municipality.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer to provide a complete and operable system.

2.02 PVC GRAVITY SANITARY SEWER PIPE

A. PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D–3034 or F679, Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR 35 pipe. All pipe and fittings shall be clearly marked as follows:

– Manufacturer's Name and Trademark

– Nominal Pipe Size (as shown on plans)

– Material Designation 12454–C PVC

– Legend "Type PSM SDR 35 PVC Sewer Pipe" or "PS 46 PVC Sewer Pipe"

– Designation ASTM D–3034 or F679

B. Joints shall be push–on type using elastomeric gaskets and shall conform to ASTM D–3212. The gaskets shall be factory installed. The pipe shall be furnished in nominal 13 foot lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle–type connections will not be considered acceptable.

C. Any pipe or fitting having a crack or other defect or which has received a severe blow shall be marked rejected and removed at once from the work site. All field cuts are to be made with saw and 90 degree miter box. Bevel the cut end to the same as the factory bevel and remove all interior burrs. Measure and place a homing mark on the pipe before assembling. The pipe installed under this specification shall be installed so that the initial deflection, measured as described below, shall be less than five percent (5%).

D. The manhole water stop gasket and stainless steel clamp assembly must be approved by the Town Wastewater Treatment Department prior to the installation of any pipe.

E. The Contractor will submit certification that the materials of construction have been sampled, tested, inspected, and meet all the requirements including wall thickness in accordance with ASTM D–3034 or ASTM F679 for all pipe and fittings to be included in project work. PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather. PVC pipe shall not be stored outside and exposed to prolonged periods of sunlight, as pipe discoloration and reduction in pipe impact strength will occur. Canvas and other opaque material shall be used to cover PVC pipe when stored outside.

2.03 PVC PRESSURE SEWER PIPE

A. PVC pipe shall conform in all respects to the latest revisions of ASTM Specifications D–2241. All pipe and fittings shall be SDR 26 clearly marked as follows:

– Manufacturer's Name and Trademark
– Nominal Pipe Size (as shown on plans)
– Material Designation 12454–A PVC ASTM D–1784

B. Joints shall be push–on type using elastomeric gaskets factory installed conforming to ASTM Specification D–3212.

2.04 MANHOLES

A. Manholes shall be sized as indicated on the plan and shall be precast concrete with a monolithic base and shall conform to the latest version of ASTM Specification C478.

B. Shelves shall be constructed with concrete having a minimum compressive strength of 3,000 psi at 28 days. Inverts for sewer manholes shall be as shown on the plans and details and shall be constructed with concrete or brick, as per the local municipality's standards. Inverts shall have the exact shape of the sewer to which they are connected, and any change in size of direction shall be gradual and even.

C. All manholes are to be provided with copolymer polypropylene plastic steps with steel reinforcement 12 inches on center.

D. All manholes shall be provided with rough, gray, cast iron manhole frames and covers. All iron castings shall be thoroughly cleaned and then coated with hot tar before being delivered. Frames and covers shall be LeBaron LC 266, or an approved equal, and have a minimum weight of 400 pounds.

E. Precast risers and bases for manholes shall conform to ASTM Specification C–478. The pipe opening in the precast manhole system shall have a cast–in–place flexible gasket or an equivalent system for pipe installation as approved by the Engineer. Joints between manhole risers shall be 1" minimum width flexible gasket or approved equals.

2.05 CLEANOUTS

A. Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Engineer. Cleanout frames and covers shall be of tough gray cast iron. Castings shall be true to pattern and free from flaws. The bearing surface of cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference.

2.06 PIPELINE INSULATION

A. Approved sewer lines with less than four feet (4'–0") of cover over the crown, five (5'–0") in plowed areas that cross a storm sewer, or where indicated on the plans, shall be protected against freezing by the installation of two inch (2") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the the lesser of 3' or 2 x diameter of the pipe. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4"–6") of clean medium or coarse sand below the pipe bottom and four to six inches (4"–6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1621–73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe. When sewer line passes within 5 feet of a catch basin install 2" min. rigid insulation, polystyrene sheets, between sewer line and cb.

PART 3 – EXECUTION

3.01 GENERAL

A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing sanitary sewer facilities without prior written approval of the Engineer.

B. When existing underground utilities not scheduled for removal or abandonment are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.

C. Installation of pipe shall be in accordance with the Utility Trenching and Backfilling and as specified by this section.

3.02 BEDDING FOR PIPE

A. The bedding material shall be shaped to fit the pipe for a depth of not less than 10 percent of its total height and shall have recesses to receive the bell.

3.03 LAYING PIPE

A. In general, sewer pipe shall be installed in accordance with the latest detailed instructions of the manufacturer.

B. The laying shall begin at the outlet end and the lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or grooved ends of rigid pipes and the circumferential laps of flexible pipe shall be placed facing upstream.

C. All pipe and fittings shall be carefully examined for defects and no pipe or fittings shall be laid which are known to be defective. If any defective piece is discovered after laying, it shall be removed and replaced at the Contractor's expense. All pipes and fittings shall be cleaned before they are laid and shall be kept clean until accepted in the completed work.

D. The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade.

E. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

F. When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.

G. For force mains, concrete reaction blocking shall be provided as detailed at all bends deflecting 22½ degrees or more. At the Contractor's option, retainer glands may be used at bends in lieu of concrete blocking. Retainer glands shall also be provided at all joints within three pipe lengths each side of the bends.

H. Any pipe that is not laid to grade and alignment shall be re–laid to the satisfaction of the Town Wastewater Department. The bedding material shall be placed and compacted on each side of the pipe to a height equal to one–half (1/2) the pipe diameter and for the full width of the excavated trench and as shown on the accepted plans. Bedding shall be #2 pea stone from Shelburne Limestone or an equivalent approved by the Town Wastewater Department and the Engineer.

I. All sewer pipes shall be marked with magnetic marking tape. The marking tape shall be installed one (1) foot directly over . Concrete thrust blocks "sewer "the pipe and shall be labeled or anchors shall be placed at bends, tees, fittings, and other locations on the force main as shown on the contract drawings or as directed by the Town Wastewater Department. Concrete for thrust blocks and anchors shall be Class B concrete. Steel rods and clamps as required shall be galvanized and rust proofed or painted.

3.04 GRAVITY SEWER PIPE TESTING

A. The Contractor shall provide all necessary equipment and instrumentation required for proper completion of the flushing and testing. Quality of water, test procedures, and method of disposal of water shall be approved by the Engineer. Prior to testing, flush with water to remove construction debris and pass through a full gauge squeegee.

B. All tests shall be made in the presence of the Engineer. Preliminary tests made by the Contractor without being observed by the Engineer will not be accepted. The Engineer will be notified at least eight hours before any work is to be inspected or tested. The Town shall be notified at least at least two (2) days before testing.

C. The maximum sewer length to be tested at one time shall be that length between any two manholes.

D. Air Testing: Low pressure air testing shall be conducted in accordance with the following procedures:

1. Each end of the test section and laterals shall be plugged, capped and braced. Necessary safety precautions shall be taken to prevent blowouts and possible injury.

2. An air hose shall be connected to a tapped plug used for an air inlet. The hose will be connected to the air control equipment, which shall include valves and pressure gauges. These shall allow air to enter the sewer test line, monitor air pressure in the sewer, shut off air, and provide pressure reduction and relief. The monitoring pressure gauge shall have a range of 0–10 psi with divisions of 0.10 psi and accuracy of 0.05 psi±.

3. The air compressor and air supply shall be connected to the test line and the test section filled slowly, until a constant pressure of 4.0 psig is maintained.

4. A pressure above 3.0 psig shall be maintained for at least five minutes to allow the temperature to stabilize. A check for leaks shall be made and if any are found, the pressure shall be released and the fitting replaced or repaired.

5. After the stabilization period, the pressure shall be adjusted to 3.5 psig and the air supply disconnected.

6. Measure and record the time interval for the test line pressure to drop from 3.5 psig to 2.5 psig.

7. If the groundwater table is above the pipe, increase above test pressures 0.5 psig for each foot the groundwater is above the invert of the pipe.

8. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi greater than the average back pressure of any groundwater that may submerge the pipe is not less than that computed according to the following table:

Minimum Test Time for Various Pipe Sizes

| Diameter (Inches) | Time (Sec./100 Ft.) |
|---|---|
| 4 | 18 |
| 6 | 45 |
| 8 | 75 |
| 10 | 90 |
| 12 | 110 |

3.05 MANHOLES

A. The excavation shall be to the depth indicated on the plans r ordered by the Engineer, and carefully shaped and graded.

B. Manhole sections shall be precast concrete and shall conform to the dimensions indicated on the plans or ordered by the Engineer.

C. Channels, inverts and floor areas for sewer manholes shall be constructed of concrete. Inverts shall have the exact shape of the sewer to which they are connected and any change in size or direction shall be gradual and even. All construction of sewer manholes must be carried out to insure watertight work.

D. The required precast concrete risers shall be placed on top of the concrete to the elevation indicated on the plans or as ordered by the Engineer.

E. The cast iron frame shall be set as indicated on the plans in a full mortar bed. The cover shall be properly placed in the frame.

3.06 MANHOLE TESTING

A. Manholes shall be tested separately by one of the following two procedures:

1. Exfiltration Leakage Test: All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blowout. The manhole shall then be filled with water to the top of the cone section. A period of time may be permitted, if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least four hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be converted to gallons per vertical foot depth for 24 hours. The leakage for each manhole shall not exceed one gallon/vertical foot/day. If leakage exceeds the allowable rate, repairs shall be made as approved by the Engineer and the manhole retested. If the Contractor elects to backfill prior to testing, the testing shall be at his own risk, and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

2. Vacuum Test: This method of testing manholes for leakage involves the use of a device for sealing the top of the manhole cone section and pumping the air out of the manhole, creating a vacuum and holding this vacuum for a prescribed period of time. The procedure for this test is as follows:

a. All lifting holes and exterior joints shall be filled and pointed with an approved non–shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes which have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of the exfiltration leakage test.

b. All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.

c. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

d. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test begun.

e. The manhole shall pass this test if the vacuum holds at 10" Hg or drops no lower than 9" Hg within the following times:

| Depth of 4'ø Manhole | Minutes | Seconds |
|---|---|---|
| 0' – 10' | 2 | 0 |
| 10' – 15' | 2 | 30 |
| 15' – 20' | 3 | 0 |
| 20' – 25' | 3 | 30 |

f. If the vacuum drop exceeds 1" Hg during the specified time periods, the manhole shall be resealed and Steps 2 through 5 above repeated until the vacuum holds for the specified time.

g. After the manhole passes the vacuum test, it shall be backfilled carefully so that no leaks are created. If the manhole is disturbed in any way during backfill, it shall again be vacuum tested according to Steps 1 through 5 above. If the manhole fails the vacuum test, the Contractor shall test the manhole using the manhole exfiltration test.

h. The Contractor shall provide the Engineer with a written log of each manhole leakage test result.

i. Manholes shall be tested and accepted prior to building manhole inverts.

3.07 PRESSURE PIPE TESTING

A. General: All force mains shall pass the hydrostatic pressure test and leakage test described herein. Prior to testing, all anchors and braces shall be installed. All concrete thrust blocks and restraints shall be in place and cured at least seven days. All buried pipe shall be backfilled. Suitable test plugs shall be installed and air release valves shall be installed at the high points.

B. Hydrostatic Test: The following procedure shall be used:

1. All air release valves shall be opened and the pipe shall be filled with water at a rate not to exceed the venting capacity of the air release valves.

2. The water pressure shall be raised to 150 percent of the designed operating pressure or 60 psi minimum at the highest point.

3. Failure to hold the designated pressure within 5 psi of the specified test pressure for the two hour period constitutes a failure of the section tested.

C. Leakage Test: The following procedure shall be used:

1. Leakage shall be defined as the quantity of water that must be supplied into the pipe being tested to maintain pressure within 5 psi of the specified test pressure.

2. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P)^{0.5}}{7{,}400}$$

Whichever is less

$$L = \frac{SD(P)^{0.5}}{133{,}100}$$

S = Length of Pipe Testing
L = Allowable Leakage in Gal/Hr
D = Nominal Diameter of Pipe (")
P = Average Test Pressure (psi)
N = Number of Joints in the Pipeline Tested

All testing shall be conducted in accordance with AWWA C600–87 or latest revision.

3.08 PUMP STATION AND STORAGE TANK TESTING

A. Pump Station and Storage Tank Testing: All manholes and storage tanks shall be tested for leakage in accordance with the following procedure:

B. Water Test: After the structure has been assembled in place, all lifting holes and exterior joints shall be filled and pointed with non shrinking mortar. All pipes and other openings into the structure shall be suitably plugged and the plugs placed to prevent blowout.

1. Each structure shall be checked for exfiltration by filling with water to the top of the cone section. A stabilization period of one hour shall be provided to allow for absorption. At the end of this period, the structure shall be refilled to the top of the cone, if necessary, and the measuring time of at least six hours begun. At the end of the test period, the structure shall be refilled to the top of the cone measuring the volume of water added.

2. This amount shall be converted to a 24–hour rate and the leakage determined on the basis of depth and size of structure. The leakage for each structure shall not exceed one gallon per vertical foot per 15 linear feet of wall (as measured in plan view) for a 24 hour period for exfiltration and there shall be no visible infiltration.

C. Air Test: Alternatively, the manhole may be tested for leakage using the following procedure:

1. All lifting hole and exterior joints shall be filled and pointed with an approved non–shrinking mortar. The completed manhole shall not be backfilled prior to testing. Structures that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.

2. All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.

3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.

5. The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.

D. Following satisfactory test results, the manhole may be backfilled.

3.09 SERVICE CONNECTION

No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as–builts received along with GPS coordinates and approved by the Town Wastewater Department.

A. Laterals

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.

B. Cleanouts for Sewers

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

C. Chimneys

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.

3.10 Force Main

After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

3.11 Wet well

The pre–cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

PART 4 – PUMP STATION

4.00 SPARE PARTS

A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

B. Two (2) spare volute gaskets shall be provided.

C. A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.

D. Provide 100% spare lamps and fuses for control panel.

E. Provide all lubricants required for initial operation.

F. Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.

G. Provide one (1) spare level transducer.

4.01 O & M MANUALS

A. Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.

B. The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as–built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.

4.02 POLYETHYLENE (PE3408) SANITARY SEWER FORCE MAINS

A. This specification covers requirements for PE3408 high density polyethylene sanitary sewer force mains. All work shall be performed in accordance with these specifications and manufacturer requirements.

B. Referenced Standards. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

C. Warranty and Acceptance. The Contractor shall warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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DRAWN SAL
CHECKED DSM
APPROVED DSM

OWNER:
HAYSTACK CROSSING, LLC
c/o JOSEPH BISSONETTE
68 RANDALL STREET
SOUTH BURLINGTON, VT 05403

APPLICANT:
BLACKROCK CONSTRUCTION, LLC
68 RANDALL STREET
SOUTH BURLINGTON, VT 05403

PROJECT:
HAYSTACK CROSSING
SHELBURNE FALLS ROAD
VERMONT ROUTE 116
HINESBURG, VERMONT 05461

| DATE | CHECKED | REVISION |
|---|---|---|
| 11/22/19 | DSM | TOWN RESUBMITTAL |
| 1/10/20 | DSM | UPDATE PER TOWN COMMENTS |
| 3/4/22 | DSM | REV. PER CONDITIONS OF APPROVAL |

SPECIFICATIONS

DATE OCT. 4, 2019
SCALE AS SHOWN
PROJ. NO. 13127

DRAWING NUMBER C10.2