty, or in equity which against the Discharged Parties or the Releasing Party ever had, now has, or which it or its successors hereafter can, shall or may have from the beginning of the world to the Release Date in connection with any and all claims on account of labor, material or services arising out of or relating to the Project.

Further, and subject only to the receipt of the Payment and the Extras identified above, the Releasing Party certifies, under oath, and in accordance with all applicable statutes, laws and regulations, that all lienors, including laborers, subcontractors or materialmen, have been paid in full up through the Release Date for all materials, equipment, fees, licenses, insurances and taxes of every description furnished for the Project and that there are no liens, causes for liens, rights to claim a lien, or claims against the Releasing Party for such items. The Releasing Party certifies that it will indemnify and save harmless the Discharged Parties from any and all manner of claims, liens, suits, losses, costs, expenses and damages, including, but not limited to, reasonable attorneys' fees arising out of or resulting from the furnishing of labor, material or services under the Contract referred to above, or any work performed or material supplied thereunder, and hereby releases forever all claim, title and interest in the Project and the Payment Bond for the same through the Release Date.

Further, and subject only to the receipt of the Payment and the Extras identified above, the Releasing Party for value received does hereby release and discharge the Project from any and all liens, claims of liens and rights to claim a lien, equitable or legal, and any claims against the Payment Bond, which the undersigned has or may have against the Project for labor, services or materials through the Release Date. Lien rights which the Releasing Party may acquire for labor, services or materials furnished subsequent to the Release Date are not released by this instrument.

Further, and subject only to the receipt of the Payment and the Extras identified above, the Releasing Party warrants that no assignment of claims for payments or rights to perfect a lien against the Project or claims against the Payment Bond have been made, and that the undersigned has the authority to execute this Conditional Partial Release and Waiver of Liens and has performed the labor and services supplied and the materials required of the Releasing Party to the state of completion of said improvements for which payment is being applied. The undersigned has personal knowledge that the statements made herein are true and correct.

Dated: _____, 20__.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ day of _____, 20__, by _____, as _____ of _____, a _____ corporation on behalf of the corporation. [He/She] is personally known to me or has produced _____ as identification and [did] [did not] take an oath.

My Commission Expires: _____

(Signature)

Name: _____

(Legibly Printed)

(AFFIX OFFICIAL SEAL)

Notary Public, State of _____

§ 102-23 **SAMPLE FORM OF FINAL RELEASE AND WAIVER OF LIENS**

FINAL RELEASE AND WAIVER OF LIENS

The undersigned, _____ (**"Releasing Party"**) located at _____, having performed or furnished, or having caused to be performed or furnished, labor, services or materials in the construction, alteration or improvement of that property of _____ (**"Authority"**) described as:

the "Project" which term includes the real property on which construction is taking place) acknowledges receipt of final payment in the amount of \$_____ pursuant to a contract (the "Contract") with the _____ (**"Owner"/"Contractor"**).

The Authority has contracted with _____ to be the engineer for the Project (**"Engineer"**).

[*FOR TRADE SUBCONTRACTORS*] The [*Contractor*], as principal, and _____, as surety, (**"Payment Bond Surety"**) have furnished a payment bond no. _____ (**"Payment Bond"**) to secure the payment of all labor, materials and services furnished on the Project.

The Releasing Party, for itself and its successors, does hereby remise, release and forever discharge Authority, Engineer, [*Contractor*], Payment Bond Surety and their respective directors, officers, officials, employees, boards, committees, and agents, and the aforementioned successors, heirs, executors and administrators (**"Discharged Parties"**), of and from all, and all manner of action and actions, cause and causes of actions, suits, debts, dues, sums of money, accounts, reckonings, bonds, bills, specialties, covenants, contracts, controversies, agreements, promises, variances, trespasses, damages, judgments, extents, executions, claims and demands whatsoever, in law, in admiralty, or in equity which against the said Discharged Parties the Releasing Party ever had, now has or which it or its successors hereinafter can, shall or may have in connection with any and all claims on account of labor, material or services arising out of or relating to the Project.

Further, the Releasing Party certifies, under oath, and in accordance with all applicable statutes, laws and regulations, that all lienors, including laborers, subcontractors or materialmen, have been paid in full for all materials, equipment, fees, licenses, insurances and taxes of every description furnished for the Project, and that there are no liens, causes for liens, rights to claim a lien, or claims against the Releasing Party for such items. The Releasing Party certifies that it will indemnify and save harmless the Discharged Parties from any and all manner of claims, liens, suits, losses, costs, expenses and damages, including, but not limited to, reasonable attorneys' fees arising out of or resulting from the furnishing of labor, material or services under the Contract referred to above, or any work performed or material supplied thereunder, and hereby releases forever all claim, title and interest in the Project for the same.

Further, the Releasing Party for value received does hereby release and discharge the Project from any and all liens, claims of lien and rights to claim a lien, equitable or legal, which the undersigned has or may have against the Project and, further, hereby releases and discharges any and all claims against the Payment Bond, for labor, services or materials furnished on the Project.

Further, the Releasing Party warrants that no assignment of claims for payments or rights to perfect a lien against the Project or claims against the Payment Bond, have been made, and that the undersigned has the authority to execute this Final Release and Waiver of Liens and has performed the labor and services supplied the materials required of the Releasing Party. The undersigned has personal knowledge that the

statements made herein are true and correct.

Dated: _____, 20__.

By: _____

Title: _____

STATE OF _____

COUNTY OF _____

The foregoing instrument was acknowledged before me this ____ day of _____, 20__, by _____, as _____ of _____, a _____ corporation on behalf of the corporation. [He/She] is personally known to me or has produced _____ as identification and [did] [did not] take an oath.

My Commission Expires: _____

(Signature)

Name: _____

(Legibly Printed)

(AFFIX OFFICIAL SEAL)

Notary Public, State of _____

SECTION 103

AWARD AND EXECUTION OF CONTRACT

§ 103-01 AWARD OF CONTRACT

Award of contract will be made only to the lowest responsible responsive Bidder as will best promote the public interest. The Greater New Haven Water Pollution Control Authority reserves the right to reject any or all proposals or any portion thereof, or, to award to other than the low Bidder, to waive minor informalities, to advertise for new proposals, or to proceed to do the Work otherwise, if, in its opinion, the best interests of the Authority will thereby be promoted. The Authority reserves the right to assess and determine the responsibility of each Bidder.

If requested by the Authority, the Bidder must present evidence of ownership; corporate structure; experience; ability; compliance with environmental, health and safety regulations; and financial standing; as well as a statement as to equipment.

§ 103-02 EXECUTION OF CONTRACT

The person or persons whose Proposal is accepted will be required to execute the written Contract provided by the Authority and to comply in all respects with the insurance coverage and bonding requirements relating to the Contract within ten (10) days of the date of the delivery of the Contract form by the Authority. In case of failure or refusal on the part of the Bidder to deliver the duly executed Contract to the Authority within the ten (10) day period herein mentioned, the amount of the Bid Deposit made will be forfeited to the Authority.

The Contractor agrees that they will conduct their operations in compliance with all the laws, and regulations of the United States, and the State of Connecticut. All costs due to compliance with the above described laws, regulations, and ordinances shall be included in the prices bid for Contract Items unless otherwise provided for in the Contract.

§ 103-03 RIGHT TO SUSPEND WORK AND CANCEL CONTRACT

If at any time during the prosecution of the Work the Engineer determines that the Work under the Contract is not being performed according to the Contract Documents or in the best interest of the Authority, the execution of the Work by the Contractor may be temporarily suspended by the Engineer, who may then proceed with the Work under its own direction in such manner as will accord with the Contract specifications and be for the best interests of the Authority; or they may terminate the Contractor's employment under the Contract while it is in progress, and thereupon proceed with the Work, in affirmance of the Contract, by a new contract negotiated or publicly let, by the use of its own forces, by calling upon the Surety to complete the Work in accordance with the Plans and specifications or by a combination of any such methods. If the cost of completing the Contract exceeds the price for which it was originally awarded, such costs shall be charged to and paid by the Contractor or their Surety. Whenever the Engineer determines

to suspend or stop work under the Contract, a written notice sent by mail to the Contractor at their address and to the Sureties at their respective addresses, shall be sufficient notice of its action.

§ 103-04 BONDS

The Contractor shall procure and maintain without any expense to the Authority and until final acceptance of the Work the following:

- A. FAITHFUL PERFORMANCE BOND. A bond in the form acceptable to the Authority with sufficient sureties, to ensure that the Contractor will perform the Work in accordance with the terms of the Contract and with the Plans and specifications, and that it will commence and complete the Work within the time prescribed in the Contract, and that it will provide against direct or indirect damages that shall be suffered or claimed on account of such construction or improvement, during the time thereof, and until the Contract is accepted.
- B. LABOR AND MATERIAL PAYMENT BOND. A bond in a form acceptable to the Authority guaranteeing prompt payment of all monies due all persons supplying the Contractor or a Subcontractor with labor or materials employed or used in carrying out the Contract. The bond shall inure to the benefit of the persons supplying such labor or materials.
- C. AMOUNT OF BONDS. The amounts of the Faithful Performance Bond and Labor and Material Payment Bond shall each be one hundred percent (100%) of the amount of the Contract price.
- D. All bonds shall be submitted to the office of the Authority Counsel for review at least five (5) days prior to the scheduled signing of a Contract. No Work on the Contract shall commence until such bonds have been properly completed and submitted.

§ 103-05 LIQUIDATED DAMAGES

Time is of the essence for the Project. The Contractor is expected to perform the Work within the time limitations set out in the Contract Documents, with due allowance being made for any extensions of time made in accordance with the provisions herein set out. In the event that the Contractor shall not so perform, it shall be liable to the Authority for liquidated damages in accordance with that specified in the Contract, for each Calendar Day that the Contractor is in default of completion. The Authority will deduct the liquidated damages from any amount due or that may become due to the Contractor, or to collect the liquidated damages from the Contractor or its Surety immediately upon demand.

SECTION 104 SCOPE OF WORK

§ 104-01 WORK REQUIRED

The Contractor shall be required to perform all Work enumerated under the different items of the Contract and to protect all adjoining property, all utilities and existing Roadway facilities within the Right-of-Way/Site and to repair or replace any such properties, utilities and facilities damaged or destroyed by them or their employees in performing the Work, both within and adjacent to the Right-of-Way/Site.

The Contractor's attention is directed to the fact that during the life of this Contract the owners and operators of Utilities may make changes in their facilities within the limits of or adjacent to this Contract which may be both temporary and permanent.

The Contractor shall be responsible for the coordination of the Work of their various Subcontractors. The Contractor shall be responsible for the acts and omissions of its Subcontractors. Their respective operations shall be arranged and conducted so that delays will be avoided. Where the Work of the Contractor, or Subcontractors, overlaps, or dovetails with that of other Contractors, materials shall be delivered and operations conducted so as to carry on the Work continuously in an efficient and workmanlike manner.

Delays or oversights on the part of the Contractor or Subcontractors or Utility owners in getting any or all of their Work properly done, thereby requiring the cutting, removing and replacing of Work already in place, shall not be the basis of a claim or request for extra compensation. Such Work will be performed at the cost and expense of the offending Contractor, Subcontractor or Utility owners.

§ 104-02 ALTERATIONS AND OMISSIONS

The Work shall be performed in accordance with the true intent and meaning of the Contract Documents without any further expense of any nature whatsoever to the Authority other than the consideration named therein.

The Authority reserves the right, at any time during the progress of the Work, to alter the Plans or omit any portion of the Work as it may deem reasonably necessary for the public interest. In such event, allowances will be made for additions and deductions in compensation at the prices named in the Proposal for this Work and shall not constitute grounds for any claim by the Contractor for damages, loss of anticipated profits, or for any variations between the approximate quantities and the quantities of the Work as done.

§ 104-03 CONTINGENCIES, EXTRA WORK, DEDUCTIONS

Whenever the Engineer determines that from any unforeseen cause the terms of any contract should be altered to provide for changes, contingencies or Extra Work, they may

issue an Order on Contract to the Contractor who shall forthwith proceed with the performance of the Work and the furnishing of the Materials and equipment necessary for its accomplishment in accordance with the pertinent specifications. No such Extra Work shall be commenced or undertaken until the Engineer has issued a signed, written Order on Contract.

No instruction or Extra Work, either written or verbal, shall be construed as an order for changes unless it is in the form of a written Order on Contract bearing the signed approval of the Engineer.

Payment for unforeseen Work shall be made as provided for in **§ 109-04 "EXTRA AND FORCE ACCOUNT WORK"**.

Pending resolution of any claim, dispute, change or other controversy, nothing shall excuse the Contractor from proceeding diligently with prosecution of the Work.

§ 104-04 CLOSING OF HIGHWAY

The legal closing of a roadway and/or street to public travel in the proper manner according to the requirements of the municipality wherein the Work is to be performed will be accomplished by the Contractor only with the approval of the municipality and the Engineer.

When a highway, roadway or street is legally closed and public travel diverted there from, adequate warning, danger and direction signs and lights shall be erected and maintained by the Contractor to properly and reasonably protect the public by day and by night. Suitable barricades shall also be erected at the ends of such closed sections of roadways and large signs displayed indicating such closure. All signs, barricades and other traffic control devices used shall conform to the Manual on Uniform Traffic Control Devices for Streets and Highways as approved and amended.

§ 104-05 RESTRICTED USE OF HIGHWAY

With the Award of this Contract, the Authority, in conjunction with the municipality, may if it is determined necessary place restrictions in the use of the particular section of roadway under construction.

The Contractor, with the approval of the municipality and the Engineer, will therefore cause signs indicating such restrictions to be placed at such points as necessary for the safe use of the roadway as restricted. The traveling public and the Contractor must observe and comply with these restrictions as posted, except that the Contractor may be allowed greater latitude with respect to size and weight of construction equipment. The size and weight of construction equipment used within the Contract limits will be limited to that which is suitable and practical for the operation at hand so as not to injure or cause damage to the Work that is being done or to that portion of the old Roadway that is to be retained as part of the completed Contract. The Engineer's determination shall control.

The Contractor may therefore utilize such equipment which does not exceed the legal weights outlined in the Vehicle and Traffic laws of the State of Connecticut without specific approval. Loads in excess of the legal weights will not be permitted on any structure, on any new pavements, or on any resurfacing contract, except as provided under **§ 105-12, "CONSTRUCTION EQUIPMENT"**.

§ 104-06 CLEANING UP

The Site shall be cleaned on a continuous, daily basis during performance of the Work and shall be neatly cleaned up upon completion according to the Engineer's directions, so that the Project Site shall be left in a neat and orderly condition.

Any salvaged material not specified to be disposed of otherwise, shall become the property of the Contractor and removed from the Site.

§ 104-07 METHODS AND EQUIPMENT

Where particular methods or equipment are specifically required in these specifications, the Contractor may apply in writing to the Engineer to use alternate methods and equipment to provide the same results. Such alternates may be used only after favorable recommendation by the Engineer and the written approval of the Authority. When, in the opinion of the Engineer, satisfactory results are not being obtained using the Contractor's alternate methods and equipment, the methods and/or equipment shall be immediately modified to produce satisfactory results in accordance with the requirements of the Authority.

SECTION 105 CONTROL OF THE WORK

§ 105-01 STOPPING WORK

The Engineer may stop by written order any Work or any part of the Work under the Contract if the methods or conditions are such that unsatisfactory Work might result, or if improper material or workmanship is being used.

§ 105-02 ORDERS TO FOREMEN

Whenever the Contractor or their superintendent is not present on any part of the Work where it may be desired to give directions, orders will be given by the Engineer or their representative and shall be received and obeyed by the person in charge of the particular Work for which the orders are given.

§ 105-03 ACCURACY OF PLANS AND SPECIFICATIONS

The detail Plans and specifications for the Contract have been prepared with care and are intended to show as clearly as is practicable the Work required to be done. The Contractor must realize, however, that construction details cannot always be accurately anticipated and that in executing the Work, field conditions may require reasonable modifications in the details of Plans and quantities of Work involved. Work under all items in the Contract must be carried out to meet these field conditions to the satisfaction of the Engineer and in accordance with their instructions and the Contract specifications.

The Contractor shall take no advantage of any apparent error or omission in the Plans or specifications. In the event the Contractor discovers an error or omission in the Plans or specifications, they shall immediately notify the Engineer in writing. The Engineer will then make corrections and interpretations as may be deemed necessary for fulfilling the intent of the Plans and specifications.

§ 105-04 CONFORMITY WITH PLANS AND SPECIFICATIONS

All Work performed and all Materials furnished shall be in Reasonably Close Conformity with the lines, grades, cross sections, dimensions and Material requirements, including tolerances, shown on the Plans or indicated in the specifications.

Plan dimensions and Contract specification values are to be considered as the target value to be strived for and complied with as the design value from which any deviations are allowed. It is the intent of the specifications that the Materials and workmanship shall be uniform in character and shall conform as nearly as realistically possible to the prescribed target value or to the middle portion of the tolerance range. The purpose of the tolerance range is to accommodate occasional minor variations from the median zone that are unavoidable for practical reasons. When a maximum or minimum value is specified, the production and processing of the Material and the performance of the Work shall be so

controlled that Material or Work will not be preponderantly of borderline quality or dimension.

In the event the Engineer finds the Materials or the finished product in which the Materials are used not within Reasonably Close Conformity with the Plans and specifications but that reasonably acceptable Work has been produced, they shall then make a determination if the Work is reasonably satisfactory and, on that basis shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modification which will provide for an appropriate adjustment in the Contract price for such Work or Materials as they deem necessary to conform to their determination based on engineering judgment.

In the event the Engineer finds that the Materials, the finished product in which the Materials are used, or the Work performed is not in Reasonably Close Conformity with the Plans and specifications and has resulted in an inferior or unsatisfactory product, the Work or Materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

§ 105-05 PROJECT RECORDS

The Contractor is required to keep their Project records in accordance with the standard procedures in force at the time the Project is started.

§ 105-06 INTERPRETATION OF PLANS

In case of any difference in the interpretation of the plans, specifications or maps, or between them, the matter must be immediately submitted to the Engineer, who shall adjust the same, and their decision shall be final and conclusive.

§ 105-07 TERMINATION FOR CONVENIENCE CLAUSE

The Authority may, by written notice, terminate the Contract or a portion thereof when the Contractor is prevented from proceeding with the Work as a direct result of an Executive Order of the President with respect to the prosecution of war or in the interest of national defense or by Executive Order of the Governor with respect to a major catastrophe.

In addition, the Authority may at any time and for any reason, with or without cause, terminate the Contract, or any portion thereof, by written notice specifying the termination date.

When contracts, or any portion thereof, are terminated before completion of all items of Work in the Contract, payment will be made for the actual number of units or items of Work completed at the Contract unit price, or as mutually agreed for items of Work partially completed. No claim for loss of anticipated profits shall be considered.

Reimbursement for organization of the Work (when not otherwise included in the Contract)

and moving equipment to and from the job will be considered where the volume of Work completed is too small to compensate the Contractor for these expenses under the Contract unit prices, the intent being that an equitable settlement will be made with the Contractor.

Acceptable Materials, obtained by the Contractor for the Work, that have been inspected, tested, and accepted by the Engineer, and that are not incorporated in the Work may, at the option of the Engineer, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the Engineer.

Termination of a contract or a portion thereof shall not relieve the Contractor of their responsibilities for the completed Work, nor shall it relieve their Surety of its obligation for and concerning any just claims arising out of the Work performed.

§ 105-08 COOPERATION BY THE CONTRACTOR

The Contractor shall give their constant personal attention to the Work while it is in progress or they shall place it in charge of a competent and reliable English speaking superintendent, who shall have authority to act for the Contractor and who shall be acceptable to the Engineer. The Contractor shall, at all times, employ labor and equipment which shall be sufficient to prosecute the several classes of Work to full completion in the manner and time specified. All workmen must have sufficient skill and experience to properly perform the Work assigned them. All workmen engaged on special or skilled Work shall have had sufficient experience in such Work to properly and satisfactorily perform it and operate the equipment involved. Any person employed by the Contractor whom the Engineer may deem incompetent or unfit to perform the Work shall be at once discharged, and shall not be again employed on a Authority Project. In case the Contractor disagrees with the Engineer regarding the discharge of such employees, the matter may be reviewed by the Authority, and its decision shall be accepted as final.

§ 105-09 WORK AFFECTING RAILROADS

All Work on any Project affecting a Railroad Company's property, right of way facilities shall be carried out under the joint supervision of the Authority and the Railroad Company in a manner satisfactory to both these agencies.

§ 105-10 STAKEOUT

The Contractor shall perform all layout work necessary for the satisfactory execution of the construction as shown on the Contract Drawings. The Contractor shall employ competent personnel and all Work shall be subject to the approval of the Engineer.

The Contractor shall be held responsible for the protection and safe guarding of all control points and bench marks set by the Engineer. Any replacement or re-establishment of control points or bench marks by the Engineer shall be at the expense of the Contractor.

When no price for **Item 985, "Project Survey and Stakeout"** is asked for on the Proposal Form, the cost of the Work as shown on the Contract Drawings shall be included in the cost of other Items and no direct payment for "Project Survey and Stakeout" will be made.

§ 105-11 REMOVAL OF UNSATISFACTORY WORK

Wherever or whenever the Engineer shall consider it necessary to remove any portion of the Work executed under this Contract for inspection or for any other purpose, no payment shall be made for such removal or for replacement of the Work to satisfactory condition in case such inspection shows that the Work was not constructed in accordance with the terms of the Contract; nor shall payment be made for the removal or replacement of any Work which may itself be satisfactory, but the removal of which is necessary for the replacement of unsatisfactory Work.

But if such inspection shows that the Work was constructed in accordance with the terms of the Contract, payment shall be made for the removal and replacement at fair and reasonable prices for the Work performed under an Order on Contract.

All Work shall be in a first-class and satisfactory condition at the time of the acceptance of the Contract and all materials shall be new.

§ 105-12 CONSTRUCTION EQUIPMENT

It is the intent of these specifications to permit the use of the most efficient equipment that is consistent with conditions at the time of use. It is, however, anticipated that seasonal or weather conditions combined with the nature of the terrain or character of the Site will often require the use of lighter and smaller equipment that might be used under optimum conditions.

Construction equipment exceeding the maximum axle loading allowable by Law shall not be operated on or across any segment of pavement or structure which is to be retained as part of the ultimate section without specific authorization in writing by the Engineer. This authorization shall indicate specifically the limits within which such equipment with over legal axle loads shall operate, frequency of such over loads and any other limiting factors consistent with conditions.

If the Engineer determines that the use of heavy equipment on portions of the Road Section other than pavement, on any part of or all of a Contract, is having or will result in detrimental effects on the finished Roadway they will so notify the Contractor in writing and shall indicate the maximum weight and/or axle load for any equipment that may be used for any specific operation or location.

§ 105-13 CONSTRUCTION EQUIPMENT IDENTIFICATION

All construction equipment used for compaction purposes shall be marked by means of an identification plate or other approved means indicating:

- A. Name.
- B. Model.
- C. Weight (Net and Ballast)
- D. Year of Manufacture.

This means of identification shall be permanently attached to the equipment, shall not be altered in any manner and shall be legible at all times.

§ 105-14 DISPUTED WORK

If the Contractor is of the opinion that any Work ordered to be done as Contract Work by the Engineer is Extra Work, and not Contract Work, or that any order of the Engineer violates the provisions of the Contract, the Contractor shall promptly notify the Authority and the Engineer in writing of their contentions with respect thereto, and the Authority shall make a finding thereon which shall be accepted by all parties as final. The Work shall, in the meantime, be progressed by the Contractor as required and ordered. During the progress of such disputed Work the Contractor and Engineer shall keep daily records and make reports of all labor, material and equipment used in connection with such Work and the cost thereof as specified in §109-04 "EXTRA AND FORCE ACCOUNT WORK".

If the Engineer determines that the Work in question is Contract Work, and not Extra Work, and that the order complained of is proper, they shall direct the Contractor to continue the disputed Work and the Contractor must promptly comply. The Contractor's right to file a claim for extra compensation or damages will not be affected in any way by their complying with the directions of the Engineer, provided the Contractor continues to keep and furnish the Engineer with Force Account Reports as specified in §109-04.

If the Engineer determines that such Work is Extra Work, and not Contract Work, or that the order complained of is not proper, then the Engineer shall have prepared, if necessary, an Order on Contract covering such Work. This will be done as soon after the determination as is practical. Adjustments in Contract Items or the addition of new items to the Contract necessitated by any such determination may be made up until the time the Final Agreement is submitted for payment provided that all the requirements of this subsection, "Disputed Work" and the section entitled **§ 104-03 "CONTINGENCIES, EXTRA WORK, DEDUCTIONS,"** are complied with.

In the event the Contractor fails to furnish force account reports, such failure shall constitute a waiver of any claim of payment for disputed Work other than for payment at Contract unit prices for the Work performed.

§ 105-15 CONTRACTOR'S RESPONSIBILITY FOR WORK

The Contractor is responsible for carrying out the provisions of the Contract at all times, regardless of whether an authorized Inspector is present or not. Any Work or item that is, at any time, found to be out of specifications or not in compliance with the Plans shall be subject to such corrective measures as are directed in writing by the Engineer.

SECTION 106 CONTROL OF MATERIALS

§ 106-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS

All Materials used in the Work shall meet the quality requirements described in the latest version of the State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Division III, Materials Section as amended unless the same are altered by specific notes shown upon the Plans, or in the Proposal. For the convenience of the Contractor and the Engineer, a copy of current Division III, Materials Section of Form 816 has been provided within these Standard Specifications. However, it shall be the responsibility of the Contractor to verify that all materials used in the Work meet the current quality requirements as amended.

It shall be the responsibility of the Contractor to advise the Engineer of the sources of proposed Materials sufficiently in advance of their use.

Immediately upon Award of the Contract, the Contractor shall furnish in writing to the Engineer the sources of supply, types of all items and kinds of Materials which they propose to use in the Work. No change shall be made in the sources of supply or kinds of Materials or in the type of any item except upon written approval by the Engineer.

§ 106-02 STORAGE OF MATERIALS

Materials shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored Materials, even though accepted before storage, shall be inspected prior to their use in the Work and shall meet the requirements of the Contract at the time of their use.

§ 106-03 CERTIFICATIONS

The Contractor shall furnish at its own expense and upon request of the Engineer a certified test report, materials certificate and certificate of compliance for all items and Materials incorporated into the Work.

These documents shall be forwarded to the Engineer; and in addition, a copy of the certified test report and materials certification shall be forwarded to the job Site.

Materials requiring such documentation may be conditionally incorporated in the Work prior to receipt of a certified test report and a materials certificate; however, payment for such incorporated Materials will not be made prior to receipt of the required documentation which shows that the Material meet the requirements of the specifications.

If the reports and certificates show the Material conditionally incorporated in the Work does not meet the requirements of the specifications, such Material shall be removed and replaced with Material which does meet the requirements, at no cost or expense to the Authority.

A certified test report is a document containing a list of the dimensional, chemical, metallurgical, electrical and physical results obtained from an actual test of the Materials involved, and shall certify that the Materials meet the requirements of the Plans and specifications, and shall also include the following information:

1. Item number and description of Material.
2. Date of Manufacture.
3. Date of Testing.
4. Name of organization to whom the Material is consigned.
5. Quantity of Material represented, such as batch, lot, group, etc.
6. Means of identifying the consignment, such as label, marking, lot number, etc.
7. Date and method of shipment.
8. Name of organization performing tests.

The certified test report shall be signed by an authorized and responsible agent for the organization manufacturing the Material, and it shall be notarized.

A material certificate is a document certifying that the materials, components and equipment furnished, conform to all requirements of the Plans and specifications. The document shall also include the following information:

1. Project to which the material is consigned.
2. Name of Contractor to whom material is supplied.
3. Item number and description of material.
4. Quantity of material represented by the certification.
5. Means of identifying the consignment, such as label, marking, lot number, etc.
6. Date and method of shipment.

The material certificate shall be signed by an authorized and responsible agent for the organization supplying the Material, and shall be notarized.

A certificate of compliance is a document certifying that the materials, components and equipment covered by the previously submitted certified test report and materials certificate, have been installed in the Work and that they conform to all the requirements of the Plans and specifications. The following information shall also be required on the document:

1. Project number.
2. Item number and description of material.

3. Quantity represented by the certificate.
4. Name of manufacturer.

The certificate of compliance shall be signed by an authorized and responsible agent for the Contractor, and shall be notarized.

§ 106-04 WARRANTIES, GUARANTEES AND INSTRUCTION SHEETS

Manufacturers' warranties and guarantees furnished for Materials used in the Work and instruction sheets and parts lists supplied with Materials shall be delivered to the Engineer prior to acceptance of the Work, and shall be written so as to provide to the Authority the benefit of their protections.

§ 106-05 EQUIVALENTS

The requirements for apparatus, articles, or materials shall be specified, if feasible, in generic terms which afford competition for equivalent products or items. When no generic specification can be found or devised, known acceptable trade names and approved equals shall be provided for the Contractor's benefit and to afford the desired competition. The Engineer shall be the judge of the qualifications of the products and will determine all questions regarding the conformance of any item with the specifications.

§ 106-06 DOMESTIC MATERIALS

Preference will be given to articles or materials manufactured or produced within the United States, conditions of quality and price with duty being equal. Unless otherwise stated in the Proposal or on the Plans, it will be understood that only domestic articles or materials will be used on the job.

§ 106-07 SHOP DRAWINGS

After checking and verifying all field measurements, the Contractor shall submit to the Engineer for review and approval, copies of all Shop Drawings, which shall have been identified, checked by and stamped with the approval of the Contractor as the Engineer may require. The data shown on the Shop Drawings shall be complete with respect to dimensions, design criteria, materials of construction and all other necessary data to enable the Engineer to review the information as required.

The Contractor shall also submit to the Engineer for review and approval with such promptness as to cause no delay in the Work, all samples required by the Specifications. All samples shall have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalogue numbers and the use for which intended.

At the time of each submission, the Contractor shall be responsible for notifying the Engineer in writing calling the Engineer's attention to all deviations that the Shop Drawings

or samples may have from the requirements of the Specifications.

The Engineer will review and approve with reasonable promptness Shop Drawings and samples, but the Engineer's review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto. The review and approval of a separate item as such shall not indicate approval of the assembly in which the item functions. The Contractor shall make all corrections required by the Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples for review and approval. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the Engineer on previous submittals. The Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to the Engineer that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalogue numbers, and similar data or assumes full responsibility for doing so, and that the Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the Work and the Specifications.

Where a Shop Drawing or sample is required by the Specifications, no related Work shall be commenced until the submittal has been reviewed and approved by the Engineer.

The Engineer's review and approval of Shop Drawings or samples shall not relieve the Contractor from responsibility for any deviations from the Specifications unless the Contractor has in writing called the Engineer's attention to such deviation at the time of submission and the Engineer has given written concurrence and approval to the specific deviation, nor shall any concurrence and approval by the Engineer relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or samples.

SECTION 107

LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

§ 107-01 LAWS, PERMITS AND LICENSES

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the Work.

§ 107-02 PATENTED DEVICES, MATERIALS AND PROCESSES

It is mutually understood and agreed that the Contract prices are to include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the Work. Whenever the Contractor is required or desires to use any design, device, material or process covered by letters, patent or copyright, the Contractor shall indemnify, defend and save harmless the Authority, its officers and employees from any and all claims for infringement by reason of the use of any such patented design, device, material or process, and shall indemnify the Authority for any costs, expenses and damages which it may be obliged to pay, by reason of any such infringement, at any time.

§ 107-03 CLEAN WATER FUND FINANCIAL PARTICIPATION

In all contracts in which the State of Connecticut, Department of Energy and Environmental Protection's participates financially, or which are designated as Clean Water Fund contracts, the Contractor shall conform in all respects in accordance with the true intent and meaning of each and all of the requirements contained in the "Required Construction Contract Provisions Under the Connecticut Department of Energy and Environmental Protection's Clean Water Fund," a copy of which will be incorporated in each Proposal for contracts so classified. When any of such Clean Water Fund Provisions are in conflict with any other provisions of the Contract Documents, the Clean Water Fund Provisions shall prevail and take precedence.

§ 107-04 SANITARY CODE

The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of their employees as may be necessary to comply with the requirements and regulations of the State and local Authority of Health and any other entity having jurisdiction over such matters.

§ 107-05 SAFETY AND HEALTH REQUIREMENTS

The Contractor shall conduct the Work at all times in such a manner as to insure the least possible obstruction to traffic. The convenience of the general public and of the residents along and adjacent to the roadway shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and Materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the Authority.

In addition to the requirements of the Maintenance and Protection of Traffic Item, the Contractor shall take all precautions necessary and reasonable for the protection of all persons, including employees of both the Contractor and the Authority and members of the public, and for protection of property until the Contractor is notified in writing of the satisfactory completion of the construction Work. The Authority makes no representation to the Contractor concerning the physical conditions or safety of the Project site and the Contractor shall be responsible for the safety of all persons and property affected by performance of the Work. Prior to the commencement of Work, the Contractor shall submit a written safety program for review by the Authority and Engineer. Review by the Authority and Engineer of the Contractor's safety program shall not be construed as an approval of the program or as a waiver of any indemnity or other obligation that the Contractor has to the Authority hereunder.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times. A copy of the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department" shall be made available by the Contractor for reference at all times in the Contractor's field office.

The Contractor shall furnish to the Engineer on project two copies of all report of each accident on the Project or contingent to the prosecution of the Project which involves personal injury requiring treatment by a doctor or loss of time. The Contractor shall also furnish to the Engineer two copies of all accident reports involving public liability or property damage. These reports shall be on forms acceptable to the Engineer.

The authority vested in the Engineer under **§ 105-01, "STOPPING WORK"**, is hereby extended to the effect that they may suspend the Work of the Contractor when the latter does not comply with the above-mentioned precautions or fails to provide adequate protection to allow for inspection of the Work without jeopardy to the safety of the Engineer or their authorized representatives.

Nothing herein shall be construed to relieve the Contractor from responsibility for the prosecution of the Work, nor the responsibility for damage claims as stated in **§ 107-08, "DAMAGE"**.

When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use the utmost care so as not to endanger life or property, including new Work, and shall comply fully with **§ 107-01, "LAWS, PERMITS AND LICENSES"**.

The Contractor shall schedule their Work in such a manner as to avoid the use of

explosives in close proximity to new or existing structures. The Contractor shall at all times take adequate protective measures and shall be responsible for any damage which may result from blasting operations.

The Contractor shall notify each public Utility company having structures in proximity to the Site of the Work, and others who may be affected, of their intention to use explosives; and such notice shall be given sufficiently in advance to enable the companies, the Contractor and others to take such steps as they deem necessary to protect utilities and property from possible injury. Such notice shall not relieve the Contractor of responsibility for any damage resulting from their blasting operation.

§ 107-06 INSURANCE

Before the Contract is executed and prior to commencement of Work thereunder, the Contractor will be required to take out and maintain at its sole cost and expense insurance of the types and amounts specified herein and to file with the Authority a certificate of insurance satisfactory to the Authority and in an acceptable form. The Contractor shall carry insurance at a minimum in accordance with the following requirements:

1. **WORKER'S COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE:** With respect to work that the Contractor performs and performed for the Contractor by subcontractors, the Contractor shall carry Worker's Compensation and Employer's Liability Insurance in the minimum amount of Five Hundred Thousand Dollars (\$500,000) each accident for bodily injury and Five Hundred Thousand Dollars (\$500,000) each employee for bodily injury by disease with a Five Hundred Thousand Dollar (\$500,000) policy limit by disease.

2. **COMMERCIAL GENERAL LIABILITY INSURANCE:** With respect to the Contractor's work and work performed for the Contractor by its subcontractors, the Contractor shall carry Commercial General Liability insurance on an ISO form CG 00 01 providing the following limits:

One Million Dollars (1,000,000) Each Occurrence
Two Million Dollars (2,000,000) General Aggregate – Applicable Per Project
Two Million Dollars (2,000,000) Products/Completed Operations Aggregate
One Million Dollars (1,000,000) Personal/Advertising Injury Per Person or Organization

The policy shall be written on an occurrence basis covering liability arising from premises, operations, independent contractors, product/completed operations, personal and advertising injury liability, and liability assumed under an insured contract. There shall be no modification limiting the scope of coverage for liability arising from explosion, collapse or underground hazards.

3. **BUSINESS AUTOMOBILE LIABILITY INSURANCE:** The operation of all motor vehicles, including those owned, hired, leased or borrowed and non-owned, used in

connection with the Work shall be covered by Automobile Liability insurance in the amount of not less than One Million Dollars (\$1,000,000) combined single limit each accident.

4. OWNER'S AND CONTRACTORS PROTECTIVE LIABILITY INSURANCE FOR AND IN THE NAME OF THE GREATER NEW HAVEN WATER POLLUTION CONTROL AUTHORITY: With respect to the Work the Contractor performs, the Contractor shall carry for and in behalf of the Authority:

Protective Liability insurance providing for a total limit of not less than One Million Dollars (\$1,000,000) each occurrence, One Million Dollars (\$1,000,000) in the aggregate.

Unless requested otherwise by the Authority, the Contractor and its insurer shall waive governmental immunity as defense and shall not use the defense of governmental immunity in the adjustment of claims or in the defense of any suit brought against the Authority, its officers or employees.

The Contractor shall assume and pay all costs and billings for premiums and audit charges earned and payable under the required insurance.

5. RAILROAD'S PROTECTIVE PUBLIC LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE: When the Project involves Work on, over or under the right of way of any railroad company, and whether or not such railroad has scheduled passenger service, the Contractor shall carry, with respect to the operations it performs and those for and in behalf of the railroad company, Railroad Protective Public Liability insurance providing for a limit as required by the Railroad Company.

6. UMBRELLA EXCESS LIABILITY INSURANCE: This policy is on a follow form basis in the minimum amount of Ten Million Dollars (\$10,000,000) excess of the Employer's Liability, Commercial General Liability and Business Automobile Liability coverages described herein.

7. EQUIPMENT AND INSTALLATION FLOATER: The Contractor shall provide an equipment and installation floater covering Contractor's tools and also materials not accepted by the Authority.

8. TERMINATION OR CHANGE OF INSURANCE: Each insurance policy shall be endorsed to provide that the insurance company shall notify the Authority by certified mail at least thirty (30) days in advance of termination or policy non-renewal.

The Contractor shall at its own expense, keep all the required insurance coverage in continuous effect until the date the Authority indicates the termination of the Contractor's responsibility. Such coverage shall be written on an "occurrence" basis and shall provide that the Commercial General Liability and Umbrella Liability coverages will be renewed for three (3) years after completion of the Work. This provision survives the termination of this contract.

9. **COMPENSATION:** The Contractor shall be fully responsible for all expenses to maintain the coverage required herein. There shall be no direct compensation allowed the Contractor on account of any premium or other charge necessary to take out and keep in effect all insurance or bonds, but the costs thereof shall be considered included in the general cost of the Work.
10. **DEDUCTIBLE/SIR CLAUSE:** Insurance contracts required under this section shall not contain a deductible or self-insured retention clause. In the event that such a deductible clause is an unavoidable part of any policy, the Contractor shall be responsible for payment of the full amount of such deductible or self-insured retention.
11. **ADDITIONAL INSURED:** All insurance policies, except for workers' compensation, shall be endorsed to include the Authority and its officers, directors, agents and employees as additional insureds (collectively "Indemnitees") covered for liability arising out of any ongoing and completed operations using additional insured endorsement being on a CG 20 10 and CG 20 37 or their equivalent.
12. **WAIVERS OF SUBROGATION:** All insurance policies shall contain express waivers by the insurance company of its right of subrogation against all Indemnitees.
13. **PRIMARY:** The Commercial General Liability policy and the Umbrella Liability policy shall be primary and non-contributory meaning each policy shall be amended to specifically state such insurance will be considered primary and will not seek contribution with respect to any and all other insurance that may be available to Authority and any other person required to be named as additional insured under this Contract.
14. **EVIDENCE:** This Contractor will furnish the Contractor's certificates of insurance, and copies of insurance policies, forms and endorsements as requested.

§ 107-07 PRESERVATION OF PROPERTY

It is the intent of this specification that the Contractor protect and preserve all public and private property including all existing vegetation, existing landscape features and monuments within, along and adjacent to the highway Right-of-Way. The Contractor shall use every precaution necessary and perform the Work as specified, in a manner approved by the Engineer, to prevent damage, injury, pollution or destruction; shall protect all trees and other woody plants which are to remain; shall take special care to protect the natural vegetation and surroundings including all natural drainage ways, ponds, lakes, wetlands, woods and fields; shall store materials in such a manner as to prevent leaching which would be injurious to soils and plants; shall repair all injuries to woody plants which are to remain by approved horticultural methods; and shall scarify and compact solid and re-grade as directed to restore the property to a natural condition.

The Contractor shall also use suitable precaution necessary to prevent damage to pipes, conduits and other underground structures, and protect carefully from disturbance or damage all land monuments and property marks until an authorized agent has witnessed

or otherwise referenced their location and shall not remove them until directed.

Where the soil over root area of trees to be preserved has been compacted, it shall be restored by proper cultivation as directed by the Engineer to a condition to permit the entrance of water and the proper aeration of roots.

The Contractor shall exercise care in its construction procedures in order to protect all trees and shrubs which are not directly and unavoidably in conflict with its excavations. Prior to the commencement of Work, the Engineer and the Contractor shall inspect the Site to determine the extent of clearing and grubbing and the specific locations in which tree protection is required.

§ 107-08 DAMAGE

All damage, direct or indirect, of whatever nature resulting from the performance of the Work or resulting to the Work during its progress from whatever cause, including omissions and supervisory acts of the Authority, shall be borne and sustained by the Contractor, and all Work shall be solely at its risk until it has been finally inspected and accepted by the Authority except that:

- A. Payment shall be made to the Contractor for the repair or replacement of the following completed permanent elements of the Roadway, for which the Contractor is responsible, and which may be damaged by public traffic other than that of the Contractor's:

Guide Rail, Guide Posts, Bridge Railing, Median Barrier, Curbs, Permanent Barricades, Fencing, Light Poles and Appurtenances, Delineators, Signs and Sign Structures, and Traffic Signal Equipment.

Work for which there is no bid item will be paid for at an agreed price or by means of force account. Payment will not be made for repair or replacement in any way connected with untimely failure of any portion of the highway under public traffic, and the determination regarding this matter shall be made by the Director, taking into consideration the normal life and the amount of normal wear of the element involved. This provision does not relieve the Contractor of the responsibility for maintenance and protection of traffic for the Project or of the responsibility of having a wholly complete and acceptable job at the time of final inspection and acceptance of the entire Project. Payment for such damage shall be made only after the Contractor has demonstrated to the satisfaction of the Director that the Contractor has made every reasonable effort to collect the costs from the person or persons responsible for the damage.

- B. The Contractor shall not be responsible for damages resulting from faulty designs as shown by the Plans and specifications nor the damages resulting from willful acts of Authority officials or employees and nothing in this paragraph or in this Contract shall create or give to third parties any claim or right of action against the

Contractor, the Authority beyond such as may legally exist irrespective of this paragraph or Contract.

The Contractor shall indemnify, defend and save harmless the Authority its agents, servants and employees from all suits, actions, damages and financial costs of every name and description resulting from the Work under this Contract and the Authority may retain such monies from the amount due the Contractor as may be necessary to satisfy any claim or potential for damages against the Authority. The Contractor's obligations under this paragraph shall not be deemed waived by the failure of the Authority to retain the whole or any part of such monies due the Contractor, nor shall such obligation be deemed limited or discharged by the enumeration or procurement of any insurance coverage for damages imposed by law upon the Contractor, Subcontractor or the Authority.

§ 107-09 RESTORATION

All areas outside of the right of way and those within the right of way but outside of the Work limits, except as noted in the following text, that is in anyway disturbed, used by, or serving as a source of Material for the Contractor, shall be restored to a pleasing and acceptable condition as specified and as satisfactory to the Engineer.

The Contractor shall obtain the written approval of the Engineer for the use of any specific area before any Work in such area is begun, except as noted in the following text. Where deemed necessary by the Engineer, the Contractor shall submit, as part of the request for approval, a grading plan. Such a plan shall not be given if, in the opinion of the Engineer, the area is not suited to acceptable restoration or if serious or permanent ecological damage is foreseeable. This specification applies to areas such as, but not limited to, borrow pits or areas, spoil or waste areas, haul roads, storage areas, batching areas, equipment storage areas, shop areas and all similar areas. These provisions do not apply to areas that have been or are being used by the Contractor as its established and permanent headquarters and equipment pool sites; or to commercial gravel pits, commercial quarries, public disposal areas; and all similar areas.

In general, the restoration shall include:

- A. The removal of all equipment and parts, junk, rubbish, excess materials and debris of all kind;
- B. Clean up as required, grading as shown, if a grading plan has been prepared; or grading so as to blend into the surrounding ground forms, to the satisfaction of the Engineer;
- C. Scarification of storage yards, batching sites, haul roads, etc., to the depth determined by the Engineer as necessary to support vegetation.
- D. The removal and re-grading of temporary roads or areas as required by the

Engineer.

- E. The repair or removal of damaged trees and the fertilizing, seeding and mulching of the areas as provided for in the Contract or as directed by the Engineer.

All of this restoration shall be accomplished prior to acceptance of the Contract except that Work of restoring Contractor's Work areas may be done after the official acceptance of the Project but must be completed prior to the final release of retained funds.

Since the extent of such area to be restored and the use and treatment during construction is within the discretion of the Contractor, within the limitations and requirements outlined, no payment will be made for any labor, material or equipment necessary for the restoration of these areas. The cost of the Work shall be included in the amount bid for other items of Work. Any Work done shall, in general, be in accordance with the Department's specifications for similar items of Work and/or as specified by the Engineer.

In the event the Contractor carries on any operation on the referenced areas without written approval of the Engineer no payment will be made for any item in the Contract involved in any way with any operation on the unapproved area.

§ 107-10 SOIL EROSION, WATER AND AIR POLLUTION ABATEMENT

The Contractor shall schedule and conduct its operations in such a way as to minimize erosion of soils and to prevent silting and muddying of streams, rivers, irrigation systems, impoundments, lakes, wetlands, reservoirs, etc. and lands adjacent to or affected by the Work. Construction of drainage facilities and performance of other Contract 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 practicable. The area of bare soil exposed at any one time by construction operations shall be kept to a minimum.

Whenever the Contractor's operations, carried out in accordance with the approved schedule, result in a situation where temporary erosion control measures not shown on the Plans, must be taken and these measures are approved or ordered by the Engineer, the Contractor shall conduct this Work in accordance with the provisions of **ITEM 210, "TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL."**

In carrying out erosion control measures, the Contractor will be guided by, controls which shall include but not be limited to the following:

- A. Frequent fording of live streams will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings are necessary. Unless otherwise approved in writing by the Engineer, mechanized equipment shall not be operated in live streams.
- B. When Work areas are located in or adjacent to live streams, such areas shall be separated from the main stream by a dike or other barrier to keep sediment from entering a flowing stream. Care shall be taken during the construction and removal

of such barriers to minimize the muddying of a stream.

- C. All waterways shall be cleared as soon as practicable of false work, piling, debris or other obstructions placed during construction operations and not part of the finished Work. Ditches which are filled or partly inoperative before the Contractor stops work for any day, and shall be maintained in a condition satisfactory to the Engineer for the duration of the Project.
- D. Water from aggregate washing or other operations containing sediment shall be treated by filtration, settling basin or other means sufficient to reduce the sediment content to not more than that of the stream into which it is discharged.
- E. Pollutants such as fuels, lubricants, bitumen, raw sewage and other harmful materials shall not be discharged into or near rivers, streams, wetlands and impoundments or into natural or man-made channels leading thereto. Wash water or waste from concrete mixing operations shall not be allowed to enter live streams.
- F. All applicable regulations of fish and wildlife agencies and statutes relating to the prevention and abatement of pollution shall be complied with in the performance of the Contract.

The Contractor shall at all times exercise every reasonable precaution to safeguard the air resources of the State by controlling or abating air pollution as set forth by the Authority of Environmental Protection's and Federal Clean Air Act regulations. These measures shall include the control and abatement of dust, fumes, mist, smoke, vapor, gas, aerosol, other particulate matter, odorous substances, or any combination thereof arising from the construction operations, hauling storage or manufacture of materials.

The Contractor shall take measures to control the noise intensity to comply with the prescribed ratings as set forth by the regulations of the Department of Environmental Protection, the Occupational Safety and Health Administration and any other agencies of the Municipality wherein the Work is to be performed, the Authority, State or Federal Government.

When it becomes necessary, the Engineer will inform the Contractor of unsatisfactory construction procedures and operations insofar as erosion control, water and air pollution are concerned. If the unsatisfactory construction procedures and operations are not corrected promptly, the Engineer may suspend the performance of any or all of other construction until the unsatisfactory condition has been corrected.

§ 107-11 FURNISHING RIGHT OF WAY

The Authority will secure all rights of way in advance of construction. Any exceptions will be indicated prior to the Award of the Contracts.

The Contractor shall not enter upon any parcel until the proper rights of entry have been

obtained.

If certain parcels of land within the Project area are being or are to be acquired by the Authority and until so acquired, the Contractor shall not enter upon or Work in or on said parcels of land until authorized in writing to do so by the Authority. Before commencing Work under this Contract, the Contractor shall ascertain from said Authority the location of said parcels of land and the status of such acquisitions.

The Contractor's proposed construction schedule shall be so arranged that the failure of the Authority to acquire such parcels shall in no way delay the start of construction under this Contract.

As the construction proceeds, if the Work need be suspended or delayed by reason of the aforesaid or by any act or omission of the Authority, or because the Authority does not own or has not obtained possession of or has not the right to enter upon land on which the Work is to be performed, or because of any act or omission of any employee or agent of the Authority or of any other Contractor performing Work for the Authority, and by reason of the foregoing the Contractor is not able to complete the Work under this Contract within the time specified, and is not at fault, an extension of time for completion will be granted by the Authority upon proper application for such extension by the Contractor to the Engineer in accordance with the provisions of the Contract relating thereto. None of the foregoing shall constitute a breach of the Contract on the part of the Authority.

No right to charges or claims for damages, or additional compensation, shall inure to or be made by the Contractor against the Authority or any other Contractor for any delays or hindrances for any cause whatever, during the progress of the Work or any portion thereof embraced in this Contract, such delays or hindrances will be compensated for by an extension of time as above provided.

The easement locations as shown on the Plans are for informational purposes only, the successful Bidder shall be supplied with the appropriate documents to adequately establish, stake and reference the easement limits concurrently with the construction stakeout survey.

§ 107-12 LABOR REQUIREMENTS

Pursuant to Connecticut General Statutes, §31-52, all contracts for the construction, remodeling or repairing of any public building are required by law to contain the following provisions:

“In the employment of labor to perform the Work specified herein, preference shall be given to citizens of the United States, who are, and continuously for at least three months prior to the date hereof have been, residents of the labor market areas, as established by the Labor Commissioner of the State of Connecticut, in which such work is to be done, and if no such qualified person is available, then to citizens who have continuously resided in the

county in which the work is to be performed for at least three months prior to the date hereof, and then to citizens of the state who have continuously resided in the state at least three months prior to the date of this contract.”

In no event shall these provisions be deemed to abrogate or supersede, in any manner, any provision regarding residency requirements contained in any collective bargaining agreement to which the Contractor is a party.

Pursuant to Connecticut General Statutes, §31-52a, the following provision shall be incorporated into this Contract and each subcontract hereunder insofar as this Contract or any such subcontract concerns a public works project, including, but not limited to, construction, remodeling or repairing of any public facility or structure except public buildings covered by §31-52, site preparation or site improvement, appurtenances or highways, or the preparation or improvement of any land or waterway on or in which a structure is situated or to be constructed are required by law to contain the following provision:

“In the employment of mechanics, laborers or workmen to perform the work specified herein, preference shall be given to residents of the State who are, and continuously for at least six (6) months prior to the date hereof have been, residents of this State, and if no such person is available then to residents of other states.”

Nothing herein shall abrogate or supersede any provision regarding residence requirements contained in any collective bargaining agreement to which the Contractor is a party.

The Contractor shall include the foregoing provisions in all subcontracts and sub-agreements entered into pursuant to this Contract or related to this Project.

Pursuant to Connecticut General Statutes, §31-53, the following provision shall be incorporated into each contract for work relating to new construction of a public works project where the total cost of all work to be performed in connection with such project is Four Hundred Thousand Dollars (\$400,000) or more, and each contract for work relating to the remodeling, refinishing, refurbishing, rehabilitation, alteration or repair of any public works project where the total cost of all work to be performed in connection with such project is One Hundred Thousand Dollars (\$100,000) or more:

“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 contribution paid or payable on behalf of each such employee to any employee welfare fund described in §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 in which such public works project is being constructed. Any Contractor who is not obligated by agreement to make a payment or contribution on behalf of such employees to any such employee welfare fund shall pay to

each employee as part of their wages the amount of payment or contribution for their classification on each pay day."

NOTE: Prevailing wage rates are fixed by the State Labor Commissioner.

The most recent wage rate schedule will be obtained and attached to the Contract.

In the event that the Authority determines that any mechanic, laborer or workman employed by the Contractor or any subcontractor directly on the Site for the work contemplated hereunder has been or is being paid a rate of wages less than that required to be paid, as stated herein, the Authority may, by written notice to the Contractor, terminate the Contractor's right to proceed with the work hereunder or such part of the work for which there has been a failure to pay the required wages. In the event of such termination, the Authority may prosecute the work to completion by contract or otherwise and the Contractor and its Sureties shall be liable to the Authority for all costs incurred thereby in excess of the compensation to be paid under this Contract.

§ 107-13 GUARDING AND PROTECTION

The Contractor shall be responsible for guarding and protecting open and unattended excavations and other potentially hazardous locations in and adjacent to area lawfully frequented by any person. Such guarding and protection shall consist of any one, or a combination of the following:

1. A substantial fence or barricade, not less than four (4) feet in height and mounted on satisfactory supports spaced at intervals of not more than ten (10) feet. Warning signs reading "DANGER-KEEP OUT" shall be mounted on the fence or barricade, as required by the Engineer, at no more than one hundred (100) foot intervals. The signs shall be 16"X24" with five (5) inch black letters on a white background. All fences, barricades and warning signs shall be furnished, erected, relocated, maintained and removed as required.
2. A forty-eight (48) inch extension of the trench sheeting above the ground surface adjacent to the excavation.
3. A substantial covering over the excavation. Where it is possible that vehicles will move over such covering, the covering shall be of sufficient strength to withstand the loading.

There will be no measurement for payment for this work; however, the cost of such guarding and protection shall be included in the other unit prices bid.

§ 107-14 NONDISCRIMINATION

The Contractor agrees and warrants that in the performance of the Contract it will not

discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the State of Connecticut, and that employees are treated when employed without regard to their sexual orientation.

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.

The Contractor agrees to comply with each provision of this section and §§46a-68e and 46a-68f of the general statutes and with each regulation or relevant order issued by said commission pursuant to §§46a-56, 46a-68e and 46a-68f of the general statutes.

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 §46a-56 of the general statutes.

The Contractor shall include the foregoing provisions in every subcontract or purchase order entered into in order to fulfill any obligation of this Contract and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission .

SECTION 108

PROSECUTION AND PROGRESS

§ 108-01 START AND PROGRESS OF WORK

After filing the necessary bonds and certificates of insurance with the Authority Counsel and before starting the Work the Contractor shall submit to the Engineer for review and outline of their proposed methods and manner of executing the Work including sequences of operation and a time schedule of performing the same. This time schedule will be consistent with the Project Schedule attached to the Agreement. If found satisfactory, the Engineer shall accept, and the Work shall be prosecuted in accordance with such schedules or approved amendments.

When requested by the Engineer, the Contractor shall furnish weekly work schedules indicating number of personnel, kind of equipment and location and nature of the Work to be performed.

§ 108-02 DATE OF COMPLETION AND CLOSING

All Work to be performed under the Contract shall be completed within the time stated in the Agreement for the Project or within such extended time for completion as may be granted by the Authority.

Whenever the Engineer shall deem it necessary that any portion or certain portions of the Work shall be progressed in any particular manner or that any such portion or portions of the Work shall be completed pursuant to a certain sequence or schedule and before the date of completion of the entire Contract, the Contractor shall punctually comply with the related instructions, dates and periods of time.

The extent of the Contractor's compliance with the provisions under this heading will be considered as relevant in any future determination of an award to him as the lowest responsible Bidder for any Project under the supervision of the Authority.

If, during the progress of the Work, it should become necessary because of lateness of the season, to stop the Work, then the Contractor shall open proper drainage ditches, erect temporary structures where necessary, prepare the Project so that there will be a minimum interference with traffic, set up and maintain a competent organization, as directed by the Engineer, to keep the Project in first class condition for traffic, and take every precaution to prevent any damage or unreasonable deterioration of the Work during the time it is closed.

§ 108-03 FAILURE TO COMPLETE WORK ON TIME

For each Calendar Day that any Work shall remain uncompleted after the date specified for the completion of the Work provided in the Contract, the amount per Calendar Day specified in **§102-16 "SPECIAL SPECIFICATIONS AND NOTES"** will be deducted from any money due the Contractor, not as a penalty but as liquidated damages; provided

however that due account shall be taken of any adjustment of the contract time for completion of the Work as provided for elsewhere in the specifications.

Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the Authority of any of the rights under the Contract.

The Engineer may waive such portions of the liquidated damages as may accrue if they deem the Work is in such condition as to be safe and convenient for use by the public, and that the Authority has suffered no damages or monetary loss due to the Contractor's actions or omissions.

The assessing of liquidated damages shall be in addition to Engineering Charges as provided for in **§ 102-13, "ENGINEERING CHARGES"**, of the specifications.

§ 108-04 EXTENSION OF TIME

Delays which affect the scheduled completion date of the Project and which were unforeseeable and beyond the control of the Contractor and any entity for which it is responsible, and which are attributable to interference between contractors and Utility owners, delays by railroad companies in progressing related Work, special requirements or actions by Authority, State and Federal agencies and other public bodies not anticipated in the Contract Documents, and unusually severe storms of extended duration or impact shall be compensated solely by the granting of an extension of time by the Authority complete the Work without engineering charges. Time necessary for reviews of Shop Drawings, for field changes to meet actual conditions, and delays incurred by seasonal and weather limitations should be anticipated and are neither compensatory nor eligible for extensions of time.

In no event will the Contractor be entitled to any increase in the Contract Sum, damages or additional compensation as a consequence of any delay, impact, disruption or acceleration resulting therefrom, regardless of the cause; the Contractor accepting an extension of time as granted in accordance with the preceding paragraph as its sole and exclusive remedy for such delay, impact, disruption or acceleration.

The Contractor agrees to include in its unit price bid for the various items of the Contract the additional cost of doing the Work under this Contract caused by not having a clear Site for the Work, by interference by other contractors and necessary Utility work and by the other non-compensatory delays described above and being required to open certain sections of the Work before the entire Work is completed.

§ 108-05 SUBLETTING OR ASSIGNING THE CONTRACT

The Contractor shall perform with their own organization Contract Work amounting to not less than fifty (50) percent of the original total Contract price, except that any items

designated by the Authority as "Specialty Items" so performed may be deducted from the original total Contract price before computing the amount of work required to be performed by the Contractor with their own organization.

- A. "Their own organization" shall be construed to include only workers employed and paid directly by the Contractor and equipment owned or rented by him, with or without operators. The cost of furnishing and supplying materials to a subcontractor for installation by the subcontractor shall not be considered as Work with "their own organization."
- B. "Specialty Items" shall be construed to be limited to Work that requires specialized knowledge, craftsmanship or equipment not ordinarily available in contracting organizations qualified to bid on the Contract as a whole and in general are to be limited to minor components of the overall Contract.

SECTION 109

MEASUREMENT AND PAYMENT

§ 109-01 ESTIMATES AND PAYMENT

As the Work progresses in accordance with the Contract and in a manner that is satisfactory to the Engineer, the Authority shall make payments to the Contractor, based upon the Proposal as follows: The Authority shall once in each month and on such days as it may fix, make an estimate of the quantity of Work done and of Material which has actually been put in place in accordance with the terms and conditions of the Contract, during the preceding month, and compute the value and pay to the Contractor ninety-five (95%) percent of the amount of the Work performed. The five (5%) percent retained percentage may be held by the Authority until Final Completion and acceptance of all Work covered by this Contract.

In computing amounts in estimates or Work done the unit prices will be used.

In making up the Final Estimate, the linear measurement made along the axis of the surface of the finished Work will be considered the length of the Work.

All estimates including the final will be made for actual quantities of Work performed and Materials placed in accordance with the requirements contained in the specifications, Contract Plans and Standard Sheets as determined by the measurements of the Engineer, and resulting quantities involving in any Contract shall be accepted as final, conclusive and binding upon the Contractor. For computations of earthwork to be paid for under the various items of the Contract, it is agreed that the planimeter shall be considered an instrument of precision, and quantities computed from areas obtained by its use shall be accepted by all parties hereto as accurate. Arithmetical computations, utilizing any type of computing device or machines including electronic computers, shall not be precluded by reference to the planimeter.

PAYMENT TO SUBCONTRACTORS: Within thirty (30) days after payment is made to the Contractor by the Authority, the Contractor shall pay any amount due any subcontractor, whether for labor performed or materials furnished, when the labor and materials have been included in a requisition submitted by the Contractor and paid by the Authority. The Contractor shall include in all 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 receives a payment from the Contractor which encompasses labor or materials furnished by such subcontractor.

§ 109-02 FINAL ADDITIONS OR DEDUCTIONS

Upon the completion of the required Work as shown in the Plans and specifications, should the Final Estimate of quantities show either an increase or decrease from the approximate estimate of quantities, then such variations will be computed at the unit prices bid and a Final Agreement will be made respectively adding or deducting this amount from

the gross sum bid.

§ 109-03 PAYMENTS ON CONTRACT

Payments to the Contractor for Work satisfactorily performed will be made monthly upon the percentage basis. No monthly estimate will be rendered unless the value of the Work done equals five (5%) percent of the Contract Amount or one thousand dollars, whichever is the lesser. Semi-monthly estimates may be rendered provided the value of the Work performed in a two week interval is in excess of fifty thousand dollars or if, in the opinion of the Engineer, it is to the best interests of the Authority to do so.

§ 109-04 EXTRA AND FORCE ACCOUNT WORK

CONTRACT ITEM CHARGES

When an Order on Contract provides for similar items of Work or Materials which increase or decrease the itemized quantity or scope of Work provided for in the original Contract Documents, the price to be paid therefore, shall not exceed the unit bid price for such items.

NEW ITEM CHARGES

1. Agreed Prices for new items of Work or Materials may be incorporated in the Order on Contract as the Engineer may deem them to be just and fair and beneficial to the Authority. These prices will be used in computing the Final Estimate.

Agreed prices must be supported by a complete price analysis in the Order on Contract. The analysis will be based on an estimated breakdown of charges listed in the following paragraph 2, "Force Account Charges," unless some other basis is approved by the Authority.

2. Force Account Charges
 - A. Contractor Charges - Where there are no applicable unit prices for Extra Work ordered and agreed prices cannot be readily established or substantiated, the Contractor shall be paid the actual and reasonable cost of the following:
 1. Necessary Materials including transportation to the Site. Material used, if acquired by direct purchase, must be covered by bills or acceptable invoices. All prices on used material incorporated in either temporary or permanent Work shall be billed at fair value, less than the original cost when new. A reasonable salvage credit shall be given for all salvageable material recovered. Salvage value of substantial material recovered must be determined jointly by the Contractor and the Engineer.

2. Necessary direct labor charges. Each class of labor shall be billed separately at actual payroll rates. Average rates based on different class or labor, will not be accepted.
3. Payments required to be made to labor organizations under existing labor agreements.
4. Equipment and Plant rentals, other than small tools:
 - a. Contractor owned Equipment and Plant. The base hourly rates for Contractor owned equipment and plant shall be the rates as listed in "Rental Rate Blue Book" as published by Dataquest Incorporated of San Jose, California currently on file in the Department at the time the Work is done.

The daily rate per hour shall apply when the equipment is specifically assigned to the Work by the Engineer for a period of seven (7) consecutive Calendar Days or less.

The weekly rate per hour shall apply when the assigned time exceeds seven (7) consecutive Calendar Days.

The monthly rate per hour shall apply when the assigned time exceeds 21 consecutive Calendar Days.

The number of hours to be paid for shall be the number of hours that the equipment or plant is actually used on a specified force account Job.

Equipment used by the Contractor shall be specifically described and be of suitable size and capacity required for the Work to be performed. In the event the Contractor elects to use equipment of a higher rental value than that suitable for the Work, payment will be made at the rate applicable to the suitable equipment. The equipment actually used and the suitable equipment paid for will be recorded as a part of the record for force account work. The Engineer shall determine the suitability of the equipment. If there is a differential in the rate of pay of the operator of oversize or higher rate equipment, the rate paid for the operator will likewise be that for the suitable equipment.

In the event that a rate is not established in the "Rental Rate Blue Book" for a particular piece of equipment or plant, the Engineer shall establish a rate for that piece of equipment or

plant that is consistent with its cost and use.

It is mutually understood that the base rates for all Contractor owned equipment shall include all incidental and maintenance costs except labor necessary to operate the equipment. In addition, the base rates shall include all costs, equipment and labor, of moving equipment or plant on to and away from the Work Site.

- b. Rented Equipment and Plant. In the event that the Contractor does not own a specific type of equipment and must obtain it by rental at a higher rate than provided for in the formulas noted above, they shall be paid the actual daily rental rate for the equipment for the time that the equipment is actually used to accomplish the Work, plus the cost of moving the equipment on to and away from the job.

- 5. Profit and Overhead. Profit and overhead costs shall be computed at fifteen percent (15%) of the following:

- a. Total Material Cost (Bare Cost - F.O.B.)
- b. Total Direct Labor Cost (Actual hours worked multiplied by regular hourly wage rate).

Overhead may be defined to include the following:

- a. Premium on Bond;
- b. Premium on Insurance required by the Authority other than Workmen's Compensation Insurance, Public liability and property damage insurance, unemployment insurance, Federal retirement benefits, other payroll taxes such reasonable charges that are paid by the Contractor pursuant to written agreement with their employees;
- c. All salary and expenses of executive officers, supervising officers or supervising employees;
- d. All clerical or stenographic employees;
- e. All charges for minor equipment, such as small tools, including shovels, picks, axes, saws, bars, sledges, lanterns, jacks, cables, pails, wrenches, etc. and other miscellaneous supplies and services;

- f. All drafting room accessories such as paper, tracing cloth, blue printing, etc.
- B. Subcontractor Charges - When the Work is performed by a subcontractor, the Contractor shall be paid the actual and reasonable cost of such subcontracted Work as outlined above in Items 1 through 5 under subsection A, the subcontractor maximum profit and overhead shall not exceed fifteen percent (15%). The Contractor Charges for profit and overhead on the subcontractor's work shall not exceed five percent (5%) unless some other basis is approved by the Engineer.
- C. Force Account Report - Payment for force account work will be made on the basis of the following reports.
 - 1. The Contractor will deliver to the Engineer a daily summary of FORCE ACCOUNT WORK done on the Contract. This summary, in a format provided by the Authority, will be delivered to the Engineer not later than closing time on the day following that for which the Work is reported.

The summary shall contain:

 - a. A list of materials used indicating the amount, and nature of each material. The cost (if known) should also be included. This must be later documented by proper receipts.
 - b. A list of equipment used indicating the number of hours used and kind, type and size of equipment.
 - c. A list of personnel by name, including the hours worked, and labor classification at which they were used on the force account work and the location by station or stations of the Work proposed.
 - d. A statement of the Work accomplished by force account for that day.
 - e. This summary will be dated and signed by the Contractor's authorized representative and the Inspector.
 - f. The Contract number and other identification as well as the name of the Contractor shall appear on the statement.
 - g. The Inspector will make any notation, remarks or comments on this form that may assist in final payments.

2. Within 5 Calendar Days after the end of each pay period the Contractor shall deliver to the Engineer a FORCE ACCOUNTS SUMMARY OF LABOR used on the Work which shall include the name, hourly rate of pay, hours worked, fringe benefits and/or items as shown on the actual payroll.
3. On completion of the specific force account work the Contractor shall within 10 Calendar Days, deliver to the Engineer, a FORCE ACCOUNT SUMMATION wherein all materials, equipment and labor charges are shown and totaled together with such other expenditures as are concerned with the Force Account Summation. This summation shall be dated and signed by the Contractor's authorized representative and the Inspector.

§ 109-05 PROGRESS PAYMENTS

Unless otherwise specified in the method of payment for a particular item, no payment will be made for an item of Work until its completion in accordance with Specifications.

§ 109-06 PAYMENT OF ESTIMATES

As the Work progresses in accordance with the Contract and in a manner that is satisfactory to the Engineer, the Authority shall once in each month and on such days as it may fix, make an estimate of the quantity of Work done and of Material which has actually been put in place in accordance with the terms and conditions of the Contract Documents, during the preceding month, and compute the value thereof and pay to the Contractor the monies due.

§ 109-07 NO ESTIMATE ON CONTRACTOR'S NON-COMPLIANCE

It is understood that so long as any lawful or proper direction concerning the Work or Material given by the Engineer, or their representative, shall remain uncomplied with, the Contractor shall not be entitled to have any estimate made for the purpose of payment, nor shall any estimate be rendered on account of Work done or Material furnished until such lawful or proper direction has been fully and satisfactorily complied with.

§ 109-08 FINAL ACCEPTANCE OF WORK

When in the opinion of the Engineer, the Contractor has fully performed the Work under the Contract, the Engineer shall recommend to the Authority the acceptance of the Work so completed. If the Authority accepts the recommendation of the Engineer, the Engineer shall thereupon notify the Contractor of such acceptance, and copies of such acceptance shall be sent to other interested parties.

§ 109-09 UNCOMPLETED WORK AGREEMENT

Whenever a Contract shall, in the judgment of the Authority, be substantially completed and the withholding of the retained percentage would be an injustice to the Contractor, the Authority may, provided that the Engineer certifies that the essential items in the Contract Documents have been completed in accordance with the terms of the Contract and the provisions of **§ 109-10, "FINAL AGREEMENT"** direct the Engineer to include in the final account such uncompleted items and pay therefore at the item prices in the Contract upon the Contractor's depositing with the Authority a certified check drawn upon a legally incorporated bank or trust company equal to at least double the value of such uncompleted Work. The deposit may be used by the Authority to complete the uncompleted portion of the Contract and shall be returned to the Contractor if the Contractor completes the uncompleted portions within a specified number of working days after they have been notified to proceed with the Work.

§ 109-10 FINAL AGREEMENT

The Final Agreement will not be drawn and finalized until all Work required under the Contract Documents has been satisfactorily completed and materials have been rendered, considered, and if agreed to, made a part of such Final Agreement. Work remaining to be accomplished under an uncompleted Work agreement, shall be considered as completed Work for the purpose of the Final Agreement.

§ 109-11 FINAL ESTIMATE

The Engineer will approve a Final Estimate for final payment based on the Final Agreement as prepared and approved by the Engineer, less previous payments and any and all deductions authorized to be made by the Authority under the Contract.

§ 109-12 FINAL PAYMENT

After the final acceptance of the Work, the Engineer shall prepare a Final Agreement of the Work done from actual measurements and computations relating to the same, and the Engineer shall compute the value of such Work under and according to the terms of the Contract. This agreement shall be certified to as to its correctness by the Inspector. Upon approval of such Final Agreement by the Engineer, it shall be submitted to the Authority for final approval. The right, however, is hereby reserved to the Authority to reject the whole or any portion of the Final Agreement, should the said certificate of the Inspector be found or known to be inconsistent with the terms of the agreement or otherwise improperly given. All certificates, upon which partial payments may have been made being merely estimates, shall be subject to correction in the final certificate or Final Agreement.

§ 109-13 ACCEPTANCE OF FINAL PAYMENT

The acceptance by the Contractor, or by anyone claiming by or through him, of final

payment shall constitute and operate as a release for the Authority from any and all claims of any liability to the Contractor for anything theretofore done or furnished for or relating to or arising out of the Work done thereunder, and for any prior act, neglect, default on the part of the Authority or any of its officers, agents, or employees unless the Contractor serves a detailed and verified statement of claim upon the Authority not later than forty (40) days after the mailing of such final payment. Such statement shall specify the items and details upon which the claim will be based and any such claim shall be limited to such items. Should the Contractor refuse to accept the final payment as tendered, it shall constitute a waiver of any right to interest thereon.

§ 109-14 CONTRACTOR'S COST RECORDS

The Contractor shall maintain records of all payrolls and of the details that comprise their total cost pursuant to any of the provisions under **§ 104-03, "CONTINGENCIES, EXTRA WORK, DEDUCTIONS,"** and the Contractor shall, at any time within 3 years following the date of acceptance of the Project, make such records available, upon request therefore, to the Authority for review and audit, if deemed necessary by the Authority. In case all or a part of such records are not made available, the Contractor understands and agrees that any items not supported by reason of such unavailability of the records shall be disallowed, or if payment therefore has already been made, the Contractor shall, upon demand in writing by the Authority, refund to the Authority the amount so disallowed.

§ 109-15 MAINTENANCE BOND

The Contractor shall secure a maintenance bond of a face value equal to twenty-five (25%) of the final Contract amount in a company approved by the Authority and in a form acceptable to the Authority guaranteeing their Work for a period of two (2) years from the date of final acceptance by the Authority. The Contractor shall leave the Work in perfect condition at completion and neither the final payment or agreement shall relieve the Contractor of the responsibility for negligence or faulty materials or workmanship within the extent and period provided herein, and upon written notice the Contractor shall remedy any defects due thereto and pay all expenses for any damage to other Work resulting therefrom.

The Contractor shall notify the Engineer in writing one (1) year after the acceptance of the job by the Authority. At that time the Contractor and Engineer will make a field inspection of the Project area, and the Contractor will correct any deficiencies that may exist.

The Contractor will notify the Engineer in writing sixty (60) days before the expiration of the maintenance bond and again the Engineer and Contractor will inspect the Project area for deficiencies.

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**Greater New Haven
Water Pollution Control Authority**

TECHNICAL SPECIFICATIONS

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NOTICE TO CONTRACTOR

STANDARD SPECIFICATIONS & SPECIAL SPECIFICATIONS

All work (and related appurtenant work) included in this Contract will be performed in accordance with the Greater New Haven Water Pollution Control Authority STANDARD SPECIFICATIONS contained herein, including the General Provisions and Technical Specifications,

The technical requirements of Division II (Construction Details) and Division III (Materials Section) of the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 817 (including the latest issue of addendums and supplemental specifications) shall be made a part of these contract documents by reference, unless otherwise specified in the Contract Documents. Specifications for additional or supplemental work not covered by the STANDARD SPECIFICATIONS, such as drainage structures, bituminous concrete, concrete for structures, pavement markings, turf establishment or other incidental construction, will be performed in accordance with Form 817 requirements.

Special provisions that may replace, modify, supplement or otherwise revise the STANDARD SPECIFICATIONS are presented in Section § 102-16 Special Specifications and Notes of the Contract Documents. Section § 102-16 should be reviewed by the Contractor for any supplemental specifications, additional specifications or special provisions that may alter, be in addition to, or supersede the requirements of the STANDARD SPECIFICATIONS.

Items not specifically identified for payment in the Schedule of Bid Items shall be assumed to be included in the work effort of, and payment for, other bid items that are identified and shall not be paid or requested for payment separately.

The Contractor selected to perform this project shall obtain the referenced documents and shall maintain a set of all contract documents, including the STANDARD SPECIFICATIONS and Form 817, on the job site throughout the duration of the Contract.

ITEM 201 CLEARING AND GRUBBING

DESCRIPTION:

This work shall consist of clearing, grubbing, removing and disposing of all trees, brush, stumps, fences, debris, and miscellaneous structures not covered under other contract items within the construction area and such other areas as specified or directed. The Contractor shall clear such additional areas within the limits of the right-of-way and easement lines as specified or directed. Included in this work shall be the protection, preservation from injury or defacement of vegetation and objects designated to remain.

CONSTRUCTION DETAILS:

Within the excavation lines all trees shall be cut off and stumps removed, unless ordered otherwise by the Engineer.

Within the fill lines where an embankment is to be made not more than five (5) feet in depth, trees, stumps, roots, etc., shall be removed. Where the embankments to be made exceed five (5) feet in depth, trees, stumps, roots, etc., shall be cut off to within six (6) inches of the ground surface.

The Contractor shall carefully prune all branches of trees less than sixteen (16) feet above any part of the site including selective trimming of such trees as directed and all branches which have been broken or injured during construction. Fresh scars and wounds shall be painted with approved tree paint.

Whenever trees are felled or trimmed on/or adjacent to travel way, all wood shall be immediately removed from the roadway or any area that would present a hazard to traffic. Grubbed stumps shall be moved immediately at least thirty (30) feet from the edge of pavement.

Trees removed from private property during construction shall be cut into firewood lengths and neatly piled adjacent to the site of removal or as directed by the property owner. Wood remaining after expiration of one week following removal or not required by the property owner shall become the property of the Contractor and properly disposed of off the project site.

All trees, stumps, etc., shall become the property of the Contractor and be removed from the project site and disposed of in a satisfactory manner. All rubbish and refuse shall be removed from the project limits. **NO BURNING** will be allowed on the contract site.

All excavations made below subgrade surface by the removal of trees, stumps, etc., shall be filled with suitable material, which shall be compacted thoroughly in accordance with the provisions governing the formation of embankments.

All fences, railings, stonewall fences and ornamental and utilitarian domestic accessories, such as but not limited to garden pools, arbors, fireplaces, sheds and incinerators, within the roadway limits shall be removed as directed. However, the removal of materials in

stonewalls, that are to be removed and not used in new stonewall fences; will be paid for according to the provisions of Item 202, Excavation and Embankment.

All road signs, mail boxes, etc., shall be removed, carefully stored and reset as directed.

MEASUREMENT:

When no price for "Clearing and Grubbing" is asked for on the proposal form, the cost of the work as described above shall be included in the cost of other Items and no direct payment for "Clearing and Grubbing" will be made.

When a price is asked for on the proposal form on a lump sum basis, this shall include all the work as described above which may be necessary to properly complete the project. Should the project be increased in length or the scope of work increased due to construction changes beyond the requirements hereinabove, any additional work required will be paid for as extra work. Should the project be decreased in length, a suitable credit mutually agreed upon and based on the reduction in actual work or scope may be taken by the Authority upon approval of written documentation by the Contractor.

The work, material, tools, equipment and labor incidental to the disposal of trees, stumps, etc., will not be measured for payment.

PAYMENT:

Payment for this work will be at the contract lump sum price bid for Item 201 - Clearing and Grubbing, except as noted above, and shall include all equipment, tools and labor incidental to the satisfactory completion of this Item. All costs incidental to the disposal of trees, stumps, etc., will be included in the unit price bid for "Clearing and Grubbing".

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
201	Clearing and Grubbing	Lump Sum

ITEM 202 EXCAVATION AND EMBANKMENT

DESCRIPTION:

Roadway excavation shall consist of the removal and satisfactory disposal, in the manner herein required, of all material taken from within the limits of the work contracted for, the removal of which is necessary for the construction of the roadway, subgrade, shoulders, slopes, entrances, retaining walls, gutters, channels, swales and other miscellaneous construction to the dimensions and limits shown on the plans or as ordered and shall include the necessary excavation for pervious structure backfill outside of structure excavation limits. It shall also include the formation of embankments, the disposal of surplus or unsuitable material, removal of old foundations, concrete or masonry walls, crib walls, bin walls, stone wall fences or farm wall fences and filling of cellar or other holes, and the shaping and cleaning of slopes and of shoulders.

CLASSIFICATION:

Roadway excavation shall be classified for the purpose of payment as "Earth Excavation", "Rock Excavation", or "Unclassified Excavation", in accordance with the following definitions. The classifications applying to any particular project shall be indicated on the list of Items within the bid proposal.

Earth Excavation shall include the removal from existing grade to subgrade as indicated on the Contract Drawings or directed, or all earth, muck, so-called hardpan, loose, disintegrated or decomposed ledge rock, concrete sidewalks, concrete curb, topsoil, sod, pavement (except pavement included under the Items "Rock Excavation"). Earth Excavation includes similar materials which are sufficiently soft to permit removal by normal earth excavation machinery and methods, or which can be loosened by the use of a suitable "ripper". A suitable "ripper" is defined as a hydraulically-controlled steel tooth mounted on mechanical equipment of the proper size, type and power to perform the required excavation. Earth Excavation shall not include water or "Rock Excavation". Earth excavation shall also include the removal of topsoil, as directed, from embankment areas.

Rock Excavation shall include rock in definite ledge formation, severed or fragmented rock and boulders or the portions thereof, one (1) cubic yard, or more, in volume, that cannot be removed by means of a "ripper" as previously defined herein, in good condition and properly operated, without continuous drilling, blasting, barring and/or wedging. It shall also include the removal of concrete and cement masonry structures as may be required. It shall further include concrete pavement and concrete base (excluding any bituminous surfacing material thereon) or over (1) cubic yard in volume. Un-reinforced, fractured concrete pavement with individual sections less than one (1) cubic yard in volume will not be paid for as Rock Excavation.

Excavation of temporary watercourses for stream diversion as required for construction under this contract will not be measured for payment unless specifically indicated on the Contract Drawings or elsewhere within the Contract Documents.

Unclassified Excavation shall include any and all “Earth” and “Rock” as classified herein removed as indicated or directed. When only the Item for “Unclassified Excavation” appears on the proposal form, payment will be made under this Item only; and no compensation will be made under any of the other classifications given hereinabove.

Embankment shall include the construction of embankments with suitable materials obtained from the various proposal items of excavation. The cost of embankment construction shall be included in the unit prices bid for the Excavation Items.

When the amount of usable material excavated within the work contracted for is not sufficient to form the embankments, additional material shall be furnished from borrow/selected borrow pits obtained by and at the expense of the Contractor and located beyond the limits of the project. Prior to utilization of Item 207, Borrow/Selected Borrow by the Contractor, written authorization must be obtained from the Engineer.

CONSTRUCTION DETAILS:

Excavation shall be made in conformity with the requirements of the plans and as ordered by the Engineer. The Contractor shall, when necessary in excavation areas, provide and maintain ditches which are adequate to prevent free water from becoming incorporated in material to be used to form embankments, such ditching to be at the sole expense of the Contractor. Where buildings have been removed to clear the way for construction or where old foundations, concrete or masonry walls exist, they shall be removed to four (4) feet below the directed or finished grading; and all cellar and other holes shall be filled with suitable material.

1. **Sod and other organic matter** shall be used as “Surplus Excavated Material” or disposed of as “Unsuitable Material” at the discretion of and as directed by the Engineer.
2. **Frozen material**, otherwise suitable for formation of embankments, shall be placed on embankment slopes or disposed of as directed by the Engineer. The Engineer may direct the removal of any portion of an accepted layer which has become frozen after placement and compaction. This frozen material shall be placed on embankment slopes or disposed of as directed by the Engineer. The removal and placement of frozen material shall be at the sole expense of the Contractor.
3. **Topsoil** shall be excavated within pavement and shoulder limits at grade points and to an elevation 3 feet below finish grade and elsewhere as directed. The material excavated may be used in the construction of embankments, if permitted by the Engineer, and shall be thus used if the Engineer so directs. In all cases, the use of topsoil in constructing embankments shall be restricted to locations where the surface of the underlying material is dry, its distance above the free water surface at the time of filling is more than 3 feet, and its distance below finish pavement grade is more than 5 feet.
4. **Excavation of Rock:** When bedrock is encountered, it shall be excavated to the slope lines and depth indicated on the plans. When rock is encountered within the roadway area it shall be removed to a depth of one foot below the top of subgrade. The

Contractor shall presplit bedrock, and all presplitting, hole drilling and blasting shall be performed strictly in accordance with the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 817.

The Contractor shall schedule its operations so that all rock excavation within a distance one hundred feet (100') of bridge or other large structures, or any portions thereof, is completed to the required slope lines and depths before any structure work is started.

All loose and unstable material even if located beyond the payment lines, and all breakage and slices shall be removed as directed and as the excavation for each vertical stage (lift) progress. It shall be, at all times, the responsibility of the Contractor to perform all phases of this work to produce the required rock slope faces to the satisfaction of the Engineer.

Prior to any blasting, the Engineer will call a blasting conference at which the Contractor shall be represented to determine the methods to be used and the required protection to insure the utmost safety during blasting operations. The Contractor shall be responsible for all damage due either directly or indirectly to such operation.

5. Placement of Embankment Material: All excavated material shall be used in the formation of embankments, except as provided elsewhere herein or as ordered by the Engineer.

Rock removed from within the roadway area shall be replaced with suitable excavated material, approved by the Engineer, to the subgrade elevation.

When embankments are to be constructed on slopes steeper than 1 vertical to 3 horizontal, the slope of the existing ground on which the embankment is to be placed shall be plowed deeply or cut into steps before filling is begun.

Embankments shall be constructed of earth, rock, or a mixture of earth and rock. The embankment shall be constructed by depositing successive layers of fill for the full width of the embankment, unless a partial width is permitted by the contract documents or by the Engineer. No embankment layer shall be deposited on surfaces of snow or ice, nor shall it be placed on frozen or unstable surfaces except under the conditions permitted elsewhere herein. If the Contractor is permitted to continue work, any frozen embankment material unless otherwise directed by the Engineer shall be removed, at no cost to the Authority.

The depth of each layer, before compaction, shall not exceed 12 inches except as permitted hereinafter by these specifications, or with the permission of the Engineer.

The embankment shall be crowned or pitched to provide drainage at the close of each day's operations.

Where filling in 12-inch layers is impracticable as in the case of filling in water over slopes too steep for the operation of equipment, the embankment may be constructed in one layer to the minimum elevation at which equipment can be operated, as determined by the

Engineer; and above this elevation, the embankment shall be constructed as specified herein.

Embankments to an elevation 3 feet above the free water surface at the time of filling, shall be constructed of rock or free-draining material, or a mixture of both. Free-draining material shall conform to the requirements of Form 817 Article M.02.07.

In fills where the top of the proposed pavement will be less than 4 feet above an existing flexible pavement, and the existing pavement is not required to be removed, it shall be scarified as directed by the Engineer.

In fills where the top of the proposed pavement will be less than 3 feet above an existing concrete pavement, including all bituminous resurfacing thereon, the concrete pavement shall be removed.

In fills where the top of the proposed pavement will be between 3 and 4 feet above an existing concrete pavement, the concrete pavement shall be broken in such a manner that complete fractures are obtained. Intact fragments, undamaged after breaking, shall not be larger than 2 square feet.

When existing pavement not in cut or fill is removed, as called for on the plans or directed, the area shall be backfilled with a suitable earth material which shall be free from admixture of subsoil, refuse, stumps, roots, rocks, brush, weeds and other material which will prevent the formation of a suitable seed bed.

Wherever portions of existing concrete pavement are to be removed and later replaced in kind so as to match the adjacent remaining portions of such installations, such removals shall be made to neat lines. The areas in which such concrete surfaces are to be removed will be delineated by the Engineer before such work is done. Where no break or joint exists in the concrete pavement at the line of delineation, a kerf, at least two but no more than three inches deep, shall be made in the concrete with an approved concrete cutting saw. The concrete shall then be removed from within the delineated area exercising extreme care to avoid "breakbacks" beyond the kerf, break or joint. Concrete pavement remaining in place shall have vertical edges, and that portion below the kerf shall be reasonably smooth.

Wherever portions of existing bituminous concrete pavement are to be removed they shall be removed to neat lines. The areas in which such bituminous concrete surfaces are to be removed will be delineated on the plans or by the Engineer before the work is done. The line of delineation shall be cut by a method approved by the Engineer.

When the excavated material consists predominantly of rock fragments of such size that material cannot be placed in horizontal layers of the thickness specified above without crushing or further breaking down the pieces resulting from the excavation methods, such material may be placed in the embankments in horizontal layers not exceeding 3 feet in thickness. Large stones shall not be placed in nests but shall be distributed over the area; and the interstices shall be filled with spalls, finer fragments or earth to form a solid, compact mass.

The entire area of each layer shall be leveled off by suitable grading equipment and shall be compacted as hereinafter specified.

In portions of roadway embankments where piles are to be driven, the Contractor shall not place any material which might interfere with pile driving operations. The correction of any condition which interferes with the pile driving operations in embankments constructed under the contract shall be made by the Contractor at no cost to the Authority.

No stone over 5 inches in its greatest dimension shall be placed within 12 inches of the elevation of the top of the prepared subbase unless otherwise specifically authorized.

6. Compaction: The entire area of each layer of the embankment and the subgrade in the excavated areas shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.

The dry density after compaction shall not be less than 95 percent of the dry density for the soil when tested in accordance with AASHTO T 180, Method D. Each layer of the embankment and the subgrade shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

7. Stability: If after full compliance with the requirements of these specifications with regard to excavation, placement and compaction density requirements, a stable embankment or subgrade has not been obtained, the Contractor shall proceed to perform such corrective work as is necessary to produce a stable embankment or subgrade. This work may include, but not necessarily be limited to control of moisture to within limits suitable for obtaining the required stability; blending with rock or granular material from roadway excavation or borrow, or free draining material or any combination thereof; removal and replacement with acceptably compacted material or a combination of these methods approved by the Engineer. Any of the foregoing methods may be supplemented by suspending embankment operations and allowing the material to dry.

When embankments are constructed of borrow, they shall be stable. In this case however, the methods and material used to obtain such stability shall be determined by and performed at the expense of the Contractor.

8. Surplus Excavated Material: All surplus excavated material shall be used where directed by the Engineer, to uniformly widen embankments, to flatten slopes, to fill low places in the right of way, or for such other purposes, including transportation as the Engineer may direct, provided the area designated for deposit does not conflict with the requirements hereinbefore specified for "Placement of Embankment Material".

Any surplus or unsuitable material not required, nor permitted to be used for such purposes, shall be disposed of in accordance with the requirements hereinafter specified for "Disposal of Unsuitable Material".

9. Fences: The Contractor shall erect either the permanent or a temporary fence to the satisfaction of the Engineer, at all points where the public is inconvenienced and where the existing fences are affected by the grading operation. Permanent or temporary fences shall be erected prior to the removal or destruction of any part of the existing fence, and any temporary fence erected shall be removed when no longer required. There will be no direct payment for any temporary fence erected, but the cost thereof shall be considered as included in the cost of other work; permanent fences will be paid for at the contract unit price for this item.

10. Disposal of Unsuitable Material: The Contractor shall dispose of trees, stumps, logs, woody vegetation and unsuitable excavated material by removing such material from within the limits of the project and disposing of such material at point or points as the Contractor shall determine off the project, subject to the approval of the Engineer.

11. Slopes: Earth slopes with a degree of slope from 2:1 to 5:1 shall be tracked unless the Engineer directs that they shall not be tracked. Tracking shall consist of traversing the slopes with cleated tracks so that the cleat indentations are horizontal. Where topsoil is to be placed on slopes, the tracking shall be done prior to the installation of the topsoil.

Tracking is not to be construed to be used for slope compaction. Its sole purpose is to provide indentations in the slope to help reduce soil erosion. Other methods of achieving the desired results may be used, with permission of the Engineer.

12. Pavement Removal: Pavement to be removed shall be cut uniformly along the lines shown on the Contract Drawings or as directed by the Engineer.

Concrete pavement and/or bases shall be cut with an approved concrete saw through a minimum of one third of the depth of pavement/base.

Bituminous pavement/base to be removed shall be cut by pneumatic hammer with a clay spade, saw or other approved methods.

After the pavement has been cut, care shall be exercised by the Contractor during breaking and removal of the pavement in order that the adjacent pavement outside the cut will not be damaged.

The Contractor shall remove the excavated pavement from the site and dispose of it at a disposal area supplied by the Contractor at no additional cost to the Authority; or the Engineer may direct the Contractor to incorporate this material in other parts of the work.

No sections or pieces of pavement shall be used for trench backfill and all such material shall be kept separate from other excavated materials.

No measurements or separate payment will be made for the work under this section; the costs shall be included in the unit price bid per cubic yard for Item 202.01, Excavation and Embankment – Earth.

MEASUREMENT:

Payment lines for earth excavation shall coincide with the slope and subgrade lines or the top of the payment lines for ditch excavation, whichever applies, as shown on the plans or as ordered.

Also measured for payment shall be the volume of earth moved in cutting or plowing of steps on steep slopes, as hereinbefore described, and the removal of existing flexible pavement where shown on the plans or ordered by the Engineer.

Payment lines for rock excavation, where presplitting bedrock is required by these specifications, will extend to the slope and depth line shown on the plans or as directed, to include only the rock actually removed within this limit.

Payment lines for rock excavation, where presplitting bedrock is **not** required by these specifications, shall coincide with the depth shown on the plans or to the depth directed and payment lines for the slopes will be extended to a limit of one foot (1') outside of and parallel to the slope lines shown on the plans, or as directed, to include rock actually removed within this limit

Presplitting of bedrock performed in accordance with these specifications will not be measured for payment.

Where removal of rock is necessary for reason of safety or due to conditions clearly not attributable to the Contractor's methods of operation, the payment lines for rock excavation where presplitting is required will be fixed to coincide with limits ordered by the Engineer.

Concrete and masonry foundation walls, or portions thereof, to be removed will be measured for payment by the volume in cubic yards, in place, before removal. Existing concrete pavement and concrete base over five (5) square yards, including any bituminous surfacing material immediately thereon, shall be measured in place before removal.

Existing concrete and cement masonry structures over one (1) cubic yard, shall be measured in place before removal. Payment lines for unclassified excavation shall be the same as those outlined above for the type of material encountered.

When rock is encountered, and its removal is to be paid for as "Rock Excavation" the Contractor shall strip or expose the rock to such an extent that in the Engineer's opinion the necessary measurements can be taken. The Contractor shall notify the Engineer at least 2 days prior to distributing any of the rock to allow ample time to obtain the necessary measurements. If the Contractor shall fail to give such notice, or remove any rock prior to the taking of the measurements, the Engineer shall presume that measurements taken at the time they first see the material in question will give a true quantity of excavation.

The amount of excavation will be determined by the method of average end areas.

The work of scarifying existing pavement will not be measured for payment, but the cost shall be considered as included in the general cost of the contract.

The cutting of bituminous concrete pavement will not be measured for payment.

The work, materials, tools, equipment and labor incidental to the disposal of unsuitable excavated material or breaking concrete pavement will not be measured for payment.

PAYMENT:

Roadway excavation will be paid for at the contract unit price per cubic yard for "Earth Excavation", "Rock Excavation", or "Unclassified Excavation", as the case may be, in accordance with the classification given herein and subject to the method of measurement described above. The price shall include all equipment, tools and labor incidental to the completion of the excavation, the formation and compaction of embankment, and the disposal of surplus or unsuitable material in accordance with the provisions of the plans and of these specifications. No direct payment will be made for the formation of embankments under this item.

When the amount of usable material excavated within the work contracted for is not sufficient to form the embankments, additional material shall be furnished by the Contractor from borrow/selected borrow pits obtained by and at the expense of the Contractor and located beyond the limits of the project. Payment will be made for at the contract unit price bid per cubic yard for Item 207, Borrow/Selected Borrow.

The removal of concrete or cement masonry structures over one cubic yard, other than retaining walls or bridge structures, will be paid for at the contract unit price per cubic yard for "Rock Excavation" or "Unclassified Excavation", as the case may be.

The removal of drainage structures outside of the limits of Roadway and Structure Excavation will be paid for under the "Trench Excavation" Items.

Concrete and masonry foundation walls or portions thereof ordered removed will be paid for at the contract unit price per cubic yard for "Rock Excavation" or "Unclassified Excavation", as the case may be.

The removal of crib walls, bin walls, stone wall fences or farm wall fences will be paid for as Earth Excavation.

The removal of all pavement or pavement bases will be paid for at the contract unit price per cubic yard for "Earth Excavation" unless specified otherwise, or "Unclassified Excavation", as the case may be.

All costs incidental to the disposal of unsuitable excavated material will be included in the price for "Earth Excavation".

All costs incidental to breaking concrete pavement will be considered as being included in the general cost of the contract.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
202.01	Earth Excavation	Cubic Yard
202.02	Rock Excavation	Cubic Yard
202.03	Unclassified Excavation	Cubic Yard

ITEM 205 TRENCH EXCAVATION AND BACKFILL

DESCRIPTION:

The Work under this section consists of the removal and satisfactory disposal of all materials, including the disposal of all surplus or unsuitable material, dewatering, temporary stream or groundwater diversion, backfilling and compaction necessary for the proper completion of the Work in the locations and to the dimensions shown on the Contract Drawings or as directed by the Engineer all in accordance with these specifications for the following:

- A. The construction of sanitary sewers, water mains, storm sewers, sanitary force mains, under-drains, service laterals, catch basins, drop inlets, manholes, pipe culverts, service pipes, utilities, conduits and related work.
- B. All Work required for the sealing and removal of underground storm or sanitary sewers, and appurtenant structures (catch basins, manholes, etc.) and utility structures and appurtenances not to be replaced or not removed under other Items of Work.
- C. The removal of miscellaneous items such as abandoned underground tanks, pipelines, etc.

CLASSIFICATIONS:

- A. Earth - Shall include all earth, muck, mud, swamp, bog, peat, hardpan, ledge rock (loose, disintegrated or decomposed), bituminous and concrete pavements (unless noted otherwise), topsoil, sod, and similar materials which are sufficiently soft to permit removal by normal earth excavation machinery, vacuum excavation, hand excavation or other equipment and methods suitable for achieving the requirements of this Section.
- B. Rock - Rock, insofar as it applies to trench excavation, shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures, Portland cement concrete pavement or base, of ½ cubic yard or more in volume, removed as indicated or directed from within the payment lines for trench excavation.
- C. Unsuitable - Shall include all "Earth" as classified above ordered removed from below the bottom of the trench as defined in the Contract Documents.
- D. Unclassified - shall include any and all "Earth" and "Rock" as classified herein removed as indicated or directed. When only the Item for "Trench Excavation - Unclassified" appears on the proposal form, payment will be made under this Item only; and no compensation will be made under any of the other classifications given hereinabove.

CONSTRUCTION DETAILS:

Trench excavations shall be made in conformity with the requirements of the Contract

Documents or as ordered. The Contractor shall furnish and employ such support systems, pumps, etc. as described herein under "Trench and Excavation Support Systems" and other items, as may be necessary for the safe and proper completion of work, protection of property and the safety of the public, employees of the Contractor, the Authority and the Engineer; all in accordance with the current regulations of the applicable Safety Code and pertinent local/state ordinances and regulations and as specified elsewhere within the Contract Documents. The words sewer, pipe, culvert and conduit are used interchangeably herein.

After the excavation is completed, the Contractor shall notify the Engineer. No bedding material, masonry, pipe or any other material shall be placed in the excavated area until the Engineer has approved the depth of excavation and the suitability of the foundation material.

The length of 100 feet shall be the maximum amount of trench opened at one time, or such length as the Engineer considers reasonable and necessary. Rock excavations shall be 20 feet in advance of pipe at all times. All blasting operations shall be conducted in strict accordance with local/state ordinances and regulations, the applicable Safety Code and as specified under "Blasting and Explosives" of the Supplemental General Conditions.

Unless otherwise specified, trenches shall not be wider than the horizontal limits permitted from the elevation of the trench bottom to one (1) foot above the top of the pipe.

Whenever a stub for a proposed sewer, a service lateral, an extension of a sewer or a service chimney is built in rock, the rock shall be excavated not less than five (5) feet beyond the end of the stub, lateral or extension and in the case of a service chimney at right angles to the trench.

The Contractor shall at all times keep the excavation free from water. The water shall be disposed of by the Contractor in accordance with the Contract Documents and applicable permits, laws and regulations.

The Contractor shall provide all necessary pumps, dams, drains, ditches, flumes, well points, cofferdams and other means for excluding water from the trenches, tunnels and other parts of the work, and for preventing the slopes from sliding or caving, and shall satisfactorily remove all water which interferes with the work. The Contractor shall sufficiently dewater all trenches to completely dry out and solidify the foundation below the bottom of the pipe/structure to whatever depth is necessary below the bottom of the pipe/structure to provide a firm, solid, completely dry foundation on which to lay the pipe or construct the structure.

The flow of all sewers, drains, service laterals, utility lines and laterals and water courses shall be maintained and provided for by the Contractor without damage or nuisance to other parties. All connections shall be restored as ordered. Before any bedding material, masonry is placed or any pipe is laid, suitable drains shall be provided as needed and maintained in order that the trench bottom shall be free from water and sufficiently dry at all times. No pipe shall be laid in water. Water shall not be permitted to rise to the level of

the bottom of the pipe until such time as it has been inspected as to acceptability, compaction, bedded and the trench properly backfilled. No masonry of any kind laid in cement mortar shall be placed in water. No water shall be allowed to flow over or rise upon fresh concrete or mortar, and no water shall be allowed to enter the pipe until such time and under such conditions as the Engineer shall approve (never for Water Mains).

It shall be the responsibility of the Contractor to maintain and protect the pipe at all times during the work. Any displacement or damage sustained by the pipe or appurtenant structures as the result of inadequate drainage protection during construction shall be the sole responsibility of the Contractor. The Contractor shall be required to restore any pipe or appurtenant structure so displaced without additional compensation.

Except as otherwise provided, no direct payment shall be made for the work of dewatering as specified above or herein, but compensation for such work and all expenses incidental thereto shall be considered as having been included in the prices submitted for the appropriate Items.

Where the soil in the bottom of the trench is found to be soft or loose or in any way unsuitable, the Engineer may order it removed and replaced with "Gravel Fill", "Borrow", or any other material that the Engineer considers suitable.

Bedding material, wrapped in filter fabric, shall be installed on both sides of pipe and up to a depth of 1 foot over top of pipe, placed carefully in layers 4 inches to 6 inches thick, and each layer will be tamped and compacted before the next layer is placed. Care must be taken that the fill is made compact and tight under the pipes. Backfill material above the bedding material shall be placed carefully in layers, 4 inches to 6 inches thick, and each layer will be tamped and compacted before the next layer is placed. No payment will be made for such backfill material or the disposal of the excavated soil.

The Engineer is not under any obligation to order "Borrow" or other suitable material to be used as backfill when in their opinion, the inorganic soils from the excavation can, by utilization of drying or re-handling procedures, be utilized as suitable backfill.

All excavated material shall be so placed as not to endanger the work and to give free access to all flow control devices, hydrants, gates and pipe in the vicinity. All excavated materials shall be kept neatly piled at the side of the trench. Bridges or fences shall be constructed so as to inconvenience the adjoining property owners and the traveling public as little as possible.

Rock excavation, boulders and other excavated material, which, in the opinion of the Engineer, cannot be used as backfill shall be used in other portions of the Work as directed by the Engineer or if not so directed shall be removed from the site and disposed of by the Contractor at a disposal site supplied by the Contractor at no additional cost to the Authority.

The site of the Work will be cleaned of all rubbish and surplus or unsuitable materials and promptly restored as specified elsewhere in the Contract Documents as backfilling proceeds and work progresses. Pavements adjacent to the site of the work shall be

constantly swept so as to prevent scarring of the pavement by scattered stones.

No separate payment shall be made for clean up or removal of unused materials.

TRENCH AND EXCAVATION SUPPORT SYSTEMS:

A. The Contractor shall provide a support system as necessary and in a manner that complies with the applicable Safety Code. The system shall be adequate to support earth and groundwater pressures; accommodate traffic; permit access to adjacent occupied properties; protect adjacent buildings, pavements, structures and all existing utilities; provide an opening of proper depth and width in which to install the proposed pipes and other underground structures; and protect the workmen, subcontractors and employees of the Authority and Engineer, and the public, from death or injury from bank failure, earth collapse or earth movement of any nature.

Generally, all trenches and excavations over 5 feet in depth, any other unstable excavations or excavations in unstable material, shall be protected against the hazard of collapse.

The Contractor shall be entirely and solely responsible for the adequacy and sufficiency of the system and of all steel sheet piling, timber sheet piling, steel plates, bracing, shoring, underpinning, coffer-damming, dewatering, etc. The Contractor shall assume the entire responsibility for damages due to injury to persons or damage to adjacent pavements and public and private property (including but not limited to the Work under construction, existing buildings, facilities, etc.) if such injury or damage results directly from said Contractor's failure to install an adequate and sufficient support system.

The support system may be left-in-place at the option of the Contractor to serve its own interest, to protect existing facilities, the Work built or to be built under this Contract, or for the safety of the public, etc., at no cost to the Authority.

It is expressly understood and agreed that removing or leaving-in-place the support system, shall not relieve the Contractor from any responsibility for any loss or damage whatever due to omission of or failure of the system.

The Contractor may, with the approval of the Engineer, lay back slopes in accordance with the provisions of the applicable Safety Code in order to avoid the necessity for a support system or limiting the quantity thereof. However, in the case of trenches, the toe of this slope will not be lower than one (1) foot above the top of the pipe to be installed. A level bench of at least two (2) feet in width shall be maintained between the toe of the sloped section and vertical trench excavation. For pipes with an outside diameter of six (6) feet, a minimum four (4) foot bench shall be provided.

If the Contractor chooses to lay back slopes to avoid or limit the necessity for a support system, the payment limits for trench excavation will not be increased, and

all additional work will be done without added compensation.

Portable trench boxes or sliding trench shields designed solely for the protection of personnel are not acceptable as support systems for utility trenches. The support system must be designed to support the undisturbed face of the trench or excavation.

B. Bracing, shoring, sheeting and other supports, shall be in conformance with the requirements of the applicable Safety Code.

All steel sheet piles shall be continuous and interlocking with materials conforming to the provisions of ASTM Specification A-328 as amended or superseded or equal.

C. Unless expressly authorized by the Engineer, sheeting shall be advanced ahead of the excavation. If it is necessary to excavate below the sheeting to facilitate its advancement, care shall be taken to prevent voids behind the sheeting but if the voids are formed, they shall be promptly filled with approved material and compacted to the satisfaction of the Engineer.

Pilot cuts for trenches/excavations shall not exceed five (5) feet at any time.

The Engineer may reduce the depth of the pilot cut should the soil and subsurface conditions warrant such action. Sheet piling must be driven by drop hammer or other methods approved in writing by the Engineer below the area of the pilot cut. Driving of sheet piling above the pilot cut is subject to the directions of the Engineer. The Engineer may direct the Contractor to use other types of equipment, and to revise the procedure during the excavation of the pilot cut and the driving of the sheet piling should it be found necessary to do so.

Vibratory driving hammers may NOT be used unless specifically authorized by the Engineer.

If sheeting is to be removed, the backfilling, in accordance with sections "Trench Excavation and Backfill" or "Structure Excavation", shall proceed (1) simultaneously with the withdrawal of sheeting and as each layer is compacted, or (2) up to each set of rangers and braces; the rangers and braces will be removed; the backfilling will proceed up to the next set of rangers and braces, etc. up to the top of the excavation. Alternate sections of sheeting from the left side and right side of the trench/area shall be removed and the cavity remaining there from shall be jetted thoroughly by high pressure water, starting at the toe of the sheeting and being drawn to the surface. Sand shall be inserted with the jetting process. Where the bottom of the excavation is not free draining material (some areas of organic material or miscellaneous fill) or where granular backfill is not available or ordered by the Engineer, the jetting shall be very carefully done with a minimum amount of design revisions, relocations and/or adjustment. No work shall be started within these areas of conflict until authorized by the Engineer.

TEST PITS

Test pit excavation and backfill shall comply with the provisions of Item 205 "Trench Excavation and Backfill".

The Contractor shall measure, record and provide to the Engineer, the size, configuration, exact horizontal and vertical location of all utilities, pipes or other obstacles uncovered in the various pits dug under this section.

The Engineer must be notified well in advance of excavation to obtain the necessary measurements to locate all objects within the test pit.

Excavation of test pits shall be accomplished by such means as are required to ensure that any underground utilities or structures as may be encountered are not damaged. It shall be the Contractor's sole responsibility to correct any damages incurred during the excavation operations. Any such damages shall be repaired or replaced by him (if permitted) to the satisfaction of the Utility Owner Responsible Agency or the Engineer at the Contractor's own expense. Where the repair and/or replacement must be done by the Utility Owner/Responsible Agency all costs thereof shall be borne by the Contractor.

Where the test pit is to be excavated within an existing pavement area, the pavement and base shall be removed in accordance with Item 202.01, Earth Excavation.

Where an existing pavement has been removed for the test pit excavation, the surface shall be restored in accordance with Item 407, Temporary Pavement Trench Repair as ordered by the Engineer.

In all other areas, the surface of the test pit area shall be restored to a condition equal or better than prior to excavation as directed by the Engineer.

If, in the opinion of the Authority, the Contractor has failed to maintain a safe trench and work area, Authority forces shall refuse to enter the trench until safety concerns are satisfied. This requirement shall not in any way relieve the Contractor of complete responsibility and liability for maintaining a safe and adequate trench excavation at all times and at any depth.

MEASUREMENT:

Except as noted below, trench excavation will be measured in its original position by taking the difference between the ground surface at the time the trench is excavated and that after the excavations are complete. Before starting any excavation, the Contractor shall notify the Engineer so that elevations and measurements of the work may be obtained.

Any work done prior to such notification will not be paid for.

Trench excavation in roadway cuts shall include only that portion outside of the limits of roadway excavation and will not include open ditches.

Test Pit excavation will be measured for payment under this Item.

Payment limits shall be described hereinafter.

HORIZONTAL PAYMENT LIMITS: Payment lines shall be vertical for pipe culverts, pipe-arches, sewers, service pipes and outlets for under-drains, and shall be the width to which the material is actually removed, except that in no case, even though the actual excavation is wider, shall the width between payment lines be more than the following:

- a.) two (2) feet greater than the nominal inside diameter circular pipe, or nominal inside span of elliptical pipe or pipe-arch for such diameters or spans of less than thirty (30) inches.
- b.) three (3) feet greater than the nominal inside diameter circular pipe, or nominal inside span of elliptical pipe or pipe-arch for such diameters or spans that are thirty (30) inches or greater.

For end-walls, manholes, drop inlets and catch basins, payment lines shall be vertical and two (2) feet outside of the neat lines of the foundations in each direction horizontally.

For under-drains, payment lines shall coincide with the sides and bottoms of the ditch of the dimensions shown on the plans or as ordered.

In case it is necessary to excavate to a greater width than specified above on account of the removal of existing structures, such additional excavation will be considered as trench excavation and will be measured and paid for as such.

For the removal of underground obstructions such as pipelines, tanks, etc., payment lines shall be vertical and two (2) feet outside of the underground item measured horizontally.

If rock is encountered, the Contractor shall strip it of sufficient overlying material to allow for proper measurement and then shall notify the Engineer that the rock surface is ready for measurement. If the Contractor shall fail to give such notice, the Engineer shall presume that the measurements taken at the time they first saw the material in question will give the true quantity of excavation.

VERTICAL PAYMENT LIMITS: Where pipe bedding is used, the lower vertical payment limit shall be as shown on the plans. There will be no direct payment for the excavation necessitated by the shaping of the bedding, but the cost shall be included in the cost per linear foot for the pipe culvert specified.

VERTICAL PAYMENT LIMITS OTHER THAN IN FILLS: Payment lines will extend vertically from the bottom of the trench to the bottom of the roadway excavation.

If trench excavation is not located within the limits of roadway excavation, payment lines will extend vertically from the bottom of the trench to the existing ground surface.

VERTICAL PAYMENT LIMITS IN FILLS: For the various drainage installations, the vertical payment lines shall extend from the bottom of the completed and accepted trench to the lowest of the following upper limits:

- a. Bottom of subbase.
- b. In the case of culverts, one foot above the top of the pipe.
- c. In case of drainage structure other than culverts, one foot above the top of the uppermost culvert pipe placed in the structure.
- d. In the case of culvert installations transverse to the roadway extending down fill slopes, the vertical payment limit will be the depth below bottom of loam or embankment surface, as the case may be, and measured perpendicular to the bottom of the trench.

VERTICAL PAYMENT LIMITS UNSUITABLE: When the soils conditions at the bottom of the trench are determined unsuitable by the Engineer, they shall so order the material removed to a depth to provide adequate support to the pipe or structure. The Vertical Payment Limit for Unsuitable shall be measured from the bottom of the applicable Vertical Payment required to the bottom of the Unsuitable Payment Limit as ordered by the Engineer.

Vertical payment limits shall be as described above except that in no case shall the depth measurement used for payment be greater than that actually excavated.

If gravel fill or borrow are used for trench backfill, they will be measured in place within the payment limits described herein.

PAYMENT:

This work will be paid for at the contract unit price per cubic yard for "Trench Excavation-Earth", regardless of depth. When rock, conforming to the description given in this item is encountered within the payment lines for trench excavation, its removal will be classified and paid for at the contract unit price per cubic yard for "Trench Excavation - Rock", regardless of depth.

Those portions of trench excavation classified and paid for as "Trench Excavation - Rock" will be the actual volume of earth excavated within the payment lines. When payment is made for trench excavation in fill, no such excavation will be classified as "Trench Excavation - Rock".

For any portion of trench excavation classified and paid for as "Trench Excavation - Unclassified", no payment will be made under "Trench Excavation - Earth", "Trench Excavation - Rock" or Trench Excavation - Unsuitable" for the designated project or portion thereof. Excavation necessary for the removal of pipe culverts, test pits, or other installations described herein, will be paid for as trench excavation.

The above prices shall include all materials, tools, equipment and labor necessary to complete the excavation in conformity with the plans or as ordered. They shall also include backfilling where required and the disposal of surplus material. No additional payment will be made for vacuum excavation, hand excavation, shoring, bracing, sheeting, pumping, bailing or for material or equipment necessary for the satisfactory completion of the work.

No measurement or separate payment will be made for the work under "Trench and Excavation Support Systems," the cost shall be included in the prices bid for other Items unless an item for permanent and/or temporary sheet piling appears in the proposal.

Test pits up to a depth of 10 feet will only be measured for payment where the location of the pit is such that said pit will never be incorporated into any excavation being dug for the work, or when the test pit will ultimately be within the limits of an excavation required for the work, but said pit must be backfilled for safety or other reasons, as ordered by the Engineer, prior to the excavation reaching the location of the pit. If any pit is not backfilled and it is subsequently incorporated into the excavation, said pit will not be measured for payment separately.

Bituminous surface restoration over test pits shall be measured and paid for in accordance with Item 407, Temporary Pavement Trench Repair.

No additional payment will be made for saw cutting bituminous or Portland cement concrete pavement, curbs or sidewalks and/or concrete base course according to the requirements of Item 407, Bituminous Concrete Trench Repair.

If gravel fill or borrow are used for trench backfill, payment will be made at their respective contract unit prices, or in the absence of such Items in the contract, as extra work.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
205.01	Trench Excavation - Earth	Cubic Yard
205.02	Trench Excavation - Rock	Cubic Yard
205.03	Trench Excavation - Unsuitable	Cubic Yard
205.04	Trench Excavation - Unclassified	Cubic Yard
205.05	Test Pit – Conventional Excavation	Each
205.06	Test Pit - Vacuum Excavation	Each

ITEM 207 **BORROW / SELECTED BORROW**

DESCRIPTION:

When the amount of usable material excavated within the work contracted for is not sufficient to form the embankments, backfill trenches or other features of the work, additional material shall be furnished by the Contractor from borrow/selected borrow pits located beyond the limits of the project. This material shall be known as borrow/selected borrow. Borrow/selected borrow shall include the furnishing, removing and satisfactory placing of the additional material necessary to complete the work.

Hydraulically dredged and stockpiled material may be used for part, or all borrow/selected borrow requirements if it meets the requirements under "Materials". Stockpiles shall be placed at locations arranged for and provided by and at the expense of the Contractor will not be allowed within the project area except at locations and under conditions stipulated by the Engineer. All permits, easements, right or other requirements related to dredging and stockpiling shall be the obligation and responsibility of the Contractor.

MATERIALS:

Materials for this work shall conform to the following requirements:

Borrow shall consist of inorganic granular soils and/or rock having not more than 20 percent by weight passing the No. 200 sieve. The maximum stone size shall be 1-1/2 inches for use as trench backfill or 5 inches for construction of embankments and the material shall be well graded throughout the entire size range. Borrow shall be free from garbage, roots, leaves, and other organic or unsuitable materials. Rubbish, garbage or trash in any quantity shall not constitute a part of the borrow. Borrow shall also be free of ice or frost and no aggregations of soil particles shall be frozen. The moisture content of the borrow shall be within +3 percent of its optimum moisture content at the borrow source.

Selected Borrow will be free-draining material consisting of sound, hard, durable stone, run of the bank gravel, sand, or other acceptable granular material, the particles of which shall have a maximum size of 12 inches unless otherwise specified and shall be of such size that, of the portion passing the 4 inches square sieve, not more than 20 percent by weight, shall pass the No. 40 mesh sieve and not more than 10 percent by weight shall pass the No. 200 mesh sieve as determined by washing through the sieve in accordance with ASTM Test Designation D422 as amended or superseded.

Selected Borrow shall include sufficient well-graded material to fill any voids in the embankment/backfill area in its upper strata prior to placing any courses thereon.

CONSTRUCTION DETAILS:

Borrow/Selected Borrow will be permitted only to the extent necessary to complete the embankments, backfill trenches and similar details and only after all usable material from the excavation has been placed. However, with prior written approval of the Engineer, the Contractor may be permitted to place borrow/selected borrow before the excavation is completed. This permission is at the sole discretion of the Engineer and may be revoked at any time if satisfactory progress is not maintained on other operations.

The Contractor shall notify the Engineer at least 15 days prior to obtaining material from any borrow pits so that an examination of the fitness of the material may be made. The limits approved of material from borrow pits shall be given to the Contractor. The Contractor shall be required to clear the borrow pit area of all unsuitable material.

If the Contractor elects to obtain borrow/selected borrow from a, commercial pit, it will be necessary to have a section of the pit set off for its use, unless otherwise directed.

The Contractor shall, at its expense, employ effective dust control measures so that the public will not be adversely affected by dust from stockpiles material or such material in transit. The Contractor shall also provide and maintain at its expense effective and adequate drainage for all dredging and stockpiling operations at all times, and shall be solely responsible for all damages which result from dredging and stockpiling and for the continuing maintenance and final restoration of all drainage facilities affected by the Contractor's operations.

Borrow/selected borrow shall be placed where directed and in accordance with the specifications for the information of embankments under the Item "Roadway Excavation, Formation of Embankment and Disposal of Surplus Materials," the item "Trench Excavation and Backfill" of these Specifications.

MEASUREMENT:

The amount of "Borrow" or "Selected Borrow" to be paid for will be determined by the Engineer in place after compaction and within the payment lines shown on the Contract Drawings or as directed by the Engineer unless otherwise specified.

PAYMENT:

Payment will be made for at the contract unit price per cubic yard for "Borrow" or "Selected Borrow" complete in place, which price shall include furnishing, placing and compacting the material and all other material, equipment, tools, labor and work incidental to or necessary for the completion of the Item.

If no separate Item for "Selected Borrow" has been included in the Bid Proposal, then "Selected Borrow", where required, will be paid for as "Borrow".

No payment will be allowed for "Borrow" or "Selected Borrow" until all suitable excavation has been placed in the embankments or used for trench backfill except with the prior

written approval of the Engineer.

The contract unit price for “Borrow” or “Selected Borrow” shall also include the cost, if any, of restoration of the borrow area as required by the Local Regulatory Agency or these Specifications.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
207.01	Borrow	Cubic Yard
207.02	Selected Borrow	Cubic Yard

ITEM 208 FREE DRAINING MATERIAL

DESCRIPTION:

Free-draining material shall consist of material conforming to the requirements stated elsewhere herein. This material shall be furnished and placed in accordance with these specifications and as indicated on the plans, special provisions, or as ordered by the Engineer for the stabilization of embankments, or for fill in free water areas, or wherever specified.

MATERIALS:

Material for this work shall meet the requirements of Form 817 Article M.02.07.

CONSTRUCTION DETAILS:

The Contractor shall notify the Engineer at least 3 days prior to obtaining free-draining material from any source so that an examination may be made of the material and the necessary measurements may be taken.

The limits of the proposed source shall be shown to the Engineer; and prior to the taking of measurements, the Contractor shall be required to clear the area of all unsuitable material. No payment will be made for any material removed outside of the area measured or which was not used in the contract work. No excavation shall be made within the confines of a source after the Engineer has taken the original measurements, except for material to be used for the purposes hereinbefore indicated, except with the permission of the Engineer.

The Contractor may, with the approval of the Engineer, obtain free-draining material, if available, from within the roadway excavation limits subject to the written approval of the Engineer.

If the Contractor elects to obtain free-draining material from a commercial pit, it will be necessary to have a section of the pit set off for its use solely, so that the amount of material removed may be accurately determined. During the period between the original and the final release by the Engineer, no material shall be taken from a measured pit except by the Contractor and for use only in the work under the contract.

If the Contractor elects to use stone from a quarry or reclaimed miscellaneous aggregate, the Contractor shall use only the materials from stockpiles which have been approved for use.

Free-draining material will be permitted only to the extent necessary to construct embankments to 3 feet above free water, or to promote free drainage in areas specified on the plans, in the special provisions, or as directed by the Engineer. Free-draining material shall be placed in accordance with the provisions for the formation of embankment of Item 202, Excavation and Embankment.

MEASUREMENT:

The amount of free-draining material to be paid for will be determined by the average end area method based on the results obtained from cross-sectional elevations taken before and after the free-draining material has been excavated.

When material is drawn from a quarry stockpile or stockpile formed from reclaimed miscellaneous aggregate, the material shall be weighed on scales furnished by and at the expense of the Contractor. The scales shall be of a type satisfactory to the Engineer and shall be sealed at the expense of the Contractor as often as the Engineer may require. All weighing (measurements of mass) shall be done in the presence of a representative of the Authority. From the weight (mass) so obtained, the volume shall be computed based on a specific gravity of 2.92 for the aggregate and smaller particles. For material having a different specific gravity, an appropriate correction shall be made.

PAYMENT:

Payment will be made at the contract unit price per cubic yard for "Free-Draining Material," complete in place, which price shall include furnishing and placing the material and all equipment, tools and labor necessary thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
208	Free Draining Material	Cubic Yard

ITEM 209 PREPARATION OF SUBGRADE

DESCRIPTION:

This work shall consist of the forming and compaction of all subgrade surfaces as specified. All trenches shall be backfilled and all other excavation work completed within the immediate vicinity prior to the commencing of subgrade preparation. Base courses shall not be placed until the proper completion of the subgrade surface.

CONSTRUCTION DETAILS:

All soft and yielding material and other portions of the subgrade which will not compact readily when rolled or tamped, shall be removed, as directed, and all loose rock or boulders, over 5 inches in size, found in the earth shall be removed or broken off to a depth of not less than one foot below the subgrade. All holes or depressions made by the removal of material, as described, shall be filled with suitable material and the whole surface compacted uniformly by rolling the entire area with an approved power roller weighing not less than 10 tons. Any portion of the subgrade which is not accessible to a roller shall be compacted thoroughly with hand tampers, weighing not less than 12 pounds, the face of which shall not exceed 50 square inches in area.

The rolling and tamping shall be continued until the entire subgrade is uniformly and thoroughly compacted, true to lines and grades given. In excavation, the ground shall not be disturbed below the elevation of the subgrade.

In handling materials, tools, equipment, etc., the Contractor shall protect the subgrade from damage by exercising such precautions as the Engineer may deem necessary. At all times the subgrade surface shall be kept in such condition that it will drain readily and correctly. The subgrade shall be checked and approved before any foundation or surfacing material is placed thereon.

The subgrade shall be compacted a minimum density of 90 percent of the maximum dry density as determined by the Modified A.A.S.H.T.O. Method T-180-57.

MEASUREMENT:

Preparation of subgrade will be measured coincident with the outside edges of the pavement or its base course construction as approved by the Engineer.

PAYMENT:

This work will be paid for at the contract unit price per square yard for "Preparation of Subgrade" which price shall include all materials, equipment, tools and labor incidental thereto.

When no price for "Preparation of Subgrade" is asked for on the Proposal Form, the cost of the Work as shown on the Contract Drawings shall be included in the cost of other items and no direct payment for "Preparation of Subgrade" will be made.

Item Number**Pay Item****Pay Unit**

209

Formation of Subgrade

Square Yard

ITEM 210 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

DESCRIPTION:

This work shall consist of temporary control measures as shown in the Contract Documents or as ordered by the Engineer during the life of the contract to control soil erosion and water pollution, through use of berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains and other acceptable erosion control devices or methods. The inspection, maintenance, repair or replacement of Temporary Soil Erosion and Water Pollution Control facilities shall be performed by the Contractor at regular intervals as well as before and after every storm.

Where appropriate, the temporary control provisions contained herein shall be coordinated with the permanent erosion control features specified elsewhere in the contract to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post construction period.

Work under this specification will not be used and paid for in situations where permanent contract items in the final position in the contract can be practically installed and can provide the necessary control measures.

MATERIALS:

Materials required for this work shall include the following:

Mulches: Mulches may be hay, straw, fiber mats, netting, wood cellulose, bark, wood chips or other suitable material acceptable to the Engineer and reasonably clean and free of noxious weeds and deleterious materials.

Slope Drains: Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, plastic sheet or other material acceptable to the Engineer and adequate for erosion control.

Grass: Grass shall be a quick growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area and as a temporary cover, which will not compete with the grasses sown later for permanent cover.

Fertilizer: Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer.

CONSTRUCTION DETAILS:

General: In the event of conflict between these specification requirements and pollution control laws, rules or regulations of other Federal or State or local agencies, the more restrictive laws, rules or regulations shall apply.

Authority of Work: The Engineer has the authority to limit the surface area of earth material exposed by excavation, borrow and fill operations and to direct the Contractor to

provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent land, streams or other watercourses, lakes, ponds or other areas of water impoundment

Schedule of Work: At the pre-construction conference or prior to the start of the applicable construction, the Contractor shall submit to the Engineer for acceptance, the schedules for installing of temporary and permanent erosion control measures, as are applicable for clearing and grubbing; grading; bridges and other structures at watercourses; construction; and paving. In addition, the Contractor shall also submit for acceptance at the same time, the proposed method of erosion control on haul road and borrow pits and the plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operations have been accepted by the Engineer.

The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the approved schedule. Temporary control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion is likely to occur, clearing and grubbing operations should be so scheduled and performed 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.

Areas of Work: The Engineer will limit the area of clearing and grubbing, excavation, borrow and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

Under no conditions shall the work area of earth material exposed at one time by clearing and grubbing, excavation, borrow or fill within the right-of-way exceed 75,000 square feet without prior approval by the Engineer. The same limitations shall apply to each borrow or spoil area and haul road outside the right-of-way.

The Engineer may increase or decrease the area of earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by an analysis of project conditions.

Temporary soil erosion and water pollution control may include construction work outside the right-of-way where such work is necessary as a result of highway construction. Legal rights of access will be provided by the Authority in accordance with **§ 107-11, Furnishing Right- of-Way.**

Where the work to be performed is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, and falls within the specifications for a work item that has a contract price, the units of work shall be computed at the proper contract price for lump sum payment as hereinafter stated. Should the work not be comparable to the project work under the applicable contract Items, the Contractor shall be ordered to perform the work on a force account basis, or by agreed unit prices as approved by the Engineer.

The quantity to be paid for will be computed by one or any combination of the following methods:

Temporary Work: Where contract Bid Items cover the temporary work ordered, the amount obtained by the product of the quantity and the unit bid price of the Items.

Agreed Unit Prices: Where no contract Bid Items are available, the amount obtained by the product of the Item quantities and agreed unit prices.

Force Account: By force account records where bid prices do not exist and agreed prices are not available for temporary work Items.

General: The lump sum for this work includes the cost of furnishing, maintaining and repairing/replacing all materials, labor and equipment to satisfactorily complete the temporary erosion and pollution control work shown on the plans or ordered to be performed by the Engineer. Monthly payments will be made for this work for the amount of temporary work completed during the Estimate period.

Temporary control measures that are made necessary by the Contractors negligence, carelessness, failure to install permanent controls as a part of the work as scheduled and are ordered by the Engineer, or are made necessary by the Contractor's failure to perform the sequence and scheduling of work as part of the schedule as given in the pre-construction conference or as later amended and approved, shall be ordered by the Engineer to be accomplished and performed by and at the expense of the Contractor.

In case of repeated failures on the part of the Contractor to control emission, pollution and/or siltation, the Engineer reserves the right to employ outside assistance or to use Authority forces to provide the necessary corrective measures. Such incurred direct costs plus project engineering costs will be charged to the Contractor and appropriate deductions made from the Contractors monthly progress estimate.

On areas off the right-of-way that are selected by the Contractor and which include but are not necessarily limited to borrow pits (other than commercially operated sources), Contractor's haul roads, disposal areas, storage, maintenance, batching areas, etc., temporary control work shall be the responsibility of the Contractor and shall be performed by him at its expense in a manner approved by the Engineer. No direct payment will be made for this work; the cost is to be included in other Items of the contract. Temporary control work on the aforesaid areas which are specifically designated for contractual operations by the Authority shall be paid for under the provisions of this specification.

Item Number**Pay Item****Pay Unit**

210

Temporary Soil Erosion and Water
Pollution Control

Lump Sum

ITEM 213 **GRAVEL FILL**

DESCRIPTION:

This material shall be used as a foundation for structures, to replace unstable material in slopes, as a foundation for sidewalks and culverts, in shoulders and elsewhere as indicated on the plans, required by the specifications or ordered by the Engineer. It shall consist of gravel conforming to the requirements of these specifications.

MATERIALS:

Gravel fill shall conform to the requirements of Form 817 Article M.02.01.

CONSTRUCTION DETAILS:

When gravel fill is used for foundation for structures or to replace rock or unsuitable material in trenches, it shall be deposited in layers not over 6 inches in depth, with each layer thoroughly compacted before the addition of other layers.

MEASUREMENT:

Gravel fill will be measured in place after compaction within the payment lines shown or specified by the Engineer.

PAYMENT:

This work will be paid for at the contract unit price per cubic yard for "Gravel Fill", complete in place, which price shall include all materials, tools, equipment and labor incidental thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
213	Gravel Fill	Cubic Yard

ITEM 216 PERVIOUS STRUCTURE BACKFILL

DESCRIPTION:

Pervious structure backfill shall include the furnishing, placing, and compaction of pervious material adjacent to structures.

MATERIALS:

Pervious structure backfill shall conform to the requirements of Form 817 Article M.02.05. The crushed stone or gravel shall meet the grading requirements of Form 817 Table M.01.02-2 for No. 3 or No. 4 coarse aggregate or a combination of both.

CONSTRUCTION METHODS:

Pervious structure backfill shall be placed adjacent to abutments, retaining walls, box culverts, and elsewhere as called for. It shall be placed above a plane extending on a 2 to 1 slope from the upper edge of the footing to the top of the embankment, or as shown on the plans. Where the face of undisturbed material is above or beneath this slope plane, the amount of pervious structure backfill shall be decreased or increased accordingly, if ordered by the Engineer.

In filling behind abutments, retaining walls, box culverts, or other structures, the fill is placed against undisturbed material, or against compacted embankments having a length in a direction at right angles to the abutment wall or culvert not less than twice the height of the structure against which the fill is placed. The slope of the embankment on which the pervious structure backfill is to be placed shall be plowed deeply or cut into steps before and during the placing of pervious structure backfill so both types of material will be thoroughly bonded and compacted.

Each layer of pervious structure backfill shall be spread to a thickness not exceeding 6 inches in depth after compaction and shall be thoroughly compacted as directed by the Engineer by the use of power rollers or other motorized vehicular equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes and equipment which is not in proper working order in all respects shall not be used within the area described above.

Special attention shall be given to compaction in places close to walls where motorized vehicular equipment cannot reach. Within 3 feet of the back face of walls and within a greater distance at angle points of walls, each layer of pervious structure backfill shall be compacted by mechanical rammers, vibrators, or pneumatic tampers.

The dry density of each layer of pervious structure backfill formed from broken or crushed stone, broken or crushed gravel or reclaimed miscellaneous aggregate free of bituminous concrete shall have a dry density after compaction that is no less than 100 percent of the dry density for that material when tested in accordance with AASHTO T180, Method D.

If a layer formed from reclaimed miscellaneous aggregate containing bituminous concrete

is placed as pervious structure backfill, the wet density of this layer after compaction shall not be less than 100 percent of the wet density for that material when tested in accordance with AASHTO T180, Method D. In this test, material retained on the ¾ inch sieve shall be replaced with material retained on the number 4 sieve, as noted as an option in the specifications for this test.

Each layer of the pervious structure backfill shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

Where weep holes are installed, bagged stone shall be placed around the inlet end of each weep hole, to prevent movement of the pervious material into the weep hole as specified on Form 817.

MEASUREMENT:

Payment lines for pervious structure backfill shall coincide with the limits of the compacted pervious structure backfill as actually placed and ordered by the Engineer.

PAYMENT:

Pervious structure backfill will be paid for the contract unit price per cubic yard for "Pervious Structure Backfill," complete in place.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
216	Pervious Structure Backfill	Cubic Yard

ITEM 217 BEDDING MATERIAL

DESCRIPTION:

The Work under this section shall consist of furnishing, placing and compacting Bedding Material, to the lines, grades and dimensions for all sewer and water pipes, including services, in accordance with the details on the Contract Drawings, or as ordered, all to the satisfaction of the Engineer.

MATERIALS:

The bedding material shall consist of broken stone or crushed gravel conforming to Form 817 Table M.01.02-2, No.6 coarse aggregate. Material shall be free from soft, disintegrated pieces, mud, dirt, organic and other foreign material. Samples of the material shall be delivered to the site at least 5 days prior to use, so that it may be approved by the Engineer and tested for size and gradation. Periodic Tests will be taken by the Engineer to establish conformity. Stone Quality, soundness and loss due to Abrasion shall conform to Form 817 Article M.02.06.

CONSTRUCTION DETAILS:

The Bedding Material shall be deposited in layers not over 6 inches thick and each layer shall be thoroughly compacted before the addition of other layers. The surface shall be carefully brought to grade as shown on the Contract Drawings and compacted to 95% of the maximum dry density as determined by AASHTO T-180 Method C. The moisture content of the material shall not vary by more than plus/minus 3% from its optimum moisture content. Approved methods of compaction shall be used.

MEASUREMENT:

This material will be measured for payment by the number of cubic yards of bedding material furnished, complete in place, and accepted within the pay limits.

PAYMENT:

This work will be paid for at the contract unit price per cubic yard for "Bedding Material", complete in place, which price shall include all materials, tools, equipment and labor incidental thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
217	Bedding Material	Cubic Yard

ITEM 220 CONTROLLED LOW STRENGTH MATERIAL

DESCRIPTION:

Controlled Low Strength Material (CLSM) is a self-consolidating, rigid setting material to be used in backfills, fills, structural fills and elsewhere as indicated on the plans, or as directed by the Engineer. The flow and set time characteristics of CLSM shall be designed to meet the specific job conditions. All CLSM material covered by this specification shall be designed to be hand excavatable at any time after placement. It shall be composed of a mixture of Portland cement, aggregate, and water with the option of using fly ash, air-entraining agents, and other approved admixtures.

For the purpose of this specification, CLSM shall be used for filling and abandoning sanitary sewer pipes and/or manholes throughout the project. It may be used elsewhere as ordered by the Engineer.

MATERIALS:

All materials utilized in the CLSM mix design shall be in accordance with the applicable requirements of Form 817 Article M.03.01

COMPOSITION:

The composition of the CLSM shall be in accordance with the requirements set forth in Form 817 Article M.03.01-General Composition of Concrete Mixes, as well as the applicable sections of ACI 229R. The Contractor shall submit each proposed mix design, with all supporting data, to the Engineer for review and approval at least two weeks prior to its use.

The setting time of CLSM materials shall be designed so as to achieve the strength necessary to comply with the time constraints called for under the Maintenance and Protection of Traffic requirements of the project specifications. The use of chloride accelerators is not permitted.

The minimum compressive strength of the CLSM material shall be 30 pounds per square inch (psi) and the maximum compressive strength of the CLSM shall be 150 pounds per square inch (psi) when tested in accordance with ASTM D4832 after 56 days.

The CLSM mix design shall utilize a nominal maximum size of No. 8 aggregate as specified in Form 817 Table M.01.02-2.

CLSM mixes that are designed with high entrained air shall have a minimum of 25% entrained air when tested in accordance with AASHTO T152.

CONSTRUCTION METHODS:

CLSM shall only be placed when the ambient temperature is at least 30° F and rising. CLSM material shall be deposited within 2 hours of initial mixing.

CLSM may be placed by chutes, conveyors, buckets or pumps depending upon the application and accessibility of the site. Should voids or cavities remain after the placement of the CLSM, the Contractor shall modify the placement method or flow characteristics of the CLSM. Voids or cavities which have not been filled properly shall be corrected as directed by the Engineer and at the Contractor's expense.

MEASUREMENT:

This work will be measured for payment by the actual number of cubic yards of "Controlled Low Strength Material installed and accepted within the pay limits shown on the contract plans or as directed by the Engineer.

PAYMENT:

This work will be paid at the contract unit price per cubic yard "Controlled Low Strength Material," which price shall include all materials, equipment, tools and labor incidental thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
220	Controlled Low Strength Material	Cubic Yard

ITEM 304 PROCESSED AGGREGATE BASE

DESCRIPTION:

The base shall consist of a two-course foundation constructed on the prepared subbase in accordance with these specifications and in conformity with the lines, grades, compacted thickness and typical cross-section as shown on the plans.

MATERIALS:

All Materials for this work shall conform to the requirements of Form 817 Article M.05.01-1.

CONSTRUCTION DETAILS:

Coarse aggregate shall be either gravel or broken stone at the option of the Contractor. However, only one type of coarse aggregate shall be used on the project unless otherwise permitted by the Engineer.

Prior to placing the bottom coarse of the processed aggregate base, the prepared subbase shall be maintained true to line and grade, at all times, for a minimum distance of 200 feet in advance of the work. In addition, any of the base aggregate courses shall not be placed more than 500 feet ahead of the compaction and binding operation on that particular course.

The bottom course shall be spread uniformly upon the prepared subbase. Only approved spreaders or stone boxes shall be used. Power graders shall not be used unless otherwise permitted by the Engineer. The thickness of the course shall not be more than 6 inches after compaction, unless otherwise ordered.

After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 pounds per lineal inch of contact width and shall weigh not less than 10 tons. Vibratory units shall have a static weight of not less than 4 tons. Water may be used during the compaction and binding operation. Water shall be applied from an approved watering device. The direction and intensity of the stream shall be as ordered by the Engineer. The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 inches and progress towards the middle, parallel with the centerline of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of superelevation and special cross slope shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. The amount of compactive effort shall be as directed by the Engineer, but in no case shall be less than four (4) complete passes of the compacting equipment being used. Any surface lines shall be distributed uniformly by use of brooms during the compacting and

binding operations. All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the road.

Should the subbase material become churned up or mixed with the bottom course material at any time, the Contractor shall, without additional compensation, remove the mixture. The Contractor shall add new subbase material, if required, and reshape and compact the subbase in accordance with the requirements of Form 817 Article 2.12.03. New aggregate bottom course material shall be added, compacted and bound as hereinbefore specified, to match the surrounding surface.

When the bottom course has been completed, as specified above, the top course Aggregate shall be spread over it to such thickness that, after final compaction and binding, the total thickness of the two courses will equal the thickness specified for the completed base. The top course shall be spread, compacted and bound exactly as specified above for the bottom.

The final surface of the subbase course shall be fine graded so that, after final compaction and just prior to placement of base or pavement courses, the surface elevation shall not vary more than one-quarter inch above or below the design line and grade at any location. The surface shall be completed to the above tolerance and approved by the Engineer prior to any work at a given location to place an overlying course. If after approval, the course becomes displaced or disturbed in any way for any reason, the Contractor shall repair and regrade the damage to the satisfaction of the Engineer prior to placing the overlying course. All repaired sections shall be recompacted until they meet the requirements as stated herein.

MEASUREMENT:

This material shall be measured for payment by the number of cubic yards of processed aggregate base furnished and complete in place, and the work accepted.

PAYMENT:

This work will be paid for at the contract unit price per cubic yard for "Processed Aggregate Base", complete in place, which price shall include all materials, tools, equipment and work incidental thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
304	Processed Aggregate Base	Cubic Yard

ITEM 306 RECLAIMED ASPHALT – GRAVEL BASE

DESCRIPTION:

Work under this item shall consist of establishment of reclaimed asphalt - gravel base utilizing the existing asphalt surface and base material. This work includes, but is not limited to: (a) surveying and staking in conformance with Item 985, Project Survey and Stakeout; (b) scarification and pulverization of the existing asphalt surface; (c) daily dust control by a method approved by the Engineer; and (d) final grading and compaction of the reclaimed asphalt - gravel base to the lines and grades as shown on the plans or as directed by the Engineer which shall provide a suitable base for the placement of a bituminous concrete binder and surface courses.

MATERIALS:

Existing in-place materials only will be used to create a homogenous mixture. If additional material is required to obtain the proper grades and cross-slope, the new aggregate shall conform to Form 817 Article M.05 for Item 304, Processed Aggregate Base.

RECLAIMED ASPHALT-GRAVEL BASE GRADATION TABLE

<u>SIEVE DESIGNATION</u>	<u>PERCENT PASSING BY WEIGHT</u>
2 ½"	100
2"	95-100
¾"	50-75
¼"	25-45
No.40	5-20
No.100	2-12

EQUIPMENT:

The Contractor shall provide a list of the specific equipment to be used in the performance of this work for approval by the Engineer. The equipment shall include, but not be limited to: (a) a pavement and base reclaimer capable of pulverizing material to meet gradation requirements and mixing to a minimum width of six (6) feet and a minimum depth of twelve (12) inches; and (b) a 10-ton (minimum) steel wheel roller or other compaction equipment capable of achieving the specified density. The equipment shall be maintained in satisfactory working condition at all times.

CONSTRUCTION DETAILS:

The existing road pavement shall be pulverized, processed, blended, and compacted to the lines and grades established by the Contractor and approved by the Engineer.

The Contractor shall be responsible for determining the exact location of the utility structures and all obstructions that effect the reclaiming operation (i.e. manholes, water

gates, valves, etc.). The Contractor shall be responsible for all maintenance and protection of traffic in accordance with the requirements of Item 971.

Care shall be utilized by the Contractor to insure no damage to curbing, manholes, water boxes, and similar equipment installed in the street, and the Contractor must guarantee repair or replacement of any and all damaged structures when encountered. The Contractor will be responsible for structure adjustments. If additional material is required, it shall be placed over the entire area and uniformly blended with the existing base prior to grading and compacting. The reclamation operation shall be conducted so as not to permit the contamination of the asphalt/gravel material with any shoulder debris, grass, leaves or dirt.

The material shall be uniformly graded to the lines and grades shown on the plans or as directed by the Engineer to establish the reclaimed asphalt gravel base. This material will be thoroughly compacted with a roller(s) to produce 100% compaction and uniform density based on the modified Proctor Test, (AASHTO T-180). Water shall be applied to ensure optimum moisture content during compaction. The maximum compacted lift for reclaimed asphalt gravel bases shall be six (6") inches unless otherwise directed by the Engineer

The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 inches and progress towards the middle, parallel with the center line of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of super-elevation and special cross slopes shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. Any surface lines shall be distributed uniformly by use of brooms during the compacting and binding operations. All aggregates shall be completely compacted and bound at the end of each day of work or when traffic is to be permitted to operate on the road. The Contractor shall also be responsible for supplying dust control on a daily basis with a method acceptable to the Engineer.

Should the subbase material become churned up or mixed with the bottom course material at any time, the Contractor shall, without additional compensation, remove the mixture. The Contractor shall add new subbase material, if required, reshape and recompact the subbase in accordance with the requirements of the standard specifications. New aggregate bottom course material shall be added, compacted and bound as hereinbefore specified, to match the surrounding surface.

The final surface of the reclaimed asphalt-gravel base course shall be fine graded so that, after final compaction and just prior to the placement of pavement courses, the surface elevation shall not vary more than one quarter inch above or below the design line and grade at any location. The surface shall be completed to the above tolerance and approved by the Engineer prior to the placing of the overlying course. If after approval, the course becomes displaced or disturbed in any way for any reason, the Contractor shall repair and regrade the damage to the satisfaction of the Engineer prior to the placing

of the overlying course. All repaired sections shall be recompacted until they the requirements stated herein.

If excess material exists after formation to the specified grades and cross slope, the Contractor shall dispose of the excess material in a manner acceptable to the Engineer.

If excess material exists after additional processed aggregate base was added for the formation to specified grades because of error on the part of the Contractor, the Contractor shall load and weigh the excess material at a certified scale approved by the Engineer. The amount in tons of excess asphalt/gravel base shall be subtracted from the quantity of Item 304, Processed Aggregate Base incorporated in the work.

When rock or unsuitable material is encountered within the reclaimed area, the removal of such will be paid for on a time and material basis.

MEASUREMENT:

Work shall be measured by the actual number of square yards of surface area pulverized, blended and compacted in accordance with this specification to a specified depth as shown on the plans or as directed by the Engineer

Additional Aggregate: The costs associated with supplying additional aggregate if ordered, blending, and compacting shall not be included in the unit price bid for reclaimed asphalt – gravel base, but shall be measured by the actual number of square yards of Item 304, Processed Aggregate Base furnished, blended, and compacted in accordance with this specification or as directed by the Engineer.

Dust Control: This work will not be measured for payment, but the cost shall be considered as included in the price bid for reclaimed asphalt – gravel base.

Structure Adjustment: This work will not be measured for payment, but the cost shall be considered as included in the price bid for reclaimed asphalt – gravel base.

PAYMENT:

Payment for accepted quantities as measured will be at the contract unit price per square yard per specified depth, which price shall include full compensation for all labor, equipment, materials, supplies, required within this specification, including, but not limited to, surveying and staking, pulverization, blending, grading, compacting, dust control and structure adjustments.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
306.01	6" Reclaimed Asphalt - Gravel Base	Square Yard
306.02	8" Reclaimed Asphalt - Gravel Base	Square Yard
306.03	10" Reclaimed Asphalt - Gravel Base	Square Yard
306.04	12" Reclaimed Asphalt - Gravel Base	Square Yard

ITEM 405 BITUMINOUS CONCRETE MILLING

DESCRIPTION:

The work under this Item shall consist of removal of bituminous concrete including cold mix, and/or surface treatment pavement by cold milling; hauling of cuttings; cleaning of asphaltic concrete pavement in preparation for an overlay; and may include stockpiling for reuse in a Recycling Program, in conformity with these specifications, and to the lines, grades, and cross sections shown on the plans or ordered by the Engineer. This work includes milling of intersecting streets to the limits shown on the plans or ordered by the Engineer.

All work shall be performed in a manner which prevents the tearing and breaking of underlying and adjacent pavement.

All salvaged pavement shall become the property of the Contractor and shall be removed from the site unless otherwise negotiated by the Authority.

The Contractor shall cold mill within the time limits specified by the municipality in which the project is located. The Engineer may further restrict the time limits when conditions warrant.

EQUIPMENT:

Pavement Profilers - Prior to the start of milling operations, the Contractor shall submit full details concerning the machine to be used, including type, weight, milling width (sixty (60) inch minimum for primary operations), milling depth per pass (two (2) inch minimum), operating speeds, air pollution control, dust suppression, and assurance that no tree damage will occur as a result of the process used, for review by the Engineer.

The Contractor shall furnish one (1) or more machine(s) operated by experienced operators. The equipment for removing the pavement surface shall be a cold planing (milling) machine specifically designed for automatically controlled profiling which has operated successfully for a minimum of one (1) year on similar work, or equipment proven through test results satisfactory to the Engineer.

The equipment shall be maintained in a satisfactory working condition so as not to cause delays and the machine must be equipped with taillights, headlights, and necessary reflectors so that it can be operated in traffic with complete safety.

Pavement profilers shall have a means of loading by an integral loading belt, and it shall have the ability to cold mill concrete patches when encountered in the pavement.

Track-mounted cold milling equipment will be required for primary operations on roadway surfaces in which the pavement is milled down to within three quarters (3/4) of an inch of an unbound base course. Either track or conventional wheel milling machines will be acceptable on work requiring only partial-depth milling of the bound materials such that sufficient pavement materials exist after removal to support the cold milling operation.

Areas not accessible to the milling machine, such as around and/or adjacent to inlets,

manholes, curbs and transverse joints on structures, may be removed by a small milling machine, handwork or other methods approved by the Engineer. Wheel machines of sufficient size will be permitted for trimming operations.

Grade Control - The automatic controls on the milling machine shall provide accurately established profile grades at each edge of the machine by referencing from the existing pavement or an independent grade reference, where required, or be capable of automatically maintaining a designated cross slope from a single reference.

The finished milled surface will be inspected before being accepted, and any deviations in the profile exceeding ½ inch under a 16 foot string line or straightedge placed parallel to the centerline will be corrected to the satisfaction of the Engineer. Any deviations in the cross-slope that exceed 3/8 inch under a 10 foot string line or straightedge placed transversely to centerline will be corrected to the satisfaction of the Engineer. All corrections will be made with approved methods and materials. Any areas that require corrective measures will be subject to the same acceptance tolerances. Excess material that becomes bonded to the milled surface will be removed to the satisfaction of the Engineer.

The milling machine shall be self-propelled and shall have sufficient power, traction, and stability to maintain an accurate depth of cut.

Sweepers - The surface shall be left clean and dust free by the use of self-propelled power sweepers, vacuums, hand sweepers, or other methods approved by the Engineer.

Pollution Control - All equipment will be operated such that it will effectively control dust generated by cutting, loading, and/or cleaning operations. All equipment must meet or be lower than the current standards set by the Air Quality Act of noise and air pollution.

TRANSPORTATION OF MATERIAL:

Caution shall be taken to ensure that any vehicle used to transport milled material intended for use in recycled asphalt concrete will be free from any foreign matter (such as dirt, debris, leaves, solvents, etc.) Disposal of the sweepings or oversized pieces of pavement will not be permitted near the cold milling stockpiles.

CONSTRUCTION DETAILS:

Surface - The milled surface produced by the pavement profilers operation should be characterized by uniform discontinuous longitudinal striations or other patterns which will meet the requirements of the contract documents, and in the opinion of the Engineer, provide a satisfactory riding surface and suitable surface for paving.

Edge Transition Pavement Milling - The tapered cut should consist of a milled depth of up to two (2) inches, as indicated on the plans and as ordered by the Engineer, at the edge of existing pavement, transitioning to a depth of zero (0) inches, seven (7) feet from the edge of pavement.

Structures - Care shall be utilized by the Contractor to ensure that no damage occurs to curbing, manholes, water boxes, and/or similar equipment installed in the street, and the Contractor must guarantee repair or replacement of any structures damaged by its negligence.

Intersecting Streets - All streets intersecting the proposed work area shall be milled to a minimum one and one-half (1-1/2) inch depth within the limits shown on the plans or where directed by the Engineer, and shall match the new grade line of said work area. All irregularities shall be eliminated to the satisfaction of the Engineer. At local street intersections classified as "local", where more than a two (2) inch vertical face is anticipated, the butt joint created by the milling operation shall be stepped in such a manner that the rise is no greater than two (2) inches and the run (horizontal distance) is no less than twelve (12) inches. At local street intersections classified as "collector or arterial", the butt joint shall be eliminated, and a temporary transition shall be placed from the milled surface to the adjacent un-milled surface.

Joints - Where the milling area terminates and abuts the existing adjacent pavement, a neat straight line shall be cut with suitable power-driven equipment before commencing the pavement removal with a milling machine. It is the intention of this operation and the obligation of the Contractor to produce a uniform straight line at the joint.

All butt joints created by the milling operation at driveways which are greater than two (2) inches in depth shall be filled with millings or cold patch material and maintained by the Contractor to allow a safe egress and ingress for the traveling public at all times. All butt joints created by the milling operation at intersecting streets which are greater than one and one-half (1-1/2) inches in depth shall be filled with cold patch material and maintained by the Contractor to allow a safe egress and ingress for the traveling public at all times.

Safety - The Contractor will provide all necessary labor, materials, and equipment for protection of motorists and pedestrians from any protruding structures that may result from the milling operation. The Contractor shall be responsible for the protection of motorists and pedestrians from any irregularities and pavement drop-offs that may result from the milling operation.

In the event of rain or inclement weather, the Contractor shall suspend milling operations. The Contractor shall make necessary allowances for drainage of water that may pond in areas where the milling was completed and the paving has not been completed.

Sweeping - The Contractor shall provide sweeping equipment to remove all cuttings from the surface on a daily basis. The Contractor shall sweep and remove loose cuttings, dust or other objectionable material from the roadway by the end of each working day using power brooms, power vacuums or both; and whatever ancillary equipment, tools and labor necessary to properly prepare the road for subsequent tack coat and paving.

The pavement removal and cleaning operations shall be conducted in such a manner as to effectively minimize the amount of dust being emitted. The operation shall be planned and conducted so as to be safe for persons and property adjacent to the work, including the traveling public.

Bituminous concrete that cannot be removed by cold planing equipment because of physical or geometrical restraints should be removed by other methods acceptable to the Engineer.

Patching - Areas of base exposure caused by the milling Contractor as a direct result of adjusting profiling equipment, over cut beyond specified depths, use of jackhammer around structures, or utilizing equipment not specifically designed to cold plane pavements will be repaired and paid for by the Contractor. These areas of base exposure shall be repaired as a partial depth patch or a full depth patch, as directed by the Engineer. Any patching required shall be repaired before the end of the working day, and in a manner satisfactory to the Engineer.

In areas where the Contractor has held to the specified milling depth, any localized areas of exposed base materials shall be repaired as a partial depth patch by the Contractor and paid by the Engineer under the appropriate bid item.

The Engineer may require re-milling of any area where a non-uniform surface has resulted from the Contractor's operations; these areas will be corrected at no additional cost to the Authority.

SURFACE TEXTURE

Deviation - The milled surface texture deviation produced by pavement profilers should not exceed one quarter (1/4) of an inch in ten (10) feet in any direction in preparation for placing a final wearing surface, or three eighths (3/8) of an inch for an intermediate course.

Milling work shall be of varying depths, as required by the plans and/or specifications, or as directed by the Engineer. The Contractor shall take the necessary steps to prevent the pavement from being torn, gouged, shoved, broken, sooted, oil coated, or otherwise injured by the planing operation.

STOCKPILING MATERIALS

For Recycling - The salvaged material intended for use in the recycled bituminous concrete shall be segregated and stockpiled separately so as not to be contaminated by any foreign matter.

The planing operation shall be conducted so as not to permit the contamination of the salvaged pavement material by any unbound pavement materials, shoulder debris, grass, sweepings, oversized cuttings, leaves, or dirt.

MEASUREMENT:

Work shall be measured by the actual number of square yards of surface area milled to a specified depth in accordance with the specification, as shown on the plans, and accepted by the Engineer.

PAYMENT:

Payment for accepted quantities as measured will be at the contract unit price per square yard per specified depth, which price shall include full compensation for milling, loading, hauling, cleaning the milled pavement surface, temporary transitions, and stockpiling the reclaimed milled material, and for all labor, tools, equipment, materials, supplies, sweeping, and all incidentals necessary to complete the work.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
405.02	Bituminous Concrete Milling 0" – 2"	Square Yard
405.03	Bituminous Concrete Milling 0" – 3"	Square Yard
405.04	Bituminous Concrete Milling 0" – 4"	Square Yard

ITEM 407 BITUMINOUS CONCRETE TRENCH REPAIR

DESCRIPTION:

The Contractor shall repair pavements which have been damaged or removed during this construction in accordance with these specifications and as ordered by the Engineer. The pavement repair item shall be used only where pipes and structures are proposed with no road reconstruction contemplated, and in other areas as ordered by the Engineer.

MATERIALS:

1. Bituminous Concrete Mixtures shall conform to Form 817 Section 4.06.
2. Tack coat shall conform to the requirements of Form 817 Section 4.06.

CONSTRUCTION DETAILS:

The pavement replacement procedure shall be as follows:

Upon completion of the sewer installation the Contractor shall backfill in accordance with the specifications outlined under Item 205.

If the surface settles, additional base materials shall be added by the Contractor as ordered at no additional cost to the Authority. The surface shall be maintained smooth and even.

At a date, determined by the Engineer, dependent mostly upon the date of placement of base and the amount of settlement, the final pavement shall be placed as follows:

The edges of the excavation shall be line cut vertically one foot beyond the undisturbed earth and at no time be less than the trench limit plus two feet. The Contractor shall prepare the excavated area to receive bituminous concrete to the depth and type of pavement material as shown on the plans or as ordered by the Engineer.

Recommended maximum compacted lift thickness shall be as follows:

HMA S0.5 (Class 1)	2 inches
HMA S0.375 (Class 2)	1.5 inches
HMA S1 (Class 4)	4 inches

The minimum allowable replacement thickness shall be as shown on the standard sheets.

All surfaces, both horizontal and vertical, which will be in contact with the new asphalt mix, must be thoroughly cleaned of all dirt and debris. Vertical faces of existing pavements, curbs, gutters, drainage gratings, manholes, and other contact surfaces shall be painted with a uniform coating of asphalt emulsion tack coat to provide closely bonded watertight joints. This work will be performed in such a manner as to not stain exposed curb or gutter surfaces.

The base course shall be thoroughly compacted to the methods and satisfaction of the Engineer prior to the placement of any pavement materials.

Temporary Pavement

If temporary pavement is ordered it shall be placed upon completion of the pipe/structure installation and backfill. The Contractor shall construct the pavement consisting of a 2" thick rolled Bituminous Concrete Pavement. During the paving season, Class 2 mix shall be used; in winter months after November 15th, Class 5 (Cold Patch) will not be allowed within streets, unless otherwise authorized by the municipality and the Engineer. The use of a minimum 2-inch thickness of "Hybrid Asphalt" (such as Wespro, QPR High Performance Pavement Repair, or equivalent) to temporarily seal open trench excavations, or as a skim coat, may be used with the approval of the Engineer. The Bituminous Concrete shall be placed on an approved base, consisting of trench backfill, gravel fill, or subbase, as ordered by the Engineer.

If the surface settles, additional bituminous material shall be added by the Contractor as ordered by the Engineer at no additional cost to the Authority. The surface shall be maintained smooth and even.

The final pavement will be placed after 60 days and by methods specified herein.

MEASUREMENT:

The work will be measured for payment by the number of square yards for the Items "Bituminous Concrete Trench Repair" and the number of square yards for "Temporary Pavement - Trench".

There will be no direct measurement for payment for the preparation of the trench for final pavement and coating of asphalt emulsion tack coat. This work and material will be included in other items.

The maximum pay width shall be the trench excavation pay limit plus two feet, as indicated by the Contract Documents, or as specifically ordered by the Engineer.

PAYMENT:

The furnishing and placing of bituminous concrete will be paid for at the contract unit price per square yard for "Bituminous Concrete Trench Repair" of the class and thickness specified in the Proposal Form. No payment will be made for trench repair beyond the trench excavation pay limit plus two feet. Where alternate construction methods are chosen by the Contractor, additional trench repair will be completed at the sole expense of the Contractor.

The unit price shall include trench preparation and the placing of materials for asphalt emulsion tack coat.

The furnishing and placing of temporary pavement will be paid for at the contract unit price

per square yard for "Temporary Pavement, of the thickness and class specified herein.

Payment for the above items will be for the items completed and accepted in place, which price shall include pavement removal as specified elsewhere, any cutting or trimming, any excavation, all materials, equipment, labor and work incidental thereto.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
407.00	Temporary Pavement, Trench Class _____, Thickness_____	Square Yard
407.10	Bituminous Concrete Trench Repair Class 1 (HMA S0.5), Thickness_____	Square Yard
407.20	Bituminous Concrete Trench Repair Class 2 (HMA S0.375), Thickness_____	Square Yard
407.40	Bituminous Concrete Trench Repair Class 4 (HMA S1), Thickness_____	Square Yard

ITEM 512

SANITARY SEWER

DESCRIPTION:

The Contractor shall furnish and install complete and ready for use all sanitary sewer pipes, fittings, specials, connections, service laterals, capped outlets and all incidental Items as shown on the Contract Drawings, ordered by the Engineer and as specified herein.

The sanitary sewer pipe shall be of size and type as shown on the Contract Drawings and Proposal Form and shall conform to these Specifications.

All excavations trenching supports and backfilling shall conform to applicable sections in these Specifications.

MATERIALS:

All sewer pipes shall be of the sizes and classes as shown on the Contract Drawings. The Contractor shall submit to the Engineer the manufacturer's name with details of pipe, fittings and joints.

The Contractor shall provide all the facilities, labor, materials and equipment for testing pipe when required by the Engineer.

Tests provided by ASTM Specifications will be made in the presence of or by representatives of the Engineer when so required. The manufacturer or the Contractor shall furnish equipment and labor, both skilled and unskilled, for making tests and certificates of each test, without cost to the Authority and so far as applicable, the Authority shall be considered as the "Purchaser" as that word is used in ASTM Specifications.

Preliminary passing of tests or acceptance of pipe at the manufacturer's plant or storage yard shall not constitute final acceptance of the pipe.

Pipe shall be in accordance with the following:

- I. **Polyvinyl Chloride Pipe (PVC) shall be made of compounds conforming to ASTM D1784 manufactured in accordance with the material requirements of ASTM D3034 or ASTM F679 amended to date with the following additions and/or exceptions:**

The pipe and fittings shall be made from PVC plastic having a cell classification of 12454-B as described in ASTM Specifications D-1784 for "Rigid Polyvinyl Chloride Compounds and Chlorinated Polyvinyl Chloride Compounds" as amended to date.

PVC Sewer Pipe must meet all dimensional, chemical, and physical requirements as outlined in ASTM D3034 and ASTM F679 or ASTM F679 ANNEX. PVC Sewer Pipe shall be installed according to the requirements of ASTM D2321.

Each length of pipe shall have a bell-and-spigot or shall have furnished with it a

separate jointing sleeve or coupling with rubber rings compressed into place to make a watertight closure. Joints shall be sealed with a rubber ring gasket and shall be of a composition and texture which is resistant to common ingredients of sewage and groundwater and which will endure permanently under the conditions likely to be imposed by this use, and shall meet the requirements of ASTM D3212.

All wyes, tees, bends and adapters and any other fittings required by the Engineer shall be provided. Plans for such fittings showing cross sectional views with dimensions shall be provided by the Contractor to the Engineer for approval and be approved prior to their use. Fittings shall conform to ASTM D3034 and ASTM F679.

Markings - Pipe shall be marked along the outside of the barrel in bold style type and shall indicate the manufacturer's name, pipe size, PVC cell classification, type, PVC sewer pipe, and ASTM designation.

Ratings shall be marked and indicate the manufacturer's name, nominal size, material designation "PVC", type and ASTM designation.

II. Reinforced Concrete Sewer Pipe (RCP) shall conform to ASTM C-76 amended to date.

Each section of pipe delivered to the job site shall be marked with the manufacturer's name, the date of manufacture and the pipe class.

- a. Bituminous Lining - All concrete sewer pipe shall be coated on the inside with a bitumastic coating. The bitumastic coating shall conform to the following requirements:

Weight per gallon, pounds	11-13 weighting cup
Ash, by weight	36-41 ignition
Flash point Degrees Fahrenheit, minimum	95 ASTM D-56

The interior of each pipe shall be given two coats of the above bitumastic coating. It shall be applied with spray equipment in accordance with the manufacturer's recommendations. The first coat shall dry to touch in from three to six hours under normal atmospheric conditions. The second coat shall be applied in not less than 24 hours nor more than 48 hours after the first coat is applied.

The coating shall cover evenly the entire interior of the pipe, the bell or groove and exterior of the spigot or tongue.

- b. Joints shall conform to the requirements of ASTM C-361 for all reinforced concrete sewer pipes as amended.

Each length of pipe shall be provided with bell-and-spigot or tongue and-groove ends formed in the concrete wall which shall enclose the gasket on all surfaces when the joint is in final position. Tongue or spigot ends of pipe shall be a grooved type to hold O-ring compression gasket in place.

The compound used for the O-ring compression gasket shall conform to the requirements for physical properties of rubber gaskets as given in Section 5.9.1 of ASTM C-361 as amended.

The properties enumerated in Section 5.9.1 of ASTM C-361 shall be determined from tests performed on the rubber cord or specimens prepared from the cord. Tests for determination of the physical properties of the rubber cord shall be made in accordance with the test procedures outlined in Section 9.5 of ASTM C-361 as amended.

Prior to acceptance of the pipe, manufacturers must submit certified test reports which show that the rubber cord used meets all requirements for rubber gaskets given above.

- c. Elbows shall be segmented or mitered bends in accordance with the details on the Contract Drawings or as specified elsewhere. The removal of concrete to achieve the bend or miter shall be made while the concrete is still green; the concrete will be cured; the reinforcement will then be cut and welded back together with the halves held at the proper angle and approved epoxy mortar applied to fully fill the gap between pipe halves to a true cylindrical surface. Materials shall conform to those used for main sewer pipe. The angle changes indicated on the Contract Drawings are theoretical and the Contractor shall determine accurately all angle changes in the field prior to manufacture of elbow.
- d. Tees and Wyes - For pipe 33 inches in diameter or smaller, tee and wye branches with bells to take connection shall be integrally formed or cast into the pipe or constructed in a method similar to that for elbows with rewelded reinforcement and epoxy mortar. Additional steel reinforcement surrounding the tee or wye branch shall be placed in accordance with manufacturer's details subject to the approval of the Engineer. For pipe 36 inches in diameter and larger, inlets for service lateral connection may be cast in the field into the wall of the pipe with a socket for the tongue or spigot of the connection, or an approved flexible service tee seal may be installed into a core drilled hole.

If integral wyes or tees are used, the pipe extension shall be as shown on the Contract Drawings. All joints shall be compatible with the pipe to be used.

- e. Increases-Reducers - Materials shall be in accordance with the Reinforced Concrete Sewer Pipe (RCP) with the exception that the Increases/Reducers shall be eccentric about the horizontal axis and symmetrical about the vertical axis of the pipe, with uniform and gradual varying dimensions to/from the larger diameter pipe from/to the smaller diameter pipe. Joints shall be as those of the main sewer pipe.

III. Cast Iron (CIP) and Ductile Iron (DIP) Sewer Pipe shall conform to ASTM A746-09 and ANSI/AWWA C150/A 21.50 for the design methods and requirements,

and to ANSI/AWWA C151/A 21.51 for the mechanical properties of the pipe. The DIP standard thickness and pressure class shall be as specified on the Contract Drawings or ordered by the Engineer. Nominal laying length shall be 18 feet or 20 feet.

Fittings shall conform to the requirements of ANSI/AWWA C110/A21.10 with pressure rating of 250 psi.

Joints - All joints shall be push-on design or mechanical, both complying with ANSI/AWWA C111/A21.11.

Linings and Coatings - Except as otherwise specified, all ductile iron pipe and fittings shall have a cement-mortar lining with a bituminous seal coat inside in accordance with ANSI/AWWA C104/A21.4. The exterior coating of all pipe and fittings shall be a coal tar pitch varnish, in accordance with Federal Specifications Designation WW-P-421.

Markings - All pipe and fittings shall be marked in accordance with the latest applicable ANSI Specifications for the "Marking of Pipe" and the "Marking of Fittings". Mark number and weight shall be conspicuously painted on each piece.

IV. High Density Polyethylene Pipe (HDPE) shall be manufactured from a PE 3408 high density resin compound meeting the specifications of ASTM D3350. Pipe and accessories shall be 160 psi at 73.4 F degrees meeting requirements of Standard Dimension Ratio (SDR) 11 as a minimum strength.

Fittings shall be fully pressure rated to match the pipe SDR pressure rating to which they are made. All fittings shall be molded or fabricated by the manufacturer. No contractor fabricated fittings are allowed. The HDPE pipe manufacturer shall supply all HDPE fittings, accessories, adapters, and/or special components required to perform the work.

All HDPE pipe shall have a minimum bury of 36 inches.

Ropes, fabric or rubber protected slings and straps shall be used when handling pipes. Chains, cables or hooks inserted into the pipe ends shall not be used.

HDPE pipe shall be installed in accordance with the instruction of the manufacturer. A qualified joining technician as specified by the manufacturer shall perform all heat fusion joints.

All fittings shall be butt fused, electrofused, or flanged.

1) Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

2) Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

3) Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D-3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D-3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

All HDPE pipe used on low pressure sewer systems shall be field tested in conformance with Item 514.

CONSTRUCTION DETAILS:

1. Pipe Laying - All sewers shall be laid true to line and grade with bells or grooves upgrade. The sections of the pipe shall be so laid and fitted together that, when complete, the sewer will have a smooth and uniform invert. The pipe shall be kept thoroughly clean so that jointing compounds will adhere. Each pipe shall be inspected for defects before being lowered into the trench.

If pipe laying cannot start at the downgrade end and progress upgrade, due to restrictions imposed by land acquisition and/or other construction activities, then construction may be done in sections approved by the Engineer.

At the start of each job, when the Contractor is in a position to start laying pipe, the Contractor shall notify the proper representative of the supplying pipe company who will come to the job and thoroughly instruct the Contractor, its men and the Inspector in the proper methods of laying said pipe. The Contractor shall notify its men who are actually doing the laying that this method shall be strictly enforced.

At any time during pipe-laying operations, if the occasion arises, when instruction or advice is required from pipe representatives, they shall be notified and shall come to the site of pipe-laying operations for consultation before any further pipe is laid involving any such problems. Under such conditions the Contractor shall have no claim for delays.

Where the pipe connects with the outside faces of manhole walls or the outside faces of the walls of other structures and approved flexible connections are not used there shall be a short section of pipe (usually 2 feet) placed at the connection to the structure. In order to accomplish this, without cutting pipe and destroying water tight integrity by having other than the normal type joints, minor modifications in manhole locations may be made with the approval of the Engineer.

The Contractor shall furnish materials, tools and labor to assist the Inspector and to handle survey equipment, levels, grade poles, plumb poles, plumb bobs, straight edges, laser equipment, and other equipment used for transferring grades, setting strings on profiles or grade slats or aligning pipe. While Inspectors may at times assist or check alignment, the Contractor's crew shall not be dependent upon the

Inspector for the performance of such work. The Contractor shall furnish all labor, tools and facilities needed to set or transfer line and grade, to measure pipe beds pipe grade and line, etc.

To oversee pipe laying and other work in general, only one pipe laying crew will be permitted to operate at any time under one Inspector. Thus, the number of pipe laying crews and the number of locations at which pipe may be laid simultaneously under this Contract may be limited by the number of Inspectors assigned by the Engineer to oversee that type of work on the Contract. If the Contractor wishes to lay pipe at more than one location on a given day, or add additional pipe laying crews, the Contractor must notify the Engineer at least two days in advance so that an adequate number of Inspectors may be assigned to the job.

Not more than 100 feet of trench shall be opened in advance of pipe laying unless permitted by the Engineer.

The excavation of trenches shall be fully completed a sufficient distance in advance of laying of the sewer, and the exposed end of all pipes shall be fully protected with a board or other approved stopper to prevent earth or other substances from entering the pipe.

Any sewer pipe delivered to the job site in a damaged condition shall be removed from the job site immediately. Except for RCP, any other sewer pipe bruised or damaged after delivery to the job site may be repaired and used as specified when permitted by the Engineer.

Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the site.

In any pipe except as specified otherwise, showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

Except as otherwise approved, all cutting of sewer pipe shall be done with an approved power-driven cutter or pipe-cutter. Hammer and chisel shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting. The use of an oxyacetylene torch for flame cutting CIP/DIP will not be permitted. Any necessary cutting shall be done in a neat and workmanlike manner without damage to the pipe or its lining and so as to leave a smooth end at right angles to the pipe.

Field cutting of RCP will generally not be allowed.

CIP/DIP and fittings shall be subjected to a careful inspection and a hammer test just before being laid or installed.

2. Pipe Jointing - Approved joint materials shall be handled and installed in accordance with the recommendation of the manufacturer. All joints shall be wiped smooth inside the pipe.
 - A. RCP Joints shall be made in accordance with the recommendation of the manufacturer. Prior to laying the pipe the spigot of the pipe shall be lubricated with an approved vegetable soap mixture, which will not harm the rubber. The gasket shall then be placed on the spigot end and adjusted to equalize the tension within the gasket around its circumference. After the pipes are aligned in the trench, ready to be jointed, all joint surfaces shall be cleaned and immediately before jointing the pipes together, the bell shall be completely covered with the same vegetable soap mixture. The pipe shall then be carefully pushed home into place without damage to pipe, gasket, bells or bitumastic coating of the pipe. Any interior coatings damaged during installation shall be given two field coats of bitumastic.
 - B. PVC shall be installed in accordance with manufacturer's recommendations. Particular care should be taken to keep fine materials from interfering with proper joint assembly. Mating surfaces of a joint shall be wiped clean. The surfaces shall then be coated with a lubricating material prescribed by the manufacturer to overcome the frictional resistance encountered when shoving the pipe home. Pipe that is not marked with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.
 - C. CIP/DIP shall be joined in accordance with the recommendation of the pipe manufacturer. When joining the pipe with the push-on type joint, the inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket.

A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot end of the pipe or both. Gasket lubricant shall be supplied by the pipe manufacturer and approved by the Engineer.

The spigot end of the pipe shall be entered into the socket and care exercised to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked or jack-type tool or other device acceptable to the Engineer. Pipe that is not marked with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint. Field cut pipe shall be filed or ground to resemble the spigot end of such pipe as manufactured. Assembly instructions from the pipe manufacturer shall be strictly followed as approved by the Engineer.

3. Dewatering - The Contractor shall provide all necessary pumps, dams, drains, ditches, flumes, well points and other means for excluding and removing water from trenches and other parts of the work. Water shall not be allowed to rise

around the joint until it has set.

4. Foundations for Sewers - All bedding material surrounding sewer main pipes and sewer lateral pipes shall be wrapped in Mirafi 140N or Supac 5NP filter fabric or an approved equal conforming to the requirements of Form 817 Article M.08.01.19. The pipe shall be laid on a foundation and backfilled as shown on the Contract Drawings and as directed by the Engineer. Where the soil in subgrade is found to be soft, loose, freshly-filled earth, unstable or unsuitable as a base for the proposed sewer or appurtenances, the Engineer, may, at their discretion, order it excavated to such additional depth and width as they may deem proper and replace with gravel fill, borrow, Class "A" concrete, or similar materials as directed by the Engineer.

Pipe foundation for each length of pipe shall be as noted on the Contract Drawings and conform to bedding details. The top of the stone shall be brought carefully to the proper grade, well tamped or compacted as directed and shaped for the barrel of the pipe and the pipe laid thereon.

Concrete cradles and encasements where called for on the Contract Drawings or directed by the Engineer shall be of Class "A" concrete. The concrete shall conform to the requirements of Form 817 Article M.03.02. The cradle or encasement shall be as detailed on the Contract Drawings.

Where pipe is to be encased in concrete or laid in a concrete cradle; the pipe will be laid on wooden cross sills of adequate size and area to support the pipe to grade and line after excavating to required subgrade. Wooden wedges or shims and tie down will be used to secure pipe in place and to proper lines and grades.

5. Caps and/or Plugs - All pipes (e.g. manhole pipe stubs, service laterals, service chimneys, sewer to be abandoned, etc.) shall be either plugged with manufactured units or masonry bulkheads as specified hereafter. All plugs and masonry bulkheads must be installed so that any future removal will not damage the bell of the pipe.

- A. Plugging Sewer Laterals – Excavation Method: Sewer service laterals scheduled to be abandoned shall be plugged in accordance with GNHWPCA Standard Detail SD512-30. Contractor shall excavate as necessary to reach both the sewer main connection, and the lateral pipe at the apparent edge of road or at back of sidewalk. Contractor shall install plugs and fill the abandoned service lateral with controlled low strength material.
- B. Plugging Sewer Laterals – Trenchless Method: Sewer service laterals scheduled to be abandoned using the trenchless method shall be plugged in accordance with Item 513 Plugging Sewer Laterals – Trenchless Method included herein, and GNHWPCA Standard Detail SD512-31.
- C. Manufactured Plugs - Whenever possible manufactured watertight plugs shall be used. The material of the plug shall be compatible with the pipe and shall be coated however the pipe is coated externally. Pipe shall be closed

with the plug having a gasket set into the bell of the pipe in accordance with the manufacturer's recommended installation procedures and as approved by the Engineer.

- D. Masonry Bulkheads - Where manufactured plugs are not available, the Contractor shall cap manhole stubs and pipes to be abandoned by constructing masonry bulkheads of brick and mortar, or Class "C" concrete; The thickness of the masonry plug shall be at least 12 inches, forming a solid waterproof plug completely bonded to the pipe. The outside of brick bulkheads shall be parged with non-shrink mortar. Any sheeting, which is left in place, shall be cut away and removed from in front of plugged manhole stubs and service laterals.

The Contractor shall provide a piece of lumber (2 X 4") to be set vertically and left in place, extending from a point directly in front of but not in contact with the outer end of plugged manhole stubs and service laterals. Markers shall be set up to a point about 4 feet below the ground surface or finished street grade. In addition, at service laterals when directed by the Engineer a 2" X 4" should be set 3 feet into the ground and 2 feet above grade (unless public safety dictates otherwise) and shall be protected and maintained undisturbed until the Engineer has completed all their measurements, and if so ordered, will thereafter be removed by the Contractor.

6. Service Chimneys - Where ordered by the Engineer, service chimneys shall be contracted to facilitate making connections to the sewer where the sewer is in deep cut, either for connection made under this contract or for future use. Since the location of service chimneys cannot be fully determined in advance, the Engineer shall determine, as the work progresses, where they should be located. Service chimneys will be built as indicated on the Contract Drawings.

All pipe and fittings shall be properly aligned and fitted together. The chimney shall be surrounded with and embedded in, a pier of concrete as shown on the Contract Drawings. When the chimney is complete except for the top plug, a pole or rod shall be run down through the chimney from the top to the invert of the sewer below, in the presence of the Engineer, to make sure the chimney is clean and without obstructions and to measure the actual "as-built" height of the chimney. Thereafter, a watertight plug shall be set in the upper, or straightaway, end of the pipe forming the top of the chimney, and secured into place. Plugs shall be as specified hereinbefore.

7. Service Laterals shall be 6 inches or larger pipe laid on the grade or as ordered by the Engineer. Laterals shall be laid to a point at least 5 feet beyond the edge of pavements, and if an obstruction such as water service, etc., is encountered, the lateral shall be extended beyond same as ordered by the Engineer. Since the location of laterals cannot be fully determined in advance, the Engineer will determine, as the work progresses, where they should be located. They will not be laid on a grade flatter than one percent (1%), and will usually have a minimum of 42 inches of cover at the curb or street line.

Unless otherwise directed, the entire lateral trench shall be excavated to the required grade before any pipe is laid therein to conform setting of pipes without conflict, or to allow for grade adjustment. The pipe shall be laid closely to line and grade, using a grade line, hand level, or straight edge as may be ordered. Service laterals will generally be laid at right angles to the main sewer, as detailed on the Contract Drawings.

Care shall be taken to make smooth, close-fitting joints at all bends. Pipes shall be trimmed or extra bends used when ordered to accomplish this. All requirements for laying as described elsewhere herein, shall be observed in laying service laterals, insofar as those requirements apply. The end shall be closed with watertight plug before being placed in the trench, as described elsewhere for capped outlets, etc.

- A. Connections for Service Laterals to new street sewers shall only be made using a plant manufactured wye set in the line of the sewer with the outlet for the service lateral formed integrally therewith regardless of the sewer pipe material unless otherwise specified or ordered by the Engineer.

New connections to existing sewer mains shall be cored. Drill core shall be the proper size per insert manufacturer's recommendation. Pipe inserts and saddles shall be GENECO's "Sealtite Type U" as manufactured by General Engineering Company or approved equal, as shown on the plans or directed by the Engineer.

- B. Laterals shall be of the type and size as noted on the Contract Drawings listed in the proposal form or otherwise specified or approved.

- 8. Inspection and Testing - Upon completion of the installation and backfilling portions of the sanitary sewer, the pipe shall be inspected in accordance with the methods subsequently described. This inspection and testing shall be undertaken as the work progresses. The Engineer shall be notified in advance of such inspection and testing and the Contractor shall provide all facilities, materials, equipment and labor required for such testing. Such inspection and testing shall be a prerequisite for acceptance of all work.

It is the intent of this specification that the completed sanitary sewer pipes of all types, along the manholes and other appurtenances shall be watertight. Each section of sanitary sewer between two successive manholes shall be tested for leakage and/or infiltration. If the leakage and/or infiltration rate as shown by the tests specified herein is greater than the amount specified, the pipe joints shall be repaired or, if necessary, the pipe shall be removed and re-laid by the Contractor at no additional cost to the Authority. The sanitary sewer will not be considered acceptable until the leakage and/or infiltration rate, as determined by test, is less than the allowable.

- A. Visual Inspection - An inspection of the interior of the completed sanitary sewer pipe by direct visual inspection shall be made for all pipe installed from manhole to manhole. Any light, equipment or labor necessary for such inspection shall be provided by the Contractor. Any foreign material found in

the interior of the sewer, any dirt, debris or other objects shall be removed by the Contractor. Visible defects such as broken pipe sections, improperly installed gaskets, projecting connections, cracks, visible leaks or other defects shall be noted, corrected and the pipe re-inspected.

- B. Low Pressure Air Testing – Each section of sanitary sewer between two successive manholes shall be tested. The procedure for low pressure air testing shall conform to the following:

ASTM C 924-02, Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.

ASTM F 1417-92 (Re-approved 2005), Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

ASTM C 828, Practice for Low-Pressure Air Test for Vitrified Clay Pipe Lines (4 to 12 inches)

All cast iron (CI) pipe and ductile iron (DI) pipe gravity sewers shall be tested using low pressure air testing (time-pressure drop method) in accordance with ASTM F 1417-92.

- C. Deflection Testing – At least thirty (30) days after construction and flushing, all sanitary sewer systems constructed of PVC pipe shall be tested for vertical ring deflection using a deflectometer, properly sized rigid mandrel (“Go, No-Go”) device cylindrical in shape and constructed with a minimum of 9 evenly spaced arms or prongs. Drawings of the mandrel with complete dimensions shall be submitted to the Engineer for each diameter of pipe to be tested. The mandrel shall be hand pulled through all sanitary sewer lines.

Deflection shall be computed by multiplying the amount of deflection (nominal diameter less minimum diameter when measured) by one hundred (100) and dividing by the nominal diameter of the pipe. Maximum allowable vertical ring deflection is six percent (5%) of the pipe’s diameter.

Any section of sanitary sewer not passing the mandrel shall be uncovered at no additional cost to the Authority and the bedding and backfill replaced to prevent excessive deflection. Repaired sanitary sewer shall be retested. Retested sanitary sewer shall not deflect more than 4 percent (4%).

- D. Inspection by Closed Circuit TV Camera – All sanitary sewers shall be televised in accordance with the provisions of Item 522, Sanitary Sewer Television Inspection. Television inspection shall be made on the completely installed, backfilled and Infiltration/exfiltration tested sanitary sewers, and shall be required for final acceptance.

- E. Major Test by Sections – After any such section has been tested, the Engineer may, at their discretion, permit capped connections to be made

with this section of sewers by other parties; said sections may not be put in service until all sewers contemplated under this Contract have been completed and tested unless specifically waived by the Authority.

MEASUREMENT AND PAYMENT:

1. Sanitary Sewers will be measured and paid for at the unit price bid per linear foot under the Item "Sanitary Sewers" of the size, type of pipe as listed in the Proposal Form. The total length of the sewer will be measured along the invert to the outside face of manholes or other structures.
2. Service Laterals will be measured and paid for at the unit price bid per linear foot under the Item "Sanitary Laterals" of the size and type of pipe, as listed in the Proposal Form. The length shall be measured along the invert from the outside of the wye or tee to the end of the lateral.
3. Service Chimneys will be measured and paid for at the unit price bid per linear foot under the Item "Sanitary Chimneys" of the size and type of pipe as listed in the Proposal Form. The length shall be measured at the chimney vertically from the crown of the sewer to the end of the vertical pipe. The unit price bid shall include the cost of concrete encasement.
4. Cradles and Encasements will be measured and paid for at the unit price bid per cubic yard under the Item "Concrete Cradles and Encasements" as listed in the Proposal Form. The quantity will be the actual cubic yards measured within the payment limits shown on the Contract Drawings or ordered by the Engineer. The volume of the pipe will not be included in the measurement. Concrete encasements for Service Chimneys will not be measured for payment under this Item.
5. Plugging Sewer Laterals – Excavation Method will be measured and paid for at the unit price bid per Each under the Item "Plugging Sewer Laterals – Excavation Method" of the size and depth, as listed in the Proposal Form.
6. Caps. Plugs. Markers will not be measured for payment, but the cost shall be considered as included in the unit price bid for sanitary sewers.
7. Inspection and Testing will not be measured for payment, but the cost shall be considered as include in the unit price bid for sanitary sewers.
8. Wyes and Tees will be measured and paid for at the unit price bid per Each under the Item "Wyes and Tees" of the size and type of pipe, regardless of depth, as listed in the Proposal Form. The cost shall include the cost of furnishing and placing a manufactured plug at the end of the wye or tee.
9. Excavation will be performed in accordance with the Contract Drawings and shall be measured for payment in accordance with Item 205, Trench Excavation and Backfill of the appropriate classification listed in the Proposal Form.
10. Bedding shall be performed and measured for payment in accordance with the

details as shown on the Contract Drawings or as ordered by the Engineer.
 Payment shall be made at the unit price bid for Item 217, Bedding Material.

This work will be paid for at the contract unit prices, complete in place, which price shall include all materials, equipment, tools and labor, testing and inspection of the pipe and all else necessary and incidental to the satisfactory completion of the work in accordance with the Contract Drawings and these specifications or as ordered by the Engineer.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
512.01	Sanitary Sewer Size_____” Type_____	Linear Foot
512.02	Wyes and Tees Size _____” x _____” Type_____	Each
512.03	Sanitary Laterals Size_____” Type_____	Linear Foot
512.04	Service Chimneys	Linear Feet
512.05	Concrete Cradles and Encasement	Cubic Yard
512.06	Plugging Sewer Laterals - Excavation Method Size_____” Depth_____	Each

ITEM 513 PLUGGING SEWER LATERALS - TRENCHLESS METHOD

DESCRIPTION:

The work to be performed under this Item consists of the installation of a cured-in-place pipe lining plug in existing sanitary sewer laterals or storm drains in combined sewer areas of the type and size shown on the drawings or as directed by the Engineer. The intent is to provide a closed end plug at the hub connection to the main for permanent abandonment of an existing lateral.

The lining plug shall be a resin-impregnated, flexible tube which is inverted into the existing conduit by use of hydrostatic head or air pressure. When cured, the finished plug will be a continuous and tight-fitting tube that extends to within two (2) feet of the lateral/sewer main connection.

The new liner plug shall meet the requirements of the Greater New Have Water Pollution Control Authority Standard Detail SD512-31 Plugging Sewer Laterals - Trenchless Method.

REFERENCES:

American Society of Testing and Materials (ASTM):

D 5813	Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe.
F 1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

MATERIALS:

Materials shall conform to the requirements of ASTM F 1216.

SUBMITTALS:

The Contractor shall submit their proposed method of installation for approval by the Authority's Engineer. The submittal shall include all materials, methods, equipment, details, and procedures necessary to meet the intent of this specification.

CONSTRUCTION DETAILS:

The lining plug shall be installed in accordance with the practices given by ASTM F1216. After insertion is complete, pressure shall be maintained pressing the lining plug firmly against the inner pipe wall. The lining plug is chemically cured at ambient temperatures or by a suitable heat source as recommended by the resin manufacturer for the particular application.

The length of the liner shall be sufficient to effectively carry out installation to within two (2) feet of the lateral/sewer main connection. All lengths shall be verified by the Contractor prior to construction.

The liner plug wall thickness shall be 6.0 mm (minimum).

The Contractor shall install the liner through a clean out or from an excavated insertion pit inside the property line of the lot served by the abandoned lateral.

Pre- and post-installation CCTV Push Camera Inspections shall be performed in the presence of a GNHWPCA Inspector as part of the lateral plugging process. Work found defective by the GNHWPCA Inspector shall be excavated and removed by the Contractor at no additional cost to the Authority.

The insertion end of the lining plug shall be capped/sealed to prevent water infiltration.

The Contractor performing the lining plug work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner. Contractor shall perform operations in strict accordance with OSHA and manufacturer's safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces, work on elevated platforms, and working with pressurized equipment.

MEASUREMENT AND PAYMENT:

This work will be measured for payment by the actual number of linear feet of each size of sewer lateral lined with cured-in-place pipe lining plug, measured along the centerline of the sewer lateral from the insertion point to the end of the liner plug closest to the sewer main.

This work shall be paid for at the contract unit price per linear foot of "Plugging Sewer Laterals - Trenchless Method (Size)", completed, which price shall include lateral sewer cleaning, pre and post CCTV inspections, watertight plugs, and all other materials, labor, tools, and equipment incidental and necessary to furnish and install the resin-impregnated, liner plug in existing sewer laterals.

Excavation and backfill of insertion pits will be paid for in accordance with the provisions of Item 205 "Trench Excavation and Backfill" under the appropriate classifications.

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
513	Plugging Sewer Laterals – Trenchless Method (Size)	LF

ITEM 514 SEWER FORCE MAIN LEAKAGE TEST

DESCRIPTION:

Provide all labor, materials, equipment and services required to complete sewer force main leakage testing specified herein.

CONSTRUCTION DETAILS:

As a minimum, all sewer force mains shall be tested in accordance with the Hydrostatic Testing Requirements of AWWA C600.

- A. All force mains shall be given a hydrostatic test of at least 1.5 times the shutoff head of the connected pumps or 150 psi, whichever is greater. Loss of water pressure during test shall not exceed 5 psi in a 2-hour period.
- B. Where practicable, pipelines shall be tested between line valves or plugs in lengths of not more than 1500 feet.
- C. The pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection, and all necessary apparatus shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.
- D. Duration of test shall not be less than two hours.
- E. The test pressure shall not exceed the rated pressure of the valves in the pipeline.
- F. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the Contractor shall repair the joints, retighten the bolts, relay the pipe, or replace the pipe until the leak is eliminated--regardless of total leakage as shown by the hydrostatic test. Polyethylene encasement damaged from repairs must also be properly repaired or replaced to the satisfaction of the ENGINEER.
- G. All pipes, fittings and other materials found to be defective under test shall be removed and replaced at the Contractor 's expense.
- H. Lines that fail to meet test requirements shall be repaired and retested as necessary until test requirements are complied with.
- I. The Contractor will provide water for testing the force mains; the Contractor will be responsible for piping or hauling the water if necessary.
- J. No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. Allowable leakage at various pressures and pipe sizes are shown in the Table below (from AWWA C600 - Table 5A):

Allowable Leakage Per 1,000 Feet of Pipeline* - gph

Nominal Pipe Size (in)	Average Test Pressure in Force Main, psi													
	50	75	100	125	150	175	200	225	250	275	300	350	400	450
2	0.10	0.12	0.14	0.15	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.25	0.27	0.29
3	0.14	0.18	0.20	0.23	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.38	0.41	0.43
4	0.19	0.23	0.27	0.30	0.33	0.36	0.38	0.41	0.43	0.45	0.47	0.51	0.54	0.57
6	0.29	0.35	0.41	0.45	0.50	0.54	0.57	0.61	0.64	0.67	0.70	0.76	0.81	0.86
8	0.38	0.47	0.54	0.60	0.66	0.72	0.76	0.81	0.85	0.90	0.94	1.01	1.08	1.15
10	0.48	0.59	0.68	0.76	0.83	0.89	0.96	1.01	1.07	1.12	1.17	1.26	1.35	1.43
12	0.57	0.70	0.81	0.91	0.99	1.07	1.15	1.22	1.28	1.34	1.40	1.52	1.62	1.72
14	0.67	0.82	0.95	1.06	1.16	1.25	1.34	1.42	1.50	1.57	1.64	1.77	1.89	2.01
16	0.76	0.94	1.08	1.21	1.32	1.43	1.53	1.62	1.71	1.79	1.87	2.02	2.16	2.29
18	0.86	1.05	1.22	1.36	1.49	1.61	1.72	1.82	1.92	2.02	2.11	2.28	2.43	2.58
20	0.96	1.17	1.35	1.51	1.66	1.79	1.91	2.03	2.14	2.24	2.34	2.53	2.70	2.87
24	1.15	1.40	1.62	1.81	1.99	2.15	2.29	2.43	2.56	2.69	2.81	3.03	3.24	3.44
30	1.43	1.76	2.03	2.27	2.48	2.68	2.87	3.04	3.21	3.36	3.51	3.79	4.05	4.30
36	1.72	2.11	2.43	2.72	2.98	3.22	3.44	3.65	3.85	4.03	4.21	4.55	4.86	5.16
42	2.01	2.46	2.84	3.17	3.48	3.75	4.01	4.26	4.49	4.71	4.92	5.31	5.68	6.02
48	2.29	2.81	3.24	3.63	3.97	4.29	4.59	4.86	5.13	5.38	5.62	6.07	6.49	6.88
54	2.58	3.16	3.65	4.08	4.47	4.83	5.16	5.47	5.77	6.05	6.32	6.83	7.30	7.74
60	2.87	3.51	4.05	4.53	4.97	5.36	5.73	6.08	6.41	6.72	7.02	7.58	8.11	8.60
64	3.06	3.75	4.32	4.83	5.30	5.72	6.12	6.49	6.84	7.17	7.49	8.09	8.65	9.17

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

MEASUREMENT AND PAYMENT:

Testing of sewer force mains is not a pay item, and the costs are to be distributed through other related items of work.

ITEM 516 TEMPORARY BYPASS PUMPING SYSTEMS

DESCRIPTION:

Under this Item, the Contractor shall provide all materials, labor, equipment, power, maintenance, etc., to implement a temporary pumping system for the purpose of diverting the existing flow around the work area for the duration of the project.

The design, installation and operation of the temporary bypass pumping system shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that he specializes in the design and operation of temporary bypass pumping systems.

The estimated daily flow rates for dry weather and wet weather flows will be provided for specific projects identified in need of Temporary Bypass Pumping systems.

The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

MATERIALS AND EQUIPMENT:

- A. The Contractor shall provide temporary pumps, conduits, and other equipment to bypass sewer flow.
 - 1. Engines must be equipped with mufflers and/or enclosed to keep noise level less than 50 decibels, or 10 decibels above ambient noise levels when measured at the building closest to noise source.
 - 2. Provide pumps and bypass lines of adequate capacity and size to accommodate flows.
- B. The Contractor shall maintain sufficient equipment and materials on site to ensure continuous and successful operation of bypass and dewatering systems.
 - 1. Keep standby pumps fueled and operational at all times.
 - 2. Maintain on site sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping, and other parts or system hardware to ensure immediate repair or modification of any part of system as necessary.
- C. The Contractor shall provide piping, joints and accessories designed and installed to withstand at least twice the maximum system pressure, or 50 psi, whichever is greater. The bypass system shall be 100% watertight.
- D. The Contractor is responsible for ensuring that operating equipment is secure and protected and that the safety of the public is maintained at all times.

CONSTRUCTION DETAILS:

Under this item, the Contractor shall furnish, install, operate, maintain, dismantle and completely remove when completed, all necessary pumps, generators, pipelines, fittings

and all incidentals necessary for by-passing sanitary sewage flow around work to be performed on the Authority's sanitary sewer system, in accordance with the requirements of these specifications.

A. SUBMITTALS

Prior to the start of work, the Contractor shall submit drawings and complete design data showing methods and equipment to be utilized in sewer bypassing and dewatering for the review of the Engineer. The Contractor shall submit the following information:

1. Plan indicating location of temporary sewer plugs, staging areas for pumps, and the routes of proposed bypass discharge lines.
2. Capacities of pumps, prime movers, power requirements and standby equipment.
3. Sewer plugging method and types of plugs.
4. Standby power generator size and location.
5. Traffic control and public warning signing plan.
6. Road crossing details.
7. Method of protecting discharge manholes or structures from erosion and damage.
8. An emergency response plan describing the steps to be taken, personnel involved, notifications and documentation required (including Connecticut DEEP), in the event that raw sewage escapes from or as a result of the bypass pumping operations.
9. Calculations of static lift, friction losses and flow velocity together with pump curves showing pump operating range.
10. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by his firm within the past three years.

B. PROTECTION

1. In areas where flows are bypassed, the Contractor shall discharge bypass flow to a location in the sanitary sewer system approved by the Engineer. No bypassing to ground, surface receiving waters, storm drains, or any other unauthorized location or bypassing which results in environmental contamination or potential health hazards shall be permitted. The Contractor shall provide additional protection of wetlands, watercourses, etc., when, in the opinion of the Engineer, such protection is appropriate.
2. In the event sewage accidentally escapes from the Contractor's bypass pumping system, the Contractor shall immediately stop the bypass operations, notify the Engineer, implement the emergency response plan

and take all necessary actions to clean up the affected area or waterway and disinfect spillage area to the satisfaction of the Engineer.

3. The Contractor shall at all times conduct its operations in such a manner as to protect the health and safety of the Authority's staff, consultants employed by the Authority, the general public and all construction personnel.
4. The Contractor shall provide one hundred percent (100 %) back-up for the bypass pumping system in the event of an equipment failure.
5. The Contractor shall provide secondary containment for diesel pumps and appurtenances.
6. When flow in sanitary sewers is plugged, or partially blocked, sufficient precautions must be taken to protect the sewers from damage that may result from sewer surcharging. Precautions must also be taken to ensure that bypass pumping operations do not cause flooding or damage to public or private property.
7. The Contractor shall be allowed to block the flows from building services or house connections only during the cured-in-place lining process, and/or existing sewer replacement process. The interruption of flow in these connections shall be coordinated with the occupant. Flows shall only be blocked after the occupants and/or residents of the buildings affected by the service disruption have received proper notifications. It is the Contractor's responsibility to maintain lateral service to each customer and/or coordinate limited sanitary sewer use outages with the owner(s) and/or customer(s) at no additional cost to the Authority. It is the Contractor's responsibility to determine which customers will require an individual bypass system as it relates to their own proposed means and methods of construction. The Contractor shall install individual bypasses for heavy water users to prevent sewer backups specially on hospitals, buildings with multiple residential units, and other businesses. The cost for individual building bypasses including the licensed plumber(s), special investigation(s), plumbing modifications, excavations, bypass pumps, equipment, labor, and all work incidental to or necessary for the completion of all individual bypass shall be included in the lump sum price for Item 516 Temporary Bypass Pumping Systems.
8. The Contractor shall notify all property occupants who discharge sewage directly to the sanitary sewer affected by the work, that their service will be temporarily discontinued while work on the sewer system is taking place and active service connections can be re-established and re-opened. The Contractor shall notify, individual property occupants at least forty-eight (48) hours in advance, providing the date, start time and estimated completion time for the work.
9. High flow conditions may result in a temporary suspension of bypass pumping operations to ensure that spills or back-ups do not occur. No additional payment will be made to the Contractor for temporary suspension of the work due to high flows.

C. PROSECUTION OF THE WORK

1. Preparation:

- a. It is essential to the operation of the existing sewer system that there be no interruption in the flow of sewage throughout the duration of the project.
- b. The Contractor is responsible for locating any existing utilities in the area where the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the municipality and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.
- c. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access location indicated on the Drawings and as may be required to provide adequate suction conduit.
- d. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours' notice prior to testing.

2. Plugging or Blocking:

- a. Plugging or blocking of sewage flows shall incorporate primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

3. Pumping and Bypassing:

When pumping and bypassing is required, the Contractor shall provide pumps, conduits, and other equipment to divert flow of sewage around the section of the sanitary sewer system in which work is to be performed. In addition,

- a. The bypass system shall have sufficient capacity to handle the full capacity of the pipe in which flow is blocked.
- b. It shall be constructed of materials, fittings, etc., and shall be assembled in such a manner so as to prevent leakage during pumping operation.

- c. After sewer repairs or other maintenance activities have been completed, the Contractor shall restore flow to normal operation as soon as possible.
- d. When bypass pumping operations are complete, the Contractor shall flush, clean and drain the piping and pumping equipment into the sanitary sewer prior to disassembly.
- e. The Contractor shall route the bypass lines using shoulders, snow shelves, etc., wherever possible and in such a manner as to accomplish the least effect on vehicular and pedestrian traffic.
- f. When required to do so by the local traffic authority, the Contractor shall install the bypass line across the traveled way in a shallow trench, covered with temporary pavement or steel plating with the permission of the local jurisdiction and with the approval of the Engineer.

D. NOTIFICATIONS

The Contractor is responsible for notifying the appropriate authorities and for securing permission, as required, for all installations within the public right-of-way or across private property. Where a prior agreement exists between the property owner and the Authority, bypass pumping shall be in accordance with the agreement. Any damage to private property shall be repaired by the Contractor to the satisfaction of the property owner and the property shall be restored to the condition in which the Contractor first entered the property.

E. LEGAL, SAFETY AND HEALTH REQUIREMENTS

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits from each jurisdiction, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Contractor shall conduct the work at all times in such a manner as to insure the least possible obstruction to traffic. The convenience of the general public and of the residents along and adjacent to the roadway shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the Authority and the local traffic authority.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times.

The Contractor shall obtain the appropriate permits and approvals to perform operations in strict accordance with OSHA and equipment manufacturers' safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces, working in the presence of sewer gases, and working in combustible or oxygen-deficient atmospheres.

F. WATCHMAN SERVICES

The Contractor shall provide watchman service during all non-working hours for the continuous monitoring of the entire work site whenever bypass pumping is in place and operating during non-working hours. The watchmen shall be responsible for insuring that all signs, barricades, flares, and markers are up and that the bypass pumping system is in good working condition.

The watchmen shall maintain daily logs of the patrols and record any incidents relating to the by-pass pumping operations. Copies of these logs shall be made available to the Engineer.

In the event that any unusual or emergency condition arises, the watchmen shall immediately notify the Contractor, the Engineer and the appropriate emergency agency for assistance, in accordance with the emergency response plan.

The Contractor will supply the name and telephone number of the individual that may be contacted in an emergency or at any time, including nights, weekends and holidays during which by-pass pumping activities are undertaken

G. CLEAN UP

The Site shall be cleaned on a daily basis during performance of the work and shall be cleaned upon completion so that the Project Site shall be left in a clean and orderly condition acceptable to the Engineer.

MEASUREMENT AND PAYMENT:

Measurement for the work specified herein will be by lump sum, as the work progresses, and as required by the plans and specifications. Partial payment of the "Lump sum" bid for Temporary Bypass Pumping shall be in accordance with the following: (Multiple set-ups and operations shall be included in the "Lump-Sum" price)

1. When initial set-up and operation of the bypass system begins, 40% of the line item will be paid.
2. The remaining portion of the line item will be paid when the bypass pumping operations for the entire job are completed.

Bypass pumping not specifically required on plans, but directed by the Engineer and/or the Inspector, will not be measured separately for payment and will be considered incidental.

Repair or replacement of manhole sections disturbed as part of the bypass operations is

considered incidental to the line item and will not be measured separately for payment.

Construction and repair of shallow trenches to accommodate bypass lines across streets and driveways as part of the bypass operations as required by the Traffic Department to meet the requirements of their permit, will be measured for payment separately under Item 205 Trench Excavation and Backfill.

Bituminous concrete trench repair will be measured for payment under Item 407 Bituminous Concrete Trench Repair Class 2, Thickness 4 inches, to provide a final pavement repair to the areas damaged or removed during the installation of the bypass piping.

If no Item "Temporary Bypass Pumping" is listed on the Proposal Form, the cost of this work shall be included in the prices bid for the following items when the temporary bypass pumping is performed in conjunction with work under these items:

Item 518, Sanitary Sewer Cleaning
Item 520, Sanitary Sewer Cured-In-Place Pipe Lining
Item 522, Sanitary Sewer Television Inspection
Item 521, Sanitary Sewer Point Repairs
Item 524, Sanitary Sewer Manhole Rehabilitation

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
516	Temporary Bypass Pumping Systems	Lump Sum

ITEM 518 SANITARY SEWER CLEANING

DESCRIPTION:

Sanitary Sewer Cleaning shall consist of removing and disposing of sediment, rocks, debris, roots, grease accumulations and obstructions from sanitary sewer pipes and manholes. In addition, cleaning of sewer and manhole walls in the vicinity of pipe and/or manhole lining operations shall remove grease, scale, encrustation and loose mortar so that no foreign intrusion shall cause imperfections in lining materials (e.g. bumps, folds, dimples).

Sanitary Sewer Hydraulic Cleaning (Light) shall mean up to 3 passes of washing with high pressure water. Removal of roots and grease is included under this item.

Sanitary Sewer Hydraulic Cleaning (Heavy) shall mean more than 3 passes of washing with high pressure water unless alternate means are approved, in writing, by the Engineer. Removal of roots and grease is included under this item.

Sanitary Sewer Bucket Cleaning shall mean the mechanical removal of obstructions using bucket-type equipment followed by Sanitary Sewer Hydraulic Cleaning (Light).

MATERIALS AND EQUIPMENT:

A. HIGH-VELOCITY HYDRAULIC (HYDRO-CLEANING) EQUIPMENT:

Equipment shall be capable of removing dirt, grease rocks, sand, roots, and other materials and obstructions from sewer lines and manholes.

1. Equipment shall have selection of two or more high-velocity nozzles. Nozzles shall be capable of producing scouring action from 15 to 45 degrees in all size lines designated to be cleaned, with nozzles capable of producing flows from fine spray to solid stream. One of the nozzles shall be designed for penetrating blockages.
2. Equipment shall carry its own minimum of 1,000 gallons water tank, auxiliary engines, at least 500 linear feet of high pressure hose, and a high pressure water pump.
3. Combination Unit Pump: Capable of pumping at least 80 gallons per minute at 2,000 psi, measured at beginning of hose reel.
4. Water Pump: Able to run at 2,000 psi while pulling full vacuum, completely independent from vacuum system, with ability to vary vacuum without affecting water pressure.
5. Equipment shall also include attachments for cutting roots and other intrusions into the sanitary sewer flush with the pipe walls.

6. Only trucks and dumpsters suitable for handling semi-liquid waste shall be used to store and/or dispose of debris taken from sanitary sewers. No leakage or dripping from the Contractors equipment will be tolerated.

B. WATER

1. When water must be taken from fire hydrants the Contractor shall obtain all permits from the appropriate water utility and local agencies for any use of the potable water source. It shall be the responsibility of the Contractor to contact the appropriate water utility to determine, and comply with, all permit conditions and requirements such as limited hydrant use or other limitations including payment of all fees. All water utility requirements stipulated by the permits for the use of potable water supply shall be strictly enforced.
2. The Contractor shall not be allowed to utilize the water source until it has been approved by the appropriate water utility and the Engineer.
3. Water supplied from fire hydrants shall be at the expense of the Contractor. The Contractor shall be required to make repair any damages resulting from the improper use of the water supply system. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant nor shall a hydrant be used for the purpose described unless a back-flow preventer/vacuum break is provided.
4. The Contractor shall provide all of the necessary temporary piping, valves, certified reduced pressure backflow preventors, equipment, and other items for handling potable water and wastewater.

CONSTRUCTION DETAILS:

Under this item, the Contractor shall perform sanitary sewer cleaning operations, furnish, install, operate and maintain, and when completed remove, all necessary rodding, bucket-type and other cleaning equipment and all incidentals necessary for sanitary sewer cleaning operations, in accordance with the requirements of this specifications and to the satisfaction of the Engineer.

A. SUBMITTALS

Prior to the start of work, the Contractor shall submit to the Engineer the methods that it will use to remove sediment, debris, grease, scale, encrustations, loose concrete, and roots throughout the section of sanitary sewer to be cleaned. The submittal shall include a detailed explanation of the cleaning process; a schedule of activities; references where the Contractor has used the identified cleaning method successfully in the past; together with a list of the actions that will be taken to mitigate impact on the collection system during the cleaning operation.

B. PROSECUTION OF THE WORK

1. The Authority shall ensure that access to manholes is available. The Authority will provide to the Contractor with the project documents details of any easements over private property within which the cleaning operations are to be conducted. The Contractor shall comply with any restrictions and/or requirements of the subject easement. The Contractor is responsible for providing adequate notice to the property owner prior to entering onto private property. The Contractor shall not enter onto any private property not subject to the appropriate easements without the written permission of the property owner.
2. The Contractor shall not be permitted to use chemicals without prior written approval of the Engineer. Chemicals which may be considered by the Engineer to be hazardous or detrimental to organisms or equipment at the wastewater treatment plant shall not be permitted.
3. The Contractor shall be aware of flow conditions in the system to be cleaned, and be able to identify potential access problems to sewer access points. The Contractor shall restrict the flow level in the pipe to a maximum of 30% of the pipe diameter.
4. Sanitary Sewer Hydraulic Cleaning (Light) and Sanitary Sewer Hydraulic Cleaning (Heavy). The Contractor shall clean designated sewer lines using approved methods and equipment.

Remove internal obstructions such as roots or gaskets by trenchless techniques when obstruction encountered prevents further pipe cleaning.

- a. Provide special attention during cleaning operation to assure almost complete removal of roots from joints.
- b. Procedures to remove internal obstructions may include use of equipment such as rodding machines, root saws,
- c. No roots greater than 1½" shall remain following root removal procedures.

If cleaning of the entire section of sewer cannot be successfully performed from one manhole, equipment shall be dismantled and set up at another manhole and cleaning shall re-commence from this location.

- a. If successful cleaning cannot be performed or equipment fails to traverse entire sewer line section, it will be assumed that a major blockage exists. Temporarily suspend cleaning effort and immediately notify the Engineer.

- b. Upon removal of obstruction by the Contractor, complete cleaning operation.

Employ satisfactory precautions to protect sewer line from damage that might be inflicted by improper use of cleaning equipment.

- a. Immediately notify the Engineer if fresh soil, pieces of pipe, bricks or other visible signs of serious potential damage to the structural integrity of the pipes and/or manholes being cleaned, occurs during cleaning operation.
- b. Insure that water pressure created does not cause damage due to flooding of property being served by sewer section(s) involved.

Sanitary sewer hydraulic cleaning of sanitary sewer pipes shall be performed by the Contractor using a CCTV camera that simultaneously follows the high velocity nozzles to immediately identify any existing problems or any problems that the high velocity nozzles may create. A GNHWPCA representative shall be present during cleaning operations of any brick sanitary sewer pipes.

- 5. When Bucket Cleaning is required, in the opinion of the Engineer, in any particular pipe or section of pipe, bucket machines and winches using root cutters, porcupines, and jet machines equipped with hydraulically driven cutters may be employed.
- 6. When all large obstructions have been removed from pipes or sections of pipe, to the satisfaction of the Engineer, the Contractor shall clean the entire section of pipe according to the requirements for sanitary Sewer Hydraulic Cleaning (Light).
- 7. When manholes are to be cleaned, include entire manhole interior, including manhole benches and walls. Incorporate into line cleaning operation by scouring walls with high velocity nozzle after pipe segment cleaning operation is complete.
- 8. All debris collected and/or loosened during cleaning operations shall be completely removed from the pipes and manholes and transported by the Contractor to the East Shore Water Pollution Abatement Facility (ESWPAF) for disposal, in accordance with rules established by the ESWPAF. At no time shall the Contractor discharge sewage or solids removed from downstream manholes, onto streets, or into ditches, catch basins or storm drains. Removal of any debris that is allowed to escape downstream must be promptly removed from downstream manholes.

9. The Contractor shall install screens of adequate aperture in the sewer system, upstream of the cleaning operations in such a way as to prevent debris from entering into the cleaned sections of pipe.
10. Any blockage of building laterals resulting from cleaning operations shall be removed by the Contractor including cleaning of the subject lateral if necessary to restore flow.
11. The Contractor shall monitor the locations where plugs are introduced into pipes upstream of the cleaning operation to ensure no danger of surcharge or of sewage overflow at manholes or sewage back-up into buildings.

C. LEGAL, SAFETY AND HEALTH REQUIREMENTS

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Contractor shall conduct the work at all times in such a manner as to insure the least possible obstruction to traffic. The convenience of the general public and of the residents along and adjacent to the roadway shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and Materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the municipality and the Authority.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times.

The Contractor shall perform operations in strict accordance with OSHA and manufacturers' safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces.

D. ACCEPTANCE BY THE ENGINEER

Final Acceptance of the work shall be determined by the Engineer based upon the verification by television inspection that the Sanitary Sewer Cleaning has been successfully completed in accordance with the following requirements:

- 1 Where cleaning is in preparation for television inspection, cleaning shall be in accordance with these specifications and the requirements of Item 522, Sanitary Sewer Television Inspection.

- 2 Where cleaning is in preparation for the installation of cured-in-place pipe lining, cleaning shall be in accordance with these specifications and the requirements of Item 520, Sanitary Sewer Cured-in-Place Pipe Lining.
- 3 Where cleaning is in preparation for manhole rehabilitation, cleaning shall be in accordance with these specifications and the requirements of Item 524, Sanitary Sewer Manhole Rehabilitation.
- 4 Where cleaning is performed for all other operational or maintenance activities performed by the Authority and not listed above, these specifications shall solely apply.

If the Engineer determines that the cleaning has not been completed in accordance with the requirements of these specifications, the Contractor shall continue the cleaning process until final acceptance is obtained.

The Contractor shall notify the Engineer of any sections of pipe that could not be adequately cleaned with up to 3 passes of the washing equipment and the Engineer shall confirm to the Contractor that all such sections of pipe will be paid for at the contract unit price for Sanitary Sewer Hydraulic Cleaning (Heavy).

E. CLEAN UP

The site and the disposal area at the East Shore Water Pollution Abatement Facility shall be cleaned on a continuous, daily basis during performance of the work and shall be cleaned upon completion so that the project site and disposal area shall be left in a neat and orderly condition acceptable to the Engineer.

MEASUREMENT AND PAYMENT:

This work will be measured for payment by the actual number of linear feet of the size and type of sanitary sewer cleaned, measured along the centerline of the sanitary sewer from the center of the manhole to the center of the manhole.

Sanitary Sewer Hydraulic Cleaning (Light)

This work shall be paid for at the contract unit price per linear foot of "Sanitary Sewer Hydraulic Cleaning (Light) (Size) (Type), actually completed, which price shall include all materials, labor, tools, and equipment incidental and necessary for the cleaning of the sanitary sewers and manholes including the collection and transportation of all solids removed in the cleaning process to the disposal area at the East Shore Water Pollution Control Facility.

Sanitary Sewer Hydraulic Cleaning (Heavy)

This work shall be paid for at the contract unit price per linear foot of "Sanitary Sewer Hydraulic Cleaning (Heavy) (Size) (Type), actually completed, which price shall include

all materials, labor, tools, and equipment incidental and necessary for the cleaning of the sanitary sewers and manholes including the collection and transportation of all solids removed in the cleaning process to the disposal area at the East Shore Water Pollution Control Facility.

Sanitary Sewer Bucket Cleaning

This work shall be paid for at the contract unit price per linear foot of "Sanitary Sewer Bucket Cleaning (Size) (Type), actually completed, which price shall include all materials, labor, tools, and equipment incidental and necessary for the cleaning of the sanitary sewers and manholes including the collection and transportation of all solids removed in the cleaning process to the disposal area at the East Shore Water Pollution Control Facility.

The cost for work performed in sanitary sewers in which cleaning had to be terminated because of blockages or obstructions will be paid for at the contract unit price per linear foot for the actual portion of the sanitary sewer cleaned and accepted.

There will be no measurement for payment for the cost of cleaning manholes, but the cost thereof shall be included in the contract unit price per linear foot for the size and type of Sanitary Sewer Hydraulic Cleaning (Light).

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
518.01	Sanitary Sewer Hydraulic Cleaning (Light) (Size) (Type)	Linear Foot
518.02	Sanitary Sewer Hydraulic Cleaning (Heavy) (Size) (Type)	Linear Foot
518.03	Sanitary Sewer Bucket Cleaning (Size) (Type)	Linear Foot

ITEM 520 SANITARY SEWER CURED-IN-PLACE PIPE LINING

DESCRIPTION:

The work to be performed under this Item consists of the installation of a cured-in-place pipe lining in existing sanitary sewers of the type and size shown on the drawings or as directed by the Engineer. The intent is to correct deficiencies in the existing sewers and to extend their service life. The work shall be accomplished through existing manholes without excavations.

The lining shall be a resin-impregnated, flexible, polyester felt, or equivalent material tube which is inserted into the sewer to be rehabilitated and cured in place by an acceptable curing method until it is tightly and rigidly fitted against the existing pipe. The lining shall have a suitable membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface. The resin shall be a thermosetting or ultraviolet setting (UV) resin, and shall be suitable for the design conditions as well as the curing process.

The new liner shall be continuous from manhole to manhole, and shall be designed to carry all superimposed soil, hydrostatic and traffic loads by itself without considering any load relief from the existing sanitary sewer pipe.

Cured-in-Place Pipe Lining shall conform to the following requirements:

REFERENCES:

1. American Society of Testing and Materials (ASTM)

C 581	Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures, Intended for Liquid Service.
D 543	Test Method for Resistance of Plastics to Chemical Reagents.
D 578	Standard Specification Glass Fiber Strands.
D 790	Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials.
D 3567	Standard Practice for Determining Dimensions of Reinforced Thermosetting Resin Pipe (RTRP) and Fittings.
D 3681	Test Method for Chemical Resistance of Reinforced Thermosetting Resin Pipe in a Deflected Condition.
D 5035	Test Method for Breaking and Elongation of Textile Fabrics (Strip Method).

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|--------|---|
| D 5199 | Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes. |
| D 5813 | Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe. |
| F 1216 | Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube. |
| F 1743 | Standard Practice for the Rehabilitation of Existing Pipelines and Conduit by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP). |

When reference is made to one of the above Standards, the revision in effect at the time of bid receipt shall apply.

MATERIALS AND EQUIPMENT

A. LINER MATERIAL - GENERAL

1. The tube shall be light-colored or white liner material to facilitate closed-circuit TV inspection shall be used.
2. The liner material, including any plastic covering and the thermosetting resin shall conform to the requirements of ASTM D5813 and F1216.
3. Resin-impregnated tube liner material shall consist of one or more layers of flexible needled felt, or equivalent woven or non-woven material.
4. Capable of carrying resin, and withstanding installation pressures and curing temperatures. The tube should be compatible with the resin system to be used on this project.
5. Able to stretch to fit irregular pipe sections and negotiate bends.
6. The length of the liner shall be sufficient to effectively carry out installation and seat the liner at the inlet and outlet pipes of each manhole. All lengths shall be verified by the Contractor prior to construction.
7. The Contractor shall be responsible for ensuring that the correct liner is installed in each sewer being rehabilitated.
8. The actual cured liner thickness shall be ± 5 percent of the approved design thickness and shall not include the thickness of the membrane coating.

9. Outside layer of tube should be plastic-coated with material compatible with resin system used.
10. The felt content of the liner shall be determined by the manufacturer but shall not exceed 25 percent of the total impregnated liner volume.
11. The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system that when properly cured meets the minimum requirements given herein or those that are to be utilized in the design of the CIPP liner for this project. The quantity of resin used for the tube's impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances being made for polymerization shrinkage and the anticipated loss of any resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used in conjunction with a roller system to achieve a uniform distribution of the resin throughout the tube.

B. LINER MATERIAL – PHYSICAL REQUIREMENTS

Liners fabricated from resin-impregnated tubes shall meet the following physical requirements:

PROPERTY	TEST METHOD	MINIMUM VALUE
Flexural Modulus (Initial)	ASTM D790	250,000 psi
Flexural Modulus (Long Term)	ASTM D790	125,000 psi
Flexural Strength	ASTM D790	4,500 psi
Tensile Strength (Yield)	ASTM D638	3,000 psi
Tensile Modulus (Initial)	ASTM D638	300,000 psi
Tensile Modulus (Long Term)	ASTM D638	150,000 psi

CONSTRUCTION DETAILS:

The CIPP shall be installed in accordance with the practices given by ASTM F 1216 (for direct inversion installations) or ASTM F 1743 (for pulled-in-place installations). Under this item the Contractor shall perform cured-in-place pipe lining; furnish, install, operate and maintain, and when completed remove, all necessary equipment; furnish, install

impregnate and cure pipe lining materials and provide all incidentals necessary for complete sanitary sewer cured in place pipe lining in accordance with the contract documents and the requirements of these specifications.

A. *SYSTEM DESCRIPTION*

1. LINER DESIGN REQUIREMENTS

- a. The liner shall be designed to have a service life of a minimum of 50 years under continuous hydraulic and structural loading conditions.
- b. The liner shall be designed by a Professional Engineer Registered in the State of Connecticut.
- c. The thickness of liner system will be designed for a fully deteriorated host pipe condition. Design calculations shall be based on a minimum ovality of 2 percent, a soil unit weight of 120 pounds per cubic foot, a soil modulus of 1000 psi and a water table condition at the ground surface. Traffic loads shall be based on HS-20-44 highway loading. A minimum safety factor of 2.0 shall be used and the short term modulus of elasticity shall be reduced by 50 percent in the calculations.
- d. Manning's "n" value used for the host pipe shall be 0.015, and rehabilitated line shall be 0.013.
- e. Diameter and wall thickness of new liner shall be manufactured to size such that when installed, it will provide minimum wall thickness determined by the use of the standard flexible pipe equations as detailed in ASTM F1216.
- f. The short-term modulus of elasticity shall be reduced by 50 percent in the calculations.
- g. Assume that the installed CIPP shall have complete structural support, without considering structural support from existing pipe except during construction.
- h. The design of the liner shall include considerations for ring bending, deflection, combined loading, buckling, and ovality.

2. LINER PERFORMANCE REQUIREMENTS

- a. Liner system shall have minimal effect on the flow-carrying capacity of the existing sewer, but in no case shall system capacity be reduced by more than 16 percent.

- b. Liner material shall be inert to attack by domestic sewage and suitable for use in underground sewer environment.
- c. Liner material shall be manufactured in such manner as to result in tight-fitting liner after installation. There shall be no measurable continuous annular space between outside diameter of new liner and the inside diameter of the existing host pipe.

B. SUBMITTALS

1. SHOP DRAWINGS

The Contractor shall submit a set of design calculations signed and sealed by the designer. These calculations shall include all stresses expected to result from the specified design loading conditions. Calculations shall include thickness calculations, and assumptions used as the basis for the design calculations

The Contractor shall submit shop drawings that identify locations and method of liner insertion.

- a. Shop Drawings shall be submitted for review by the Engineer at least ten (10) working days prior to start of work.
- b. Submit temporary bypass pumping plans and locations with sufficient detail to assure that Work can be accomplished without service interruption or sewage spill. The bypass pumping plan shall be in accordance with the provisions of Item 516, Sanitary Sewer Flow Control and Bypass Pumping.
- c. Submit an emergency response plan to be followed in event of failure of bypass pumping system.

2. PRODUCT DATA

The Contractor shall provide manufacturer's data for lining materials and resins, and the following documentation:

- a. Manufacturer's certification that liner materials are in compliance with specifications, codes, and standards referenced herein.
- b. Installation instructions and details of component materials and construction details, including complete manufacturer's recommendations for storage and handling procedures and temperature control, and inserting liner, curing details, and trimming, sealing and finishing.

- c. Manufacturer's certification that liner has been properly sized to avoid creation of wrinkles or folds including field measurements, and pipe-sizing calculations.
- d. Resin manufacturer's specifications, characteristics and properties of the resin, methods of application, curing temperatures, and duration of temperature (step cooking temperatures/hours at each and final stages).
- e. A history of successful production of the materials to be used acceptable to the Engineer

3. CONTRACTOR QUALIFICATIONS

The Contractor performing the CIPP lining work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner. The Contractor shall submit the following information to the Engineer for review at the time of the bid opening:

- a. The number of years of experience in performing this type of specialized work.
- b. The name(s) of the CIPP lining manufacturer(s) and supplier(s) for the work and previous work listed below.
- c. Evidence acceptable to the Engineer, such as certified copy of license or agreement, establishing that the Contractor has authority from patent owner(s) to use and/or install patented equipment, materials and methods.
- d. A list of municipal clients for whom the CIPP Contractor has performed this type of work without defects or performance problems for a period of three years after installation. This list shall include the names and telephone numbers of persons who can be contacted to verify previous satisfactory performance. A description of the actual work performed. The Contractor shall write the type of installation process (inversion or pulled-in-place) that was used for the work. The list of municipal clients shall include the approximate linear footage and sizes of CIPP lining installed.

C. QUALITY CONTROL

TEST CERTIFICATES: The Contractor shall submit certificates of compliance with design and test reports in accordance with applicable ASTM test methods.

D. QUALITY ASSURANCE

1. The Contractor shall comply with the requirements of these specifications and all applicable product manufacturer's recommendations. Any conflict between product manufacturer's recommendations and any portion of these specifications shall be resolved by the Engineer prior to the start of the work.
2. Manufacturer Qualifications: Products used in the work shall be produced by manufacturers regularly engaged in the manufacture of similar items, and with history of successful production acceptable to the Engineer.
3. Installer Qualifications: Licensed by lining system manufacturer, and have the following qualifications:
 - a. Thoroughly trained and experienced in necessary crafts.
 - b. Completely familiar with specified requirements and methods needed for proper performance of Work.
4. All CIPP linings shall be from a single manufacturer. The supplier shall be responsible for complying with the provisions of all test requirements specified in the respective ASTM standards.
5. Pre-installation inspections of the CIPP lining material may be made by the Engineer or other representative of the Authority after delivery to the site. The CIPP shall be subject to rejection at any time prior to installation for failure to meet any of the specification requirements, even though sample CIPP may have been accepted as satisfactory at the place of the manufacturer. CIPP rejected after delivery shall be marked for identification and shall be immediately removed from the project site.
6. If the Contractor uses any material other than an approved material or a method other than an approved method, the Contractor shall, at its sole expense and with no cost to the Authority, remove the entire section of rehabilitated pipe and replace it with a new pipe as directed by the Engineer.

E. DELIVERY, STORAGE, AND HANDLING

1. The Contractor shall exercise care during transportation, handling, and installation of the liner to ensure that the liner material is not torn, cut,

exposed to direct sunlight or otherwise defective or damaged.

2. If any part of the liner material becomes torn, cut, or otherwise damaged before or during insertion, the Contractor shall repair or replace the affected section at Contractor's expense before proceeding with any additional lining work.
3. The liner shall be adequately supported and protected during delivery storage and handling. The liner shall be stored and handled according to the manufacturer's recommendations.

F. MANUFACTURERS

Subject to compliance with the requirements of the specifications, manufacturers offering products that may be incorporated in the work include, but are not limited to the following companies:

1. Insituform Technologies, Inc. CIPP
2. Applied Felts
3. InLiner USA
4. Impreline Technologies
5. Cure-Line Pipe

G. GUARANTEE

All cured-in-place pipe lining and sewer lateral/sewer main connection lining systems placed shall be guaranteed by the Contractor for a period of three years from the date of acceptance by the Engineer. During this period, all serious defects discovered in the lining, as determined by the Engineer, shall be repaired in an approved manner or the liner shall be replaced at no cost to the Authority.

The Contractor shall perform a CCTV inspection prior to the end of the three-year period at no additional cost to the Authority. The cost for the Guarantee CCTV inspection shall be included in the cost for CIPP lining. This inspection shall be performed during night time low flow conditions. Bypass pumping will not be required unless during the inspection it becomes apparent that bypass pumping is necessary.

H. LEGAL, SAFETY AND HEALTH REQUIREMENTS

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Contractor shall conduct the work at all times in such a manner as to ensure the safety of the traveling public. The convenience of the general public and of

the residents along and adjacent to the site shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the Engineer and Local/State Agency with authority over roadway encroachments.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times.

Perform operations in strict accordance with OSHA and manufacturers' safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces, work on elevated platforms, and working with pressurized equipment.

I. PROSECUTION OF THE WORK

1. EXAMINATION

- a. The Contractor shall take field measurements of pipe inside diameter of sewer lines to be rehabilitated.
- b. In conjunction with review of color closed-circuit television (CCTV) records, provide correct liner diameter and wall thickness to ensure tight fit with existing pipe to be restored.
- c. Confirm lengths of liner to be installed.
- d. Locate live services prior to rehabilitation activities. Each service connection shall be noted by size, position from reference manhole, and orientation with respect to circumference of pipe. For purposes of this specification, live services include inactive service lines to vacant lots, vacant buildings, or to occupied buildings with more than one service line serving property.

2. PREPARATION

The Contractor shall successfully complete the following items before installation of the work.

- a. Control sewer flow.
- b. Clean sewer.

- c. Perform television inspection of sewer.
- d. Take precautions to protect the new liner, and existing pipe and manholes from damage that might result from the liner insertion process.

3. SEQUENCE OF WORK

The Contractor shall perform work in the following sequence:

- a. Divert sewer flow to comply with the requirements of Item 516, Sanitary Sewer Flow Control and Bypass Pumping.
- b. Perform point repairs called out in the project documents or as directed by the Engineer.
- c. Clean sewer in accordance with the requirements of Item 518, Sanitary Sewer Cleaning and perform pre-insertion television inspection to comply with the requirements of Item 522, Sanitary Sewer Television Inspection. Complete cleaning and television inspection a minimum of 24 hours prior to commencement of lining operations.
- d. Install and cure liner and seal ends.
- e. Perform adaptation and sealing of liner at intermediate manhole inverts, as applicable.
- f. Reconnect service connections.
- g. Perform post-insertion television inspection to comply with the requirements of Item 522, Sanitary Sewer Television Inspection.

4. PIPELINE POINT REPAIR

- a. The Contractor shall repair pipeline where point repairs are identified in Contract documents or as directed by the Engineer in accordance with the requirements of Item 521, Sanitary Sewer Point Repairs.
- b. Pipe and repair materials shall be as directed by the Engineer, unless otherwise indicated on the contract documents.
- c. Trenching and excavation shall conform to the requirements of Item 205, Trench Excavation and Backfill
- d. Bypassing and Dewatering: When required to maintain sanitary

service, bypass sewer flow around work area, in conformance with the requirements of Item 516, Sanitary Sewer Flow Control and Bypass Pumping.

- e. Notify the Engineer, a minimum of forty-eight (48) hours in advance of commencement of pipeline point repair work at each particular location.
- f. Installation and Field Inspection: Installation of replacement pipe and/or repair work shall conform to the requirements of Item 512, Sanitary Sewer. All pipeline point repairs shall be inspected by the Engineer and the Authority's Inspectors prior to back filling and compaction.

5. LINER INSTALLATION - CIPP

Contractor shall perform operations in strict accordance with OSHA and manufacturer's safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces, work on elevated platforms, and working with pressurized equipment.

- a. The Contractor shall install liner for cured-in-place pipe in accordance with ASTM F1216.
- b. *Resin Impregnation:* The Contractor shall designate a location where uncured resin in original containers and un-impregnated liner tube will be impregnated prior to installation. The Contractor shall notify the Engineer where resin impregnation will take place.
 - i. A vacuum impregnation process with roller system or other approved method designed to uniformly distribute resin throughout tube shall be used.
 - ii. The Engineer may inspect materials and "wet out" procedure.
 - iii. Use resin and catalyst system compatible with requirements of this method.
- c. *Liner Insertion:* The Contractor shall install the liner through existing or new manholes. Unless otherwise approved in writing by the Engineer, excavation for liner insertion shall not be permitted. Ensure that pressure in liner exceeds both pressure due to groundwater head and any pressure due to sewage in laterals or connecting side sewers.
 - i. Insert impregnated tube through existing or new manholes

by means of installation process, and application of hydrostatic head, compressed air, or other means sufficient to fully extend it to next designated manhole or termination point.

- a) Inflate and firmly adhere liner to pipe wall.
 - b) Install liner at rate greater than three feet per minute and less than 10 feet per minute.
- ii. Prior to insertion, mark exterior of manufactured tube along its entire length at regular intervals not to exceed five (5) feet as a gauge to measure elongation during installation.
 - a) During insertion of resin impregnated tube into pipeline, maximum allowable longitudinal elongation or stretch of material shall be 5 percent.
 - b) Longitudinal stretch of tube shall be gauged by comparing markers on fully inserted tube to actual length of pipe being rehabilitated.
- d. *Insertion by Inversion:* Insert wet out liner through existing manhole by means of inversion process, and application of hydrostatic head or air pressure sufficient to fully extend it to next designated manhole.
 - i. At lower end of standpipe or guide chute, turn liner inside out and attach to standpipe (or chute) so that a leak proof seal is created.
 - ii. Adjust inversion head or air pressure to be of sufficient magnitude to cause impregnated liner to invert from manhole to manhole, hold tube tight to pipe wall, and produce dimples at service lateral connections and flared ends at manholes.
 - iii. Use lubricant if required.
- e. *Insertion by Winching:* The Engineer may accept winched-in applications as an alternate to the inversion process, provided that the liner tube and resin conform to materials and curing requirements of ASTM F1216 and these specifications.
 - i. Insert wet out liner through upstream manhole, and pull through section with power winch and steel cable attached to end of liner with appropriate pulling head.

- ii. Provide monitoring device on cable to measure pulling force. Should the pulling force exceed manufacturer recommendations, tube shall be rejected and replaced.
- iii. Install rollers in upstream and downstream manholes to guide liner into and out of host pipe, and to guard against chafing of crowns at entry and exit from winch cable.
- iv. Where indicated on the contract documents, cover sewer invert throughout section to be lined, with polyethylene foil or other suitable material to facilitate threading of liner and reduce risk of damage to liner material.
- v. Use flexible and impermeable calibration hose to inflate tube. Calibration hose may be allowed to remain in completed installation at the discretion of the Engineer.
 - a) Dry liner or inflation hose material that enters existing pipe that has not been previously vacuumed impregnated with resin under controlled conditions cannot be included in structural wall of CIPP. Nominal thickness of this material shall be deducted from field sample thickness measured in order to verify that minimum specified wall thickness is achieved.
 - b) Hose material remaining in installation shall be compatible with resin system used, bond permanently with tube, and be translucent to facilitate post-installation inspection.
 - c) Hose material to be removed after curing shall be non-bondable material.
- vi. Introduce water, air and/or steam into liner. Pressure will inflate and press liner material in tight fit against inner walls of host pipe, producing dimples at lateral and side connections and flared ends at manholes.

6. CURING

Heat Curing: After the insertion is completed, the Contractor shall use a heat source to uniformly heat the liner to cure the resin in the liner. The curing temperatures shall be as recommended by the resin/catalyst system of the resin manufacturer. The heat source shall be fitted with suitable monitors to gage the temperature of the incoming and outgoing heat source. Initial cure may be considered completed when the exposed portions of the liner appear to be hard, and the remote sensing device indicates the temperature to be adequate, as recommended by the resin/catalyst system manufacturer. Curing temperatures and duration shall comply with previously submitted data and information.

UV Curing: After the insertion is completed, the liner shall be visually inspected before curing is to begin. The Contractor shall then use an Ultraviolet light source to cure the resin in accordance with manufactures recommendations. The light source should be fitted with closed circuit television and infrared sensors to monitor the liner wall temperatures to ensure proper cure. Initial cure may be considered completed when the infrared data indicates adequate reaction temperatures throughout the entire length of liner. Contractor shall provide documentation of curing equipment calibration, lamp intensity, number of lit lamps, inner air pressure of the liner in psi, curing speed in feet per minute, and resin reaction temperature.

7. COOL-DOWN

Cool hardened liner to temperature below 100 degrees F before relieving pressure in section.

- a. Cool-down may be accomplished by introduction of cool water or air into lined pipe to replace water or steam and water being drained.
- b. Drain water from small hole made in downstream end.
- c. Prevent development of vacuum during release of static head or air pressure that could damage pipe or newly installed lining.
- d. After tube has cured, a sufficient cool-down period shall elapse prior to continuation of the work.

8. SEALING AT MANHOLES

If CIPP fails to make tight seal at manhole walls, apply seal consisting of resin mixture compatible with liner/resin system, in accordance with manufacturer specifications and approved by the Engineer.

- a. All cutting and sealing of lining at manhole connections shall provide watertight pipe and manhole trough seals. All cut edges of the cured liner shall be thoroughly sealed with the same resin as was used in the liner. The catalyst or hardener used shall be compatible with the resin/catalyst used in the liner previously, but shall not require an external heat source to begin the exothermic reaction (curing).
- b. Where the liner has been continuously laid through a manhole during installation, the cured liner shall be neatly saw cut to fit the top of the channel through the width of the manhole base. Any void between the manhole shelf and the liner wall shall be cleaned and filled with hydraulic grout. The cut edges of the cured liner shall be sealed with resin as described above.

9. REINSTATEMENT OF SERVICES

- a. Live services shall be reinstated as soon as possible.
- b. Reconnect from interior of sewer line by means of a handheld cutting device or television camera and remote-controlled cutting device, appropriate for the liner material and the rehabilitated sewer pipe.
- c. Excavation for service reinstatement will not be allowed.
- d. Holes cut through rehabilitation liner for service laterals shall be neat and smooth, and shall match the entry invert of the service line. Coupons should be recovered at downstream manhole and removed.
- e. Service openings shall be reinstated to minimum of 95 percent and maximum of 100 percent of service lateral pipe area.
- f. New edges shall be brushed smooth with no loose or abraded material.
- g. Seam between host pipe and new liner at reinstated service shall be free of gaps, voids, or cavities. Excessive gaps, voids, or cavities as determined by the Engineer shall be tested and sealed as described herein:
 - i. Chemical grouting: The procedure for testing and sealing lateral connections from the mainline sewer with appropriate chemical grouts shall conform to the requirements of ASTM F 2454. The approved procedure uses the lateral packer

method.

- h. Post-construction CCTV will show focused close-up of entire perimeter of each service reconnection.
- i. Provide fully-operational backup device for reinstating service laterals. If for any reason remote cutting device fails during reinstatement of service lateral, standby device shall be immediately deployed to complete reinstatement.
- j. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs associated with such excavation and restoration work.

10. SEWER LATERAL / SEWER MAIN CONNECTION LINING

It is the intent of this portion of the specification to provide the requirements for the rehabilitation/reconstruction of sewer lateral connections to sewer mains, without excavation, by installation of a resin-impregnated lateral connection liner (LCL).

The LCL product shall extend from the mainline into the lateral connection in a continuous tight fitting, corrosion resistant and watertight pipe within-a-pipe to eliminate any ground water leakage and future root growth at the lateral to mainline connection.

A qualified Contractor shall have a minimum of 5 years of experience installing sewer lateral/sewer main connection lining systems. The Contractor shall use a Manufactured System that has a minimum of a five-year history of satisfactory performance, and the Manufactured System shall have performed a minimum of 3,000 successful installations during this time period in the U.S. Bidders shall be prepared to submit a list of installation projects and number of lateral connections sealed providing contact names, addresses, and telephone numbers for reference.

Sewer lateral connections may be a combination of tees, wyes or break-in taps of varying sizes and angles of connection. After LCL has cured, the liner shall be a hard, impermeable seal in the lateral pipe and around the lateral connection.

If, within the warranty period, the LCL installed in the sewer system is not acceptable due to leakage or any other defects, although originally accepted, the Contractor shall repair or replace the affected portion at no cost to the Authority. It is understood that if the Contractor fails to do such work as required, the Contractor shall be responsible for said costs of repair or replacement.

Approved manufacturers/methods include, but are not limited to the following: Formadrain LMC, Amerik Top Seal Lateral System, LMK T-Liner, Trelleborg Drain LCR, and Easy Liner Saddle Liner.

11. SEWER LATERAL/SEWER MAIN CONNECTION EPOXY-COATED REPAIR MORTAR REHABILITATION

It is the intent of this portion of the specification to provide the requirements for the rehabilitation of sewer lateral connections to sewer mains, without excavation, by filling all voids with an epoxy-coated repair mortar as specified in this Specification.

Contractor shall reopen all of the existing active service connections in each length of sewer following installation and cooling of the liner. If, during the pre-lining television inspection, service connections are found to be visibly leaking or have visible voids between the service connection pipe and the main line sewer, those connections shall be repaired internally using an appropriate method approved by the Engineer.

Where the service connection pipe does not extend to the inside face of the brick sewer, the gap between the installed cured-in-place liner and the service connection shall be filled using an epoxy-coated repair mortar as specified in this specification. The repair mortar shall be applied such that the finished transition section is smooth, uniform and matches the inside diameter of the service connection. All installed repair mortar shall be epoxy coated. All epoxy coating and repair mortar application procedures shall be in accordance with all applicable manufacturers' instructions. The minimum thickness of the epoxy coating shall be 20 mils.

a. MORTAR

- i. Mortar for sewer transition between lateral pipes and liner shall be a single component, high strength polymer modified cementitious patching mortar. Material supplied shall have a set time of 15 to 30 minutes.
- ii. A bonding agent shall be added to the repair mortar to reinforce the bond to the existing surface.
- iii. Mortar shall be Octocrete furnished with Octoblen bonding agent as manufactured by IPA Systems, Philadelphia, PA, or approved equal.

b. EPOXY COMPOUND FOR LATERALS

- i. The epoxy coating to be applied over repair mortar at lateral pipe transitions shall be a 100% solid, corrosion resistant epoxy, capable of being applied to brick by brush or roller. The epoxy should be quick setting and specifically designed

for submergence in a sanitary wastewater. The epoxy shall be capable of being applied and cured in an active sanitary sewer environment.

- ii. The epoxy compound shall be AquataPoxy A-6 as manufactured by Raven Lining systems, Tulsa, OK or approved equal.).

J. FIELD QUALITY CONTROL

1. CCTV INSPECTION

After completion of liner installation, side sewers, and finish work at manhole, sewer shall be televised according to the requirements of Item 522, Sanitary Sewer Television Inspection. The post-construction CCTV inspection that clearly shows the entire perimeter of each service reconnection shall be performed.

- a. Finished liner shall be continuous over entire length of liner insertion run between manholes, and free from visual defects such as foreign inclusions, dry spots, pinholes, and de-lamination.
 - b. Wrinkles in finished liner pipe which cause backwater of one inch (25 mm) or more, or reduce hydraulic capacity of pipe (wrinkles which exceed 5 percent of pipe diameter) and wrinkles in finished liner that reduce structural stability of pipe are unacceptable and affected sections of lined pipe will be removed and repaired at no additional cost to the Authority.
 - c. In the event that the Engineer, based on post installation CCTV inspections, has reasonable cause to suspect that annular space exists between liner and host pipe, Contractor will be directed to excavate and expose existing sewer and remove existing host pipe such that confirmation of suspected annular space can be made.
 - i. If annular space is determined to exist, repair in manner approved by the Engineer.
 - ii. If it is determined that no annular space exists, Contractor shall be reimbursed in accordance with **§ 109-04, Extra and Force Account Work.**
2. The layers of the cured lining shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any re-occurrence may cause rejection of the work.

K. TESTING FOR CERTIFICATION

1. The Contractor shall provide sufficient specimens from each length of CIPP Lining installed to allow an independent laboratory to conduct three separate tests for each of the flexural and tensile properties of the liner as specified below. The specimens shall be cut from each installed liner at an intermediate point, the termination point or from the downtube after the liner has been cured and cooled. Each specimen shall be clearly marked to indicate the installed location of the liner, the date of installation, the pipe diameter and the resin used.

The following test shall be performed for each length of CIPP lining installed: Short-Term Flexural (Bending) Properties -The initial tangent flexural modulus of elasticity and flexural yield strength shall be measured in accordance with ASTM D790.

2. Copies of the certified test results shall be sent directly to the Engineer by the laboratory. The certified results shall report the actual test results obtained for all three specimens used for each test, the average of the three results and the standard deviation of the results for each of the properties being tested.
3. Each individual reported value shall meet or exceed the value of that property as specified in this Item or as used in the design calculations, whichever is higher.
4. Contractor shall correct failed liner or liner deemed unacceptable by the Engineer as a result of the postvideo inspection, and/or thickness test. Remedy for failed thickness test shall be defined as shown in the following table. Where pipe removal and replacement is required, it shall be for the entire segment length from manhole to manhole and payment shall be made in full for the CIPP. No payment will be made to construct a new sewer segment (i.e. pipe replacement).

PIPE CORRECTION			
Test	Required Value	Test Results	Remedy
Thickness	Minimum or Design, whichever is greater	≥ 90 to 100%	No unit price reduction
		≥ 80% but less than 90%	15% Unit Price Reduction
		< 80%	Pipe Replacement

5. **All the expenses incurred relating to the certified testing of the Cured-in-Place Pipe lining furnished under this Contract, shall be paid for by the Contractor.**

L. CLEAN UP

The Site shall be cleaned on a continuous, daily basis during performance of the work and shall be cleaned upon completion so that the Project Site shall be left in a neat and orderly condition acceptable to the Engineer.

MEASUREMENT AND PAYMENT:

Sanitary Sewer Cured-in-Place Pipe Lining

This work will be measured for payment by the actual number of linear feet of each size of sanitary sewer lined with cured-in-place pipe lining, measured along the centerline of the sanitary sewer from the center of the insertion manhole to the center of the last manhole.

This work shall be paid for at the contract unit price per linear foot of "Sanitary Sewer Cured-in-Place Pipe Lining (Size), completed, which price shall include all materials, labor, tools, and equipment incidental and necessary to furnish and install the resin-impregnated, liner in existing sewers and cutting and sealing of the liner at termination manholes.

Re-establish House Service Connections

This work will be measured for payment by the actual number of house service connections re-established by the Contractor at the unit price bid for each.

This work will be paid for at the contract unit price per each of "Re-establish House Service Connections," completed, which price shall include all materials, labor, tools, and equipment incidental and necessary to re-establish house service connections.

Cut Protruding Taps

This work will be measured for payment by the actual number of protruding taps of each type cut by the Contractor at the unit price bid for each.

This work will be paid for at the contract unit price per each of "Cut Protruding (Type) Taps" completed, which price shall include all materials, labor, tools, and equipment incidental and necessary to cut protruding taps to within 1/8 inch of sewer main wall.

Sewer Lateral/Sewer Main Connection Lining

This work will be measured for payment by the actual number of sewer lateral/sewer main connections lined by the Contractor at the unit price bid for each.

This work will be paid for at the contract unit price per each of "Sewer Lateral/Sewer Main Connection Lining," completed, which price shall include all materials, labor, tools, and equipment incidental and necessary to furnish and install the resin-impregnated,

liner in existing sewer lateral connections.

Sewer Lateral/Sewer Main Connection Epoxy-Coated Repair Mortar Rehabilitation

This work will be measured for payment by the actual number of sewer lateral/sewer main connections rehabilitated by the Contractor at the unit price bid for each.

This work will be paid for at the contract unit price per each of "Sewer Lateral/Sewer Main Connection Epoxy-Coated Repair Mortar Rehabilitation," completed, which price shall include all materials, labor, tools, and equipment incidental and necessary to furnish and install an epoxy-coated repair mortar to rehabilitate sewer lateral connections.

Flow Control and Bypass Pumping

If there is no quantity shown in the bidding schedule for payment for the cost of Item 516 Sanitary Sewer Flow Control and Bypass Pumping, the work covered by this section shall be included in the contract unit price for Item 520, Sanitary Sewer Cured-in-Place Pipe Lining.

Other Items of Work

Cleaning will be measured and paid for in accordance with the provisions of Item 518, Sanitary Sewer Cleaning.

For Television Inspection (Item 522) in connection with the installation of Sanitary Sewer Cured-In-Place Pipe Lining, the work will be measured for payment by the number of linear feet, measured along the centerline of the sanitary sewer from the center of the manhole to the center of the manhole. **The actual number of linear feet shall only be measured and paid for once and the unit price bid shall include the cost of the pre-insertion, post-insertion and final guarantee television inspections of the sanitary sewer lined with cured-in-place pipe lining.**

Point Repairs will be measured and paid for in accordance with the provisions of Item 521, Sanitary Sewer Point Repairs.

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
520.01	(Size) Sanitary Sewer Cured-In-Place Pipe Lining	Linear Foot
520.10	Re-establish House Service Connection	Each
520.11	Cut Protruding (Type) Taps	Each
520.12	Sewer Lateral/Sewer Main Connection Lining	Each
520.13	Sewer Lateral/Sewer Main Connection Epoxy- Coated Repair Mortar Rehabilitation	Each

ITEM 521 SANITARY SEWER POINT REPAIRS

DESCRIPTION:

Work under this Item shall include the repairs and/or replacement of existing sanitary sewer pipes and fittings at the locations shown in the contract documents or as directed by the Engineer. Included shall be, but not limited to, sawcutting the existing pavement, excavation, trench support, dewatering, management of flows, protection of other underground structures and facilities, formation of bedding, bedding material, laying pipe, backfilling, bituminous concrete trench repair and pavement restoration in accordance with the appropriate specifications and as ordered by the Engineer.

MATERIALS AND EQUIPMENT:

The materials and equipment necessary (including the minimum lengths of pipe to be used for point repairs) are those specified under the appropriate Items of the Standard Specifications.

In general, the Contractor shall use PVC pipe in depths 0-15' deep and ductile iron pipe in depths exceeding 15' deep. Materials similar to existing materials shall be used where shown in the contract documents or as directed otherwise or approved by the Engineer.

CONSTRUCTION DETAILS:

Related Technical Specifications:

Item 205	Trench Excavation and Backfill
Item 407	Bituminous Concrete Trench Repair
Item 512	Sanitary Sewers
Item 516	Temporary Bypass Pumping Systems
Item 520	Sanitary Sewer Cured-in-Place Pipe Lining

1. The Contractor shall comply with the requirements of the appropriate Standard Specifications for the type of pipe being repaired and/or replaced, as referenced above.
2. All defective pipes shall be excavated and uncovered so that the entire defect is exposed and the repair can be made and that the restored pipe can be aligned into its final position to the correct line and grade as shown in the contract documents. This work shall be accomplished in such a manner that the integrity of the existing pipe beyond the affected section and the joints on either side of the repair/replacement are not displaced.
3. Any joints damaged by the Contractor beyond the section of repairs shown on the contract documents shall be repaired in accordance with the requirements of these specifications by the Contractor at no additional expense to the Authority.

4. Removal of fences, base material, storm drains, etc., that interfere with the point repair and are necessary to complete the work at the designated locations will be restored or replaced to their original condition at no additional expense to the Authority.
5. Joints: When connecting plain-end spigot pipe, suitable adapters shall be used for joining dissimilar materials or similar materials. The adapters shall be of either the insert type or the shielded coupling type as shown in the contract documents or as directed and approved by the Engineer. The adapter and coupling material shall be of materials which pass the strength and chemical requirements of ASTM Designation: C425, latest revision. All banded maintenance couplings and adapters shall bear the manufacturer's identifying mark and size.
6. Service Connections: Any service connection replaced during a point repair shall conform to these Specifications and applicable ASTM Specifications, for the materials and installation. Materials shall be similar to that of connecting pipe.
7. Cleanouts: Any cleanout replaced during a point repair shall conform to the pipe manufacturer's recommendations and specifications and applicable ASTM Specifications for the cleanout and for installation of such. The material of the cleanout shall be similar to the sewer pipe it is connected to.
8. Cleanout Plugs: All cleanout plugs used to seal an open cleanout shall be a cap similar to the pipe material of the cleanout. All cleanout plugs shall conform to the manufacturer's recommendations and specifications for the cap or plug and for installation of such.

MEASUREMENT AND PAYMENT:

The length of each section of pipe repaired or replaced under this Item shall be measured by the total length of pipe repaired or replaced measured from the centerline of the last upstream joint to the centerline of the last downstream joint, in that section.

Sanitary Sewer Point Repairs measured for payment shall include all labor, materials, equipment, personnel, supervision and all incidentals required for the proper execution of the work including but not limited to, sawcutting the existing pavement, excavation, trench support, dewatering, management of flows, protection of other underground structures and facilities, formation of bedding, bedding material, laying pipe, backfilling, bituminous concrete trench repair and pavement restoration.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
521	Sanitary Sewer Point Repairs	Linear Foot

ITEM 522 SANITARY SEWER TELEVISION INSPECTION

DESCRIPTION:

Under this item, the Contractor shall inspect sanitary sewer interior using color closed-circuit television (CCTV) camera, and document the record of the inspection in DVD format with audio location and date information, video title information, continuous tape counter and provide paper and digital copies of all inspection logs. Work may be performed in conjunction with sanitary sewer cleaning, installation of cured-in-place pipe lining and/or manhole rehabilitation, independently or in conjunction with other sanitary sewer activities.

MATERIALS AND EQUIPMENT:

- A. Television Inspection Camera(s): Equipped with rotating head, capable of ± 275 -degree rotation from horizontal and 360-degree rotation about its centerline.
 - 1. Minimum Camera Resolution: 400 vertical lines and 460 horizontal lines; picture quality and definition shall be to the satisfaction of the Engineer.
 - 2. Camera Lens: Not less than 140 degree viewing angle, with automatic or remote focus and iris controls.
 - 3. Focal Distance: Adjustable through range of 6 inches to infinity.
 - 4. Camera(s) shall be intrinsically safe and operative in 100 percent humidity conditions.
 - 5. Lighting Intensity: Remote-controlled and adjusted to minimize reflective glare.
 - 6. Lighting and Camera Quality: Provide clear, in-focus picture of entire inside periphery of sewer. A reflector in front of the camera may be required to enhance lighting in large diameter pipe.
 - 7. Height adjustment: Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being inspected. Camera height adjustment is particularly necessary on oval/egg shaped brick sewer pipes for the Contractor to be able to inspect as far into the lateral sewer pipe connection as possible.
- B. Footage Counter: Measures distance traveled by camera from the centerline of the starting manhole, accurate to two-tenths of a foot over the entire length of the section being inspected.
- C. Video Titling: Video equipment shall include genlocking capabilities to extent that computer generated data (such as footage, date, and size) as determined by SDR, can be overlaid onto video, and be indicated on television monitor and permanently recorded on inspection videotape.
- D. Recording: All recordings are to be in digital format.

1. Image Capture: Capture color still shots of video recordings for all defects encountered. Digitized picture images shall be stored and be exportable as JPEG formats.
2. Video Capture: Full time live video and audio files shall be captured for each pipe segment and lateral inspected. The files shall be stored in industry standard MPEG format viewable from a DVD on an external personal computer that utilizes Microsoft Media Player, version 9.0 to view the recording. The MPEG video shall be ISO-MPEG Level 1 (MPEG-1) coding with a resolution of 352 pixels (x) by 240 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be "Burned" to DVDR format. It shall have the capability of "burning" a minimum of 120 minutes of recording to the DVDR media. The video recording shall be free of electrical interference and shall produce a clear and stable image. The audio recording shall be sufficiently free of background and electrical noise as to produce an oral report that is clear and discernable. The digital recordings and inspection data shall be cross-referenced to allow instant access to any point of interest within the digital recording.

CONSTRUCTION DETAILS:

The Contractor shall provide qualified and experienced personnel and all necessary equipment, tools and materials and all incidentals required to perform sanitary Sewer Television Inspection according to the requirements of these specifications.

Inspection shall be performed by a NASSCO Pipeline Assessment Certification Program (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by PACP, and severity ratings shall be calculated according to PACP.

A. SUBMITTALS

1. Quality Assurance: Submit one example DVD of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s).
2. DVD and inspection logs will be reviewed to determine if quality of CCTV image is acceptable, and if defects were properly identified and documented according to Authority requirements.
3. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.
4. Do not commence Work prior to approval of report material quality by the Engineer. Upon acceptance, report material shall serve as standard for remaining Work.

5. Maintain copy of all inspection documentation (tapes, databases, and logs) for duration of Work and warranty period.
6. Copies of PACP certificate for inspectors completing the work.
7. Final Submittal: After the inspections have been completed, the Contractor shall submit a DVD containing electronic files of the inspection databases in unmodified NASSCO-PACP Certified Access format, movies, pictures and reports. The Contractor shall submit individual PACP exchange database (.mdb) inspection files (version 2.2 or 4.2) for each of the structures inspected. Each database must be labeled and named using the inspected structure's GNHWPCA identification (ID) number. Databases that merge multiple inspection files will not be accepted. The DVD shall also contain video files in MPEG format of each of the inspected structures and pictures in JPEG format. An inspection report shall be submitted both in electronic and hardcopy form. The report shall include a table of contents listing all the segments inspected with corresponding street names and associated report page number.

B. LEGAL, HEALTH AND SAFETY REQUIREMENTS

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Contractor shall conduct the work at all times in such a manner as to insure the least possible obstruction to traffic. The convenience of the general public and of the residents along and adjacent to the roadway shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and Materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the Authority.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times.

The Contractor shall obtain the appropriate permits and approvals. Perform operations in strict accordance with OSHA and equipment manufacturers' safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces.

C. PROSECUTION OF THE WORK

Sewer Flow Requirements:

1. Minimal visible sewage flow in the sanitary sewers shall be allowed during inspection. If in the opinion of the Engineer, the amount of sewage flow observed during the television inspection becomes detrimental to the effectiveness of the work, it shall be eliminated by plugging of the sewers in the upstream manhole and/or bypass pumping, if necessary.
2. Plugs for flow control shall be of a design which permits the release of a portion or all of the stored sewage flow in an emergency.
3. Water levels in the manholes upstream of the plugs shall not be allowed to rise to an elevation higher than two (2) feet above the manhole invert. If water levels rise to higher elevations, the plugs shall be removed to release a portion of the stored sewage or bypass pumping shall be utilized. Flows shall be restored to normal after completion of the television inspection.
4. Should Contractor's televising equipment become lodged in any sewer line, it shall be removed by the Contractor at his expense. Contractor shall re-televis any line segment in which his equipment became lodged after said equipment has been removed to demonstrate to the Authority that no damage exists as a result of his televising operations and the recovery of the equipment.

D. SEQUENCE OF THE WORK

When performed in conjunction with cured-in-place lining, the Contractor shall perform the Work in the following sequence:

1. Clean sewer lines and manholes in accordance with requirements of Item 518, Sanitary Sewer Cleaning.
2. Perform TV inspection to comply with requirements of this specification.
3. Install cured-in-place pipe lining in accordance with requirements of Item 520, Sanitary Sewer Cured-In-Place Pipe Lining.
4. Repeat TV inspection in same direction as previous inspection, after completion of installation of cured-in-place lining.
5. Inspection Requirements
 - a. The entire inspection survey shall be recorded in MPEG-1 format written to DVD and submitted with digital links to the survey. The documentation of the work shall be consistent with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (current edition), including CCTV Reports, unmodified PACP database, logs, electronic reports, etc. noting important features encountered during the inspection.

- b. Audio portion shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
 - c. Identify each DVD with labels showing Authority's name, Contractor's name, and each manhole-to-manhole pipe segment of sewer line represented on DVD.
 - d. The completed DVD will become the property of the Authority.
6. The speed of travel shall be slow enough to inspect each pipe joint, tee connection, structural deterioration, infiltration and inflow sources, and deposits, but should not, any time, be faster than 30 feet per minute. The camera must be centered in the pipe to provide accurate distance measurements to provide exact locations of important features in the sewer and these footage measurements shall be displayed and documented on the video.
7. Stop at every joint for three seconds and using a pan and tilt view when appropriate, and stopping elsewhere when necessary to ensure proper documentation of the sewer's condition. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Recording all defects found in the service connection. Where lateral flow is observed, observe flows from service connections for approximately two minutes to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on video recording and inspection logs.
8. The Engineer shall have access to observe and monitor operations at all times.
9. Every section of sewer (manhole to manhole) shall be identified by audio and alphanumeric on the video display and shall include: Project title, name of Greater New Haven Water Pollution Control Authority, time of day, map number, manhole to manhole pipe section, pipe material, sewer diameter and length, compass direction of viewing, direction of camera's travel, pipe depth, and operator name.

Important features shall be identified by audio and on PACP log to include all manholes, active and inactive service connections, structural defects, maintenance problems, grease, roots, infiltration, obvious inflow sources, etc. All video must be continuously metered from manhole to manhole. **In addition to televising the sewer, all manholes shall be panned with the video camera and visually inspected.**

E. ACCEPTANCE BY THE ENGINEER

Final Acceptance of the work shall be determined by the Engineer based upon the verification that the Sanitary Sewer Television Inspection has been successfully completed in accordance with the following requirements:

1. Where television inspection is in preparation for the installation of cured-in-place pipe lining, the television inspection shall be in accordance with these specifications and the requirements of Item 520, Sanitary Sewer Cured-in-Place Pipe Lining.
2. Where television inspection is in preparation for manhole rehabilitation, the television inspection shall be in accordance with these specifications and the requirements of Item 524, Sanitary Sewer Manhole Rehabilitation.

If the Engineer determines that the television inspection has not been completed in accordance with the requirements, the Contractor shall repeat the television inspection process until final acceptance is obtained.

F. CLEAN UP

The Site shall be cleaned on a continuous, daily basis during performance of the work and shall be cleaned upon completion so that the Project Site shall be left in a neat and orderly condition acceptable to the Engineer.

MEASUREMENT AND PAYMENT:

This work will be measured for payment by the actual number of linear feet of the size and type of sanitary sewer television inspections, measured along the centerline of the sanitary sewer from the center of the manhole to the center of the manhole.

This work shall be paid for at the contract unit price per linear foot of "Sanitary Sewer Television Inspection (Size) (Type), actually completed, which price shall include all materials, labor, tools, and equipment incidental and necessary for the television inspection.

For Television Inspection in connection with the installation of Sanitary Sewer Cured-In-Place Pipe Lining, the work will be measured for payment by the actual number of linear feet, measured along the centerline of the sanitary sewer from the center of the manhole to the center of the manhole. The actual number of linear feet of the sanitary sewer lined with cured-in-place pipe lining shall only be measured and paid for once and the unit price bid shall include the cost of the pre-insertion and post-insertion television inspections as well as the final television inspection performed at the completion of the three year guarantee period.

There will be no measurement for payment for the cost of television inspection of

manholes, but the cost thereof shall be included in the contract unit price per linear foot for the size and type of sanitary sewer television inspection.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
522	Sanitary Sewer Television Inspection (Size) (Type)	Linear Foot

ITEM 523 SANITARY SEWER MANHOLES

DESCRIPTION:

The work under this Item shall consist of the construction, alteration, reconstruction, conversion, or resetting of sanitary manholes and drop manholes. Said structures shall be constructed in conformity with the lines grades, dimensions and details shown on the Contract Drawings or as ordered and in accordance with the provisions of these specifications. In this Contract unless otherwise directed by the Engineer, or shown on the details, all manholes shall be precast.

For the work under this Item the following definitions shall apply:

- A. "Construct" shall mean the work required to construct a new manhole.
- B. "Alter" shall mean that work required on existing manholes in order to make required connections of pipes being installed under other Items of work.
- C. "Reconstruct" shall mean major changes made to an existing manhole in order to adjust the frame and cover or other reconstruction work all as indicated on the Contract Drawings.
- D. "Convert" shall mean the work required in changing an existing unit to a unit of another type.
- E. "Reset" shall mean the minor adjustment of frames and covers of existing units to the proposed grade not involving major reconstruction of the unit. (Examples of resetting are: adding several courses of brick/block or use of an approved manufactured manhole extension adapter ring to bring a frame to required grade.; removing some masonry courses for lowering a frame without reconstruction below the required elevation of the bottom of the frame (providing that the frame will be properly seated).

MATERIALS:

The materials to be used in this construction shall be those indicated on the Contract Drawings or ordered by the Engineer and they shall conform to the requirements of these specifications. All units shall be of precast reinforced concrete. Manhole sections and base shall conform to the type and size specified on the Contract Drawings and the requirements of ASTM Specification C-478.

Precast manhole sections shall be joined using "O-ring" or butyl rubber type sealers. If "O-ring seals are used, they shall conform to ASTM C-443 and be set in a groove cast into the spigot of each base and riser. "O-rings" shall be installed as recommended by the manhole manufacturer. Butyl rubber seals shall conform to ASTM C-990 and shall

be installed only on clean and dry surfaces as recommended by the manufacturer.

Sewer brick shall conform to the provisions of ASTM C-32, Grade MM and Grade MS. No common brick will be allowed.

Manhole frames, covers and steps shall conform to the requirements of the GNHWPCA Standard Construction Details. The lower surface of the cover and the corresponding upper surface of the frame shall be machine finished to provide a smooth flat contact or fit, so that covers shall bear uniformly on their supports without tendency for the cover to rock or rattle. Manhole steps shall comply with the provisions of ASTM C-478.

CONSTRUCTION DETAILS:

Excavation, backfilling and compacting for the installation of sewer manholes shall be performed in accordance with the provisions of Item 205, Trench Excavation and Backfill.

Contractor shall set precast base section on a firm, stabilized foundation and 8 inches of bedding material to prevent settlement and misalignment. Precast concrete riser sections shall be carried to below finished grade as shown on the standard details.

Precast concrete sections of manholes will be joined using "O-ring" gaskets installed in conformance with the provisions of ASTM Specification C-443. As an alternative, Contractor may install a double row of butyl rubber seals as shown on the standard details using Bidco C-56 Sealant, Kent Seal, or approved equal, which meet the provisions of ASTM C-990.

After sections are joined, the inside of the bell and spigot joint shall be plugged with non-shrink grout as required. A minimum six (6) inch wide external butyl rubber joint wrap (Infi-shield Gator Wrap or approved equal) shall be installed on the outside of all joints; A 6 inch square of butyl rubber joint wrap shall be applied by the Contractor to plug all manhole lifting holes.

The Contractor shall set the manhole frame and cover to grade using not less than two nor more than six courses of brick or precast manhole grade rings. Contractor shall seal casting, rings and cone with rubber butyl mastic seal (Infi-shield Uni-band or approved equal).

Manhole invert shall be formed out of manhole brick (grade MS or MM); or cast-in-place concrete with manhole brick shelf and channel; or a precast concrete manhole base. Manhole shelf shall be built to 0.8 of the diameter of the pipe exiting the manhole. All pipe connections to manhole walls shall be cast-in flexible watertight connectors manufactured by Press-Seal Corporation or approved equal.

Doghouse Manhole: Where proposed doghouse manholes are indicated on the Contract Drawings to be constructed over existing sewers, the existing sewer pipe shall

be left undisturbed and the flow maintained through it until the manhole has been completed and accepted. Unless otherwise specified, required or ordered by the Engineer, the Contractor shall carefully excavate around and properly support the existing sewer pipe. The base section of the manhole shall be cast-in-place and shall have ring-formed joint cast or formed in the base section which shall be compatible with the corresponding precast manhole riser sections. On completion and acceptance of the manhole, the top portion of the existing sewer pipe shall be carefully removed and the invert formed to the limits and in accordance with the details shown on the Contract Drawings or as directed by the Engineer. Reinforced concrete pipe shall have the reinforcement cut off and mortared over with a minimum of one-half inch of mortar.

TESTING

A. Vacuum Test (required on all **new manholes and junction chambers)**

1. Vacuum testing shall be performed using an inflatable compression band, vacuum pump, and appurtenances specifically designed for testing manholes. Test procedures shall be in accordance with the equipment manufacturer's recommendations. The Contractor shall be familiar with the vacuum testing equipment and shall provide a minimum of 4 hours of instruction by a factory authorized representative prior to the performance of any vacuum testing.
2. Each manhole and junction chamber shall be tested immediately after assembly including the connection of pipes and prior to backfilling.
3. All lift holes shall be plugged with non-shrink grout and all pipes entering the manhole and junction chamber shall be plugged and braced to prevent the plug from being drawn into the manhole or junction chamber.
4. After the test equipment is in place the test shall be performed at the following rate and test times:
 - a. For 48", 60", 72" or 84" Diameter Manholes.
 - (1) Initial pressure test – 10 inches Hg.
 - (2) Test time - 1 inch Hg drop to 9 inch Hg shall exceed the 1 minute minimum allowable test time, for 0 -10 ft deep manholes; 1 minute 15 seconds minimum allowable test time for 10 -15 ft deep manholes; 1 minute 30 seconds minimum allowable test time for 15 - 25 ft deep manholes.
 - b. If the pressure drop exceeds 1 inch Hg in the specified time the manhole shall be repaired in accordance with approved procedures and retested.

- c. If a manhole fails to meet a 1 inch Hg drop in the specified time after repairs the unit shall be water exfiltration tested and repaired as necessary.

B. Water Exfiltration Test (for all manholes and chambers)

1. The Contractor shall assemble the manhole in place; fill and point all lifting holes and exterior joints within six (6) feet of the ground surface with an approved non-shrinking mortar. The test shall be performed prior to the installation of the shelf and invert and before filling and pointing the horizontal joints below six (6) foot of depth. The Contractor shall lower ground water table below the bottom of the manhole for the duration of the test. Plug all pipes and other openings into the manhole and brace to prevent blow out.
2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and no water is observed moving down the surface of the manhole, the manhole is satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, continue the test. A period of time may be permitted to allow for absorption. Following this period, refill manhole to the top of the cone, if necessary and allow at least eight hours to pass. At the end of the test period, refill the manhole to the top of the cone again, measuring the volume of water added. Extrapolate the refill amount to a 24-hour leakage rate. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24 hour period. If the manhole fails this requirement, but the leakage does not exceed three gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer. If leakage due to a defective section of joint exceeds three gallons per vertical foot per day, the manhole shall be rejected. Uncover the rejected manhole as necessary and disassemble, reconstruct or replace it as directed by the Engineer. Retest the manhole and, if satisfactory, fill and point the interior joints.
3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete.
4. An infiltration test may be substituted for an exfiltration test if the ground water table is above the highest joint in the manhole. If there is no leakage into the manhole as determined by the Engineer, the manhole will be considered water-tight. If the Engineer is not satisfied, testing shall be performed as described hereinbefore.

- C. If any manhole fails the initial test, the Contractor shall locate the leak and make the necessary repairs. The manhole shall be retested as above. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc.
- D. An infiltration test may be substituted for an exfiltration test if the ground water table is above the highest joint in the manhole or where manholes are placed in service immediately and cannot be tested by using the vacuum test or exfiltration test.

MEASUREMENT:

- 1. Construction of Sanitary Manholes, Sanitary Doghouse Manholes, and Sanitary Drop Manholes - shall be measured for payment by the number of vertical feet, per each diameter manhole installed. The depth of a unit shall be the total depth, measured to the nearest tenth of a foot from the bottom side of the floor slab to the top of the highest point of the frame.
- 2. Alterations - of existing manholes necessary to make the required connections to pipes installed under other Items, will not be measured for payment but the cost thereof included in the pipe costs being installed under those Items.
- 3. Reconstruction - of existing manholes where shown on the Contract Drawings or ordered by the Engineer will be measured for payment by the number of linear feet measured vertically. The depth of a unit shall be the total depth, measured to the nearest tenth of a foot from the bottom side of the floor slab to the top of the highest point of the grate or frame.
- 4. Conversion - of existing manholes to manholes of another type as specified, will be measured for payment as a unit, including all necessary alterations to the walls and furnishing and setting the frame and cover, whichever applies.
- 5. Resetting - of existing units where shown on the Contract Drawings will be measured for payment as units.
- 6. New Frames and Covers - when replacing existing frames and covers will be measured for payment as units and will appear in the proposal form.
- 7. Dampproofing - will not be measured for payment, but the cost thereof shall be included in the unit price bid for sanitary manholes.
- 8. Excavation - will be measured for payment as described in Item 205, Trench, Excavation and Backfill.
- 9. Bedding Material, Borrow/Selected Borrow and Processed Aggregate Base - will be measured and paid under their respective Items.

10. Inspection and Testing will not be measured for payment, but the cost shall be considered as include in the unit price bid for sanitary manholes.

PAYMENT:

1. Construction of "Sanitary Manholes", "Sanitary Doghouse Manholes", or "Sanitary Drop" Manholes" - will be paid for at the contract unit price per vertical foot of height measured to the nearest tenth of a foot from the bottom side of the floor slab to the top of the highest point on the frame. The price shall include frame, cover, concrete, reinforcing, masonry, castings, parging, dampproofing, and all other materials, equipment, tools labor and work necessary for or incidental to the completion of the Item unless they are specifically called out for separate payment above.
2. Alteration - of existing manholes will not be paid for but included under other Items of work as specified. Alterations shall include the Items "Proposed Connection at Existing Manhole", and "Proposed Drop Connection at Existing Manhole."
3. Reconstruction - of existing manholes will be paid for at the contract unit price per vertical foot of height measured to the nearest tenth of a foot from the bottom side of the floor slab to the top of the highest point on the frame, of completed and accepted units. The price shall include dampproofing, materials, equipment, tools, labor and work incidental to or necessary for the completion of the Item.
4. Conversion - of existing manholes to the type specified shall be paid for at the contract unit price per each, completed and accepted, which price shall include all necessary, alterations, dampproofing, and all other materials equipment tools, labor and work incidental to or necessary for the completion of the Item.
5. Resetting - of existing units shall be paid for at the contract unit price per each as specified, completed and accepted. Said price shall include dampproofing and all other materials, equipment, tools, labor and work incidental to or necessary for the completion of the Item, except that when the work requires reconstruction greater than three feet measured vertically, then the entire cost of resetting the unit will be paid for as extra work unless otherwise provided.
6. New Frames and Covers - except where included in the other contract unit prices, will be paid for at the contract unit price per each if an Item appears in the Proposal Form.
7. Dampproofing – this work will not be measured for payment, but the cost shall be included in the unit price bid for sanitary manholes.

8. Excavation and Backfill - will be paid for in accordance with the provisions of Item 205, "Trench Excavation and Backfill" under the appropriate classifications.

The unit prices bid shall include all materials, equipment, tools, testing, labor and all else necessary and incidental to the satisfactory completion of the work.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
523.01	Sanitary Sewer Manhole – (DIAMETER)	Vertical Foot
523.02	Sanitary Doghouse Manhole – (DIAMETER)	Vertical Foot
523.03	Sanitary Drop Manhole – (DIAMETER)	Vertical Foot
523.04	Reconstruct Sanitary Sewer Manhole	Vertical Foot
523.05	Conversion – Sanitary Sewer Manhole	Each
523.06	Reset - Sanitary Sewer Manhole	Each
523.07	Proposed Connection at Existing Manhole	Each
523.08	Proposed Drop Connection at Existing Manhole	Each

ITEM 524 SANITARY SEWER MANHOLE REHABILITATION

DESCRIPTION:

Work under this Item consists of sanitary sewer manhole rehabilitation necessary to provide for the waterproofing, sealing, structural enhancement and corrosion protection of and the non-disruptive structural replacement of existing sewer manholes.

1. Sanitary sewer manhole rehabilitation work for all manholes except precast concrete shall be completed in accordance with following methods as shown within the Contract Documents and as ordered by the Engineer.
 - a. Structurally stable manholes: Spray on application of a uniform and densely compacted cementitious layer. Some manholes shall receive an additional layer of epoxy for corrosion protection. The manholes with cementitious layer and epoxy will be as shown within the Contract Documents or as ordered by the Engineer.
 - b. Unstable or structurally deficient manholes: Installation of a formed-in-place, thick-wall, seamless concrete manhole within the existing manhole extending from bench to frame. The manholes with the formed-in-place concrete with embedded plastic liner will be as shown on the Contract Documents or as ordered by the Engineer.
2. Sanitary sewer manhole rehabilitation work for precast concrete manholes includes the following as shown on the drawings:
 - a. Injection Grout Manhole Base: Work includes injection of chemical grout and application of joint sealing compound to the manhole base to make a structurally sound, watertight manhole base.
 - b. Injection Grout Manhole Wall Joint: Work includes injection of chemical grout and application of joint sealing compound to wall joints to make a structurally sound watertight manhole.
 - c. Injection Grout Pipe Penetration: Work includes injection of chemical grout and application of joint sealing compound to the joint of the penetrating pipe to make a structurally sound watertight pipe connection.
3. Sanitary sewer manhole rehabilitation work for all manholes selected for rehabilitation shall include the replacement of all manhole frames and covers and the structure adjusted to grade, if required.

4. Flex Coat Chimney Seal: Work includes applying alkylamine epoxy or urethane based flexible coating to chimney section of manhole. Work also includes chimney rehabilitation including replacement of any loose or broken bricks or block.

MATERIALS:

1. GENERAL

- A. Handling, formulation, and storage of the sealing compounds and grouts shall be in strict conformance with the manufacturer's recommendations. The uncured compound and grouts shall be delivered to the site in unopened containers, with the date of manufacture clearly indicated. Any uncured compound determined to be more than six months old shall be immediately removed from the site. Once a container of uncured compound or grout has been opened it shall be used within 24 hours of being opened.
- B. Mixing and handling of the compounds and grouts and the constituents producing it, which may be toxic on contact or inhalation, shall be as recommended by the manufacturer and Contractor shall minimize hazard to personnel. The Contractor is responsible for providing appropriate protective measures to ensure that the components and the chemicals produced in mixing are under the control of the Contractor at all times and are not available to unauthorized personnel or others. Excess material resulting from rehabilitation operations shall be disposed of in a safe manner. All equipment and material shall be subject to the review of the Engineer.
- C. All chemical materials used shall meet the following minimum application requirements:
 - i. All component materials shall be easily transportable by common carriers.
 - ii. Packing of component materials shall be compatible with field storage requirements.
 - iii. Components shall be packed in such a fashion as to provide for maximum worker safety when handling the materials and minimize spillage when preparing for use.
 - iv. Mixing of the components shall be compatible with field applications, not require precise measurements, and be within the limits recommended by the manufacturer.
 - v. Catalyzation shall take place at the point of injection/repair.

- vi. Cleanup shall be done without inordinate use of flammable or hazardous chemicals.
- vii. Residual sealing materials shall be removed from the sewer after injection to ensure no flow reductions, restrictions or blockages of sewer flows.

2. *SPRAY-ON CEMENTITIOUS LINER*

- A. Provide the following as manufactured by AP/M Permacast of Johnston, IA or equal:

Plugging holes and stopping active hydrostatic infiltration at points in concrete and masonry manholes includes underdrains: A premixed Portland cement-based hydraulic cement consisting of Portland cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles, or gas forming agents or promote the corrosion of steel it may come in contact with. Set time shall be approximately 50 seconds. The ten (10) minute compressive strength shall be approximately 500 psi.

- B. A silicate-based liquid accelerator field mixed with neat Portland cement. Set time approximately 50 seconds.

A premixed Portland cement-based hydraulic cement consisting of Portland cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsums, plasters, iron particles, or gas-forming agents or promote the corrosion of steel it may come in contact with. Set time approximately 3 minutes or 15 minutes to suit application. One-hour compressive strength shall be approximately 600 psi.

- C. Cementitious Liner

Provide the following MS-10,000 lining mortar as manufactured by AP/M Permaform of Johnson, IA or equal

1) Ultra high strength, high build, corrosion resistant mortar, based on Portland cement fortified with micro silica. The mortar, when mixed with the appropriate amount of water, shall be able to be sprayed, cast, pumped or gravity-flowed into any area 1/2 inch and larger. The mortar shall harden quickly without any need for special curing and shall develop (80%) eighty percent of its ultimate flexural strength in the first 24 hours.

2) The hardened binder shall be dense and highly impermeable. Graded quartz sands shall be added to enhance particle packing and

further improve the fluidity and hardened density. The mortar shall possess excellent thin-section toughness, high modulus of elasticity and be self-bonding. Fibers shall be added as an aid to casting, for increased cohesion and to enhance flexural strength.

3) The water content shall be adjusted to achieve the desired consistency. Despite its high fluidity, the mortar shall have good wet adhesion and shall not sag or run after placement. The mortar shall be able to be cast against soil, metals (including aluminum and lead), wood, plastic, cardboard and other normal construction material.

4) Physical properties

Unit weight	125 pcf
Set Time at 70o F ASTM C-403	
Initial Set	244 minutes
Final Set	440 minutes
Modulus of Elasticity ASTM C-469	
24 hours	180,000 psi
28 days	1,150,000 psi
Flexural Strength ASTM C-293	
24 hours	650 psi
28 days	800 psi
Compressive Strength ASTM C-307	
24 hours	3,000 psi
28 days	10,000 psi
Tensile Strength ASTM C-307	600 psi
Shear Bond ASTM C-882	>1,000 psi
Shrinkage ASTM C-157	None
Chloride Permeability ASTM C-1202	<550Coulombs

D. Chemical protective coating

For the manholes where an additional layer of epoxy is specified provide the following COR+GARD Composite as manufactured by AP/M Permaform of Johnson, IA or equal

1) The chemical protective coating shall be a two-component 100% solids epoxy design formulated for use in sewer systems. It shall be white in color for enhanced visibility and shall be applied uniformly over the entire interior surface. Application shall avoid air bubble entrapment. The chemical protective coating shall cure quickly, even when immersed in fresh or salt water and rapidly form a tenacious bond to freshly applied mortars. The chemical protective coating shall produce a smooth, glossy and homogenous protective layer that is impervious to biological corrosion, water, oils and chemicals.

2) The chemical protective coating shall be applied at a minimum thickness of 0.065 inches (1.65 mm) to provide a complete and uniform vapor barrier against attack by sewer gases and corrosion causing bacteria. The surface shall be free of entrapped air bubbles or holidays.

3) Physical properties

Dry Time	4-6 hours @ 75° F
Compressive Strength ASTM D-695	16,800 psi
Flexural Strength ASTM D-790	13,900 psi
Tensile Strength ASTM D-638	12,400 psi
Hardness ASTM D-2240	68-72 Shore D
Heat Distortion ASTM D-648	220 ° F
Ultimate Elongation ASTM D-638	4.5 %
Adhesive Shear ASTM C-882	1,000 psi

3. FORMED-IN-PLACE CONCRETE WITH EMBEDDED PLASTIC LINER

Provide the following as manufactured by AP/M Permaform of Johnston, IA or equal:

1) Concrete: The concrete shall be Type I/II Portland cement concrete with 5/8 inch minus coarse aggregate with fiber reinforcement and plasticizers producing an average compressive strength of 4,000 psi at full cure.

2) Plastic Liner: A ribbed or studded plastic liner shall be anchored into the new interior wall during the procedure to create an impermeable barrier. The plastic liner shall be PVC and shall be able to resist corrosion.

4 MANHOLE GROUT INJECTION

A. Acrylamide base grout shall have the following characteristics:

1) A minimum of 10% acrylamide base material by weight in the total grout mix. A higher concentration (%) of acrylamide base material may be used to increase strength or offset dilution during injection.

2) The ability to tolerate some dilution and react in moving water during injection.

3) A viscosity of approximately 2 centipoise, which can be increased with additives.

4) A constant viscosity during the reaction period.

5) A controllable reaction time from 10 seconds to 1 hour.

- 6) A reaction (curing) that produces a homogenous, chemically stable, non-biodegradable, firm, flexible gel.
- 7) The ability to increase mix viscosity, density and gel strength by the use of additives.
- 8) Product Manufacturer: Avanti AV-100; or equal.

B. Acrylic base grout shall have the following characteristics:

- 1) A minimum of 10% acrylic base material by weight in the total grout mix. A higher concentration (%) of acrylic base material may be used to increase strength of set dilution during injection.
- 2) The ability to tolerate some dilution and react in moving water during injection.
- 3) A viscosity of approximately 2 centipoise, which can be increased with additives.
- 4) A constant viscosity during the reaction period.
- 5) A controllable reaction time from 5 seconds to 6 hours.
- 6) A reaction (curing) that produces a homogenous, chemically stable, non-biodegradable, flexible gel.
- 7) The ability to increase mix viscosity, density and gel strength by the use of additives.
- 8) Product Manufacturer: Avanti AV-118; or equal.

C. Additives

1. Latex additive (or equal) shall be added to strengthen the grout. The quantity of latex additive will be according to the manufacturer recommendation. The grout admixture shall be adjusted to meet specified viscosity and reaction time. Strictly follow manufacturer's recommendations for product handling and start. Latex additive shall have the following characteristics.

- | | | | |
|----|---|----------------------|--------------|
| a. | Solids Content | 49% minimum | ASTM D-1010 |
| b. | pH | 7.5-8.5, 8.0 Average | |
| c. | Viscosity | 130 cps @ 77oF | ASTM D-1638 |
| d. | Density | 8.52 lbs / gal. | ASTM D-1564W |
| e. | Solvent | Water | |
| f. | Shall provide protection against shrinkage and improve the strength | | |

- of the gel.
- g. Shall not contain organic solvents.
- 2. A root deterrent chemical such as dichlobenil shall be added to the grout in proportions as recommended by the manufacturer.
- 3. A shrink control agent that is a water-based emulsion shall be used with the grout. The shrink control agent shall reduce shrinkage and improve strength of the grout providing the resultant cured material with both improved hydrostatic pressure resistance and flexibility. The agent shall be added in proportions as recommended by the manufacturer.

5 FLEX COAT CHIMNEY SEAL MATERIAL

- A. Coating shall be 100% solids, solvent-free flexible epoxy or urethane coating having the following characteristics:
 - 1. Tensile Strength (ASTM-D 412): 1,100 psi.
 - 2. Tensile Ultimate Elongation (ASTM-D 412): 400%
 - 3. Hardness, Shore D (ASTM-D 2240): 65
 - 4. Adhesion Strength (ASTM-D 412): 175 lb/in
 - 5. Initial Tear Resistance (ASTM-D1004): 150 lb/in
 - 6. Minimum Application Thickness: 170 mil.
- B. Acceptable Manufacturer: Flex-Seal Utility Sealant by Sealing Systems, Inc. or Equal.

6. WALL PATCH

A quick setting fiber reinforced calcium aluminate cementitious shall be used as a patching mix, mixed and applied according to manufacturer's recommendations, and having the following minimum physical properties:

- 1. Compressive Strength (ASTM C109B): 1,400 psi, 1 hrs
2000 psi, 24 hours
- 2. Shrinkage (ASTM C596): <0.06% at 90% R.H.
- 3. Bond Strength (ASTM C321): 900 psi, 24 hour
- 4. Flexural Strength 500 psi, 24 hour
900 psi, 28 days
- 5. Cement: sulfate resistant
- 6. Density, when applied: 105 +/- 5 pcf

7. HYDRAULIC CEMENT

A rapid setting cementitious product specifically formulated for leak control shall be used to stop minor water infiltration, mixed and applied according to manufacturer's recommendations, and having the following minimum physical

properties:

- | | |
|---------------------------------------|--|
| 1. Compressive Strength (ASTM C109B): | 600 psi, 6 hours
2000 psi, 24 hours |
| 2. Shrinkage (ASTM C596): | <0.06% at 90% R.H. |
| 3. Bond Strength (ASTM C321): | 40 psi, 1 hour
80 psi, 24 hours |

CONSTRUCTION DETAILS:

A. REFERENCES:

1. ASTM C-39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
2. ASTM C-94 - Standard Test Method for Ready-Mix Concrete
3. ASTM C-143 - Standard Test Method for Slump of Hydraulic Cement Concrete
4. ASTM D-149 - Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
5. NACE RP0274 - High Voltage Electrical Inspection of Pipeline Coating Prior to Installation
6. ASTM C-109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
7. ASTM C-293 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
8. ASTM C-307 – Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
9. ASTM C-469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete Compression
10. AASTM C-882 – Standard Test Method for Bond Strength of Epoxy Systems Used with Concrete by Slant Shear
11. ASTM C-157 – Modified Standard Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
12. ASTM C-1202 – (AASHTO T 277 Equivalent) Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
13. ASTM C150 – Specifications for Portland Cement
14. ASTM C321 – Standard Test Method for Bond Strength of Chemical Resistant Mortars
15. ASTM C495 – Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
16. ASTM C496 - Test Method of Splitting Tensile Strength of Cylindrical Concrete Specimens
17. ASTM C579, Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing.
18. ASTM C596, Test Method for Drying Shrinkage of Mortar Containing Portland Cement.

19. ASTM WK4521, Standard Practice for Sealing Sewer Manholes using Chemical Grouting.
20. Standards of American Water Works Association, AWWA.
21. Standards of American National Standards Institute, ANSI.
22. International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

B. SUBMITTALS:

1. The Contractor shall submit manufacturer's technical data, details, and specifications showing complete information on surface preparation and application procedures, material composition, physical properties and installation equipment in accordance with the requirements of **§ 106, Control of Materials**.
2. The Contractor shall submit manufacturer's certification of applicator's successful completion of training in use of the application equipment, rehabilitation products, and rehabilitation procedures.
3. The Contractor shall submit warranty information.

C. MANUFACTURER'S PRODUCT SUPPORT

The Contractor shall provide a representative employed by the manufacturer having technical training in admixture and manhole wall liner design and construction available for consultation on site during the repair work.

D. QUALIFICATIONS:

1. Contractor shall be licensed and certified by the manufacturer of the manhole lining process. Contractor shall have completed spray on cementitious manhole rehabilitation of at least 100 manholes and shall have completed manhole grout injection for at least 100 manholes.
2. All work must be supervised by a foreman responsible for rehabilitating a minimum of 50 manholes using the proposed manufacturer's manhole lining process for spray-on cementitious manhole rehabilitation and a minimum of 50 manholes using the proposed manufacturer's manhole lining process for manhole grout injection.

E. GUARANTEE:

1. Contractor shall re-inspect all manholes in the presence of the Owner or the Engineer 12 to 18 months after Conditional Acceptance of the work during high groundwater conditions.
2. All manhole repairs shall be guaranteed by the Contractor against infiltration,

spalling, or loss of adhesion for a period of 5 years from the date of Conditional Acceptance. During this period, all defects shall be repaired by Contractor in a manner satisfactory to the Engineer at no additional compensation.

F. LEGAL, SAFETY AND HEALTH REQUIREMENTS

The Contractor shall observe all federal, state and local laws, ordinances, policies, practices and regulations. In addition, the Contractor agrees to promptly procure all necessary approvals, licenses and permits, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

The Contractor shall conduct the work at all times in such a manner as to insure the least possible obstruction to traffic. The convenience of the general public and of the residents along and adjacent to the roadway shall be provided for in an adequate and satisfactory manner as the Engineer may direct.

All equipment and Materials shall be placed or stored in such locations so as not to be or to create the danger of becoming a hazard to the traveling public. No section of road shall be closed to the public except by permission of the municipality and Authority.

The safety provisions of applicable laws, building, construction and fire safety codes and the latest edition of the "Construction Safety Code, State of Connecticut, Labor Department", approved by the State Labor Commissioner, shall be complied with at all times.

The Contractor shall perform operations in strict accordance with OSHA and manufacturers' safety requirements. Particular attention is drawn to safety requirements involving entering confined spaces.

G. WORK IN CONFINED SPACES

All work in existing manholes shall be performed in accordance with OSHA 29CFR 1910.146, "Permit Required Confined Space."

H. MANHOLE CLEANING / PREPARATION

1. Clean bench/invert floor and interior walls of manholes by removing deleterious material, including dirt, grease, and other debris. Use high-pressure water, at a minimum force of 3,500 psi. If required, use approved cleaners to remove grease, oil, and other matter, which would prevent a good bond between existing manhole wall and the approved repair materials. Cleaning can also be accomplished by applying a 10 percent solution of muriatic acid or hydrochloric acid over surfaces. If an acid solution is used, the surface shall be thoroughly rinsed and neutralized prior to the application of mortars and coatings.
2. Preparation of the interior surfaces shall conform to requirements of the

wall liner material manufacturer. Loose and protruding brick, mortar and concrete shall be removed using a mason's hammer and chisel and/or scrapper. No debris shall be disposed of into the sewer system.

3. Ensure all sub-surfaces are clean and free of laitance or loose material.
4. Ensure that overhead sub-surfaces have been prepared to a minimum degree of roughness designated as CSP 4 by the International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
5. Ensure that sub-surfaces other than overhead have been prepared to a minimum degree of roughness designated as CSP 3 by the International Concrete Repair Institute (ICRI) Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
6. Inset plywood mats or sheeting over the existing flow channel and bench to prevent debris from falling into the sewer and to collect debris from manhole bench.
7. Contractor shall remove existing manhole rings for the installation of the formed-in-place concrete with the embedded plastic liner. Rungs shall not be replaced.

I. GENERAL APPLICATION

Materials shall be applied in accordance with the material manufacturer's specifications. Plugging leaks and patching surfaces shall be performed where indicated or required. Coatings and sealants shall be applied to all surfaces from the manhole base to the manhole frame.

J. SPRAY ON CEMENTITIOUS LINER

1. Plug any active leaks with hydraulic cement includes underdrains as specified in Part 2 above. Fill voids and overhangs with patching material.
2. Equipment: Mortar mixers, compressors and pumps shall be standard commercial models.
3. Avoid overly windy and arid curing conditions.
4. Application of the Cementitious Liner
 - a) Material shall be applied evenly around the entire circumference of the manhole. Multiple passes shall be made until the desired thickness

has been obtained. Thickness shall be verified at any point with a wet gage as directed by the Engineer.

b). Total thickness of cementitious product to be spray applied shall be ½" minimum. The liner shall start in the manhole invert and stop at the bottom of the manhole frame. All inverts shall be included in the manhole lining.

5. Application of the protective coating if required. These manholes will be identified by the Engineer during the course of the work if required.

a) The epoxy shall be uniformly cast onto the fresh mortar lining before re-exposure to the chemicals can contaminate the underlying mortar.

b) If application is delayed beyond 24 hours, or if the mortar liner is exposed to foreign matter, it shall be rinsed to neutralize its surface and the epoxy shall then be applied.

c) The epoxy corrosion protection coating shall be applied at a thickness of 0.065 inches and shall include the invert up the walls and overlap the bottom of the manhole frame by a minimum of 2 inches.

K. FORMED IN PLACE CONCRETE WITH EMBEDDED PLASTIC LINER

1. Infiltration which may adversely affect placement of the concrete shall be eliminated. Plug active leaks with hydraulic cement as specified in Part 2 above.

2. Equipment: Segmented, stackable steel forms shall be bolted together in cylindrical and conical sections with either eccentric or concentric cones or flat top ceilings and conform generally to the interior slope of the existing manhole.

3. Installation procedure:

a) Pipe extensions shall be placed through the new concrete wall at the base and at higher points of entry, such as drop inlets, to maintain flows during the procedure.

b) The form shall be sized and erected to conform to the existing interior dimensions and shape. The space between the forms and the existing wall shall be of a sufficient thickness, a minimum of 3 inches. The finished opening shall have a minimum diameter of 20 inches.

c) The form shall be positioned, sealed and finished at the manhole base to ensure concrete does not enter the sewer.

- d) The concrete shall be carefully placed from the bottom up in such a manner as to prevent segregation of the cement and aggregate. The concrete shall be consolidated to fill all pockets, seams and cracks within the existing wall.
- e) When the concrete has sufficiently cured to preclude slump or damage, the form shall be disassembled and removed.
- f) The plastic liner shall be fitted securely to the exterior of the steel forms during their erection within the manhole. When the forms are removed, all joints in the liner shall be welded and tested.
- g) The bench shall receive an overlay of cementitious liner with a chemical protective coating for corrosion resistance as directed by the Engineer at a thickness of three inches at the wall tapering to 1/2" at the edge of the invert channel. Prior to the overlay, a hydrophylic sealing strip shall be placed around the circumference of the bench where it meets the vertical wall and around all pipe penetrations to form a water stop.
- h) The plastic liner shall extend 2" above the finished concrete at which time the chemical protective coating is poured into the annular space against the plastic liner to seal any exposed concrete.
- i) Sealing at all pipe penetrations shall be accomplished using one of the following procedures:
 - 1) If the penetrating pipe is PVC, a fusion or extrude weld shall be made at their jointure with the new plastic lined wall.
 - 2) If the penetrating pipe is clay (VCP), cast iron, ductile iron or other material, a flat square section of the plastic liner approximately 1.5 times the pipe diameter shall be fitted over the penetrating pipe and fastened with a stainless-steel hose clamp. Then it shall be folded back over the hose clamp and flush with the plastic liner embedded into the wall. A weld strip or an extrude bead shall be welded along each edge of this flashing.
- j) Finish: The resultant concrete interior wall shall be smooth and free of honeycomb and areas of segregated aggregate.

L. JOINT SEALING BY GROUT INJECTION

1. Sealing of the manhole base and wall joints, and of penetrating pipe joints shall be by the grout injection method as shown on the drawings and summary tables.

2. Where indicated by field conditions or directed by the Engineer, grout wall joints as follows.

The wall joints shall have the drill holes at 4, 8, and 12 o'clock positions one foot above the joint to be sealed and drill holes with grout sleeves inserted into the walls at 2, 6, and 10 o'clock positions one foot below the joint to be sealed. For each wall joint, pump grout into the lower holes until grout comes out of the upper holes.

3. Where indicated by field conditions or directed by the Engineer, grout base and/or bench by drilling one hole on one side of the defect with grout sleeves inserted into the bench or base, whichever is lower. Pump grout into drill hole.
4. For each penetrating pipe joint, drill one hole on each side of the pipe with grout sleeves inserted into the walls at the spring line or top of manhole bench, whichever is lower. Pump grout into both drill holes.
5. Into each insert sleeve, grout shall be pumped at controlled pressures which are in excess of groundwater pressures. The Contractor shall install additional insert sleeves and grout as necessary, due to type and size of leak encountered, type of soil and type of voids being filled.
6. Leaks, which are determined to be too large to be effectively eliminated by the grout injection method, shall be plugged with hydraulic cement prior to initiating the injection of grout. The hydraulic cement shall require no additives, shall set in 45 – 90 seconds, and shall be dimensionally stable, freeze/thaw resistant and sulfate resistant.
7. The Contractor shall allow one day for the grout to cure, after which each sealed joint shall be inspected. If leaks are observed in the sealed area, the Contractor shall place new gel insert sleeves and apply more sealant as necessary to stop the leak. The process shall be repeated as necessary to stop the leaks.
8. All holes created by the grouting process shall be repaired with hydraulic cement. Manholes shall be cleaned, as specified, after chemical sealing operation. Any large voids shall be filled with wall patch mix.

M. FLEX COAT CHIMNEY SEAL

1. All manholes identified for rehabilitation shall receive a flex coat chimney seal.
2. If inflow or infiltration is observed within the structure after surface preparation is complete, grout/seal leaks by grout injection method first. Hydraulic cement may also be used upon approval by the Engineer. No

infiltration leaks may be evident in the manhole prior to installing chimney seal.

3. Prepare all chimney surfaces in accordance with manufacturer's recommendations.
4. After surface preparation, apply flexible coating to prepared surfaces in accordance with manufacturer's recommendations.

The chimney seal shall be applied from a point 2-inches above the joint between the manhole frame and chimney to a depth as required to rehabilitate the chimney. The minimal coverage shall be 12-inches, unless otherwise directed by the Engineer.

N. INSPECTION AND TESTING

1. Quality Assurance and Acceptance:
 - a) Two test cubes of the cementitious liner with chemical protective coating and two test cubes of the formed-in-place concrete with embedded plastic liner shall be taken randomly for every fifth manhole as directed by the Engineer at the Contractor's expense to verify strengths using ASTM C-109. Testing shall be done by an independent testing laboratory acceptable to the Engineer and paid for by the Contractor.
 - b) After completion of manhole rehabilitation, Contractor shall verify the minimum coating thickness of the manhole liner with a wet gauge. Test several points on the manhole wall, four minimum. Repair verification points. Any areas found to be thinner than minimum tolerances shall immediately receive additional material.
 - c) Spark testing shall be performed by an independent testing laboratory for each manhole to verify the thickness, continuity and thoroughness of the chemical protective coating and the embedded plastic liner. NACE RP0274 testing standard will detect bubble or blister type voids, cracks, thin spots, and foreign inclusions or contaminants in the coating. All areas of each manhole shall be inspected with a spark-testing device. Any area found to be a defect shall immediately receive additional material. All costs associated with testing shall be paid for by the Contractor.
 - d) All work shall be performed in accordance with T&R testing voltage. The dielectric strength of the chemical protective coating requires testing at 100 volts per each mil of thickness.
2. After the manhole rehabilitation work has been completed, the manhole shall be visually inspected by the Engineer in the presence of the

Contractor and the work shall be found satisfactory to the Engineer. Any work that has been found to be defective shall be redone by the Contractor at no additional expense to the Owner.

3. All manholes rehabilitated by spray on cementitious liner or formed-in-place concrete with embedded plastic liner shall be free of visible leakage. All such manholes shall be tested for leaks and inspected. Manhole testing may be accomplished by vacuum testing instead of spark testing:
 - a) Testing for water tightness shall be accomplished by vacuum testing in accordance with ASTM C 1244-93 or latest edition.
 - b) Manholes shall be vacuum tested and shall have a minimum of 8-inches of mercury applied to the manhole. Pressure drop shall not exceed 1 inch of mercury in a 1-minute test.
 - c) If the tested manhole meets the required test pressure and duration, full payment for the manhole will be made. If the time duration measured to drop 1 inch of mercury is less than the required time as noted above, the manhole will have failed the vacuum test, and payment will be reduced as described below.
 - i. If the tested manhole achieves the required initial vacuum pressure, but holds the required pressure for less than the required time duration, half payment for the applicable manhole pay Item will be made for that manhole.
 - ii. If the tested manhole fails to achieve the initial specified pressure, no payment will be made for the applicable manhole pay Item for that manhole.
4. Contractor may repair and re-test manholes which fail the vacuum test. If the manhole passes the subsequent vacuum test, the Contractor shall be entitled to the commensurate payment for the manhole Work.
5. Vacuum equipment shall be approved by the Engineer prior to its use.
6. Written verification of every manhole test must be provided to the Engineer. The following minimum information shall be recorded and provided:
 1. Manhole Number.
 2. Beginning test pressure, end test pressure, and test duration (minimum 60 seconds).
 3. Repeat test number.
 4. Repairs made.

O. CLEAN UP

The Site shall be cleaned on a continuous, daily basis during performance of the work and shall be cleaned upon completion so that the Project Site shall be left in a neat and orderly condition acceptable to the Engineer.

MEASUREMENT AND PAYMENT

This work will be measured for payment by the actual number of vertical linear feet of manhole rehabilitated, of each size, and each type of manhole, in accordance with these specifications. Measurement shall be made from the invert of the out flowing pipe to the geometric center of the top of the frame and cover and rounded to the nearest whole number of feet.

This work shall be paid for at the unit price bid per vertical foot for Sanitary Sewer Manhole Rehabilitation completed and accepted, which price shall include all materials, labor, tools, and equipment necessary and incidental to complete the work in accordance with these specifications including plugging holes and under drains, stopping active hydrostatic infiltration, patching, filling and repairing non-infiltrating holes, cracks and breaks, surface preparation, installation and/or application of spray-on lining system, installation and/or application of a flex coat chimney seal, installation and/or application of an injection grout system, testing, sealing pipe connections, lift holes, riser joining sections, bench/trough and corbel sections, frames and covers, and cleanup of the site.

No measurement will be made for partially completed manhole rehabilitation.

New Frames and Covers will not be measured for payment, but the cost shall be included in the unit price bid for sanitary sewer manhole rehabilitation.

There will be no separate measurement for payment for the cost of temporary bypass pumping, but the cost thereof shall be included in the contract unit price for sanitary sewer manhole rehabilitation.

Maintenance and Protection of Traffic will be measured and paid for in accordance with the provisions of Item 971, "Maintenance and Protection of Traffic." When no price for Item 971, Maintenance and Protection of Traffic, is asked for on the Proposal Form, this work will not be measured for payment, but the cost shall be included in the unit price bid for sanitary sewer manhole rehabilitation.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
524.01	Sanitary Sewer Manhole Rehabilitation Spray on Cementitious Liner (Size), Cast in Place	Vertical Foot
524.02	Sanitary Sewer Manhole Rehabilitation Spray on Cementitious Liner with Chemical Protective Coating (Epoxy) (Size), Cast in Place	Vertical Foot
524.03	Sanitary Sewer Manhole Rehabilitation Formed-in-Place Concrete with Embedded Plastic Liner (Size), Cast in Place	Vertical Foot
524.04	Sanitary Sewer Manhole Rehabilitation (Size), Pre-Cast	Vertical Foot
524.05	Sanitary Sewer Manhole Rehabilitation Flex Coat Chimney Seal (Size), Pre-Cast	Vertical Foot

ITEM 713 PERMANENT STEEL SHEET PILING

DESCRIPTION:

This specification covers only steel sheet piling shown on the plans to be left in place so that it becomes a part of the finished structure. For purposes of this specification, steel sheet piling shall be any type of adequately braced sheet pile wall which the Contractor elects to build to satisfy, and which does satisfy, the condition that existing facilities be properly retained during excavation for the placement of substructure or other facilities.

MATERIALS:

Materials for steel sheet piling shall conform to the requirements of ASTM A328.

CONSTRUCTION DETAILS:

The sheet piling shall be safely designed and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for batter pile clearance when necessary. Movements of steel sheet piling or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the steel sheet piling or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

The Contractor shall submit to the Engineer for approval plans showing the proposed method of construction prior to the start of such construction. The furnishing of such plans shall not serve to relieve the Contractor of any responsibility for the safety of the work or for the successful completion of the project.

The steel sheet piling shall be cut off at the elevation shown on the plans or as ordered by the Engineer. All material cut off shall remain the property of the Contractor and shall be disposed of by the Contractor.

MEASUREMENT:

Permanent steel sheet piling will be measured for payment by the square foot. This area will be measured or computed from the horizontal and vertical payment limits shown on the plans or as ordered.

PAYMENT:

This work will be paid for at the contract unit price per square foot for "Permanent Steel Sheet Piling," which price shall include the cost of designing, furnishing, driving, cutting off, and all incidental expenses, including all materials, equipment, tools and labor incidental thereto.

Item Number**Pay Item****Pay Unit**

713

Permanent Steel
Sheet Piling

Square Foot

ITEM 714 TEMPORARY SHEET PILING

DESCRIPTION:

Under this Item, the Contractor shall, with the approval of the Engineer, install temporary sheet piling. This sheet piling shall be removed upon completion of the permanent work. For purposes of this specification, temporary sheet piling shall be any type of adequately braced sheet pile wall which the Contractor elects to build to satisfy, and which does satisfy, the condition that existing facilities be properly retained during excavation for the placement of substructure or other facilities.

MATERIALS:

Materials of steel sheet piling shall conform to the requirements of ASTM A 328. Timber sheet piling shall conform to the requirements of Form 817 M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended.

CONSTRUCTION DETAILS:

Temporary sheet piling shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for batter pile clearance when necessary. Movements of sheet piling or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor.

Prior to the commencement of any excavation work, the Contractor shall submit to the Engineer the proposed methods of sheeting and bracing of excavations, size and type of materials, methods of installation and removal. All sheeting shall be designed and sealed by a Professional Engineer licensed to practice in the State of Connecticut. The furnishing and/or approval of such plans shall not serve to relieve the Contractor of any responsibility for the protection of the public, property and workmen, nor the obligation to conform with Local, Federal and State Regulations.

Unless otherwise ordered by the Engineer, all parts of the temporary sheet piling shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of piling unless otherwise permitted by the Engineer. Sheet piling may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

MEASUREMENT:

Temporary sheet piling, timber and/or steel, will be measured for payment by the number of square feet of temporary sheet piling completed and accepted, as computed from the horizontal and vertical payment limits described below.

The limits used for payment will be the actual horizontal limit of temporary sheet piling installed and accepted, and the vertical limit as measured from the bottom of the exposed face of the sheeting to the top of the retained earth behind the sheeting.

Trench shields or any other temporary sheeting used to protect workmen or adjacent utilities on the remainder of the project shall not be measured for payment, but the cost of which should be included in the unit price bid for the appropriate trench excavation items.

PAYMENT:

Payment for this work will be made at the contract unit price per square foot for "Temporary Sheet Piling", measured as described above, which price shall include all design, materials, equipment and labor incidental to the construction and removal of the temporary sheet piling required at the locations specified on the plans; including removal of obstructions, repair and correction, adjustments or reconstruction required by the plans. Any common sheet piling wall required for staged construction will be measured for payment only once.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
714	Temporary Sheet Piling	Square Foot

ITEM 970 TRAFFICPERSON

DESCRIPTION:

Under this item the Contractor shall provide the services of Trafficpersons for the control and direction of vehicular and pedestrians traffic in areas affected by Project operations. Trafficpersons shall be of the type and number, and for such periods, in accordance with the requirements and regulations of the applicable municipality and as approved by the Engineer. Trafficpersons' services which have not been requested or approved by the Engineer, but which have been obtained by the Contractor solely to meet its operational plans or needs, will not be approved for payment.

CONSTRUCTION METHODS:

Prior to the start of operations which require the use of Trafficpersons, a meeting will be held with the Contractor, the Engineer, any relevant Trafficperson agency or firm, and, if applicable, State Police, to review the Trafficperson operations, lines of responsibility, and operating guidelines for the Project. The Contractor shall provide a copy of each pertinent municipality's billing rates for Municipal Police Officers and their vehicles, as applicable, to the Engineer prior to the start of Project construction.

On a weekly basis, the Contractor shall inform the Engineer of its scheduled operations for the following week and the number of Trafficpersons it proposes to use for those operations. The Engineer will review the proposal and, if it is acceptable to them, approve the type and number of Trafficpersons to be used. In the event of an unplanned, emergency, or short-term operation, the Engineer may approve the temporary use of properly-clothed persons for traffic control until such time as an authorized Trafficperson may be obtained for that work. In no case shall such temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operation without prior notice of same as may be required by the agency providing the Trafficpersons, the Contractor shall be responsible for payment, at no cost to the Authority, of any show-up cost charged by said agency for affected Trafficpersons who would have been used if not for the pertinent change or cancellation. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control, and not involving the fault or negligence, of the Contractor.

Trafficpersons assigned to a work site are to take direction only from the Engineer.

Trafficpersons shall wear a high-visibility safety garment compliant with OSHA, MUTCD, and ASTM Standards; and the safety garment shall have the words "Traffic Control" printed and clearly visible on the front and rear panels (minimum letter size 2 in) of the garment. Worn or faded safety garments that are no longer highly visible shall not be used. At the direction of the Engineer, the Contractor must replace any such garments at no cost to the Authority.

A Trafficperson shall assist in implementing the traffic control specified in the item "Maintenance and Protection of Traffic" contained elsewhere in the Contract ,or as otherwise directed by the Engineer. Any use of a Trafficperson for Project operations in a manner that conflicts with the requirements of the Maintenance and Protection of Traffic specification must have been authorized in writing by the Engineer.

Trafficpersons shall consist of the following types:

1. **Law Enforcement Personnel:** Uniformed Municipal or State Police Officers shall be sworn Police Officers or Uniformed Constables employed by the Municipality in which the Project is located, who perform criminal law enforcement duties for the Municipality. Law enforcement personnel shall wear the high-visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided by said agency, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated below for a Uniformed Flaggers' garment.

Law Enforcement Personnel may also be used for conducting motor vehicle enforcement operations in and around work areas as directed or approved by the Engineer.

Their services will also include their use of an official Municipal Police vehicle when so requested by the Engineer. Uniformed Municipal Police Officers must not be used on limited access highways. If Uniformed Municipal Police Officers are unavailable, for a given task, other Trafficpersons may be used if so authorized in writing by the Engineer.

Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary for the control of traffic operations and for the safety of motorists passing through sites affected by Project operations.

2. **Uniformed Flagger:** Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other such training approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any Project work. The credentials and conduct of Uniformed Flaggers shall comply with the requirements of Chapter 6E, Flagger Control in the Manual on Uniform Traffic Control Devices (MUTCD). Uniformed Flaggers shall wear high-visibility safety apparel and use a STOP/SLOW paddle that is at least 18 in wide with letters at least 6 in high. The paddle shall be mounted on a pole of sufficient length to be 6 feet above the ground as measured from the bottom of the sign.

Uniformed Flaggers shall only be used on non-limited access highways for the purpose of controlling traffic operations and only when authorized to do so in

writing by the Engineer.

MEASUREMENT:

Services of Trafficpersons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include only such Trafficpersons as are employed within the limits of construction, right of way of the Project or along detours authorized by the Engineer in order to assist public travel through areas affected by Project construction. Trafficperson services employed due to use of a detour or bypass beyond the limitations approved by the Engineer, or in connection with movement of construction vehicles or equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than 12 hours in any one 24-hour period. If such services are essential for more than 12 hours in such period, for a use approved by the Engineer, additional Trafficpersons engaged by the Contractor to meet that circumstance shall be measured for payment. If a Trafficperson used with the Engineer's authorization is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when said employee is performing Trafficperson services.

No travel time will be measured for payment for Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

PAYMENT:

Trafficpersons will be paid in accordance with the schedule described herein.

There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

- 1. Uniformed Law Enforcement Personnel:** The sum of money for this item shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used in determining the total amount for the Contract.

The invoice must include a breakdown of each officer's actual hours of work and

actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a Municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the Municipality. Upon receipt of the invoice from the Municipality, the Contractor shall forward a copy of it to the Engineer. No payment on such an invoice will be made until and unless the Engineer has reviewed the invoice and approved the payment. The rate charged by the Municipality for use of a Uniformed Municipal Police Officer or a Municipal police vehicle shall not be greater than the rate that the Municipality normally charges others for similar services.

- 2. Uniformed Flagger:** Uniformed Flaggers will be paid for at the Contract unit price per hour for "Trafficperson (Uniformed Flagger)," which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the Trafficperson services authorized under the Contract or approved by the Engineer.

"Trafficperson" will be paid for the actual hourly rate charged for Trafficperson services (monthly statement or receipted bills) by the entity which actually provided the service. The cost of Trafficperson is a pass-through cost without markup or any additional fees.

<u>Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
970	Trafficperson	Estimate

ITEM 971 MAINTENANCE AND PROTECTION OF TRAFFIC

DESCRIPTION:

The Contractor shall maintain and protect traffic in the project area in accordance with the requirements and regulations of the applicable municipality and these Specifications. Unless otherwise specified, the Contractor must maintain pedestrian and vehicular traffic to permit access to commercial and industrial businesses, residences, and intersecting streets. It shall be the sole responsibility of the Contractor to warn the Local Regulatory Agencies (including but not limited to the Police and Fire Departments) at least 72 hours in advance of changes in traffic patterns due to reduction of pavement widths or closing of streets. The Contractor shall furnish, install, maintain, move, adjust, clean, relocate and store all signs, barricades, drums, delineators and traffic cones, as necessary to carry out the traffic routing plan and maintain vehicular and pedestrian traffic. All of this work shall meet with the approval of the applicable municipality.

MATERIALS AND METHODS:

1. Access: The Contractor shall arrange its operations to provide access to properties along the street including temporary bridges to driveways, and provide access to fire hydrants, manholes, gate boxes, or other utilities. Whenever any trench obstructs traffic in or to any public way, private driveway, or property entrance, the Contractor shall take such steps as required to maintain necessary traffic and access including temporary bridging if required. The Contractor shall confine its occupancy of public or travel way to the smallest space compatible with the efficient and safe performance of the work.

The Contractor shall observe and obey all local and state laws, ordinances, regulations and permits in relation to the obstruction of streets and highways, keeping passageways open and protecting traffic where there may be danger from blasting or other construction activities.

If the Contractor's operations shall interfere with the removal or sanding of snow or ice by the public authorities or adjoining land owners, in an ordinary manner with regular highway equipment, the Contractor shall be required to perform such services for the public authorities or adjoining owners without charge. If the Contractor fails to do so, it shall reimburse the said authorities or adjoining owners or the Authority for any additional cost to them for doing such work occasioned by conditions arising from the Contractor's operations, occupancy, or trench surfaces, together with any damage to the equipment of said parties by those conditions, or claims of any parties for damage or injury or loss by reason of failure to remove snow or ice or to said icy spots under these conditions.

2. Detours: If a detour is shown on the plans or deemed necessary, a proposed detour plan will be submitted by the Contractor to the Engineer and the applicable

municipal agencies.

3. Signs: Properly lighted, adequately sized clear, concise, legible signs shall be furnished as necessary for the safe regulation of traffic. Construction signs shall meet the requirements specified on Form 817 Section 12.20, and Form 817 Section 9.71. There will be no direct payment for any signs, but the cost thereof shall be considered as included in the cost of Maintenance and Protection of Traffic.

4. Barricades: Suitable lighted barriers or barricades shall be furnished by the Contractor and put up and maintained at all times during the night or daytime, around all open ditches, trenches, excavations, or other work potentially dangerous to pedestrians and traffic. Barricades shall be placed on all sides and throughout the entire length of all open ditches, trenches, excavations, or other work which must be barred to the general public. Barricades shall be properly painted in order to retain a high degree of visibility to vehicular and pedestrian traffic. Construction barricades shall meet the requirements specified on Form 817 Section 9.79, and Form 817 Section 9.71. There will be no direct payment for any barricades, but the cost thereof shall be considered as included in the cost of Maintenance and Protection of Traffic.

5. Flashers: Barricades shall be lit by flashers in accordance with Form 817 Section 9.76 "Barricade Warning Lights". There will be no direct payment for any flashers, but the cost thereof shall be considered as included in the cost of Maintenance and Protection of Traffic.

6. Traffic Cones: Traffic cones shall meet the requirements specified on Form 817 Section 9.77, and Form 817 Section 9.71. There will be no direct payment for any traffic cones, but the cost thereof shall be considered as included in the cost of Maintenance and Protection of Traffic.

7. Traffic Drums: Traffic Drums shall meet the requirements specified on Form 817 Section 9.78, and Form 817 Section 9.71. There will be no direct payment for any traffic drums, but the cost thereof shall be considered as included in the cost of Maintenance and Protection of Traffic.

8. Non-Performance: Should the Contractor or its employees neglect to set out and maintain barricades or lights, as required in these Specifications, the Engineer immediately, and without notice, may furnish, install and maintain barricades or lights. The cost thereof shall be borne by the Contractor and may be deducted from any amount due or to become due to the Contractor under this contract.

The Contractor will be held responsible for any damages that the Authority, Engineer, Governmental units, or their heirs or assigns may have to pay as a consequence of the Contractor's failure to protect the public from injury, and the same may be deducted from any payments that are due or may become due to the Contractor under this contract.

All signs, barricades, flashing lights, traffic personnel, detours, etc. and all else necessary and incidental shall conform to the Manual on Uniform Traffic Control for

Streets and Highways as approved and amended.

MEASUREMENT AND PAYMENT:

Monthly payments will be made in proportion to the amount of work done. Said payments will be a proportionate amount of the unit price bid (Lump Sum) for "Maintenance and Protection of Traffic" and shall include all costs for furnishing signs, lighted barricades and traffic protection devices and for labor, equipment and services involved in the erecting, maintaining, adjusting, storing of signs, flashers, lights, barricades, traffic cones, and other devices furnished by the Contractor, as well as the cost of all labor and equipment involved in the maintenance of traffic lanes and detours ordered or included in the approved scheme for maintenance of traffic.

The Contractor will be required under the unit price bid for "Maintenance and Protection of Traffic" to maintain and protect the traffic throughout the entire duration of the Contract. No claim for additional payment due to unusual construction conditions encountered or delay caused by the Contractor or other outside agencies shall be considered.

The Contractor will not be paid separately for repair and maintenance "such as patching, grading, snow removal, etc." or detours; said cost to be included in the unit price bid for "Maintenance and Protection of Traffic."

The Contractor shall include in the unit price bid for "Maintenance and Protection of Traffic" bridging for trenches at all street and driveway crossings in such manner as the Engineer may direct in order that the traffic on intersecting streets may not be blocked, and in order that entrance may be made to properties along the line of work.

No payment will be made under maintenance and Protection of Traffic for each calendar day during which there are deficiencies in compliance with the specification requirements of any subsection of this Item.

The amount of such calendar day non-payment will be determined by dividing the lump sum amount bid for Maintenance and Protection of Traffic by the number of calendar days between the date the Contractor commences work and the date of completion as designated in the proposal, without regard for any extension of time or the amount of Five Hundred Dollars (\$ 500.00) whichever is the greatest amount.

Where major nonconformance with the requirements of this specification is noted by the Engineer, and prompt Contractor compliance is deemed unobtainable, all contract work may be stopped by direct order of the Engineer.

If no Item "Maintenance and Protection of Traffic" appears in the Bid Schedule, the cost of this work shall be included in the prices bid for other Items.

Item Number**Pay Item****Pay Unit**

971

Maintenance and Protection
of Traffic

Lump Sum

ITEM 975 MOBILIZATION

DESCRIPTION:

Under this work the Contractor shall set up the necessary general plant, including shops, storage areas, office and sanitary and other facilities as are required by local or state law or regulations.

This item consists of all work necessary for moving Project personnel and equipment to the Project Site; all work necessary for the establishment of the Contractors' field offices, buildings and other facilities necessary for Contract performance; the preparation of work plans and other documents that must be submitted by the Contractor to the Department prior to the start of physical Project construction. These initial submittals are identified elsewhere in the Contract and may include Project schedules, Project management plans, staging and storage areas, safety plans, quality control plans, erosion and sedimentation control plans, and other documents addressing general Project sequencing or management; demobilization of plant and equipment; completion of all physical work; completion of administrative closeout items as required by the Contract. The work entailed in this item shall not be subcontracted in whole or part

MEASUREMENT:

Payment for mobilization will be made on a lump sum basis.

PAYMENT:

The amount bid for mobilization shall not exceed three percent (3%) of the total contract price excluding the bid price for mobilization. Should the bidder exceed the foregoing three percent (3%), the Authority will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

The amount bid shall include the furnishing and maintaining of services and facilities noted herein under "Description", to the extent and at the time the Contractor deems them necessary for its operations, consistent with the requirements of this work and the respective contract.

The amount bid shall be payable to the Contractor whenever it has completed at least ten percent (10%) of the contracted work. For the purposes of this Item, ten percent (10%) of work shall be considered complete when the total of payments earned, as reflected by estimates of work done, as set forth in **§109-06, Payment of Estimates**, not including the amount bid for this work, shall exceed ten percent (10%) of the total amount of the Contractor's bid for this contract.

Unless otherwise provided for elsewhere, the cost of required insurance and bonds and/or any initiation of the Contract work may be included in this work.

Item Number

Pay Item

Pay Unit

975

Mobilization

Lump Sum

ITEM 985 PROJECT SURVEY AND STAKEOUT

DESCRIPTION:

The work to be performed under this Section consists of providing all necessary survey required to construct all elements and phases of the project as shown on the Drawings and as specified herein, and to document the completed construction.

The work shall include, but shall not necessarily be limited to, stake-out as shown on the Drawings and/or as required to locate the required work features, consistent with current generally accepted construction surveying practice.

Prior to construction the required Work shall be laid out using vertical and horizontal control points provided by the Owner as shown on the Drawings.

The stake-out survey shall proceed immediately following the Contractor's mobilization and shall expeditiously progress to completion in a manner satisfactory to the Engineer.

The Contractor shall perform surveys for measurement and payment of completed work.

In addition, under this Item, the Contractor shall furnish a set of "Red-Line" plans. The "Red-Line" plans record the changes that have occurred during construction and are incorporated onto the plans manually by the Contractor as approved/verified by the Engineer. The Engineer will use the "Red-Line" plans to prepare the final As-Built plans.

MATERIALS:

All instruments, equipment, stakes and any other material necessary to perform the work satisfactorily, shall be provided by the Contractor.

All stakes used shall be of a type approved by the Engineer. It shall be the Contractor's responsibility to maintain these stakes in their proper position and location at all times.

CONSTRUCTION DETAILS:

PROJECT SURVEY AND STAKEOUT

The Contractor shall trim trees, brush and other interfering objects, not inconsistent with the plans, from survey lines in advance of all survey work to permit accurate and unimpeded work by the stakeout survey crews and the Authority's cross-section survey crews.

The location and length shown on the plans for culverts shall be considered to be approximate. The ordered length of culverts will be determined by the Engineer after the Contractor accurately stakes the proposed culvert in the planned location as

approved by the Engineer and after appropriate and necessary engineering study.

The exact position of all work shall be established from control points, base line transit points or other points of similar nature and/or modified by the Engineer. Any error, apparent discrepancy or absence of data shown or required for accurately accomplishing the stakeout survey shall be referred to the Engineer for interpretation or furnishing when such is observed or required.

The Contractor shall place two offset stakes or references at each center line station and at such immediate locations as the Engineer may direct. From computations and measurements made by the Contractor, these stakes shall be clearly and legibly marked with the correct centerline station number, offset and cut or fill so as to permit the establishment of the exact center line location and elevation during construction. If markings become faded or blurred for any reason, the markings shall be restored by the Contractor at the request of the Engineer. The Contractor shall locate and place all cut, fill, slope, fine grade or other stakes and points, as the Engineer may direct for the proper progress of the work. All control points shall be properly guarded and flagged for easy identification.

Drainage structures shall be staked out by the Contractor at the locations and elevations shown on the plans or specified by the Engineer.

All required Right-of-Way and easement limits shall be established, staked and referenced by the Contractor concurrent with the Construction stakeout survey. Right-of-Way and easement limits shall be staked by or under the direction of, a Licensed Land Surveyor. The Contractor shall supply proof to the Engineer that such work is being performed by or supervised by a Licensed Land Surveyor

Permanent Survey Marker locations shall be established and referenced by the Contractor

The Contractor shall be responsible for the accuracy of the work and shall maintain all reference points, stakes, etc. throughout the life of the contract. Damaged or destroyed points, bench marks or stakes, or any reference points made inaccessible by the progress of the construction shall be replaced or transferred by the Contractor. Any of the above points which may be destroyed or damaged shall be transferred by the Contractor before they are damaged or destroyed. All control points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted and the information furnished to the Engineer immediately. All stakeout survey work shall be referenced to the center line shown on the Plans. All computations necessary to establish the exact position of the work from control points, shall be made and preserved by the Contractor. All computations, survey notes and other records necessary to accomplish the work shall be neatly made. Such computations, survey notes and other records shall be made available to the Engineer upon request and shall become the property of the Authority and delivered to the Engineer not later than the date of acceptance of the Contract.

The Engineer may check all or any portion of the stakeout survey work or notes made by the Contractor. Any necessary correction to the work shall be made immediately by the Contractor. Such checking by the Engineer shall not relieve the Contractor of any responsibility for the accuracy or completeness of the work.

Prior to the final cross-section survey of the project by the Engineer, the Contractor shall reestablish center line or base line points and stationing as required by the Engineer.

The Contractor will not be required or permitted to take the pre-construction or final cross-sections that are used for payment purposes.

During the progress of the construction work the Contractor will be required to furnish all of the surveying and stakeout incidental to the proper location by line and grade for each phase of the work. For paving and any other operation requiring extreme accuracy, the Contractor will re stake with pins or other acceptable hubs located directly adjacent to the work at a spacing directed by the Engineer.

Any existing stakes, iron pins, survey monuments or other markers defining property lines which may be disturbed during construction, shall be properly tied in to fixed referenced points before being disturbed and accurately reset in their proper position upon completion of the work.

Just prior to completion of the Contract, the Contractor shall re-establish if necessary and re-tie all control points as permanently as possible and to the satisfaction of the Engineer.

AS-BUILT DOCUMENTS

The Contractor shall be required to prepare and furnish a paper "Red-Line" plan recording all construction changes, deletions or modifications. The Engineer will provide additional original bid drawings to the Contractor if necessary.

The "Red-Line" plans indicate all field changes to project plans and location of rock elevations, groundwater levels and soil conditions.

All work, both in the field and in the office, shall be under the direct supervision of a Land Surveyor, licensed in the State of Connecticut. The Land Surveyor shall be required to seal, date and sign each of the "Red-Line" plans. These "Red-Line" plans must be submitted at the same time as the request for final payment. No final payment will be considered unless accompanied by "Red-Line" plans.

The Contractor shall be responsible for the care and preparation of the "Red-Line" plans during the course of construction.

The original lines or lettering should not be erased when making corrections.

All work on the "Red-Line" plans is to be done in red ink. No entries should be made on the backs of the plans.

Line revisions should be made by using lines which stand out clearly. No shading is allowed.

All lettering must be done using 1/8" minimum height letters.

Revisions to the notes and written matter on the drawings should be made by crossing out the original and inserting the revision as close to the original as is possible without impairing the legibility. New lettering should be similar in size (1/8" minimum) and spacing to the original lettering so that it will be legible.

When sheets are added to the contract, these sheets should be added to the index in the plans.

All computations, survey notes and other records necessary to accomplish the work shall be neatly made. Such computations, survey notes and other records shall be made available to the Engineer upon request and shall become the property of the Authority and delivered to the Engineer not later than the date of acceptance of the Contract.

The Contractor shall be responsible for obtaining all the necessary field information which is required to be shown on the "As-Built" Documents. Information obtained by the Authority is for its own use and is not intended to substitute for the information required in these specifications.

MEASUREMENT:

Payment will be made at the lump sum price bid for this work.

PAYMENT:

The price bid shall include the cost of furnish all labor, equipment, instruments and other material necessary to satisfactorily complete the project survey and stakeout and the preparation and submission of the as-built documents.

Monthly payments will be made under this work in proportion to the amount of work done as determined by the Engineer.

Included shall be the cost of all field work by the Licensed Land Surveyor, drafting and furnishing the Authority with the necessary information and all else necessary to satisfactorily complete the work in accordance with the specifications.

Item Number

Pay Item

Pay Unit

985

Project Survey and Stakeout

Lump Sum