At a high-high liquid level in Tank #4, as indicated by LT-0404-D0, Shut down Sludge Return Pump(s) PU-1101, PU-1102, and PU-1103.

At a low flow rate, as indicated by FSL/LAL-02, Shut down Multimedia Feed Pump #2 (PU-0702).

A low flow rate, as indicated by FSL/LAL-03, will shut down Multimedia Feed Pump #3 (PU-0703)...

A high-high (HH) turbidity at the combined Multimedia Filter outlet, as indicated by AE/AT-08D1-00, Coordinate signal(s) from SCA, including HH level in the destination basin/tank, to shut off the Effluent ReCyc de Pump(s) PU-1002, PU-1003, and PU-1004. Stop the addition of sulfuric acid by shutting down CF-1204 and CF-1205.

A high-high differential pressure across Multimedia Filter #4 (MMF-0804), as indicated by PDIT-08C4-DQ, will start the idled spare Multimedia Filter and corresponding Multimedia Feed Pump. Stop the addition of sodium hydroxide or sulfuric acid by shutting down CF-1204 and CF-1205...

A high-high differential pressure across Multimedia Filter #3 (MMF-08D3), as indicated by PDIT-08Q3-DO, will start the idled spare Multimedia Filter and corresponding Multimedia Feed Pump. Stop the addition of sodium hydroxide or sulfuric acid by shutting down CF-12D2 and CF-12D3...

A high-high differential pressure across Multimedia Filter #1 (MMF-08D1), as indicated by PDIT-CB01-D0, will start the idled spare Multimedia Filter and corresponding Multimedia Feed Pump. Stop the addition of sodium hydroxide or sulfuric acid by shutting down CF-12D1 and CF-12D3...

Typical of the other Clarifiers. Provide interlock numbers for each Clarifier.

At a low liquid level in Inclined Plate Clarifier #1, as indicated by LT-0101-00 or LSHH/LAAH-0101-00, will shut down Sludge Return Pump(s) PU-1101, PU-1102, and PU-1103.

At a low liquid level in Influent Monitoring Tank #4 (T-1104), as indicated by LT-1104-00, Stop the addition of influent by shutting down CF-1204 and CF-1205.

At a low liquid level in Influent Monitoring Tank #3 (T-1103), as indicated by LT-1103-00, Stop the addition of influent by shutting down CF-1204 and CF-1205.

At a low liquid level in the Backwash/Sludge Pumping Station (T-1101), as indicated by LT-1101-00 or LSHH/LAHI+1101-00, Profitable process may cease to resume operations of the influent Feed Pumps, and shut the influent valve FCV-01. Stop the addition of sodium hydroxide or sulfuric acid by shutting down CF-12D1 and CF-12D3.

At a high liquid level in the Backwash/Sludge Pumping Station (T-1101), as indicated by LT-1101-00 or LSHH/LAHI+1101-00, Profitable process may cease to resume operations of the influent Feed Pumps, and shut the influent valve FCV-01. Stop the addition of sodium hydroxide or sulfuric acid by shutting down CF-12D1 and CF-12D3.
NOTES:
1. ARMS OVER UNLOADING PANEL
2. SINGLE-DOOR CONCRETE PEE-TO-SHAKE LEAKAGE
3. USE SUPPLIERS' CONCRETE FOR MORTAR, TAPPING, AND INSTALLATION.

INTERLOCKS:
REFER TO SHEET "D-3"

HONEYWELL INTERNATIONAL, INC.
DP #1
WATER TREATMENT PLANT
TOWN OF CAMillus, NEW YORK

PROCESS AND INSTRUMENTATION
CHEMICAL STORAGE - H2SO4/UNLOADING
P&ID

T-1301
CHEMICAL STORAGE
SIZE OF CON: 6 X 12' X 12' H
VOLUME: 5,000 GAL
MCF: 150
DEGIN: GENERAL MEMORIAL

PRELIMINARY
NOT FOR CONSTRUCTION
DATE: 3/15/10

DRAWN BY: LMM
FEBRUARY 2010
TECHNICAL SPECIFICATIONS
SECTION 01160

SPILL AND DISCHARGE CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED

A. Preparation, submission, and implementation of an acceptable Spill and Discharge Control Plan by the Contractor as specified herein and in accordance with all provisions of the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Honeywell Syracuse Portfolio Health and Safety Programs (HSP2)

1.3 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

A. Not Used.

1.4 SUBMITTALS

A. The following items shall be submitted:

1. Spill and Discharge Control Plan

2. Spill Incident Reports

PART 2 PRODUCTS

2.1 GENERAL

A. Spill and Discharge Control (SDC) Plan

1. The Contractor shall develop, implement, maintain, supervise, and be responsible for a Spill and Discharge Control Plan. This SDC Plan shall provide contingency measures for potential spills of oil and hazardous materials and construction-related materials including, but not limited to, fuels, hydraulic fluids, lubricants, and construction water.

2. Procedures outlined in the SDC Plan shall follow applicable local, State, and Federal laws and regulations. The plan shall, at a minimum, contain the following:

a. Procedures for Containing Dry and Liquid Spills.
b. Absorbent Material available on-site.
c. Procedures for collection, storage, and handling/disposal of spilled materials.
d. Decontamination Procedures. Decontamination procedures may be required after cleanup to eliminate traces of the substance spilled or reduce it to an acceptable level. Acceptable levels shall be in accordance with all applicable local, State, and Federal laws and
regulations and shall be approved by the New York State Department of Environmental Conservation (NYSDEC). Complete cleanup may require removal of contaminated soils. All contaminated materials that cannot be decontaminated must be properly containerized, labeled, and properly disposed of within 90 days. Any and all testing and disposal costs related to the cleanup of a spill caused by the Contractor's activities shall be borne by the Contractor.

e. Spill Incident Report Format. A written report detailing the spill or discharge shall include, at a minimum, the cause and resolution of the incident, the substance and quantity spilled, outside agencies involved, date and time the incident occurred and actions taken to prevent incident reoccurrence. The report shall be submitted to the Owner’s Representative, the Owner, and NYSDEC, within 24 hours of the incident, and earlier if necessary to comply with local, state, or federal regulations. The Contractor shall document the location of all spills on the Site Drawings and submit the Drawings to the Owner’s Representative at project completion.

B. Spill and Discharge Control

1. The Contractor shall provide methods, means, equipment, facilities, and personnel required to prevent contamination of soil, water, air, equipment, or materials by the discharge of bulk wastes from spills due to Contractor's operations.

2. The Contractor shall provide methods, means, equipment, facilities and personnel to perform emergency measures required to contain any spillage and to remove spilled materials and soils or liquids that become contaminated due to spillage. All collected spill material shall be properly disposed of at the Contractor's expense.

C. Decontamination

1. The Contractor shall provide equipment and personnel to perform decontamination measures that may be required to remove spillage from previously uncontaminated structures, equipment, or material. Decontamination residues shall be properly disposed of at the Contractor's expense. Hazardous waste shall be handled in accordance with local, state and Federal regulations.

PART 3 EXECUTION

3.1 GENERAL

A. Contractor shall be responsible for all liabilities related to spills, discharges, leaks, or emissions from equipment, tankage, vessels, drums, or any other devices owned, operated, or controlled by the Contractor, his subcontractors, vendors, personnel, agents, or assigns.

B. In the case of a spill or discharge, the Contractor shall follow procedures outlined in the SDC Plan.
3.2 NOTIFICATION

A. The Contractor shall notify the Owner and Owner’s Representative at the time of occurrence and follow-up in writing within 24 hours.

B. The Contractor shall report a spill or discharge to regulatory agencies, as necessary to comply with local, state, and federal regulations.

*** *** ***
SECTION 02111
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes clearing and grubbing by removal or destruction of trees, underbrush, logs, stumps, decayed or growing organic matter above the surface of the ground, and snow and ice which interfere with construction or landscaping, specified or directed within or adjacent to the lines of work.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork, Section 02220
B. Restoration of Surfaces, Section 02503

PART 2 PRODUCTS

2.1 Not Used.

PART 3 EXECUTION

3.1 GENERAL

A. Only those portions of the site necessary and essential to be cleared for work shall be cleared.

B. Removal of brush, trees, stumps, and spoil

1. Contractor shall chip brush, tree trunks and tree limbs.

2. Contractor shall likewise chip tree stumps, provided however, that if the tree was located in a potentially contaminated area, all soil adhering to the stump must first be removed prior to chipping. Soil adhering to the stump shall be handled in a manner accepted by the Owner’s Representative.

3. All chipped brush, trees, stumps, and spoil material shall be removed from the area and disposed of by the Contractor in a manner accepted by the Owner and Owner’s Representative.

* * * * *
SECTION 02220

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes excavation and backfilling including the loosening, removing, refilling, transporting, storage and disposal of all materials classified as "earth" necessary to be removed for the construction and completion of all work under the Contract, and as shown on the Contract Drawings, specified or directed.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
   a. A328 Specification for Steel Sheet Piling
   b. D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³) (600 kN-m/m³)
   c. D1556 Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
   d. D1760 Specification for Pressure Treatment of Timber Products
   e. D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Material Handling and Disposal, Section 01170

1.4 DEFINITIONS

A. Excavation (or Trenching)

1. Grubbing, stripping, removing, storing and rehandling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all the work under construction.

2. All sheeting, sheetpiling, bracing and shoring, and the placing, driving, cutting off and removing of the same.

3. All diking, ditching, fluming, cofferdamming, pumping, bailing, draining, well pointing, or otherwise disposing of water.

4. The removing and disposing of all surplus materials from the excavations in the manner specified.

5. The maintenance, accommodation and protection of travel.
6. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the work, whether over- or underground or which appear within or adjacent to the excavations, and the restoration of the same in case of settlement or other injury.

7. All temporary bridging and fencing and the removing of same.

B. Earth

1. All materials such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots or pieces of timber, soft or disintegrated rock, not requiring blasting, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock and individual boulders or masonry larger than one-half cubic yard in volume.

C. Backfill

1. The refilling of excavation and trenches to the line of filling indicated on the Contract Drawings or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in filling or refilling by rolling, ramming, watering, puddling, etc., as may be required.

D. Spoil

1. Surplus excavated materials not required or not suitable for backfills or embankments.

E. Embankments

1. Fills constructed above the original surface of the ground or such other elevation as specified or directed.

F. Limiting Subgrade

1. 6-inches below the underside of the pipe barrel for pipelines
2. 6-inches below the underside of footing lines for structures

G. Excavation Below Subgrade

1. Excavation below the limiting subgrades of structures or pipelines.
2. Where materials encountered at the limiting subgrades are not suitable for proper support of structures or pipelines, the Contractor shall excavate to such new lines and grades as required.
PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Wood Sheeting and Bracing
   1. Shall be sound and straight; free from cracks, shakes and large or loose knots; and shall have dressed edges where directed.
   2. Shall conform to National Design Specifications for Stress Grade Lumber having a minimum fiber stress of 1200 pounds per square inch.
   3. Sheeting and bracing to be left-in-place shall be pressure treated in accordance with ASTM D1760 for the type of lumber used and with a preservative approved by the Owner’s Representative.

B. Steel Sheeting and Bracing
   1. Shall be sound
   2. Shall conform to ASTM A328 with a minimum thickness of 3/8 inch.

PART 3 EXECUTION

3.1 UNAUTHORIZED EXCAVATION

A. Whenever excavations are carried beyond or below the lines and grades shown on the Contract Drawings, or as given or directed by the Owner’s Representative, all such excavated space shall be refilled with special granular materials, concrete or other materials as the Owner’s Representative may direct. All refilling of unauthorized excavations shall be at the Contractor's expense.

B. All material which slides, falls or caves into the established limits of excavations due to any cause whatsoever, shall be removed and disposed of at the Contractor's expense and no extra compensation will be paid the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave-in.

3.2 REMOVAL OF WATER

A. General
   1. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work or the proper placing of pipes, structures, or other work.
   2. Unless otherwise specified, all excavations which extend down to or below the static groundwater elevations shall be dewatered by lowering and maintaining the groundwater beneath such excavations at all times when work thereon is in progress, during subgrade preparation and the placing of the structure or pipe thereon.
3. Water shall not be allowed to rise over or come in contact with any masonry, concrete or mortar, until at least 24 hours after placement, and no stream of water shall be allowed to flow over such work until such time as the Owner’s Representative may permit.

4. Where the presence of fine grained subsurface materials and a high groundwater table may cause the upward flow of water into the excavation with a resulting quick or unstable condition, the Contractor shall install and operate a well point system to prevent the upward flow of water during construction.

5. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be managed per Section 02141 Construction Water Management and without injury to adjacent property, the work under construction, or to pavements, roads, drives, and water courses. No water shall be discharged to sanitary sewers.

6. Any damage caused by or resulting from dewatering operations shall be the sole responsibility of the Contractor.

B. Work Included

1. The construction and removal of sheeting and bracing, and the furnishing of materials and labor necessary therefor.

2. The excavation and maintenance of ditches.

3. The furnishing and operation of pumps, well points, and appliances needed to maintain thorough drainage of the work in a satisfactory manner.

3.3 STORAGE OF MATERIALS

A. Sod

1. Any sod cut during excavation shall be removed and stored during construction so as to preserve the grass growth. Sod damaged while in storage shall be replaced in like kind at the sole expense of the Contractor.

B. Topsoil

1. Topsoil suitable for final grading shall be removed and stored separately from other excavated material.

C. Excavated Materials

1. All excavated materials shall be stored in locations so as not to endanger the work, and so that easy access may be had at all times to all parts of the excavation. Stored materials shall be kept neatly piled and trimmed, so as to cause as little inconvenience as possible to public travel or to adjoining property holders. Erosion & Sediment control practices shall be installed, inspected, and maintained around stockpiled material.
2. Special precautions must be taken to permit access at all times to fire hydrants, fire alarm boxes, police and fire department driveways, and other points where access may involve the safety and welfare of the general public.

3.4 DISPOSAL OF MATERIALS

A. Spoil Material

1. All spoil materials shall be disposed of on site in a location designated by the Owner’s Representative and as required by the local, state or federal regulations pertaining to the area.

2. The surface of all spoil areas shall be graded and dressed and no unsightly mounds or heaps shall be left on completion of the work.

3.5 SHEETING AND BRACING

A. Installation

1. The Contractor shall furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such manner as to prevent any movement which could, in any way, injure the pipe, structures, or other work; diminish the width necessary for construction; otherwise damage or delay the work of the Contract; endanger existing structures, pipes or pavements; or cause the excavation limits to exceed the right-of-way limits.

2. In no case will bracing be permitted against pipes or structures in trenches or other excavations.

3. Sheetling shall be driven as the excavation progresses, and in such manner as to maintain pressure against the original ground at all times. The sheeting shall be driven vertically with the edges tight together, and all bracing shall be of such design and strength as to maintain the sheeting in its proper position. Seepage which carries fines through the sheeting shall be plugged to retain the fines.

4. Where breast boards are used between soldier pile, the boards shall be back packed with soil to maintain support.

5. The Contractor shall be solely responsible for the adequacy of all sheeting and bracing.

B. Removal

1. In general, all sheeting and bracing, whether of steel, wood or other material, used to support the sides of trenches or other open excavations, shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a pipe or structural foundation shall not be withdrawn, unless otherwise directed,
before more than 6 inches of earth is placed above the top of the pipe or structural foundation and before any bracing is removed. The voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

2. The Contractor shall not remove sheeting and bracing until the work has attained the necessary strength to permit placing of backfill.

C. Left in Place

1. If, to serve any purpose of his own, the Contractor files a written request for permission to leave sheeting or bracing in the trench or excavation, the Owner’s Representative may grant such permission, in writing, on condition that the cost of such sheeting and bracing be assumed and paid by the Contractor.

2. The Contractor shall leave in place all sheeting, shoring and bracing which are shown on the Contract Drawings or specified to be left in place or which the Owner’s Representative may order, in writing, to be left in place. All shoring, sheeting and bracing shown or ordered to be left in place will be paid for under the appropriate item of the Contract. No payment allowance will be made for wasted ends or for portions above the proposed cutoff level which are driven down instead of cut-off.

3. In case sheeting is left in place, it shall be cut off or driven down as directed so that no portion of the same shall remain within 24 inches of the street subgrade or finished ground surface.

3.6 BACKFILLING

A. General

1. All excavations shall be backfilled to the original surface of the ground or to such other grades as may be shown, specified or directed.

2. Backfilling shall be done with suitable excavated materials which can be satisfactorily compacted during refilling of the excavation. In the event the excavated materials are not suitable, Special Backfill as specified or ordered by the Owner’s Representative shall be used for backfilling.

3. Any settlement occurring in the backfilled excavations shall be refilled and compacted.

B. Unsuitable Materials

1. Stones, pieces of rock or pieces of pavement greater than 1 cubic foot in volume or greater than 1.5 feet in any single dimension shall not be used in any portion of the backfill.
2. All stones, pieces of rock or pavement shall be distributed through the backfill and alternated with earth backfill in such a manner that all interstices between them shall be filled with earth.

3. Frozen earth shall not be used for backfilling.

C. Compaction and Density Control

1. The compaction shall be as specified for the type of earthwork, i.e., structural, trenching or embankment.
   a. The compaction specified shall be the percent of maximum dry density.
   b. The compaction equipment shall be suitable for the material encountered.

2. Where required, to assure adequate compaction, in-place density test shall at the expense of the Contractor be made by an approved testing laboratory.
   a. The moisture-density relationship of the backfill material shall be determined by ASTM D698, Method D.
      1) Compaction curves for the full range of materials used shall be developed.
   b. In-place density shall be determined by the methods of ASTM D1556 or ASTM D2922 and shall be expressed as a percentage of maximum dry density.

3. Where required, to obtain the optimum moisture content, the Contractor shall add, at his expense, sufficient water during compaction to assure the specified maximum density of the backfill. If, due to rain or other causes, the material exceeds the optimum moisture content, it shall be allowed to dry, assisted if necessary, before resuming compaction or filling efforts.

4. The Contractor shall be responsible for all damage or injury done to pipes, structures, property or persons due to improper placing or compacting of backfill.

3.7 OTHER REQUIREMENTS

A. Drainage

1. All material deposited in roadway ditches or other water courses shall be removed immediately after backfilling is completed and the section, grades and contours of such ditches or water courses restored to their original condition, in order that surface drainage will be obstructed no longer than necessary.

B. Unfinished Work

1. When, for any reason, the work is to be left unfinished, all trenches and excavations shall be filled and all roadways, sidewalks and watercourses left
unobstructed with their surfaces in a safe and satisfactory condition. The surface of all roadways and sidewalks shall have a temporary pavement.

C. Hauling Material on Streets

1. When it is necessary to haul material over the streets or pavements, the Contractor shall provide suitable tight vehicles so as to prevent deposits on the streets or pavements. In all cases where any materials are dropped from the vehicles, the Contractor shall clean up the same as often as required to keep the crosswalks, streets and pavements clean and free from dirt, mud, stone and other hauled material.

D. Dust Control

1. It shall be the sole responsibility of the Contractor to control the dust created by any and all of his operations to such a degree that it will not endanger the safety and welfare of the general public.

2. Calcium chloride, chemicals, and petroleum products shall not to be used for dust control.

E. Test Pits

1. For the purpose of obtaining detail locations of underground obstructions, the Contractor shall make excavations in advance of the work or as ordered by Owner’s Representative. Test pits shall include sheeting, bracing, pumping, excavation and backfilling.

* * * * *
SECTION 02226
TRENCHING, BACKFILLING AND COMPACTING

PART 1  GENERAL

1.1  SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of the Section entitled "Earthwork" unless modified herein.

PART 2  PRODUCTS

NOT USED

PART 3  EXECUTION

3.1  EXCAVATION

A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 6 inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12 inches on each side of the pipe hub for 24-inch diameter pipe and larger.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.

F. Bridging across open trenches shall be constructed and maintained where required.
3.2 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.3 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required at least one-half of the street must be kept open for traffic.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

3.4 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance with the Section entitled "Earthwork".
3.5 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.6 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. Where trenches are within the Site area or road or within a driveway, shall be under a structure, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density, and determined as set forth in the Section entitled "Earthwork".

2. Where trenches are in open fields or unimproved areas, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 90% maximum density.

3. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.

C. All settlement of the backfill shall be refilled and compacted as it occurs.
D. Temporary pavement shall be placed as specified in the Section entitled "Restoration of Surfaces".

* * * * *
SECTION 02230
SELECT FILL

PART 1 GENERAL

1.1 SUMMARY
A. This Section includes select fill materials used in either embedment or special backfill, as specified or as directed by the Owner.

1.2 REFERENCES
A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
   a. D422 - Method for Particle-Size Analysis of Soil

1.3 SUBMITTALS
A. The following items shall be submitted:

1. The name and location of the source of the material.
2. Samples and test reports of the material.

1.4 DEFINITIONS
A. Embedment or Lining
   1. Any type granular material specified or directed placed below an imaginary line drawn one foot above the inside diameter of the pipe and within the trench limits.

B. Special Backfill
   1. Pipelines
      a. Any select fill material specified or directed placed above an imaginary line drawn one foot above the inside diameter of the pipe and within the trench limits.
   2. Structures
      a. Any select fill material specified or directed placed within the excavation limits, either in, under or adjacent to the structure.
C. Special Granular Material

1. Special granular material shall mean any of the granular materials listed below or other materials ordered by the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Type A

1. Crushed Gravel

a. Thoroughly washed crushed, durable, sharp angled fragments of gravel free from coatings. Crushed particles shall be a minimum of 85% by weight of the particles with at least two fractured faces. The total area of each fractional face shall exceed 25% of the maximum cross-sectional area of the particle.

b. Crushed gravel shall have the following gradation by weight:

<table>
<thead>
<tr>
<th>% Passing</th>
<th>Sieve</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>1½-inch</td>
</tr>
<tr>
<td>0-25%</td>
<td>½-inch</td>
</tr>
<tr>
<td>0-5%</td>
<td>¼-inch</td>
</tr>
</tbody>
</table>

B. Type B

1. Crushed Stone

a. Thoroughly washed clean, sound, tough, hard crushed limestone or approved equal free from coatings. Gradation for crushed stone shall be the same as specified for Type A material.

C. Type E

1. Run-of-Bank Gravel

a. Run-of-bank gravel or other acceptable granular material free from organic matter with a gradation by weight of 100% passing a 1½-inch square opening, 30 to 65% passing a ¼-inch square opening and not more than 10% passing a No. 200 mesh sieve as determined by washing through the sieve in accordance with ASTM D422.

D. Type F

1. Run-of-crusher Stone

a. Run-of-crusher hard durable limestone or approved equal having the following gradation by weight:
PART 3 EXECUTION

3.1 INSTALLATION

A. Special granular material as specified or directed for pipeline embedment shall be placed in accordance with the Section entitled "Trenching, Backfilling and Compacting".

B. Special backfill where specified or directed shall be placed in accordance with the backfilling provisions of the Section entitled "Trenching, Backfilling, and Compacting", and the Section entitled "Earthwork".

3.2 DISPOSAL OF DISPLACED MATERIALS

A. Materials displaced through the use of SELECT fill shall be wasted or disposed of by the Contractor and the cost of such disposal shall be included in the unit price bid for each of the materials.

3.3 SETTLEMENTS

A. Any settlements in the finished work shall be made good by the Contractor.

* * * * *

<table>
<thead>
<tr>
<th>% Passing</th>
<th>Sieve</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>95 – 100</td>
<td>1</td>
</tr>
<tr>
<td>65 – 80</td>
<td>½</td>
</tr>
<tr>
<td>40 – 60</td>
<td>¼</td>
</tr>
<tr>
<td>0 – 10</td>
<td>#200 Sieve</td>
</tr>
</tbody>
</table>
SECTION 02270
EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SUMMARY
A. This Section includes diversion swales, silt fences, stabilized construction entrance, and other permanent and temporary erosion and sediment control measures intended to minimize erosion of soils and sedimentation of drainage channels and lands adjacent to or affected by the work.
B. Provide temporary vegetation for all areas disturbed by construction.

1.2 REFERENCES
A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:
   1. New York State Standards and Specifications for Erosion and Sediment Control

1.3 SUBMITTALS
A. The following items shall also be submitted.
   1. Shop drawings of erosion and sediment control materials.

PART 2 PRODUCTS

2.1 MATERIALS
A. The Contractor shall provide all necessary supervision, labor, equipment and materials as needed to perform the specified work.
B. Materials shall include silt fence, stone, or other manufactured products to reduce erosion and control siltation as specified on the Contract Drawings.

2.2 SILT FENCE
A. Provide and install as indicated on the Contract Drawings or as directed by the Engineer.

2.3 TURBIDITY CURTAIN
A. Provide and install as indicated on the Contract Drawings or as directed by the Engineer.

2.3 STABILIZED CONSTRUCTION ENTRANCE
A. Provide and install as indicated on the Contract Drawings or as directed by the Engineer.
2.4 TEMPORARY VEGETATION

A. Temporary vegetation shall consist of a mixture of quick germinating, fast growing perennial rye grass mixed with sweet or white clover with an application rate of 50 pounds per acre.

B. Fertilizer shall be applied at the rate of 400 pounds per acre using 15-15-15 or equivalent. Soils which are highly acidic should be lined.

C. Mulch shall be a moist straw or hay and applied at the rate of 2 tons per acre.

D. The seed furnished by the Contractor shall not be more than two years old. Germination tests of the seed proposed to be used shall be made not more than six months prior to seeding operations and a certificate of such tests shall be furnished to the Engineer. When directed by the Engineer, the above mixture may be varied to suit any special condition of soil peculiar to the areas to be seeded. Seed which has become wet, moldy, or otherwise damaged in transit or storage shall not be acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install erosion and sediment control facilities as shown on the Contract Drawings or directed by the Engineer.

B. Temporary Vegetation

1. Spread fertilizer and work into soil by discing or other approved methods.

2. Spread seed by hand or approved sowing equipment at a rate of 50 pounds per acre.

3. After sowing has been completed, apply mulch evenly over the entire seeded area at a rate of 2 tons per acre. Wet mulch immediately after placing. Compact area by two passes of a smooth drum roller, one 90° to the other to the extent possible.

3.2 MAINTENANCE

A. Maintain silt fences as needed, and remove sediment when bulges develop in silt fence.

B. Inspect and install stone dressing on the stabilized construction entrance as necessary or as directed.

C. Install additional erosion control devices in areas as necessary during construction. Place erosion control devices as directed by the Engineer.

* * * * *
SECTION 02503

RESTORATION OF SURFACES

PART 1  GENERAL

1.1 SUMMARY

A. This Section includes restoration and maintenance of all types of surfaces, culverts and other features disturbed, damaged or destroyed during the performance of the work under or as a result of the operations of the Contractor.

B. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to the condition of each before the work began.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)

   a. D698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³)

1.3 SUBMITTALS

A. The following items shall be submitted:

1. A schedule of restoration operations. After an accepted schedule has been agreed upon it shall be adhered to unless otherwise revised with the approval of the Engineer.

PART 2  PRODUCTS

NOT USED

PART 3  EXECUTION

3.1 GENERAL

A. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the Contractor of responsibility to repair damages by settlement or other failures.

3.7 STONE OR GRAVEL PAVEMENT

A. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.
1. The depth of the stone or gravel shall be at least equal to the existing.

2. After compaction the surface shall conform to the slope and grade of the area being replaced.

3.9 LAWNS AND IMPROVED AREAS

A. The area to receive topsoil shall be graded to a depth of not less than 4 inches or as specified, below the proposed finished surface.

1. If the depth of existing topsoil prior to construction was greater than 4 inches, topsoil shall be replaced to that depth.

B. The furnishing and placing of topsoil, seed and mulch.

C. When required to obtain germination, the seeded areas shall be watered in such a manner as to prevent washing out of the seed.

D. Any washout or damage which occurs shall be regraded and reseeded until a good sod is established.

E. The Contractor shall maintain the newly seeded areas, including regrading, reseeding, watering and mowing, in good condition.

3.10 OTHER TYPES OF RESTORATION

A. Water courses shall be reshaped to the original grade and cross-section and all debris removed. Where required to prevent erosion, the bottom and sides of the water course shall be protected.

B. Culverts destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original location and grade. When there is minor damage to a culvert and with the consent of the Engineer, a repair may be undertaken, if satisfactory results can be obtained.

3.11 MAINTENANCE

A. The finished products of restoration shall be maintained in an acceptable condition for and during a period of one year following the date of Substantial Completion or other such date as set forth elsewhere in the Contract Documents.

* * * * *
SECTION 02600
PIPipeLINE INSTALLATION

PART 1 GENERAL

1.1 SUMMARY
A. This Section includes all metallic and non-metallic pipelines as shown on the Contract Drawings, complete with fittings and specials.

B. Certain features of pipes shall be as scheduled.

1.2 REFERENCES
A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:

1. American Society of Testing and Materials (ASTM)

2. American Water Works Association (AWWA)

1.3 SUBMITTALS
A. The following items shall be submitted:

1. Manufacturer’s certification that all materials furnished are in compliance with the applicable requirements of the referenced standards and this specification.

2. Layout drawings are required for pipelines to be installed within structures, showing the location including the support system, sleeves and appurtenances.

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION
A. Pipe

1. Materials for the piping, joints and fittings shall be as specified in the Section for the type of pipe to be installed, shown in the pipe schedule or on the Contract Drawings.

a. Pipe and appurtenances shall comply with the applicable standards for its type of material.

B. Joints

1. Type of joints shall be as scheduled in the pipe schedule or as shown or noted on the Contract Drawings.
C. Inspection

1. Pipe and appurtenances shall be inspected by the Contractor in the presence of the Engineer on delivery and prior to installation for conformance with the standards and specifications.
   
a. Materials not conforming to the standards and specifications shall not be stored on site but removed at once and replaced with material conforming to the specifications.

PART 3 EXECUTION

3.1 INSTALLATION - UNDERGROUND

A. General

1. Install pipelines, fittings, specials, and accessories in accordance with the configuration shown on the Contract Drawings.

2. Excavation and backfilling shall be in accordance with the applicable provisions of the Section entitled "Trenching, Backfilling and Compacting".

3. Blocking will not be permitted under pipe, except where the pipe is to be laid with concrete cradle or encasement.

4. No pipe shall be laid upon a foundation in which frost exists; nor at any time when there is danger of the formation of ice or the penetration of frost at the bottom of the excavation.

5. Temporary bulkheads shall be placed in all open ends of pipe whenever pipe laying is not actively in process. The bulkheads shall be designed to prevent the entrance of dirt, debris or water.

6. Precautions shall be taken to prevent the flotation of the pipe in the event of water entering the trench.

B. Location and Grade

1. Pipelines and appurtenances shall be located as shown on the Contract Drawings or as directed and as established from the control survey in accordance with the Special Provisions.

2. The alignment and grades shall be determined and maintained by a method acceptable to the Engineer.

C. Subgrade

The subgrade for pipelines shall be earth or special embedment as specified or directed and shall be prepared in accordance with the Section entitled "Trenching, Backfilling and Compacting".
D. Joints

1. Joints shall be assembled using gaskets, lubricants and solvents as furnished by the pipe manufacturer and in accordance with the manufacturer's recommendations.

E. Embedment

1. Embedment shall be deposited and compacted in accordance with the Section entitled "Trenching, Backfilling and Compacting", and the Section for the type of pipe being installed and shall be one of the embedments shown below unless otherwise specified or directed.

2. Non-pressure pipe of: High Density Polyethylene Pipe
   Smooth Interior Corrugated Polyethylene Pipe
   a. The embedment shall consist of compacted Type F granular materials placed from a depth of 6 inches below the pipe to a depth of 12 inches over the pipe.
      1) Embedment material shall be deposited and hand-compact ed in 6-inch maximum layers.

3.1 INSTALLATION – UNDERGROUND

A. General

1. Install pipelines, fittings, specials, and accessories in accordance with the configuration shown on the Contract Drawings.

2. Above ground Pipe (pipe installed on grade) shall be blocked using 200 pound gravel bags at 50-foot intervals or as directed by the owner’s Representative.

3.4 FIELD TESTING

A. Perform leakage tests in accordance with the applicable provisions of the Section entitled “Leakage Tests”, at the test pressure specified or scheduled.

3.5 CUTTING

A. Field cuts of pipes shall be in accordance with the manufacturer's instructions.

* * * * *
SECTION 02602
LEAKAGE TESTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes leakage tests of piping for leakage as specified.
   1. The Contractor shall furnish all labor, equipment, test connections, vents, water and materials necessary for carrying out the pressure and leakage tests.

B. All testing shall be witnessed by the Engineer.

1.2 SUBMITTALS

A. The following items shall be submitted:
   1. Reports of test results.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 TESTS ON NON PRESSURE PIPING

A. General
   1. Pipelines designed to transport effluent and storm water shall be tested hydrostatically and for leakage prior to being placed in service.
   2. The length of piping and sections included in the tests shall meet the approval of the Engineer.
   3. Equipment in or attached to the pipes being tested shall be protected. Any damage to such equipment during the test shall be repaired by the Contractor at his expense.
   4. When piping is to be insulated or concealed in a structure, tests shall be made before the pipe is covered.
   5. All fittings and appurtenances must be properly braced and harnessed before the pressure is applied. Thrust restraining devices which will become a part of the system must also be tested at the test pressure.
   6. When testing absorbent pipe materials such as asbestos cement or concrete, the pipeline shall be filled with water at least 24 hours before the test is made.
7. If the line fails the test, the Contractor shall explore for the cause of the excessive leakage and after repairs have been made the line shall be retested. This procedure shall be repeated until the pipe complies.

B. Pressure Test

1. Test pressure shall be as scheduled.

2. Test pressure shall be held on the piping for a period of at least 2 hours, unless a longer period is requested by the Engineer.

C. Leakage Test

1. The leakage test shall be conducted concurrently with the pressure test.

2. The rate of leakage shall be determined at 15-minute intervals by means of volumetric measurement of the makeup water added to maintain the test pressure. Leakage test make up water shall maintain pressure within 5 psi of the specified test pressure. The test shall proceed until the rate of leakage has stabilized or is decreasing below an allowable value, for three consecutive 15-minute intervals. After this, the test pressure shall be maintained for at least another 15 minutes.

   a. At the completion of the test the pressure shall be released at the furthermost point from the point of application.

3. All exposed piping shall be examined during the test and all leaks, defective material or joints shall be repaired or replaced before repeating the tests.

4. The allowable leakage for pressure pipelines shall not exceed the following in gallons per 24 hours per inch of diameter per mile of pipe:

<table>
<thead>
<tr>
<th>Type of Pipe</th>
<th>Leakage</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Density Polyethylene pipe</td>
<td>0</td>
</tr>
<tr>
<td>SICPPs</td>
<td>10</td>
</tr>
</tbody>
</table>

5. Regardless of the above allowables, any visible leaks shall be permanently stopped.

*** ***
SECTION 02623
HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Polyethylene pipe of the classification, size, and use as specified and as shown on the Contract Drawings.

1.2 QUALITY ASSURANCE

A. Prior to initiating joining of the pipe the Contractor or his subcontractor shall present evidence to the Engineer of having successfully installed HDPE piping using this method on a minimum of three previous projects.

B. The Contractor shall test and certify each weld.

C. All testing including field services needed during installation of the pipe shall be provided by the Contractor.

1.3 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS

Stormwater
A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Plastics Pipe Institute (PPI)

D. DOT Regulations

1.4 SUBMITTALS

A. Drawings and manufacturer's data of the pipe, joints and fittings showing compliance with this Specification.

B. Copies of Leakage test results

C. Submit five (5) copies of manufacturer's affidavit that all delivered materials comply with the following criteria:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>ASTM D1505</td>
<td>0.941 - 0.955 gm/cc</td>
</tr>
<tr>
<td>Melt Flow Index</td>
<td>ASTM D1238</td>
<td>Less Than 4 gm/10 min</td>
</tr>
<tr>
<td>Percent Carbon Black</td>
<td>ASTM D1603</td>
<td>2.5%</td>
</tr>
<tr>
<td>Hydrostatic Design Basis</td>
<td>ASTM D2837</td>
<td>Minimum of 1600 psi</td>
</tr>
<tr>
<td>Environmental Stress</td>
<td>ASTM D1693</td>
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</tr>
<tr>
<td>Crack Resistance</td>
<td>Condition C</td>
<td>Greater Than 5000 hours</td>
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<tr>
<td>Flexural Modulas</td>
<td>ASTM D790</td>
<td>110,000 - 160,000 psi</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D638</td>
<td>3,000 - 3,500 psi</td>
</tr>
</tbody>
</table>

PART 2 PRODUCT

2.1 MATERIALS

A. GENERAL

1. High density polyethylene pipe shall be constructed from PE 3408 high molecular weight polyethylene piping having a cell classification of PE 345434C and conforming to ASTM D3350.

2. Acceptable manufacturers are Performance Pipe or equal.

3. Pipe shall be HDPE, Iron Pipe Size, 6-inch outside diameter, DR 11 with butt fused joints.

B. Fittings and Couplings

1. High density polyethylene piping fittings and couplings shall conform to the requirements of HDPE pipe for classification and size.

2. The high density polyethylene pipe fittings and couplings shall be capable of withstanding the pressure required for the leakage test specified.

3. Fittings larger than 8-inch shall be fabricated. All fabricated fittings shall be one (1) class (SDR/DR) stronger than the mainline pipe.

4. Where mechanical couplings are called for, a steel sleeve in accordance with the manufacturer’s recommendations shall be used. Electrofusion couplings, up to 28-inches in diameter, shall be used where typical fusion welding is impractical.

C. Joints

Unless otherwise specified, joints for pipe and fittings shall be fusion welded in accordance with the manufacturer’s recommendations.

1. All fusion welders shall be qualified per the DOT code of Federal Regulations Title 49 Part 192.285.
2. Flanged joints shall be used for connecting to valves and other appurtenances unless indicated otherwise.
   a. Gaskets shall be 1/8" thick soft natural or synthetic rubber with a durometer of 73, plus or minus 4.”
   b. Steel bolts and nuts shall be cadmium plated.
   c. Backup (follower) rings shall be Ductile Iron.

PART 3 EXECUTION

3.1 INSTALLATION
   A. High density polyethylene pipe shall be handled and stored in accordance with the manufacturer's recommendations.
   B. The interior fusion bead shall be removed from all pipe joints and disposed of by the Contractor

3.2 TESTING
   A. Pipe shall be hydrostatically tested in accordance with Section entitled, “Leakage Tests” at a pressure of 25 psi.

* * * * *
SECTION 02625

SMOOTH INTERIOR CORRUGATED POLYETHYLENE PIPE

PART 1  GENERAL

1.1 SUMMARY

A. This Section includes the requirements for procurement, transportation, storage, handling, and installation of smooth interior corrugated polyethylene pipe (SICPP) as a storm drainage conduit.

B. The SICPP shall be installed to the prescribed lines and grades at the locations indicated on the Contract Drawings or as directed by the Owner.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards, and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
   e. F-667 - Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.

2. American Association of State Highway and Transportation Officials (AASHTO)

1.3 SUBMITTALS

A. Contractor’s certification that all products, materials, construction, and installation complies with the applicable requirements of the referenced standards, this specification and the Contract Drawings.

B. A list of minimum property values for the pipe and fittings.
C. Manufacturer’s product literature including, but not limited to, parts lists, materials of construction, operations & maintenance requirements, specifications, drawings, and installation guidelines, which demonstrate compliance with this specification.

1.4 QUALITY ASSURANCE

A. Pipe shall be marked with the manufacturer’s name, product identification, lot number, pipe size, and pipe length.

1.5 STORAGE AND PROTECTION

A. Transportation is the responsibility of the Contractor who shall be liable for all damages prior to and during transportation to the site.

B. Handling, storage, and care on-site is the responsibility of the Contractor prior to, during, and after installation.

1.6 PLACEMENT AND HANDLING

A. Handle all materials in such a manner as to ensure it is not damaged in any way.

B. Materials shall not be dragged.

C. During placement, care shall be taken not to entrap stones, excessive dust, or moisture that could hamper subsequent performance. If pipe is not free of debris and soil prior to installation, the Contractor shall clean material prior to installation.

D. The Owner will examine the drainage piping over the entire surface to ensure that no potentially harmful foreign objects are present. Any foreign objects so encountered shall be removed by the Contractor or the pipe shall be replaced.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturers are named to establish a standard of quality necessary for the Project:

1. Hancor, Inc. – Blue Seal

2. Or equal.

2.2 PIPE

A. The drainage pipe and fittings shall be smooth interior, corrugated, high density polyethylene (HDPE) with dimensions as shown on the Contract Drawings.

B. Piping shall meet all requirements of AASHTO M-294.

C. Pipe joints and fittings shall conform to AASHTO M-252 or AASHTO M-294, or be approved by the Owner.
PART 3 EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the specification.

B. Pipe shall be joined with internal or external couplers, or coupling banks and fittings supplied by the pipe manufacturer covering at least two full corrugations on each of the pipe ends.

C. The Contractor shall protect the ends of the drain pipes from being damaged or from allowing foreign objects (e.g., debris, sand, filter fabric) from entering the pipes.

D. Each pipe shall be inspected by the Contractor prior to making connections to ensure pipe is free of foreign objects. Any foreign objects shall be removed by the Contractor.

E. The Contractor shall exercise care to thoroughly compact the bedding material under the haunches of the pipe and to ensure that the material is in intimate contact with the pipe. The selected backfill shall be brought up evenly in layers on both sides of the pipe until the trench is filled to the required elevation.

F. The Contractor shall replace or repair any damaged pipe as directed by the Engineer at no additional cost to the Owner.

G. The Contractor is responsible for all excavation and backfill required for complete installation of the drain pipe.

3.2 CONFORMANCE TESTING

A. Samples of materials delivered to the site may be collected for testing to confirm conformance with the properties in Part 2 of this Specification at the Owner’s discretion.

B. Samples, if required, will be obtained by the Owner. All testing performed will be paid for by the Contractor.
PART 1 GENERAL

1.1 SUMMARY

A. This Section includes valve and meter vaults, catch basins, curb inlets, surface water inlets, and similar structures, complete with frames and covers, manhole steps and appurtenances as shown on the Contract Drawings.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American Society for Testing and Materials (ASTM)
2. American Association of State Highway Transportation Officials (ASHTO)

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Concrete

1. Cast-in-place concrete for vaults and inlets shall be as specified under the Section entitled "Concrete".

2. Precast concrete sections shall be in accordance with ASTM C478 for manhole sections and ASTM C913 for other structures with a minimum wall thickness of 5 inches. Top sections shall withstand H-25 wheel loads and shall be of the type shown.

   a. Bell and spigot joints of precast sections shall have an appropriate "O" or square Buna-N rubber section ring as supplied by the manufacturer.

B. Masonry Units

1. Brick shall meet the requirements of ASTM C62, Grade SW, and shall be of a hard-burned manufacture.

C. Mortar

1. Masonry cement for mortar shall meet the requirements of ASTM C 91, Type II and shall be mixed with a graded quality sand conforming to ASTM C144.
2. Mix shall be one part masonry cement to three parts sand using the minimum amount of clean water required for workability.

D. Castings

1. Frames and covers, grates, inlets, and other castings shall be as shown on the Contract Drawings and be in accordance with ASTM A48, Class 30. All castings shall be manufactured to withstand H-25 wheel loads. Frames and covers shall have machined bearing surfaces.

2. Steps shall be manhole steps manufactured of cast iron in accordance with ASTM A48, Class 30 or others acceptable to the Engineer.
   a. Steps shall have a minimum tread width of 16 inches.

E. Coatings

1. The exterior and interior surfaces of the precast concrete manholes shall be waterproofed with two (2) coats of Koopers 300M or equal 8 mils each for a total DFT of 16 mils.

PART 3 EXECUTION

3.1 INSTALLATION

A. Precast Sections

1. Precast sections shall be installed level on a flat stable subgrade. Where an unstable condition exists, the Contractor shall excavate the unstable material and replace with compacted granular material.

2. All joints shall be filled inside and out with mortar to provide a smooth and continuous surface.

B. Benchwalls and Inverts

1. Mortar surfaces of benchwalls and concrete floors shall be given a broom finish. Where inverts are required they shall be lined with a half section of pipe of the same type used for the sewer or shall be constructed of Class "C" concrete, shaped and troweled to produce a smooth circular cross-section.

C. Frames and Castings

1. Frames and castings shall be set in a full bed of mortar a maximum of 1/2" thick. Where required to adjust the frames and castings to grade there shall be installed to a maximum of four brick courses.

D. Steps

1. Steps shall be installed in vertical alignment spaced 12 inches on center.
2. In concrete sections the steps shall be cast into the section or secured with cadmium plated bolts to threaded inserts which are precast into the concrete.

3. In masonry construction the steps shall be built into the masonry walls.

E. Plastering

1. Plaster shall be with mortar not less than 2 inch thick and troweled smooth.

2. Outside of masonry structures.

3. Inside and outside of brick courses under frames and castings.

F. Sumps

1. Sumps of the size specified shall be built into the floors of vaults and similar structures. Floors shall be sloped to the sump.

3.2 FIELD TESTING

A. Perform leakage tests in accordance with the applicable provisions of the Section entitled “Leakage Tests”.

* * * * *