Project Name: Lucy Lane Improvement Plans – Grand Lake, CO Project Number: 23-9583 8 Pages

ITEM 10.01 SEWER PIPE

DESCRIPTION

This works consists of furnishing, and installing sewer pipe for storm and sanitary sewers and other appurtenances in accordance with these specifications, the latest revision of the American Society for Testing and Materials (ASTM) specification, and in conformity with the details, lines and grades shown on the plans or established.

Installation shall consist of excavation, shoring, laying, aligning and joining pipe, fittings, bedding and backfill, flushing, testing and other related work.

MATERIALS

- A. The Contractor shall install, sewer pipe of the type, diameter, wall thickness, and fittings as shown on the plans, and designated in the Bid Schedule.
- B. Sewer pipe and fittings shall meet and/or exceed all the requirements of the latest published specification, at the time of bid for the type of pipe and fittings used.

ASTM C 1173 "Flexible Transition Couplings for Underground Piping System".

ASTM, C 14 "Concrete Sewer, Storm Drain and Culvert Pipe

ASTM F 405-97 Corrugated Polyethylene Pipe (PE) Tubing and Fittings.

ASTM F 667-97 Large Diameter Corrugated Polyethylene Tubing and Fittings.

- ASTM C 443 "Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets".
- ASTM D 3034 "Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings" (SDR 35).
- ASTM D 679 "Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings".
- ASTM D 2729 "Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings".
- ASTM D 3212 "Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals".
- ASTM F 477 F "Elastomeric Seals (Gaskets) for joining Plastic Pipe".
- ASTM F 656 "Primers for use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fitting".
- ASTM D 3350 "Specification for Polyethylene Pipe and Fittings Materials".
- ASTM F 714 "Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on outside diameter".
- ASTM D 3261 "Specification for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing".

- C. Fittings for all Polyvinyl Chloride (PVC) pipe shall be one piece molded PVC with gasket seats molded in place.
- D. Transition couplings for Polyvinyl Chloride (PVC) pipe shall be as shown on plans.
- E. Rubber gasketed joints for concrete pipe shall be flexible and able to withstand expansion, contraction and settlement.
- F. All clamps, including the band and screw housing, shall be made from Series 300 Stainless Steel and shall be corrosion resistant and rustproof.
- G. The same manufacturer shall supply polyethylene pipe and fittings.
- H. Polyethylene fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings.
 Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.
- I. Flange adapters used with polyethylene pipe shall be made with sufficient through bore length to be clamped in a butt fusion-joining machine without the use of a subend holer. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing or to restrain the gasket against blowout.

CONSTRUCTION REQUIREMENTS

- A. Installation and testing shall conform to the latest published specification of ASTM, at the time of bid that relates to the type of pipe and fittings installed and manufacture's guides for installation.
 - ASTM C 969 "Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
 - ASTM F 1417-92 Test Method for installation Acceptance of Plastic Gravity Sewer Lines Using low-Pressure Air.
 - ASTM D 2321 "Practice for Underground Installation of Flexible Thermoplastic Pipe for Sewers and other Gravity Flow Applications:".
- B. Before commencing Work, the Contractor shall notify the proper representative of the pipe supplier or manufacturer as necessary for on-the-job instruction to the Contractor, his foreman, the Contractor's inspector and personnel in the proper methods of installation. The Contractor shall assume responsibility that these methods are strictly enforced unless otherwise specified or directed by the Engineer.
- C. When proposed sanitary sewer facilities interface with the existing flow of sewage, the Contractor shall provide satisfactory bypass facilities, at no expense to the project.
- D. At locations where the type of joint is not otherwise specified in the Contract for pipe used for joints shall be made with joint sealing compound. Primer shall be furnished when recommended by the manufacturer of the joint sealing compound. Primer shall conform and shall be applied in accordance with the manufacturer's

recommendations to both surfaces of the pipe sections being joined, for the full circumference. Sealing compound shall be applied according to the manufacturer's recommendations. When a specific type of sealing compound is desired, it shall be as shown in the Contract.

E. ONE INSPECTOR PER PIPE-LAYING CREW

1. To enable the representatives of the Engineer to oversee pipe laying and other work, in general, only one pipe-laying crew will be permitted to operate at any time under one Inspector. Thus, the number of pipe-laying crews and the number of locations at which pipe may be laid simultaneously under this Contract may be limited by the number of Inspectors assigned by the Engineer to oversee that type of work on the Contract. If the Contractor wishes to lay pipe at more than one location on a given day, or add additional pipe-laying crews, he must notify the Engineer at least two days in advance so that an adequate number of Inspectors may be assigned to the job.

F. ALIGNMENT AND GRADE

- 1. The Contract Drawings show the proposed line and grade and the location of appurtenances. The Contractor shall not deviate from the alignment unless otherwise prior approval is obtained from the Engineer. Any deviation not approved may result in the rejection of the pipeline work by the Engineer and re-installation by the Contractor at no additional cost to the project.
- 2. Whenever obstructions not shown on the Contract Drawings are encountered during the progress of the work and interfere to such an extent that an alteration in the Contract Drawings is required, the Engineer shall have the authority to change the Contract Drawings and order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstruction.
- 3. Where a modification in alignment or construction details causes no change in material quantities, additional labor, time or other associated changes, the modification is to be performed by the Contractor at no additional cost to the project.

G. HAULING AND DISTRIBUTION OF PIPE

1. Pipe, fittings, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. All pipe handling, storage and installation shall be in conformance with the manufacture's recommendations.

H. DEWATERING

1. The Contractor shall provide all necessary pumps, dams, drains, ditches, flumes, well points and other means for excluding and removing water from trenches, tunnels and other parts of the work, and for preventing the slopes from sliding or caving. Dewatering shall not create a hazard or nuisance to the public or result in damage to public or private property. Any discharge to

a natural stream may require a Discharge Permit from the Colorado Department of Health. Where necessary the Contractor shall obtain the permit and pay all costs associated with the permit. Contractor shall be reimbursed at cost for any dewatering required.

I. EXCAVATION AND BACKFILL

- 1. Trenches shall be excavated and backfilled in accordance with Item 2.06 "Excavation and Backfill for Structures". Trench width shall be sufficient to allow for proper jointing of the pipe and thorough compaction of the bedding and backfill material under and around the pipe.
- J. LOWERING OF PIPE MATERIAL INTO TRENCH
 - 1. Proper implements, tools, and facilities acceptable to the Engineer shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe materials shall be carefully lowered into the trench piece by piece by means of ropes, or other suitable tools or equipment, in such a manner as to prevent damage to water main materials, joints and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped in the trench.
 - 2. If damage occurs to any pipe or water main accessories in handling, the damage shall be immediately brought to the Engineer's attention. The Engineer shall prescribe corrective repairs or rejection of the damaged items. Damaged materials shall be promptly removed from the job site.

K. INSPECTION BEFORE INSTALLATION

- 1. All pipe barrel, bells, and connections shall be carefully examined for cracks and other defects while suspended above the trench immediately before installation in final position. Gasket materials shall be inspected for proper installation and lubrication.
- 2. In the event that a portion of a length of pipe is damaged, the damaged portion shall be cut off in an approved manner and discarded. The Contractor shall be responsible for any and all damage to material and incur the expense of repairing or replacing same. All rubber gaskets shall be stored in as cool a place as practicable, preferably at 21°C (70°F) or less. Rubber gaskets shall not be exposed to the direct sun for more than 72 hours. The Engineer shall make the final determination of pipe materials quality.
- 3. Any pipe, coupling, gasket or fittings found to be defective in workmanship or material or so damaged beyond repair shall be subject to rejection by the Engineer and shall be promptly removed from the job site.
- L. CLEANING OF PIPE JOINTS
 - 1. All dirt and debris shall be kept clear of the pipe joint during installation of the pipe. The Contractor shall cover the ends of the pipe during construction and at the end of each workday to protect the pipe joints and intrusion of dirt, debris, insects, and vermin.

- M. PIPE INSTALLATION
 - 1. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. If the pipe laying crew cannot install the pipe in place without intrusion of foreign material, the Engineer may require that a tightly woven canvas bag of suitable size be placed over each end until the connection is made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.
 - 2. As each length of pipe is placed in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. Cut pipe shall be made smooth with a suitable file. The pipe shall be secured in place with approved backfill material stamped under it except at the bells. Precautions shall be taken to prevent dirt from entering the joint space.
 - 3. Where ground water is present and at times when pipe laying is not in progress, the open ends of pipe shall be kept plugged and watertight with rubber and metal pipe stoppers, or other means approved by the Engineer. The Contractor shall have two of each size required on the job. If water is in the trench, the seal shall remain in place until the trench is completely dry.
 - 4. Where the new main is to be connected into an existing sewer main, the Contractor shall make said connections. All connections shall be made with fittings, tools, and equipment suitable for the size and pipe material to be connected. All cutting, plugging and disconnection of water mains or other similar work shall be done by the Contractor at the Contractor's expense, unless otherwise specified.
 - 5. Prior to the connection into an existing sewer main, the Contractor shall coordinate the isolation of the sewer main section with the Owner to minimize disruption of service. The Contractor shall dig observation pits at all such connections to determine exact size, location, and condition of the existing sewer main.
 - 6. HDPE Pressure Pipe installation shall be in accordance with ASTM D2321, Manufacturer's recommendations, and this specification.
- N. BELL ENDS TO FACE DIRECTION OF LAYING
 - 1. Pipe shall be laid with bell ends facing in the direction of laying, unless otherwise directed by the Engineer. The bell or groove shall point upslope in all cases. Where pipe with bells is installed, additional excavation shall be provided beneath the bell to properly bed the pipe
- O. PERMISSIBLE DEFLECTION AT JOINTS
 - 1. Wherever it is necessary to deflect the pipe alignment from a straight line in either the vertical or horizontal plane, the amount of deflection allowed shall not exceed the recommended limits for the type of joint and pipe size. Any deflection not specified on the plans, shall be approved by the Engineer. Maximum deflections shall not exceed the pipe manufacturer's

recommendations for the type of joint used. The pipe barrel shall not be bent to achieve a deflection in the alignment.

- P. PIPE JOINING PUSH-ON JOINT
 - 1. The inside wall of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, and other foreign matter. A thin film of gasket lubricant as supplied by the pipe manufacturer shall be applied according to the pipe manufacturer's recommendations. The gasket material shall be properly installed and inspected prior to joining the pipe sections.
 - 2. The spigot end of the pipe shall be entered into the socket with care used to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack-type tool or other device approved by the Engineer. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.
 - 3. The Contractor shall protect the end of the pipe where force is applied during installation. Wood blocking or other suitable material shall be utilized as approved by the Engineer. Any pipe damaged during installation shall be subject to rejection by the Engineer.
 - 4. Field cut pipe lengths shall be filed or ground to resemble the spigot end of the pipe as manufactured. Complete assembly instructions are available from the pipe manufacturer.

Q. PIPE JOINING – POLYETHYLENE PIPE

- 1. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt heat fusion, and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making the heat fusion joints have received training in the Manufacturers recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.
- 2. Heat Fusion Training Services. Upon request, the Manufacturer shall provide training in the Manufacturer's recommended butt fusion and saddle fusion procedures to the Contractor's installation personnel and to inspectors representing the Project Manager.
- 3. Butt Fusion of Unlike Wall Thickness. Butt fusion shall be performed between pipe ends, or pipe ends and fittings outlets of like outside diameter and wall thickness (SDR or DR). Butt fusion joining between like diameter but unlike wall thickness shall not be permitted. Transitions between unlike wall thicknesses shall be made with a transition nipple (anchor length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

4. POLYETHYLENE PIPE – MECHANICAL JOINGING

If allowed by the Engineer on an individual connection basis, polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with Manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

5. POLYETHYLENE PIPE BRANCH CONNECTIONS

Branch connections to the main shall be made with suitable tees.

- R. PIPELINE TESTING AND ACCEPTANCE
 - 1. CLEANING

Prior to acceptance of each sewer line, the Contractor shall remove all foreign material, which may cause interruption of flow. When excessive debris has entered or exists in the pipeline, the Engineer may require the Contractor to flush a pneumatic cleaning ball through sewers up to 24 inches in diameter. Larger sewers shall be cleaned by other appropriate methods approved by the Engineer. All dirt and debris shall be prevented from entering the active sewer system by means of watertight plugs or other approved methods.

- 2. TESTING
 - a. Infiltration and exfiltration tests shall be conducted on representative portions of the project at the expense of the Contractor. The allowable infiltration or exfiltration rate shall not exceed 50 gallons per inch of diameter per mile of pipe, per day to include manholes.
 - b. When allowed by the Engineer, the Contractor may perform air tests on the system. The Contractor shall perform tests in accordance with approved test methods and recommended Air Testing Requirements of pipe manufacture, with suitable equipment specifically designed for air testing sewers. A suitable gauge shall be used for readings not to exceed 15# maximum reading. The gauge shall be located at the surface.
 - c. Should any test on any section of pipeline fail, the Contractor shall at his own expense, locate and repair defective joints or pipe sections. After repairs are completed the lines shall be retested until leakage requirements are met.
 - d. The Engineer may require the Contractor to inspect by closed circuit television, all new public sewer lines for deficiencies prior to any

service connections being made. The Contractor shall assist in or facilitate such inspections as may be requested by the Engineer.

4. METHOD OF MEASUREMENT

A. The work will be measured for payment per linear foot of sewer pipe installed, and accepted in place, as measured along its centerline with no deduction in length through the manholes.

5. BASIS OF PAYMENT

- A. Sewer pipe will be paid for at the contract until price per linear foot installed and accepted for the size and type listed in the Bid Schedule.
- B. Excavation, shoring, backfill, bedding, compaction, dewatering, joints, elbows, concrete collars, connection bands, accessories, testing, and water will not be paid for separately, but shall be included in the work.