ARCADIS

Appendix C

Technical Specifications

TECHNICAL SPECIFICATIONS
FOR THE
MULTIPHASE EXTRACTION AND TREATMENT SYSTEM
FORMER MOHAWK FINISHING PRODUCTS
AMSTERDAM, NEW YORK

December 2008

Prepared for

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1.2 CONTRACT DESCRIPTION

A. RPM, Inc. (collectively referred to as the CLIENT) has retained ARCADIS to prepare these Technical Specifications for the design of a proposed groundwater remediation system being implemented at the Former Mohawk Finishing site in Amsterdam, New York. The CLIENT has also retained ARCADIS to construct this groundwater remediation system by directly entering into contracts with CONTRACTORS and VENDORS.

1.3 DEFINITIONS

A. For the purpose of these Technical Specifications, Remedial Design Drawings, and other contract documents, the following definitions apply:

1. OWNER/CLIENT: RPM, Inc.

2. CONSULTANT/ENGINEER: ARCADIS of New York Inc.

3. CONTRACTOR: The individual, firm, partnership, or corporation designated as the CONTRACTOR in these contract documents.

4. VENDOR, SUPPLIER or MANUFACTURER: The individual, firm, partnership, or corporation selected to supply specific system equipment components.

5. SITE: The area as indicated on the remedial design drawings.

1.4 SCOPE OF WORK

A. The Remedial Design Drawings and these Technical Specifications shall constitute the design and construction requirements for this project. The CONTRACTOR shall provide the necessary supervision, labor, materials, equipment, tools, and appurtenances as required to affect a complete Work, acceptable to the permitting authorities, the CONSULTANT/ENGINEER, and in compliance with the respective codes. Work under this Contract Document includes the following list of items which is meant as a guide and as a general description of the CONTRACTOR'S scope of work.

1. Obtain all required state, county and local construction related permits.

2. Mobilize materials and equipment.

3. Obtain access to and locate all required utilities necessary for completion of the Work, including, but not limited to the following: electric power, telephone, fiber optics, sewer and gas.

4. Supply and construct a treatment enclosure as indicated on the design drawings, including.

5. Supply and install the remedial system as indicated on the Remedial Design Drawings including but not limited to; installing recovery piping to 32 recovery wells, two rotary claw pumps, two progressive cavity transfer pumps, two bag filter assemblies, two liquid phase granular activated carbon (LPGAC), and two vapor phase granular activated carbon (VPGAC) vessels. Including, installing all associated piping and electrical controls in accordance with the Remedial Design Drawings and these Technical Specifications and MANUFACTURER'S recommendations.

6. Provide and install all necessary wiring, electrical devices, control panels, instrumentation, and controls to provide for integrated system operation.

7. Install and connect electrical devices to appropriate electrical service.

8. Perform system start-up.

9. Cleanup and dispose of all waste generated during construction.

1.5 PRINCIPAL FEATURES

This section provides an overview and summary of the different processes associated with the treatment system and the components associated with each portion of the Work to be completed by the CONTRACTOR in accordance with the Remedial Design Drawings and Technical Specifications.

A. Groundwater and Soil Gas Recovery System

1. The groundwater recovery system shall be comprised of thirty two (32) vacuum enhanced recovery wells: RW-1 through RW-32. Each existing RW recovery wellhead shall be modified in accordance with Remedial Design Drawings and shall be equipped with all necessary piping and appurtenances. Vacuum shall be applied to the recovery wells via a rotary claw pump.

2. The piping from each groundwater recovery well shall be directed to a common trench which leads up to the treatment enclosure as shown on Remedial Design.

B. Groundwater and Soil Gas Treatment System

1. Groundwater and soil gas from the recovery wells shall be directed to a common manifold and to a liquid/vapor knockout tank. The groundwater will be removed from the knockout tank via a progressive cavity pump and pumped through two bag filter assemblies, and then filtered through two 1000 lb LPGAC vessels. Once the groundwater has passed through this filtering process the treated water will be discharged from the second LPGAC to a onsite sanitary sewer line and ultimately to the local POTW. The soil gas (vapor phase) will exit the knockout tank and pass through a heat exchanger and then be filtered through two VPGAC vessels.

C. Treatment Equipment Enclosure

1. The treatment system shall be housed within the southeast corner of Building 6 utilizing the south and western walls. Two interior partition walls will be constructed from the existing slab to existing roof structure as indicated on the Remedial Design Drawings. The treatment enclosure will contain one (1) man access way for personnel ingress and egress, one (1) garage doors (roll up type) for carbon exchanges/deliveries and O&M activities. The treatment enclosure foot print will also contain a grate covered sump located within the footprint of the enclosure.

2. The treatment building shall include heating, ventilation, and lighting to maintain a standard operating environment.

3. The two installed interior partition walls will be protected by a series of pipe bollards and guardrails as shown on the Remedial Design Drawings.

D. Piping

1. Piping includes pipe supports (within above-grade structures), and all other associated appurtenances.

E. Electrical System

1. Provide and install all necessary wiring, electrical devices, control panels, instrumentation, and controls to provide for integrated system operation:

4. The electrical system shall include conduit, wiring, transformers, panel boxes, Motor Control Center (MCC), devices, instrumentation, and all other items necessary to make the system functional.

5. The control center for all system operations shall be a Main Control Panel (MCP) equipped with a Programmable Logic Controller (PLC) that can be monitored remotely.

F. Soil Excavation

1. Excavation and disposal of approximately 500 cubic yards of soils from the former tank farm area.

2. Excavation and disposal of approximately12 cubic yards of soils from the former spur ditch area.

1.6 RESPONSIBILITIES

A. The CONSULTANT/ENGINEER'S responsibilities:

1. Review the CONTRACTOR'S Health and Safety Plan to ensure its consistency with the overall plan for the SITE.

2. Stop work should it not comply with the terms of the Contract.

3. Review shop drawings, product data, and submittals.

4. Render approvals, clarifications, instructions, change orders, etc. (when appropriate).

5. Inspect materials and equipment as required.

6. Observe and verify construction activities.

7. Provide design interpretation and technical support.

8. Approve changes in the Work in writing.

B. The CONTRACTOR'S responsibilities:

1. Adhere to these Technical Specifications and the Remedial Design Drawings.

2. Conduct all work in accordance with applicable local, State, and Federal regulations.

3. Apply for and pay all permit and inspection fees.

4. Provide accurate schedules, adhere to the schedules, and receive approvals from the CONSULTANT/ENGINEER for modifications to the schedules, if necessary.

5. Attend weekly progress meetings with the CONSULTANT/ENGINEER.

6. Prepare, submit, and implement a site-specific Health and Safety Plan.

7. Submit shop drawings, product data, and test results for the products, components, and equipment to be used to the CONSULTANT/ENGINEER for approval.

8. Submit product data for all materials, and receive approvals from the CONSULTANT/ENGINEER for all materials prior to delivery to the SITE.

9. Arrange for delivery, receive, unload, and install all materials and equipment at the SITE; inspect for completeness or damage. Replace any items damaged after receipt.

10. Store and secure all materials and equipment, as required.

11. Submit changes in the Work to the CONSULTANT/ENGINEER for written approval. Obtain written approval from the CONSULTANT/ENGINEER prior to the commencement of such changes in the Work.

12. Accompany the CONSULTANT/ENGINEER for a final inspection upon completion of the Work. The CONSULTANT/ENGINEER will prepare punch list and the CONTRACTOR shall make tradesmen available to make corrections to the system after the inspection.

13. Prepare and submit a complete set of operation and maintenance (O&M) instruction manuals for all equipment furnished by the CONTRACTOR.

14. Maintain a complete set of marked-up contract drawings to reflect all approved field changes and as-built information for the CONSULTANT/ENGINEER to develop record drawings.

1.7 OWNERSHIP

A. The Remedial Design Drawings and Technical Specifications prepared by the CONSULTANT/ENGINEER are the property of the CONSULTANT/ENGINEER. They are not to be used on other projects or extensions to this Project except by agreement in writing from the CONSULTANT/ENGINEER. Submissions or distribution to meet official regulatory requirements, or other purposes in connection with this Project, is not to be construed as publication in derogation of the CONSULTANT/ENGINEER'S and OWNER'S rights.

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. In accordance with Section 01012 (Special Conditions), the CONTRACTOR shall be responsible for making sure the locations of all underground and overhead utilities and structures are known. Before doing any work at the SITE, the CONTRACTOR shall notify the CONSULTANT/ENGINEER of the locations of all utilities and structures in the area where construction activities will be taking place.

B. The CONTRACTOR shall take all steps necessary to prevent disruptions or interference to areas adjacent to the SITE.

C. The CONTRACTOR shall limit construction operations to areas noted on Remedial Design Drawings and designated by the CONSULTANT/ENGINEER.

D. The CONTRACTOR shall restore all areas disturbed by construction activities to existing conditions unless otherwise specified by the CONSULTANT/ENGINEER.

E. All work shall be conducted during hours deemed appropriate by the CONSULTANT/ENGINEER, OWNER, and/or local ordinance.

1.9 OFFSETS

A. The Remedial Design Drawings are diagrammatic in nature. Required size and termination of pipes, and suggested routings are shown to conform to the SITE requirements, avoid

creating obstructions, and preserve clearances. However, it is not the intention of these documents to indicate all required offsets. It is the specific responsibility of the CONTRACTOR to provide for offsets, horizontal and vertical control points and other surveying requirements in such a manner as to conform to the SITE features, and make all equipment requiring inspection, maintenance, and repair accessible.

1.10 QUALITY ASSURANCE

The CONTRACTOR shall be responsible for quality assurance of the Work as summarized below and in accordance with Section 01400 (Quality Control). The CONTRACTOR shall:

A. Monitor quality control over SUPPLIER'S, MANUFACTURER'S, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with MANUFACTURER'S instructions, including each step in installation, startup, and operating sequence.

C. Should MANUFACTURER instructions conflict with Contract Documents, request clarification from the CONSULTANT/ENGINEER before proceeding.

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

E. Have the Work performed by persons qualified to produce workmanship of specified quality.

1.11 MATERIALS AND EQUIPMENT

The CONTRACTOR shall be responsible for materials and equipment as summarized below and in accordance with Section 01600 (Materials and Equipment):

A. Products

1. Products: means new material, components, fixtures, and systems comprising the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work.

B. Storage and Protection

1. Equipment, products, backfill material, and all other construction materials shall be stored in an area designated by the CONSULTANT/ENGINEER.

2. Store and protect products in accordance with MANUFACTURER'S instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

3. The CONTRACTOR will be responsible for providing heating and weather protection for equipment and materials that require that level of care.

C. Substitutions

1. Substitutions after project initiation may be considered when a product becomes unavailable through no fault of the CONTRACTOR.

2. Substitution of components is allowed as follows:

   a. Where specified as “or equal” shall mean that the CONTRACTOR may use a material of equal quality, function, and value.

   b. Where specified as “or approved equal” means that substitution is allowed upon approval by the CONSULTANT/ENGINEER.

   c. Where specified as “no substitutions” means substitutions will not be allowed unless compelling reasons exist to require the substitution, and the CONSULTANT/ENGINEER concurs with the CONTRACTOR and approves substitution

3. A request for substitution constitutes a representation that the CONTRACTOR:

   a. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product.

   b. Will provide the same warranty for the substitution as for the specified product.

   c. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete, with no additional cost to the CONSULTANT/ENGINEER.

   d. Waives claims for additional costs or time extension which may subsequently become apparent.

   e. CONSULTANT/ENGINEER’S approval of a request shall place the responsibility under this section on the CONSULTANT/ENGINEER.

END OF SECTION

01010-8
SUMMARY OF WORK

SECTION 01012
SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Utilities.

B. Ordinances, Permits, Licenses.

C. Emergency Responsibility.

D. Environmental Protection.

E. CONSULTANT/ENGINEER'S Authority.

1.2 UTILITIES

A. Repair of damaged utilities caused by the CONTRACTOR'S work is the responsibility of the CONTRACTOR. Utilities such as sewer, water, natural gas, telephone and electric lines encountered in the Work shall be protected from injury and maintained in service until removed, replaced, or abandoned as required for the complete Work.

1.3 ORDINANCES, PERMITS, AND LICENSES

A. The CONTRACTOR shall at all times follow all applicable local, state, and federal laws. Neither the CONSULTANT/ENGINEER, OWNER, nor any other party shall be liable or held responsible if CONTRACTOR violates any of the above laws.

B. The CONTRACTOR must apply and pay for the cost of all local building permits.

C. The required state environmental permits shall be in place before start of construction.

1.4 EMERGENCY RESPONSIBILITY

A. In case of emergency which threatens damage of property and/or safety of life, the CONTRACTOR shall act, without previous instructions from the CONSULTANT/ENGINEER or OWNER, as the situation may warrant. The Health and Safety Plan (HASP) required under Section 01300 (Submittals) shall contain all relevant information regarding emergency response and be completed per Part 3 of this section of the Technical Specifications. The CONTRACTOR shall notify the CONSULTANT/ENGINEER of any emergencies immediately thereafter. Any claim for compensation by the CONTRACTOR, together with substantiating documents regarding expenses, shall be submitted to the CONSULTANT/ENGINEER and the amount of compensation shall be determined by agreement between the CONTRACTOR and CONSULTANT/ENGINEER.

1.5 ENVIRONMENTAL PROTECTION

A. General Requirements - The CONTRACTOR shall provide and maintain environmental protection during the life of the Contract. Environmental protection shall be provided to correct conditions that develop during all phases of construction. The CONTRACTOR'S operations shall comply with all federal, state, and local regulations pertaining to water, air, solid waste, and noise pollution.

B. Protection of Natural Resources - It is intended that the natural resources within the SITE and outside the limits of permanent Work performed under this Contract be preserved in their existing condition or be restored to an equivalent or improved condition upon completion of the Work. Construction activities shall be confined to areas defined by the Contract Documents.

1. The CONTRACTOR shall restore damaged areas of the SITE to "Original Conditions" as applicable after performing required work. An inspection by the CONSULTANT/ENGINEER shall determine completion of Work and shall approve the repair and restoration prior to the acceptance of the Work. All restoration operations shall be performed at the CONTRACTOR'S expense.

2. Signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction shall be eliminated in an approved way. Upon completion, all areas shall be clean and natural looking to the maximum extent possible.

3. All Work under this contract shall be performed in such a manner that any adverse environmental impacts are reduced to a level that is acceptable to the CONSULTANT/ENGINEER and the New York State Department of Environmental Conservation (NYSDEC).

4. Special measures shall be taken to prevent oily or hazardous substances from entering the ground, drainage areas, or local bodies of water.

C. Control of Wastes - Wastes shall be picked up and placed in containers which are emptied on a regular schedule. Handling shall be conducted in a way that prevents contamination of the Site and any other areas.

1. All waste shall be transported and disposed of in a manner that complies with federal, state, and local requirements by the CONTRACTOR. The CONTRACTOR shall maintain and submit to the CONSULTANT/ENGINEER a copy of any state and/or local permits or licenses that reflect such agency's approval and compliance with applicable solid waste disposal regulations. The permits or licenses and the location of the disposal area shall be provided prior to transporting any waste material.

2. During construction, the CONTRACTOR shall use chemical toilets or comparably effective units with sanitary wastes periodically emptied into municipal sanitary sewage systems. Provisions shall be made for pest control and for elimination of odors.

3. Fueling and lubricating of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants and waste oil shall be disposed of by the CONTRACTOR at his expense, in accordance with approved procedures meeting federal, state, and local regulations.

E. Dust Control - Dust shall be suppressed at all times, including non-working hours, weekends, and holidays. Soil at the Site, haul roads, and other areas disturbed by the construction operations shall be sprinkled with water as necessary to control dust. Only wet cutting of concrete blocks and concrete will be permitted. No unnecessary shaking of bags will be permitted where concrete mortar and plaster milling is done.

F. Noise Control - The maximum use of "low-noise emission products" as certified by the Environmental Protection Agency shall be made when available. When not available, screens and/or barriers shall be used for noise control. No blasting or use of explosives will be permitted.

1.6 CONSULTANT/ENGINEER'S AUTHORITY

A. When performing the work, the CONTRACTOR shall abide by all orders, directions, and requirements of the CONSULTANT/ENGINEER. The work shall be performed to the satisfaction of the CONSULTANT/ENGINEER at the times and places, the methods, and in the manner and sequence the CONSULTANT/ENGINEER may require. The CONSULTANT/ENGINEER shall determine the amount, quality, and acceptability of all phases of the work. The CONSULTANT/ENGINEER shall interpret the plans, specifications, contract documents, and any extra work orders. The CONSULTANT/ENGINEER shall decide all other questions in connection with the work. Upon request, the CONSULTANT/ENGINEER shall confirm in writing any oral orders, directions, requirements, or determinations.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. The CONTRACTOR shall collect samples and/or conduct tests in accordance with Section 01400 (Quality Control) and all applicable standards related to the item or system being tested.

3.2 HEALTH AND SAFETY

A. The CONTRACTOR shall be responsible for implementing the site-specific HASP prepared in accordance with Section 01300 (Submittals).

B. The CONTRACTOR shall provide adequate health and safety personal protection equipment (PPE) for his/her employees and others who might be affected by excavation and construction activities.

C. Work procedures shall conform to all applicable OSHA, State of New York, county, local government, and other federal regulations.

3.3 PROJECT SCHEDULE

A. Time is of the essence for construction. The CONTRACTOR is responsible for meeting the system start-up deadline.

B. The CONTRACTOR shall be responsible for achieving round-the-clock operation of the treatment system and address all punch list items within 5 days of the notice to proceed.

C. The CONTRACTOR shall develop, implement, and maintain a project schedule that runs the duration of the project from notice to proceed to completion of all punch list items and fully automatic operation.

D. The CONTRACTOR will be responsible for all fines and extra costs associated with the CONTRACTOR'S failure to meet the deadline specified herein and in the Contract Documents.

END OF SECTION

SECTION 01039
COORDINATION AND MEETINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site Progress Meetings.

B. Weekly Progress Reports.

C. Coordination.

1.2 SITE PROGRESS MEETINGS

A. The OWNER or CONSULTANT/ENGINEER shall designate, as necessary, progress meetings that will be conducted to review the progress of the work, and any unexpected conditions or situations that may have arisen. The CONTRACTOR is required to attend all progress meetings unless exempted by the CONSULTANT/ENGINEER or OWNER. The CONSULTANT/ENGINEER will ensure conformance with the financial plan. The CONTRACTOR shall be fully responsible for any and all of the SUBCONTRACTORS and shall be responsible for SUBCONTRACTOR attendance and/or input into the meetings.

B. The meetings shall be documented by the CONSULTANT/ENGINEER and copies of the minutes of the meetings shall be distributed to the CONTRACTOR.

C. Progress meetings shall be held approximately once a week, at which time the weekly progress report will be reviewed.

1.3 WEEKLY PROGRESS REPORTS

A. The CONTRACTOR shall provide written weekly progress reports to the CONSULTANT/ENGINEER outlining the current status of the work, any projected budget impacts, unexpected conditions or situations, updated schedule, and any information pertinent to the progress of the work.

1.4 COORDINATION

A. All on-site work shall be coordinated by the CONTRACTOR, with the approval of the CONSULTANT/ENGINEER.

B. Site, facility, and utility access shall be coordinated through the OWNER's representative and/or the appropriate utility authority.

C. Issues related to design and construction of the specified system shall be handled through the CONSULTANT/ENGINEER in accordance with Sections 01010 (Summary of Work), 01012 (Special Conditions), 01300 (Submittals), and 01400 (Quality Control).

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General
B. Submittal Procedures.
C. Shop Drawings.
D. Product Data.
E. MANUFACTURER'S Instructions.
F. Warranties
G. Proposed SUPPLIER List.
H. Proposed Subcontractor List.
I. Health and Safety Plan (HASP).
J. Construction Progress Schedules.
K. Weekly Progress Reports.
L. Operation and Maintenance Manuals.
M. As-Built Drawings.

1.2 GENERAL

A. All submittals shall be complete, neat, and orderly.

B. Submittals shall be provided according to the Contract Schedule.

1.3 SUBMITTAL PROCEDURES

A. Transmit one (1) copy of each submittal to the CONSULTANT/ENGINEER.

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify project, CONTRACTOR name, subcontractor or SUPPLIER name, submission date, pertinent drawing sheet and detail number(s), and specification section number(s) as appropriate.

D. Apply CONTRACTOR'S stamp, signature or initials certifying that review, verification of products, field dimensions, adjacent construction work, and coordination of information, is completed as required.

E. All submittals are to be submitted to and approved by the CONSULTANT/ENGINEER in writing prior to commencing work for the item which requires submittal.

F. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

G. Provide space for CONSULTANT/ENGINEER to place review stamp.

H. Revise and resubmit submittals as required by the CONSULTANT/ENGINEER until approved; identify all changes made since previous submittal.

1.4 SHOP DRAWINGS

A. The CONTRACTOR shall furnish Shop Drawings to the CONSULTANT/ENGINEER for review and approval within 21 calendar days after award of contract.

B. Shop Drawings shall show how the CONTRACTOR intends to perform the Work.

C. The Shop Drawings should include:

1. The location, elevation, size, and anchoring details of all interior access doorways and service (mechanical and electrical) penetrations.

2. Recovery well piping manifolds profile layout and associated floor penetration pipe sleeve locations.

3. VPGAC and LPGAC piping manifold profile layout.

4. Main Control Panel Layout.

5. Warranties extended by the CONTRACTOR for the Work to be completed.

D. Two (2) copies of the drawings and data submitted by the CONTRACTOR will be returned by the CONSULTANT/ENGINEER to the CONTRACTOR with comments such as, "Review Date," "Approved," "Rejected" and “Comments”. The CONTRACTOR shall make all necessary revisions, corrections, or clarifications, if required, and resubmit one (1) copy of the revised drawings and data within (7) calendar days.

1.5 PRODUCT DATA

A. The CONTRACTOR shall supply to the CONSULTANT/ENGINEER a proposed products list within 7 calendar days after award of contract. This list shall be subject to approval by the CONSULTANT/ENGINEER.

B. The proposed products list shall indicate all products that the CONTRACTOR believes will be incorporated. This list shall be interpreted as agreement by the CONTRACTOR to use the specified products. Omission from this list of any product required by the contract

documents shall not relieve the CONTRACTOR of the responsibility for providing that product and completing the associated work as specified.

C. The CONTRACTOR shall submit for the CONSULTANT/ENGINEER'S approval, within 21 calendar days after award of contract, all information and product data related to the products in the proposed products list. The product data shall be submitted with the shop drawings and include data called for under the specifications or requested by the CONSULTANT/ENGINEER, including but not limited to:

1. MANUFACTURER descriptions, technical specifications, shop drawings, and data for each component specified that will not be fabricated on-site.

2. MANUFACTURER warranties in accordance with Section 01012 (Special Conditions).

3. Submittals shall indicate that material or product conforms to or exceeds specified requirements. Submit supporting data or certifications as appropriate.

1.6 MANUFACTURER'S INSTRUCTIONS

A. CONTRACTOR shall submit printed instructions for delivery, storage, assembly, installation, and maintenance of specified components that will not be fabricated on-site to the CONSULTANT/ENGINEER. Instructions shall be provided a minimum of seven (7) calendar days prior to delivery.

1.7 PROPOSED SUPPLIER LIST

A. A complete list of SUPPLIERS with product, name, and address shall be submitted to the CONSULTANT/ENGINEER for review within 7 calendar days after award of contract.

1.8 PROPOSED SUBCONTRACTOR LIST

A. A final list of subcontractors with name, address, and experience shall be submitted to the CONSULTANT/ENGINEER for review within 7 calendar days after award of contract.

B. No work on the contract shall commence until all the proposed subcontractors have been approved by the CONSULTANT/ENGINEER in writing.

1.9 HEALTH AND SAFETY PLAN

A. The CONTRACTOR shall prepare a construction health and safety plan (HASP) in accordance with the HASP presently in place at the site. The HASP shall be submitted to the CONSULTANT/ENGINEER for review within 7 calendar days after award of contract.

B. CONTRACTOR shall be responsible for implementing the HASP in accordance with Section 01012 (Special Conditions).

C. No work shall commence at the SITE until a HASP is in place.

1.10 CONSTRUCTION PROGRESS SCHEDULES

The CONTRACTOR shall:

A. Submit initial project schedule within 7 calendar days after award of contract.

B. Submit revised schedules as substantial variations are identified or as required by the CONSULTANT/ENGINEER.

C. Show complete sequence of construction by activity, identifying Work in separate stages and in logically grouped activities. Indicate the start and finish dates and duration. Presentation shall be neat and accurate utilizing MS Project© or comparable project tracking software package.

1.11 OPERATION AND MAINTENANCE MANUALS

A. The CONTRACTOR shall provide operation and maintenance instruction manuals and warranty and service information from equipment MANUFACTURERS to the CONSULTANT/ENGINEER within fifteen (15) days of (prior to) system startup. The CONTRACTOR shall prepare an operation and maintenance manual that addresses the following items:

1. Operating Procedures: startup, break-in, and routine normal operating instructions and sequences; regulation, control, stopping, shut-down, and emergency instructions; summer, winter, and any special operating instructions.

2. Maintenance Requirements: routine procedures and guide for trouble-shooting, disassembly, repair, and reassembly instructions, and alignment, adjusting, balancing, and checking instructions.

3. MANUFACTURER's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

4. MANUFACTURER'S record drawings and any additional submittal information.

1.12 AS-BUILT DRAWINGS

A. The CONTRACTOR shall furnish drawings with all technical information (including product data, MANUFACTURER'S instructions and certificates) and all field modifications clearly indicated to the CONSULTANT/ENGINEER. All information necessary for the generation of record drawings shall be provided by the CONTRACTOR within 14 calendar days of substantial completion of construction.

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Contractor Quality Control and Assurance of Installation.

B. Workmanship.

1.2 RELATED SECTIONS

A. Section 01039 - Coordination and Meetings.

B. Section 01300 - Submittals.

1.3 CONTRACTOR QUALITY CONTROL AND ASSURANCE OF INSTALLATION

The CONTRACTOR shall:

A. Monitor quality control over SUPPLIERS, MANUFACTURERS, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with MANUFACTURER'S instructions, including each step in installation and startup sequence.

C. If MANUFACTURER'S instructions conflict with Contract Documents, CONTRACTOR shall request clarification from the CONSULTANT/ENGINEER before proceeding.

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

E. Perform Work by persons qualified to produce workmanship of specified quality.

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

G. During freezing or inclement weather, or other adverse conditions, no work shall be performed except that which can be performed in a manner that will ensure first-class construction throughout.

1.4 WORKMANSHIP

A. The intent of these Technical Specifications is to describe definitively and fully the character of materials and workmanship required with regard to all ordinary features, and to require first-class work and material in all particulars.

B. For any unexpected features arising during the progress of the Work and not fully covered herein, the specifications shall be interpreted by the CONSULTANT/ENGINEER to require first-class work and materials; and such interpretation shall be accepted by the CONTRACTOR.

C. All labor shall be performed in the best and most workmanlike manner by mechanics skilled in their respective trades. The standards of the Work required throughout shall be of such grade as will bring only first-class results.

D. Materials and methods used in the assemblage of the equipment shall comply with relevant standards, codes, or specifications related to the manufacture and operation of the specified equipment.

1.5 FIELD INSPECTION OF CONTRACTOR'S WORK

A. The CONSULTANT/ENGINEER will provide periodic inspection of the CONTRACTOR'S Work which will ensure that the Work is being performed in accordance with the Remedial Design Drawings and these Technical Specifications such that the end product will be in conformance with the Remedial Design Drawings and Technical Specifications.

B. The CONTRACTOR is responsible for complete conformance to the Remedial Design Drawings and Technical Specifications for all Work performed on the project, including all subcontractors.

C. The CONTRACTOR will provide ample opportunity for safe and easy access to the inspectors for proper inspection of the Work.

D. Inform the CONSULTANT/ENGINEER in advance of periods when the CONTRACTOR does not intend to work due to, but not limited to, inability to obtain materials or equipment or expected inclement weather.

E. Upon completion of the Work, the CONTRACTOR shall notify the CONSULTANT/ENGINEER for the final inspection of the system. The CONTRACTOR, or his representative, must accompany the CONSULTANT/ENGINEER on the final inspection. The CONTRACTOR shall have tradesmen available or on call to make changes or corrections to the system after or during the inspection, as determined by the CONSULTANT/ENGINEER.

PART 2 - PRODUCTS

2.1 BACKFILL AND PIPE BEDDING MATERIALS

A. Any fill from an off-site location shall be a certified clean fill material acceptable to the OWNER, CONSULTANT/ENGINEER, and the New York State Department of Environmental Conservation. The CONTRACTOR shall submit the results of chemical analyses of all fill material from off-site to confirm that it is free of contamination, and will provide the CONSULTANT/ENGINEER and OWNER with documentation of the material origin.

PART 3 - EXECUTION

3.1 EXAMINATION

B. Verify that existing SITE conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

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

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

3.2 FIELD QUALITY CONTROL

A. Allow representatives of the testing laboratory access to the Work at all times.

C. Provide all equipment, labor, materials and facilities required by the laboratory to properly perform its functions.

D. Cooperate with and assist laboratory personnel during the performance of their work.

E. Test specimens and samples shall be taken by the person(s) designated in other Sections, or as directed by the CONSULTANT/ENGINEER. Conduct field sampling and testing in the presence of the CONSULTANT/ENGINEER.

3.3 PREPARATION

A. Clean substrate surfaces prior to applying next material or substrate.

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

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

END OF SECTION

SECTION 01450
PIPE TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing of piping.

B. Pipe leakage testing shall comply with the limitations established in the attached Schedule.

1.2 RELATED SECTIONS

A. Section 01400 – Quality Control

1.3 DEFINITIONS

A. Leakage– The quantity of water to be supplied into the newly laid pipe, any valved section thereof, or other appurtenance, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

1.4 QUALITY ASSURANCE

The CONTRACTOR shall:

A. Prior to Substantial Completion, pressure pipes shall meet specific leakage requirements. These leakage requirements shall be satisfied by the basic materials alone. Where joint filters and the like have been specified, primarily to protect jointing materials, and secondarily to provide a factor of safety, they shall not be applied until after leakage tests have been completed and have been accepted by CONSULTANT/ENGINEER.

B. Tests will be witnessed by the CONSULTANT/ENGINEER. Tests not witnessed will be considered as not having been performed.

C. Work shall not be closed or covered up until it has been observed for proper and satisfactory construction and installation in compliance with the Contract Documents. Should incomplete or unacceptable work be covered, the CONTRACTOR shall, at his/her own expense, uncover all work so that it may be properly observed. After such observations, repair and replace the work that was found defective, unsatisfactory, and not in accord with the Contract Documents. After such repair and replacement, bring all work to completeness and status as it was before it was closed and covered, all at the CONTRACTOR'S own expense. The CONTRACTOR shall submit for review and approval means and methods for correcting failed systems.

D. Successful completion of required tests shall be in no way interpreted as relieving the CONTRACTOR of responsibility for defects that become apparent subsequent to the time of testing. It shall be the sole right of the CONSULTANT/ENGINEER to determine whether defects exist. Retest all portions of the Work deemed necessary by the CONSULTANT/ENGINEER prior to Substantial Completion.

1. 5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Complete details and specifications on testing apparatus.

C. At CONSULTANT/ENGINEER'S discretion, additional sections of pipelines may be required to be tested as soon as pipe is laid and prior to backfilling when working conditions or the standard of workmanship have been altered.

PART 2 - PRODUCTS

2.1 TESTING APPARATUS

A. Provide labor, plugs, measuring equipment, and other apparatus, complete, to perform testing.

B. Provide clean water, air, nitrogen, and other materials as required to accomplish testing.

C. Provide plugs and caps capable of withstanding test pressures.

D. Provide temporary flanges, plugs, bulkheads, thrust blocks, weighing, bracing and other items necessary to prevent joints from separating, and to prevent injuries or damage.

PART 3 - EXECUTION

3.1 PREPARATION

A. Plug open ends, adequately block bends, tees, ends, and other fittings, and do whatever is necessary to brace piping system so that it will safely withstand the pressures developed under the tests and so that no damage or injury occur to the pipeline, people or property.

B. Before tests are conducted, isolate, or remove any regulator, gauge, trap, or other apparatus or equipment which may be damaged by test pressures.

3.2 GENERAL

A. Trapped Air: Trapped air may cause a false indication of the rate of leakage. Points of concern include ends of lines, stubs, house connections and high points in pipelines. No credit will be made for this condition and no adjustment will be made to the allowable

leakage. When trapped air is suspected of causing a test failure, do whatever is necessary to evacuate the air and repeat tests until the actual leakage is equal to or less than allowable rate of leakage. All air shall be removed from the test section of the pipe prior to beginning leak testing.

B. Water Absorption: No credit will be given for absorption of water in pipe. If necessary, fill pipes and manholes with water well in advance of testing and allow them to soak in order to eliminate or minimize the effects of absorption.

3.3 TESTS FOR PRESSURE PIPES

A. General

1. Leakage shall include the main exiting pipe, service connections, and other appurtenances on the section of pipeline being tested.

2. Test pipes prior to applying insulation and before they are concealed or furred-in.

3. Provide all necessary gauges. Gauges shall be standard pressure type with a minimum 6 inch diameter dial and a pressure range not in excess of 50% of the maximum required test pressure.

4. Provide and maintain at the SITE a gauge stand with an approved laboratory calibrated test gauge. Periodically check test gauge used for testing against the test gauge, and whenever requested by CONSULTANT/ENGINEER.

5. Where it is necessary for testing, tap pipes and insert approved plugs after testing is completed.

6. Provide a hand or motor driven compressor to maintain the required test pressure constant throughout the duration of the test. If a water pump is used, pump water from a container with a known volume of water. If an air or inert gas pump is used, leakage shall be determined and calculated by the cycling of the pump.

7. Provide test gauges at each end of the line being tested.

8. Conduct leakage test in accordance with the requirements contained in paragraph 3.06 herein.

B. Hydrostatic Testing

1. All sections of newly installed multiphase/liquid phase pipe shall be subject to hydrostatic pressure and leakage tests at 75 psi. The CONTRACTOR shall follow the pipe MANUFACTURER's recommendations for pressure testing procedures.

2. The hydrostatic test will consist of an initial pressure of 75 psi which will be allowed to stand without make-up pressure for at least two (2) hours to allow for pipe expansion or stretching to stabilize.

3. Following this equilibrium period, the hydrostatic pressure test will be conducted for at least 30 minutes.

C. Pneumatic Testing

1. All sections of newly installed soil gas piping shall be subjected to pneumatic testing and leakage tests at 15 psi. The CONTRACTOR shall follow the pipe MANUFACTURER's recommendations for pressure testing procedures.

2. The pneumatic test will consist of a preliminary check of pressure at 25 psi. The pressure will be increased gradually in steps of approximately 15 minutes to all the piping to equalize strains during testing, and to check for leaks.

3. The pneumatic test will be at least 1 hour in duration.

4.

3.4 ALLOWABLE LEAKAGE

A. The maximum allowable leakage for the various piping systems is presented in the schedule.

B. It is the intent of this contract to secure piping systems without leakage. Each section of pipe shall not exceed the allowable leakage. It is also the intent to secure a piping system free from visible drips, streams and leaks. Therefore, even if a portion of the system meets the requirements for allowable leakage, visible leaks are not permitted and shall be repaired.

C. Leakage tests will be considered satisfactorily passed when the rate of leakage is equal to or less than the stipulated allowances, there is no evidence of visible leaks, and there is no evidence of other system defects.

3.5 RETESTING

A. Pipes not passing the tests shall have all defects corrected with methods approved by the CONSULTANT/ENGINEER to the inspection and satisfaction of CONSULTANT/ENGINEER, and shall be retested and recorrected as often as is necessary until the test requirements have been met.

B. It is the intent of this Contract to obtain work meeting test requirements on their own and solely through the use of the normal integral sealing components. Joint leaks shall not be stopped using concrete, caulking, mortar, or other patching materials. Leaking pipe joints shall be rejointed or replaced if necessary.

END OF SECTION

SECTION 01650
STARTING OF SYSTEMS

PART 1- GENERAL

1.1 SECTION INCLUDES

A. Scope.

B. Division of Responsibilities.

C. Process Testing.

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work.

B. Section 01012 - Special Conditions.

C. Section 01039 - Coordination and Meetings.

D. Section 01300 - Submittals.

E. Section 01400 - Quality Assurance.

1.3 SCOPE

A. This section delineates the division of responsibilities between the CONSULTANT/ENGINEER and CONTRACTOR for activities which occur during the startup/shakedown and turnover period (10 working days) after substantial construction has been accomplished.

1.4 DIVISION OF RESPONSIBILITIES

A. Certain specific activities are to be completed before the final Turnover Notice will be issued to the CONTRACTOR to signify substantial Completion of a portion (or all) of the work. Following issue of a Turnover Notice, the CONTRACTOR shall continue to complete all unfinished work covered by a "Punch-List" resulting from known deficiencies.

B. There will undoubtedly be a certain amount of "make-good" work required after issuance of a Turnover Notice; for example, insulation, paint, or paving may require repair through no fault of the CONSULTANT/ENGINEER or OWNER. In such instances, the CONTRACTOR will be expected to make such repair promptly and to the satisfaction of the CONSULTANT/ENGINEER and OWNER.

C. CONTRACTOR shall be responsible for SUBCONTRACTOR and/or vendor representatives/ technicians being available on the site during the first run-in of equipment and is to arrange for the MANUFACTURER to check out equipment as required. The CONTRACTOR shall provide SUBCONTRACTOR and vendor services at no charge to the OWNER or CONSULTANT/ENGINEER for all SUBCONTRACTORS and vendors contracted through the CONTRACTOR.

1.5 PROCESS TESTING

A. The CONTRACTOR or MANUFACTURER's representative shall perform functional testing prior to start-up. MANUFACTURER's representative or the CONTRACTOR shall be available (on-site) during start-up, in accordance with the relevant section(s) of the Technical Specifications.

B. Instrumentation, controls, and complete system integration shall be tested by the CONTRACTOR prior to system start-up.

C. The ENGINEER/CONSULTANT shall collect samples for evaluation and/or laboratory analyses to verify the performance of the process equipment.

1.6 EQUIPMENT ADJUSTMENT AND CALIBRATION

A. All mechanical equipment and electrical equipment, including related control systems, shall be subjected to preliminary operation and testing before the individual facilities and systems are put into operation. Tests shall be made to determine whether the equipment has been properly assembled, aligned, adjusted, wired, or connected.

B. The demonstration test of each piece of equipment shall include check-out from the control panel. All alarm systems and safety lockout systems shall also be demonstrated for proper function along with all process instrumentation and controls.

C. The CONTRACTOR shall coordinate and be present during all such tests.

1.7 SYSTEM STARTUP AND OPERATION

A. The CONTRACTOR shall place the various items of equipment into operation, along with the related piping and metering systems. After satisfactory startup of these individual systems, including all of the related equipment, they will remain in continuous or intermittent operation as required. System start-up shall be conducted for a period of one (1) week (5 working days) following installation of all process equipment, piping, and electrical devices as defined in Section 1010 – Summary of Work.

B. All equipment and accessories shall be adjusted and calibrated prior to any startup as specified under these Special Conditions. Any equipment placed into temporary operation prior to final completion of the total project shall be readjusted and/or calibrated.

C. The CONTRACTOR shall supervise, control, and be responsible for the operation and maintenance of the new equipment and/or system after each individual item is placed into operation. An adequate number of competent start-up personnel shall be furnished until the equipment is functional and working properly. The CONTRACTOR shall remain responsible for making any required changes, repairs, or replacements to the new installation during the startup period.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures

B. Clean-up.

C. Substantial Completion.

D. Final Inspection.

E. Project Record Documents.

F. Contractor's Closeout Submittals.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals.

1.3 PROCEDURES

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.4 CLEAN-UP

A. Remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials to the satisfaction of the CONSULTANT/ENGINEER.

B. Dispose all wastes, debris, and rubbish in accordance with applicable federal, state, and local regulations.

C. Clean all sight-exposed surfaces. Leave work clean and ready for possession by the OWNER.

1.5 SUBSTANTIAL COMPLETION

A. When the CONTRACTOR considers that the work is substantially complete, he/she shall submit to the CONSULTANT/ENGINEER the following:

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the CONSULTANT/ENGINEER will make an inspection to determine the status of completion.

C. Should the CONSULTANT/ENGINEER determine that the work is not substantially complete, the following shall occur:

1. The CONSULTANT/ENGINEER will promptly notify the CONTRACTOR, in writing, giving the reasons thereof.

2. The CONTRACTOR shall remedy the deficiencies in the work and send a second written notice of substantial completion to the CONSULTANT/ENGINEER.

3. The CONSULTANT/ENGINEER will re-inspect the work.

D. When the CONSULTANT/ENGINEER finds that the work is substantially completed, the CONSULTANT/ENGINEER will:

1. Prepare and deliver to the OWNER a tentative Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any comments made by the OWNER as provided in Conditions of the Contract, the CONSULTANT/ENGINEER will execute and deliver to the CONTRACTOR a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.6 FINAL INSPECTION

A. When the CONTRACTOR considers the work to be complete, the CONTRACTOR shall submit written certification that:

1. The contract documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been constructed in accordance with Contract Documents.
4. Equipment and systems have been tested and are operational.
5. Work is completed and ready for final inspection.
6. Certificate of Completion.

B. The CONSULTANT/ENGINEER will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should the CONSULTANT/ENGINEER consider that the work is incomplete or defective, the following shall apply:

1. The CONSULTANT/ENGINEER will promptly notify the CONTRACTOR in writing, listing the incomplete or defective work.

2. The CONTRACTOR shall take immediate steps to remedy the stated deficiencies and send a second written certification to the CONSULTANT/ENGINEER.

3. The CONSULTANT/ENGINEER will re-inspect the work.

D. When the CONSULTANT/ENGINEER finds that the work is acceptable under the contract documents, the CONSULTANT/ENGINEER shall request that the CONTRACTOR make closeout submittals.

1.7 PROJECT RECORD DOCUMENTS

A. The CONTRACTOR shall legibly mark on the Remedial Design Drawings actual construction showing horizontal and vertical location of underground utilities, field changes of dimension and detail, and changes made by change orders and details not included on the original Remedial Design Drawings.

B. The CONTRACTOR shall deliver record documents (as-builts), consisting of annotated Remedial Design Drawings as indicated to the CONSULTANT/ENGINEER at the completion of the project to be used in preparation of the as-built drawings.

1.8 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Evidence of payment and release of liens shall be done according to the requirements of the submittal procedures and Special Conditions.

END OF SECTION

SECTION 01740
WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.

2. General closeout requirements are included in Section "Project Closeout."

3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.

4. Certifications and other commitments and agreements for continuing services to CONSULTANT/OWNER are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: MANUFACTURE's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each prime CONTRACTOR is responsible for warranties related to its own Contract.

1.3 DEFINITIONS

Not used

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.

The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The CONTRACTOR is responsible for the cost of replacing or rebuilding defective Work regardless of whether the CONSULTANT/OWNER has benefited from use of the Work through a portion of its anticipated useful service life.

D. CONSULTANT/OWNER's Recourse: Written warranties made to the CONSULTANT/OWNER are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The CONSULTANT/OWNER reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

E. The CONSULTANT/OWNER reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 WARRANTY PERIOD

A. In accordance with Section 01300 (Submittals) and these Special Conditions, the CONTRACTOR shall obtain and submit in writing warranties and bonds, executed in duplicate by responsible SUPPLIERS, and MANUFACTURERS. Except for items put into use with the CONSULTANT/ENGINEER'S permission, the beginning of the time of warranty will be the Date of Substantial Completion.

B. The CONTRACTOR shall guarantee and furnish MANUFACTURER'S warranty against manufacturing and mechanical defects on all equipment provided for a period of one (1) years from date of initial operation.

C. In the event any material, part, or equipment proves defective during this period, the CONTRACTOR/MANUFACTURER shall, at his expense (including labor), furnish and replace the defective item.

1.6 SUBMITTALS

A. Submit written warranties to the CONSUILTANT prior to the date certified for Substantial Completion. If the CONSULTANT Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the CONSULTANT.

1. When a designated portion of the Work is completed and occupied or used by the CONSULTANT/OWNER, by separate agreement with the CONTRACTOR during

the construction period, submit properly executed warranties to the CONSULTANT within fifteen days of completion of that designated portion of the Work.

B. When a special warranty is required to be executed by the CONTRACTORS, and/or a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the CONSULTANT through the ENGINEER for approval prior to final execution.

1. Refer to individual Sections for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the CONTRACTOR, or by the subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the CONTRACTOR".

3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF WARRANTIES

A. Provide warranties and bonds as specified in individual sections of the Technical Specifications.

END OF SECTION

SECTION 02211
ROUGH/FINAL GRADING

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Summary of Work - Section 01010

B. Quality Control - Section 01400

D. Material and Equipment - Section 01600

E. Trenching and Backfilling - Section 02225

1.2 GRADING

A. Rough grading in conjunction with installation of underground piping shall be performed at all places that are indicated on the Remedial Design Drawings, to within a vertical tolerance of 0.2 foot of final lines, grades, and slopes as compared to the pre-excavation activities.

B. Final grades shall be carried to the lines, grades, and slopes shown on the Drawings, within a tolerance of 0.1 foot.

C. All material encountered, of whatever nature, within the limits indicated, shall be used as backfill or removed and disposed as directed by the CONSULTANT/ENGINEER. During the process of grading, the subgrade shall be maintained in such condition that it will be well drained at all times. The graded area shall be protected from surface water run on.

D. The right is reserved by the CONSULTANT/ENGINEER to make minor adjustments or revisions in lines or grades, if found necessary as the work progresses in order to obtain satisfactory construction.

E. CONTRACTOR is responsible for protection of all above/below grade pipelines, utilities and adjacent existing structures.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PROTECTION

A. The CONTRACTOR shall adhere to the following:

1. All utilities that pass through the Work Area or structures in or adjacent to the Work area shall be maintained and protected by the CONTRACTOR.

2. The CONTRACTOR shall take steps to control dust wherever the CONTRACTOR performs work.

END OF SECTION

SECTION 02222
EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavation for pipe trenches.

1.2 RELATED SECTIONS

A. Section 02223 - Backfilling

1.3 REFERENCES

A. 29 CFR - Part 1926 - Subpart P - Safety and Health Regulations for Construction - Excavations, Trenching and Shoring.

1.4 SUBMITTALS

A. Submit under provisions of Section 01010, General Requirements.

B. Submit a construction drainage plan showing the collection and disposal of surface and subsurface water that may be encountered in the course of construction.

C. Before beginning any excavation five (5) feet or more in depth, the CONTRACTOR shall submit a shoring plan (if necessary) in accordance with the requirements in Section 01010, General Requirements.

1.5 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the work are as indicated.

PART 2: PRODUCTS

2.1 SURFACE WATER CONTROL MATERIALS

A. Silt Fence: The CONTRACTOR shall supply silt fence in sufficient quantities to control surface-water runoff and sediment. Acceptable silt fence material shall be as follows:

1. Propex-Silt Stop
2. Mirafi 100X
3. Beltech 755, or
4. An approved equal.

The CONTRACTOR shall submit MANUFACTURERS product data to the CONSULTANT/ENGINEER for approval a minimum of one week prior to installation. Silt fence shall be replaced at a frequency consistent with the MANUFACTURERS directions, or as directed by the CONSULTANT/ENGINEER.

B. Straw Bales: The CONTRACTOR shall supply straw bales in sufficient quantities to be used for sedimentation control as needed. Straw bales shall be replaced at a minimum of every two months, or as directed by the CONSULTANT/ENGINEER.

PART 3: EXECUTION

3.1 PREPARATION

A. Underpin adjacent structures and roads which may be damaged by excavation work, including utilities and pipe chases.

B. Identify required lines, levels, contours, and datum.

C. Identify known underground, above ground, and aerial utilities. Stake and flag locations.

D. Coordinate utility relocation or removal with the ENGINEER.

E. Protect above and below grade utilities which are to remain. Support exposed utilities as needed.

F. Protect plant life, lawns, and other features remaining as a portion of final landscaping.

G. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.2 EXCAVATION

A. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, utilities and site structures, construction operations. The maximum slope inclinations shall comply with OSHA.

B. Excavate to working elevation[s] for sheet pile work.

C. Excavation cut not to interfere with normal 45 degree bearing splay of foundations.

D. Notify the ENGINEER/CONSULTANT promptly in writing of unexpected subsurface conditions before such conditions are disturbed and discontinue affected work in area until notified to resume work.

E. Correct unauthorized excavation at no extra cost to the CONSULTANT.

F. If direct load out of soils is not used then stockpile excavated material in area designated on site. Cover stockpiled material to protect from rain. Take preventive measures to ensure that water containing soil from excavations or stockpiles does not enter surface waters and/or storm drains.

G. Stockpiled excavated material will consist of a base liner (i.e., polyethylene sheeting) over the ground or pavement surface, providing a protective barrier between the excavated soil

and underlying surface. A double layer of 6-mil polyethylene sheeting will be placed on the ground with a perimeter berm and sloped to a sump to contain and remove water.

3.3 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400, Quality Control.

3.4 PROTECTION

A. Protect excavations as required to ensure life safety and protect property. Comply with all applicable laws and standards.

END OF SECTION

SECTION 02225
TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Trench and backfill for piping.

B. Backfill for utilities.

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work.

B. Section 01012 - Special Conditions.

C. Section 01400 - Quality Control.

D. Section 02211 - Rough/Final Grading.

F. Section 15000 - Process Piping and Accessories

1.3 BACKFILLING

A. The CONTRACTOR shall be responsible for procuring suitable backfill materials for the performance of the Work.

B. All backfill shall be free from frozen particles, clay lumps, trash, roots, wood, metal, scrap material, other vegetable matter, and refuse. Backfill shall also contain no stones larger than four inches in greatest dimension.

C. Not more than seventy (70) percent by weight shall pass the No. 40 mesh sieve, and not more than ten (10) percent shall pass the No. 200 mesh sieve, as determined by washing through the sieves in accordance with ASTM Designation D-422.

D. Backfill shall be placed in layers not more than 12 inches in loose depth, and each layer shall be compacted as specified hereafter, at a moisture content suitable for obtaining the required density. Backfill around structures shall be placed to the extent practicable, as the work progresses. Backfilling of trenches shall progress as rapidly as the construction and testing of the work permits.

E. Excavations for pipe shall not be backfilled until pipe has been tested by the CONTRACTOR and approved by the CONSULTANT/ENGINEER.

F. After testing has been approved by the CONSULTANT/ENGINEER, fill around and over the pipe shall be compacted unless otherwise noted for the entire depth of the excavation. Backfilling to one foot above the top of the pipes shall proceed uniformly on each side of the pipe to prevent unbalanced loading.

G. Provide 6" minimum of compacted non-frost susceptible base beneath exterior slabs and rigid and flexible pavements.

H. If existing subbase is not well draining to a minimum depth of 3 feet, it shall be removed, replaced with non-frost susceptible material, and compacted as per Section 3.3.

I Any fill from an off-site location shall be a certified clean fill material acceptable to the OWNER, CONSULTANT/ENGINEER, and the New York State Department of Environmental Conservation. The CONTRACTOR shall submit the results of chemical analyses of all fill material from off-site to confirm that it is free of contamination, and will provide the CONSULTANT/ENGINEER and OWNER with documentation of the material origin.

1.4 UNDERGROUND UTILITIES

A. The CONTRACTOR shall locate existing underground utilities before earthwork begins, by hand-digging exploratory pits where earthwork will occur near the utilities, and also at locations where offsets in utility lines are likely to exist. Have representative of respective utility company, and the CONSULTANT/ENGINEER present during this exploratory work.

B. The CONTRACTOR shall comply with utility company rules and directives for excavation work.

C. The CONTRACTOR shall protect exposed utility lines and be responsible for repairing or replacing damage.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIAL

A. Suitable backfill material shall include borrow material which is capable of being compacted to the required density at the proper moisture content, containing a maximum of 30 percent by dry weight of particles passing a No. 200 sieve, and of such type and characteristics approved by the CONSULTANT/ENGINEER. No rock, broken concrete, demolition material, frozen material, top soil, nor any material designated as unsuitable in Paragraph B shall be used for fill material.

B. Unsuitable material shall include, but not be limited to, all grass, weeds, vegetation of any type, roots, trash, rocks, boulders, debris, demolition materials, or any layer, strata, formation, or deposit of soil determined by the CONSULTANT/ENGINEER to be unsuitable for support of footings, slabs, or any other intended purpose. No material will be classified as unsuitable solely on the basis of excessive moisture content.

C. Granular material shall be the same as defined for "Suitable Material" above, except that it shall contain a maximum of 12 percent by dry weight of particles passing the No. 200 sieve, and a maximum of 40 percent passing the No. 40 sieve.

D. Borrow material shall be the same as defined for "Suitable Material" above, except that it shall be obtained from approved sources off the site. As specified in Section 01400 (Quality

Control), the CONTRACTOR shall provide verification and documentation to the CONSULTANT/ENGINEER that proposed borrow material is certified clean fill.

2.2 PIPE BEDDING MATERIAL

A. Material furnished shall be suitable and conform to the following requirements:

1. Gradation - the material shall have the following gradation:

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	90-100
No. 4	0-10
No. 8	0-8

2. Soundness - the material shall be substantially free of shale or other soft, poor durability particles.
3. No trench spoils shall be used for pipe bedding.

PART 3 - EXECUTION

3.1 TRENCHING

A. Sheeting and Shoring - Provide sheeting and shoring, as required, to prevent collapse of excavations and where required by local codes and regulations. Use timbers, cribbing, planking, or sheet piling, as required. All sheeting and shoring shall be approved by the CONSULTANT/ENGINEER prior to being used in the Work.

B. Hand Excavation - Excavation within 3 feet of any existing utility line shall be done by hand and in accordance with the requirements of the utility company involved. Coordinate with the utility company and make necessary arrangements to avoid damage. Be responsible for damage during excavation to existing pipe, conduit or equipment and repair any damage.

C. Trench Depth - Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

D. Trench Length - No trench shall be opened more than 100 linear feet in advance of pipe installation without express permission of the CONSULTANT/ENGINEER.

E. Drainage and Dewatering - Keep pipe trenches free from water from any source during excavation, installation and backfilling. Construct berm or grade to prevent surface run-off into excavation.

1. The contractor shall dewater the trench excavation as necessary if groundwater is encountered during the trenching.

2. The contractor shall be responsible for off-site disposal or on-site treatment and discharge of the water as directed by the CONSULTANT/ ENGINEER.

Groundwater encountered while trenching shall be pumped to an appropriate sized frac tank for temporary storage for on-site treatment.

F. Protection - Protect excavation bottom from freezing when temperature is less than 32^0 F.

3.2 PIPE BEDDING

A. Place a uniform blanket of loose bedding Material under the piping.

B. Where soil at the bottom of trench is unsuitable, remove Material and stabilize the trench bottom with bedding material. Provide depth of stabilization as required to construct a firm subgrade for the bedding Material.

3.3 PLACING BACKFILL

The CONTRACTOR shall:

A. Backfill lifts - Unless otherwise specified, all fill shall be placed in approximately horizontal lifts not exceeding 12 inches in loose thickness. So far as practical, each layer of materials shall extend the entire length and width of the area being filled.

1. Do not place material on surfaces that are muddy, frozen, or which contain frost. No frozen fill shall be placed.

B. Moisture Content - The moisture content of the backfill shall be reduced by aeration or increased by uniform sprinkling of water as necessary, to achieve optimum moisture content to facilitate compaction. The moisture content of the fill shall be within ± 2 percentage points of optimum. Backfill shall not be placed in water.

C. Surface Drainage - The backfill surface shall be sloped to facilitate the removal of run-off from the site and to prevent ponding of surface water. During periods of anticipated inclement weather, the surface of the backfill shall be graded and sealed as directed by the OWNER or CONSULTANT/ENGINEER to preclude percolation of surface water.

D. Place the backfill or bedding material in 12-inch lifts that conform to the dimensions as shown on the Construction Drawings.

E. Compact the backfill using suitable compaction equipment such as rammers or plate compactors.

F. The compaction technique to be employed shall be to the satisfaction of the CONSULTANT/ENGINEER to obtain a non-yielding surface after completion of compaction.

G. Remove and properly dispose of all surplus backfill materials.

H. Do not place backfill during freezing or excessively wet field conditions.

I. Grade backfill to existing elevations or as shown on the Construction Drawings.

3.4 COMPACTION

A. Equipment - Steel wheel vibratory rollers shall be used for compaction of predominantly granular soils. The use of sheepsfoot or tamping rollers shall be limited to the compaction of fine grained, plastic soils.

B. Compact each layer of material to a minimum of at least 85 percent of maximum dry density determined in accordance with ASTM D1557 (Modified Proctor) unless otherwise specified.

C. Make sufficient passes in order to obtain the specified densities.

D. As compaction of fill in each Work area has been completed, leave the area undisturbed for a reasonable period of time for testing in accordance with Section 01400 (Quality Control). Do not place fill over a layer which has not been tested by the CONTRACTOR and accepted by the CONSULTANT/ENGINEER.

F. Maintain moisture content of the exposed lift; desiccation cracking shall result in removal and reinstallation of affected area by the CONTRACTOR at his own expense.

G. All tests, including sieve analysis, will be performed by the CONTRACTOR.

H. The moisture content of the specified densities shall be within 3 percent more or less than the optimum. When the required density cannot be obtained with the material in place, it shall be blended with appropriate binder soil and compacted.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Formwork.

B. Cast-in-place concrete foundation, slabs, pipe supports and trench.

C. Concrete curing and finishing.

1.2 RELATED WORK

A. Section 01400 - Quality Control.

1.3 REFERENCES

A. ACI-318 - Building Code Requirements of Reinforced Concrete

B. ACI-MCP-1-74 - Manual of Concrete Practice

C. ASTM C 33 - Concrete Aggregates

D. ASTM C 94 - Ready-Mixed Concrete

E. ASTM C 150 - Portland Cement

F. RP 4-6-1 - Reinforced Concrete Foundation

1.4 QUALITY ASSURANCE

A. Perform testing and placement of concrete in accordance with Section 01400 and ACI 301.

B. Obtain materials from same source throughout the Work.

C. Defective Work: Any concrete found to be defective from any cause whatever, at any time before the final acceptance of the Work, shall be either repaired or removed and replaced at the expense of the CONTRACTOR.

D. Codes and Standards:

1. ACI 301, "Specifications for Structural Concrete for Buildings."

2. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."

3. ACI 308, "Standard Practice for Curing Concrete."

4. ACI 318, "Building Code Requirements for Reinforced Concrete."

5. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."

1.5 TESTS

A. Compression Tests: During the progress of the work, compression tests shall be made in accordance with the "Standard Method of Making and Curing Concrete Test Specimens in the Field" (A.S.T.M. Designation: C 31-84) and Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens (A.S.T.M. Serial Designation: C 39-83b).

1. The CONTRACTOR shall arrange for laboratory testing of the compression cylinders by the construction quality assurance (CQA) laboratory.

2. Strength tests shall be performed not less than once a day, one per pour, and once for each truck load of concrete.

3. The concrete used shall have a minimum ultimate strength of 4,000 psi at 28 days.

B. Slump Tests:

1. Slump tests shall be performed by the CONTRACTOR. The slump for all concrete shall be within plus or minus one inch of that determined for the design mix (2.02 E) and in no case shall the slump be more than four inches.

2. Obtain samples for one slump test for each pour in accordance with ASTM C-172.

3. Not less than four (4) specimens shall be made for each test. Concrete used in making slump tests shall not be used to make test cylinders. No water shall be added to the batch after the test cylinders are taken.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150 - Type I - All cement shall be dry, free from lumps, and its color shall be a uniform bluish-gray.

B. Ready-Mix Concrete: ASTM C94/C 94M.

C. Fine Aggregates: ASTM C 33 - The fine aggregate shall be clean, high-silica sand, having not more than three (3) percent by weight of foreign matter such as loam, clay, dirt, or other impurities and shall be free from injurious amounts of organic impurities. Fine aggregates shall be well graded from coarse to fine.

D. Coarse Aggregates: ASTM C33 - Coarse aggregate, unless otherwise specified, shall be well graded.

E. Admixtures: ASTM C260 - Admixtures to the concrete may be used to provide a benefit in water reduction, increased density, improved workability, control of shrinkage, or control of rate of setting, but only with the permission of the CONSULTANT/ENGINEER.

1. The admixture selected shall produce an air content in the freshly mixed concrete of 6% plus or minus 1% as determined in accordance with "Standard Test Method for Air Content of Freshly Mixed Concrete By the Pressure Method", A.S.T.M. Designation C 231-82; or "Standard Test Method for Air Content of Freshly Mixed Concrete By the Volumetric Method", A.S.T.M. Designation: C 173-78.

2. Acceptable evidence must be presented to the CONSULTANT/ENGINEER that such proposed admixtures, in addition to imparting the desired quality, shall cause no detrimental effect in any of the other desirable properties of the concrete.

3. The admixture, if used, shall be added by means of an approved dispenser, to accurately control the amount used in each batch of concrete.

F. Water: The water used in mixing concrete shall be clean and accurately measured for each batch. In general, all water for mixing and curing purposes shall be obtained from a local municipality water supply. Water contaminated with sewage or oil, or water containing dirt, clay, filth or vegetable matter, or river or lake water, shall not be used.

2.2 FORMWORK

A. The forms for exposed surfaces shall be of metal or plywood, adequately supported, or shall be lined with plywood, masonite board or similar lining, and/or with metal. The design of the forms shall be satisfactory to the CONSULTANT/ENGINEER, but need not be submitted for approval unless specifically requested.

B. Metal wall ties shall be of a type that will permit removal to a distance approximately 1½ inches from the face of the wall, free from spilling and allowing for patching immediately after removal of forms.

C. Twisted wire ties will not be permitted: Concrete blocks or other approved means must be used to maintain proper distance between steel and forms.

2.3 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Steel Wire: ASTM A82, plain, cold-drawn steel.

C. Fibermesh: ASTM 1116/C, 1116M

2.4 ACCESSORIES

A. Moisture Barrier: Provide moisture barrier over prepared sub-base material in the concrete slab area. Use only materials which are resistant to decay when tested in accordance with ASTM E154 as follows: polyethylene sheet not less than 6 mils thick.

PART 3 - EXECUTION

3.1 PREPARATION

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, and level in finished structures. Provide for openings, offsets, keyways, anchorages, and inserts, and other features required in Work. se selected materials to obtain required finishes.

D. Provide and install pipe penetrations as shown on the Remedial Design Drawings or as directed by the CONSULTANT/ENGINEER.

E. All forms shall be thoroughly cleaned and wetted just before placing the concrete, and if necessary to secure a smooth surface, they shall be coated with an approved nonstaining substance. Suitable moldings or bevel strips shall be placed in the forms to prevent inside or outside sharp edges. No sharp edges will be permitted in the finished Work. All exposed corners and edges of concrete shall have 3/4-inch chamfer unless otherwise shown on the Remedial Design Drawings.

F. Verify anchors, pre-cast sections, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.2 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement as shown on Remedial Design Drawings and as herein specified.

3.3 PLACING CONCRETE

A. Notify CONSULTANT/ENGINEER a minimum of 24 hours prior to commencement of concreting operations. Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

B. Delivery: Weigh-tickets shall be prepared for each truck showing the normal batch size; the actual weights of cement, aggregate and water; and the time of loading at the plant.

1. A blank shall also be provided on the weigh ticket for the time of arrival at the site, to be filled in and initialed by the CONTRACTOR's Superintendent or Foreman.

2. A copy of the weigh-ticket shall be delivered to the CONSULTANT/ENGINEER for each batch of concrete delivered to the site.

C. Rejection of Concrete: Ready-mixed concrete (central-mixed and transit-mixed) will be rejected if there is evidence of any of the following:

1. Improper proportions of ingredients, inclusive of water;

2. Initial set;

3. More than sixty (60) minutes transpires after batching or mixing before concrete is placed;

4. Mixers or trucks are overloaded; and/or

5. Successive batches are not uniform.

D. Except as provided herein, water shall not be added to the concrete mixtures at the SITE unless approved by the CONSULTANT/ENGINEER for each instance.

E. Consolidation: Concrete shall be consolidated by means of mechanical vibration equipment.

1. Vibrators shall be of the immersion type, and shall maintain a speed of not less than 7,000 impulses per minute when in operation submerged in concrete.

2. They shall be used only by personnel experienced in their use, and shall be inserted and removed vertically (not dragged horizontally) at such regular intervals to insure uniform consolidation throughout the entire section of concrete being placed.

3. In no case shall vibrators be used to transport concrete inside the forms.

4. The number of vibrators used shall be sufficient to consolidate the concrete properly.

5. At least one standby vibrator shall be on hand at all times.

F. Sloped Surfaces: In special cases, as where concrete is deposited on slopes, a comparatively dry mixture may be used, but care shall be exercised to spread such concrete

evenly, in layers not more than four (4) inches in thickness, and to ram it thoroughly. In general, the methods shall be such as to give a compact, dense and impervious concrete with a smooth surface.

G. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

H. In no case shall the concrete have a free fall sufficient to cause segregation of the aggregate. In general, the limit of free fall shall be six (6) feet.

3.4 CONCRETE COVER/SPACING

A. The minimum concrete cover for the protection of embedded steel reinforcement, unless specified otherwise in the Construction Drawings, shall be as follows:

Surfaces cast against crushed rock, sand, or earth:

All bar sizes	3 inches

Surfaces exposed directly to water, backfill, or weather after form removal:

All bar sizes	2 inches

3.5 FINISHING

A. In general, forms shall not be removed until the concrete has attained sufficient strength to assure structural stability under all dead and construction loads, and until removal can be accomplished without marring concrete surfaces.

B. All form ties shall be carefully snapped back, to a depth of at least one and one-half (1-1/2) inches below the concrete surface. The tie holes shall be patched with the driest 1:2 cement-sand mortar that can be made to stay in place.

C. All horizontal surfaces shall receive the following initial floating operation:

1. The concrete surface shall be accurately struck off and leveled with a long straight edge to the required elevation; suitable guides shall be used, as necessary, to carry the proper grade, pitch or slope; and

2. The surface shall be bull-floated to an even surface, with no unevenness exceeding 1/8-inch in 10 feet in any direction.

D. The bottom slabs of all tanks, channels, conduits, sumps, pits and similar surfaces shall be given a non-slip, heavy-patterned finish with a wood float. All other floor slabs, decks or horizontal surfaces, unless otherwise indicated in the room finish schedule or elsewhere in these specifications, shall be given a smooth finish with an steel float.

E. Float Finish: After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when

concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 5/16 inch under a 10-foot straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces as shown on Remedial Design Drawings. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

F. Unless otherwise directed, all edges and corners which will be exposed in the finished Work shall be beveled or rounded by the use of appropriate forms or form inserts, and care shall be taken to prevent chipping or cracking of finished edges.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under provisions of Section 01400 (Quality Control).

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.7 CONCRETE CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Concrete shall be maintained above fifty (50) degrees Fahrenheit and in a continuously moist condition for at least the first seventy-two (72) hours after placement. Curing compounds shall not be used. Concrete curing shall be in accordance with ACI 308, "Standard Practice for Curing Concrete."

3.8 WEATHER CONDITIONS

A. When the temperature is below forty (40) degrees Fahrenheit, or predicted to go below thirty-six (36) degrees in the next twenty-four (24) hours, or predicted to go below thirty-two (32) degrees in the next seventy-two (72) hours, no concrete shall be poured without express permission of the CONSULTANT/ENGINEER. All concrete placed during cold weather shall conform to AC1 306R.

1. Permission so granted shall be for the day and location only, and must again be requested on subsequent days when temperatures are as above.

2. When such permission is granted, no concrete shall be poured until adequate covering material is on site, and until a sufficient number of workmen are present to expedite finishing and covering to keep both as close behind the pouring as is practicable.

B. All concrete materials, and all reinforcement, forms, inserts and ground with which the concrete is to come in contact, shall be free from frost.

C. All concrete placed shall have a temperature of between fifty (50) and ninety (90) degrees Fahrenheit.

D. The housing, covering or other protection used in connection with the curing shall remain in place and intact at least twenty-four (24) hours after artificial heating is discontinued.

E. When concrete is mixed during extremely warm weather, the CONSULTANT/ENGINEER may require the CONTRACTOR to pre-cool aggregates with water sprays and to schedule the placing of successive layers of concrete so as to cause maximum release and dissipation of the heat of setting. All concrete placed during hot weather shall conform to AC1 305R.

3.9 INSERTS AND OPENINGS

A. The CONTRACTOR shall build into the concrete the steel reinforcement, sleeves, anchor bolts, sump, and other inserts as shown on the Remedial Design Drawings or as directed. Great care shall be taken to keep inserts and openings at proper lines and grade, and to thoroughly tamp under and around them so that there will not be a passage for water. Where inserts are placed in the floors for openings, the top of such shall be four (4) inches above the elevation of the finished floor, unless otherwise specified. Also, pipe sleeves shall be sealed with a watertight seal following installation.

3.10 EQUIPMENT BASES

A. Where the Remedial Design Drawings or these specifications call for concrete foundations to support equipment, such bases shall be formed as shown on the Remedial Design Drawings.

1. Anchor bolts, where required, shall be positioned by template (furnished under the equipment item) to proper elevation and secured in place. Upper edges shall be chamfered on all sides.

B. After the equipment has been set in position and shimmed to elevation, the space between the concrete foundation and the equipment metal base shall be completely filled with a non-shrink, non-metallic grout, Masterflow 713 Grout by Master Builders, Supreme Grout by Gifford-Hill and Company, Inc., or approved equal.

1. Exterior edges of the fill shall be projected slightly beyond the equipment metal base and chamfered.

END OF SECTION

SECTION 15000
PROCESS PIPING AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Related Sections.

B. Work Description.

C. References.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals.

B. Section 01400 - Quality Control.

C. Section 01450 – PipeTesting.

1.3 WORK DESCRIPTION

A. The CONTRACTOR is responsible for the installation of all process piping and accessories including, but not limited to, the following items as shown on the Remedial Design Drawings: high density polyethylene pipe and fittings, Sch. 40 carbon steel pipe and fittings; Sch. 80 PVC pipe and fittings; valves; pipe sleeves; pipe supports and pipe hangers; fasteners and mounting hardware; and flow meters, pressure indicators, and sample taps.

B. Testing of piping.

1.4 REFERENCES

A. ASTM D1784 - Standard Specification for Rigid Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) Compounds.

B. ASTM D2466 - Standard Specification for Polyvinyl Chloride (PVC) Socket Type Fittings.

C. ASTM D3350 – Standard Specification for Polyethylene Plastic (PE) Pipe and Fittings Materials.

D. ASTM F714 – Standard Specification for Polyethylene Plastic (PE) Pipe (SDR-PR) Based on Outside Diameter.

E. ASTM F402 - Standard Practice for Safe Handling of Solvent Cement and Primer Used for Joining Thermoplastic Pipe and Fittings.

F. BOCA Union Plumbing Code.

G. ANSI B16.5 - Pipe Flanges and Flanged Fittings.

H. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

I. ASTM A105 - Carbon Steel Forgings and Fittings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Materials and equipment supplied for the Work shall conform to the requirements of these Technical Specifications and Remedial Design Drawings. Suggested SUPPLIERs are indicated in some cases, however the CONTRACTOR may offer substitute material and equipment that is equivalent in all respects to that indicated. The CONTRACTOR shall provide technical data that defines the offered substitute and supports the substitution as an equal to the equipment or materials specified. The ENGINEER will review the technical data submittals from the CONTRACTOR and accept or reject the substitution. If the offered substitution is rejected, the CONTRACTOR shall be responsible for compensating the CONSULTANT/ENGINEER's costs to review the offered substitute. All submittals and substitutions shall be handled in accordance with Section 01300 of these Technical Specifications.

2.2 PIPE SLEEVES

A. All pipes passing through walls and floors of the well vaults and treatment building shall be provided with sleeves. All pipe penetrations shall be made water tight as specified or indicated on the Remedial Design Drawings.

2.3 HANGERS, SUPPORTS AND ANCHORS FOR PIPING

A. All piping shall be supported by means of an approved combination of hangers, supports, and attachments, assuring that no weight is imposed upon the connected equipment.

B. All piping and supports shall utilize the building mounting/unistrut system.

PART 3 - EXECUTION

3.1 SCHEDULING OF WORK

A. The CONTRACTOR shall coordinate and schedule mechanical installation with the CONSULTANT/ENGINEER to accommodate the CONSULTANT/ENGINEER'S requirements.

3.2 PROTECTION OF WORK

A. The CONTRACTOR shall protect all piping from entry of dirt, pipe cuttings, lubricants, debris, stormwater and other foreign material. The CONTRACTOR shall remove any foreign materials and clean piping to the satisfaction of the CONSULTANT/ENGINEER.

3.3 PIPE PREPARATION

A. The CONTRACTOR shall:

1. Mark pipe sections with required identification prior to assembly.

2. Inspect for defective or damaged spool pieces prior to assembly.

3. Remove scale, dirt, pipe fittings, and lubricants inside and outside, prior to assembly.

4. Complete piping connections to equipment with flanges or unions.

3.4 PIPE INSTALLATION

A. The CONTRACTOR shall cut the pipe to exact measurement and install without forcing or springing.

B. The CONTRACTOR shall install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

C. The CONTRACTOR shall provide adequate clearance, install unions, and orient fittings and appurtenances for ease of installation of equipment and access to valves, fittings, and appurtenances.

D. The CONTRACTOR shall install all piping and equipment as indicated on the Remedial Design Drawings. In the event of an installation requirement that is unclear, the CONTRACTOR shall consult with the CONSULTANT/ENGINEER before proceeding with the work in question.

E. The CONTRACTOR shall install all couplings, elbows, tees, and valves as shown on the Remedial Design Drawings. However, the CONTRACTOR may install additional fittings, as necessary to complete the Work. The CONTRACTOR shall consult with CONSULTANT/ENGINEER prior to installation of additional fittings.

3.5 PIPE SLEEVE INSTALLATION

The CONTRACTOR shall:

A. Install pipe sleeves around pipes protruding through walls and roofs prior to installing the pipe, as shown on the Remedial Design Drawings.

B. Seal all pipe sleeve openings with non-shrink caulking.

C. Rigidly anchor pipe to stable structures where necessary. Provide pipe guides so that movement takes place along the axis of pipe only.

3.6 HANGERS, SUPPORT, AND ANCHORS INSTALLATION

A. Hangers must be absolutely vertical and are to be secured to supplementary steel, using clamps as attachments, wherever possible. Where necessary to obtain the required vertical alignment, furnish and install angle or channel irons of ample strength and length to bridge between walls and ceilings to receive hanger attachments or supports for piping, ductwork, and equipment. Structural equipment storage container members shall not be drilled, otherwise weakened or overloaded. Hangers shall not be attached to piping, and shall not pierce or be sustained from ductwork. Supplementary steel must be kept as high as possible.

B. Wire, rope, wood, perforated band iron, tape or other makeshift material shall not be used for hangers or attachments. Threaded hangers shall have lock nuts.

C. Interior piping shall be supported, guided and anchored to maintain the required alignment and pitch, without sagging or swaying, and to provide controlled expansion, using adjustable split clevis or trapeze type hangers. Spacing of hangers and sizes shall be in accordance with ANSI B31.1. All interior piping and hangars shall utilize the building mounting/unistrut system.

D. A set of piping drawings shall be marked with approximate hanger locations and a standard hanger sheet showing typical random support arrangements shall be furnished for field guidance.

E. The CONSULTANT/ENGINEER shall have the option to direct the CONTRACTOR to either support piping from above or below at any time at no additional cost to the CONSULTANT/ENGINEER or OWNER.

F. Fittings with support bases cast with the fitting shall be used to support pipe from floors or walls whenever possible or as directed by the CONSULTANT/ENGINEER. Piping shall be supported from the floor by means of pipe stanchion saddles and U-bolts. Maximum spacing of hangers shall comply with ASA B31.3. Arrangements and location of all anchors shall be submitted to the CONSULTANT/ENGINEER for approval before installation.

3.7 IDENTIFICATION MARKER INSTALLATION

The CONTRACTOR shall identify:

A. Flow Meters and Valves: Identify all valves and flow meters on the system with brass tags with the valve or flow meter designation permanently stamped on the tag (dog tag style). The CONTRACTOR shall prepare a valve schedule including alpha-numeric designations for each valve as designated on the Remedial Design Drawings, and submit the schedule to the CONSULTANT/ENGINEER for approval prior to purchasing and installing the tags. The valve schedule shall include the valve and flow meter designation, type, and location and shall be submitted in accordance with Section 01300 Submittals.

B. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, contents, and pressure. Install in clear view and align with axis of piping. Locate identification so as not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and branch tee and at each point of penetration of enclosures, and at other obstructions to the pipe run.

C. Insulated sections of piping and valves if any shall be identified on the pipe and on the exterior of the insulation jacketing.

3.8 MARKER TAPE

A. Marker tape installed over all direct burial process piping shall be six (6") inches in width, and shall be Terra Tape "D" detectable as manufactured by Griffolyn, Inc. or approved equal. The tape shall be an inert, bonded layer plastic material with a metallized foil core, so that process piping locations can be determined with a metal detector. The color of the tape shall be blue with the following imprints:

"CAUTION! BURIED PROCESS PIPING LINE BELOW!"

3.9 TESTING

A. Field inspection and testing shall be performed under provisions of Section 01450. Equipment which is not included in the test shall be disconnected from the piping or isolated by valves.

B. Leak tests shall be performed on all piping. If tests indicate work does not meet specified requirements, remove work, replace and re-test at CONTRACTOR'S expense.

C. The tests for piping shall be observed by the CONSULTANT/ENGINEER and written acceptance shall be given to the CONTRACTOR after successful completion of the test.

C. Any damaged or defective pipe, fittings, valves, or joints that are discovered following the pressure tests shall be repaired or replaced at no cost to the OWNER or CONSULTANT/ENGINEER. The test shall be observed by the CONSULTANT/ENGINEER and written acceptance shall be given to the CONTRACTOR after successful test completion.

END OF SECTION

SECTION 15060
PUMPS AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This specification applies to the installation of pumps and associated drivers. All components necessary for the safe and satisfactory operation of the specified equipment which are not specifically included shall be considered to be a part of this specification. The CONTRACTOR shall supply, deliver, and install all pumps and associated drivers as described in these Technical Specifications and Remedial Design Drawings.

B. Design Criteria

1.2 RELATED SECTIONS

A. Section 15000 - Piping and Accessories

B. Section 15099 – Valves and Appurtenances

1.3 SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings and Technical Specifications, for all proposed pumps in accordance with Section 01300 (Submittals).

1.4 DELIVERY, STORAGE, AND HANDLING

A. The CONTRACTOR shall store equipment and materials so as to ensure the preservation of their quality and fitness for the Work. When considered necessary, they shall be placed on wooden platforms, or other hard, clean surfaces and shall be placed under cover when directed. Stored materials shall be located, so as to facilitate prompt inspection. In the event any material, part, or equipment is damaged during this period, the CONTRACTOR shall notify the CONSULTANT/ENGINEER. The CONTRACTOR shall coordinate the re-delivery of another part/equipment and install it at no additional cost to the CONSULTANT/ENGINEER or the OWNER

1.5 TECHNICAL INSPECTION

A. All Work shall be subject to inspection by the CONSULTANT/ENGINEER, but such inspection shall not relieve the CONTRACTOR from obligation to perform said Work in accordance with these specifications and MANUFACTURER'S requirements, or any modifications thereof, as herein provided, shall be corrected and made good by the CONTRACTOR whenever so ordered by the CONSULTANT/ENGINEER, without reference to any previous oversight or error in inspection.

B. All directions given to the CONTRACTOR by the CONSULTANT/ENGINEER or MANUFACTURER'S representative, pertaining to the scope of work during routine inspection, shall be binding on the CONTRACTOR.

1.6 WARRANTY

A. The MANUFACTURER shall guarantee and furnish MANUFACTURER's warranty against manufacturing and mechanical defects on all equipment provided for a period of twelve (12) months from the date of initial operation.

In the event any material, part, or equipment proves defective during this period, the MANUFACTURER shall, at his expense (including labor), furnish, and replace the defective item.

B. The MANUFACTURER shall guarantee in writing the structural integrity of the system for a period of five (5) years.

C. The MANUFACTURER shall guarantee the performance of the equipment and its components for a period of two (2) years. The performance shall meet or exceed that described in Paragraph 2.03 (Design Criteria).

D. All warranties shall be provided in writing, signed by an officer of the Manufacturing Company.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of all pumps shall be completed per these Technical Specifications and Remedial Design Drawings, and in accordance with MANUFACTURER's instructions.

B. Installation shall include furnishing and applying an initial supply of grease and oil, of a type recommended by the pump and motor MANUFACTURER's, if applicable.

3.2 TESTING

A. Field Tests

1. The CONTRACTOR shall furnish all facilities, certified calibrated instruments, personnel, and the service needed for their preparation and execution.

2. The CONSULTANT/ENGINEER, at his own and exclusive option, may provide substitutes for some or all of the instruments supplied by the CONTRACTOR. Proper calibration of every measuring device shall be checked and agreed upon

between the CONTRACTOR and the CONSULTANT/ENGINEER before running any test.

3. A preliminary field test shall be made to determine the adequacy of the instruments and apparatus. When conditions do not permit such a preparatory run, operations may be started, and later when conditions are satisfactory, the test shall be made.

4. A careful inspection shall be made before, during and after the field tests to insure the proper operation of each pump. The following items shall be inspected:

   a. Alignment of pump.

   b. Direction of rotation and flow.

   c. Electrical connections.

   d. Gauge openings.

   e. Operation of lubricating system (if applicable).

   f. Liquid passages.

   The liquid passages of the pumps should be inspected before installation to guard against error during the test caused by obstructions clogging the passage. If obstructions are found in the pump, the test shall be re-run.

5. Complete records shall be kept of all information relevant to all field tests, with test report copies to be submitted to all interested parties.

3.3 START-UP

A. CONTRACTOR shall verify that structures, pipes and equipment are compatible.

B. Make adjustments required to place system in proper operating condition.

END OF SECTION

SECTION 15099
VALVES AND APPURTENANCES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This specification applies to the installation of valves and miscellaneous piping appurtenances. The CONTRACTOR shall supply, deliver, and install all valves and miscellaneous piping appurtenances as described in these Technical Specifications and Remedial Design Drawings.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01400 – Quality Control

1.3 QUALITY ASSURANCE/QUALITY CONTROL

A. Quality assurance/quality control measures shall conform to the requirements of the conditions of the contract, as follows:

1. The CONTRACTOR shall comply with applicable provisions and recommendations of the following standards except as otherwise shown on the Remedial Design Drawings or specified herein:

a. American Society for Testing and Materials (ASTM).

b. American National Standards Institute (ANSI).

2. Obtain all valves of the same type from a single manufacturer.

3. All valves of a given type shall be the product of one manufacturer which has had valves of like size and design in similar services for at least five (5) years.

1.4 SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings and Technical Specifications, for all proposed valves in accordance with Section 01300 (Submittals).

1.5 DELIVERY, STORAGE, AND HANDLING

A. The CONTRACTOR shall store materials so as to ensure the preservation of their quality and fitness for the Work.

B. Seal valve ends to prevent entry of foreign matter into valve body. Box and protect valves, operators, and accessories from accumulation of foreign matter.

C. Store valves, operators, and accessories in area protected from weather, moisture, or possible damage. Stored materials shall be located, so as to facilitate prompt inspection. Do not store material directly on the ground. When considered necessary, they shall be placed on wooden platforms, or other hard, clean surfaces and shall be placed under cover when directed.

D. In the event any material, part, or accessories is damaged during this period, the CONTRACTOR shall notify the CONSULTANT/ENGINEER. The CONTRACTOR shall coordinate the re-delivery of another part/equipment and install it at no additional cost to the CONSULTANT/ENGINEER or the OWNER.

1.6 TECHNICAL INSPECTION

A. All Work shall be subject to inspection by the CONSULTANT/ENGINEER, but such inspection shall not relieve the CONTRACTOR from obligation to perform said Work in accordance with these specifications and MANUFACTURER'S requirements, or any modifications thereof, as herein provided, shall be corrected and made good by the CONTRACTOR whenever so ordered by the CONSULTANT/ENGINEER, without reference to any previous oversight or error in inspection.

B. All directions given to the CONTRACTOR by the CONSULTANT/ENGINEER or MANUFACTURER'S representative, pertaining to the scope of work during routine inspection, shall be binding on the CONTRACTOR.

PART 2 - PRODUCTS

2.1 Valves for the process piping shall be manufactured by an approved SUPPLIER with pressure ratings conforming to those of the piping. The CONTRACTOR shall submit this selection of a MANUFACTURER and technical data to the ENGINEER for approval prior to installation.

1. All similar valves shall be purchased from one MANUFACTURER.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of all valves shall be completed per these Technical Specifications and Remedial Design Drawings, and in accordance with MANUFACTURER’s instructions.

B. Valve size shall be equal to line piping in which valve is installed, unless approved by CONSULTANT/ENGINEER.

C. Install valves with the operator in a position for convenient operation. Ensure that space is available for operation of lever- or handwheel-operated valves without interference from wall, piping, or equipment.

D. Prior to installation, protect stored valves and appurtenances from damage due to exposure to sunlight, heat, dirt, debris, freezing and thawing, vandalism, etc.

E. Clean all debris, dirt, gravel, etc. from inside of piping before placing valves in place.

F. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation. Inspect material for defects in workmanship and material. Clean out debris and foreign material from valve openings and seats, test operating mechanisms to check proper functioning, and check nut and bolt for tightness. Repair valves and other equipment which do not operate easily or are otherwise defective.

3.2 VALVE IDENTIFICATION

A. Identify valves of the plumbing systems and indicate their function and system served. Before tagging or labeling, submit to CONSULTANT/ENGINEER for approval a final list of valves.

3.3 ADJUSTMENTS

A. Check and adjust valves and accessories for smooth operation.

3.4 TESTING

A. Test valves with piping as specified in Section 01450.

END OF SECTION