

TABLE OF CONTENTS

CHAPTER 8 REHABILITATION OF SEWER MAINS, LATERALS AND MANHOLES

Paragraph Number	Title	Page Number
8.01	Horizontal Directional Drilling Guidelines	8-3
	General Guidelines for Horizontal Directional Drilling	8-5
8.02	By-pass Pumping	8-6
8.03	Rehabilitation of Sanitary Sewer Mains and Services by the Pipe Bursting and Trenchless Pipe Replacement Methodologies	8-12
	Checklist for Up-grading/Replacement of Service Lines with Trenchless Technology	8-19

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CHAPTER 8

REHABILITATION OF SEWER MAINS, LATERALS AND MANHOLES

8.01 Horizontal Directional Drilling Guidelines

Horizontal Directional Drilling (HDD) applications should be installed in accordance with ASTM F1962 Standard Guide for Use of Maxi- Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacle, including River Crossings, Plastic Pipe Institute (PPI), “Polyethylene Pipe for Horizontal Directional Drilling”, and the “Horizontal Directional Drilling Consortium HDD Good Practices Guidelines Book”, published by the North American Society of Trenchless Technology (NASTT).

As described in the PPI publication, the HDD process begins with boring a small, horizontal hole (pilot hole) under the crossing obstacle (e.g. a highway) with a continuous string of steel drill rod. When the bore head and rod emerge on the opposite side of the crossing, a special cutter, called a back reamer, is attached and pulled back through the pilot hole. The reamer bores out the pilot hole so that the pipe can be pulled through. The pipe is usually pulled through from the side of the crossing opposite the drill rig.

Pilot Hole

Drilling the pilot hole establishes the path of the drill rod (“drill-path”) and subsequently the location of the PE pipe. Typically, the bore-head is tracked electronically so as to guide the hole to a pre-designed configuration. One of the key considerations in the design of the drill-path is creating as large a radius of curvature as possible within the limits of the right-of-way, thus minimizing curvature. Curvature induces bending stresses and increases the pullback load due to the capstan effect. The capstan effect is the increase in frictional drag when pulling the pipe around a curve due to a component of the pulling force acting normal to the curvature. Higher tensile stresses reduce the pipe’s collapse resistance. The drill-path normally has curvature along its vertical profile. Curvature requirements are dependent on site geometry (crossing length, required depth to provide safe cover, staging site location, etc.) But, the degree of curvature is limited by the bending radius of the drill rod and the pipe. For small size pipes the stiff drill rod usually controls the curvature and thus significant bending stresses do not occur in the pipe. The designer should minimize the number of curves and maximize their radii of curvature in the right-of-way by carefully choosing the entry and exit points.

Pilot Hole Reaming

The REAMING operation consists of using an appropriate tool to open the pilot hole to a slightly larger diameter than the carrier pipeline. The percentage oversize depends on many variables including soil types, soil stability, depth, drilling mud, borehole hydrostatic pressure, etc. Normal over-sizing may be from 120% to 150% of the carrier pipe diameter. While the over-sizing is necessary for insertion, it means that the inserted pipe will have to sustain vertical earth pressures without significant side-support from the surrounding soil.

Drilling Mud

Usually a “drilling mud” such as fluid bentonite clay is forced down the hole to stabilize the hole and remove soil cuttings. Drilling mud can be made from clay or polymers. The primary clay for drilling mud is sodium montmorillonite (bentonite). Properly ground and refined bentonite is added to fresh water to produce a “mud”. The mud reduces drilling torque, imparts lubrication to the pipe, provides annular flushing of the freshly cut borehole soil debris, and gives stability and support to the bored hole.

Drilling muds are thixotropic and thus thicken when left undisturbed after pullback. However, unless cementitious agents are added, the thickened mud is no stiffer than very soft clay. Drilling mud provides little to no soil side-support for the pipe.

Pull-Back

The pull-back operation involves pulling the entire pipeline length in one segment (usually) back through the drilling mud along the reamed-hole pathway. Proper pipe handling, cradling, bending minimization, surface inspection, and fusion welding procedures need to be followed. Axial tension force readings, constant insertion velocity, mud flow circulation/exit rates, and footage length installed should be recorded. The pullback speed ranges usually between 1 to 2 feet per minute.

Mini-Horizontal Directional Drilling

The Industry distinguishes between mini-HDD and conventional HDD, which is sometimes referred to as maxi-HDD. Mini-HDD rigs can typically handle pipes up to 10” or 12” and are used primarily for utility construction in urban areas, whereas HDD rigs are typically capable of handling pipes as large as 48”. These machines have significantly larger pullback forces ranging up to several hundred thousand pounds.

Site consideration for Horizontal Directional Drilling

Research of all utilities within the proposed construction (“zone”) area shall be completed prior to site mobilization. This information should be indicated on the proposed plan and profile drawings, per these standards (showing pothole data, existing depths and locations of utility crossings, etc.) submitted for approval by Colorado Springs Utilities.

Tracer wire shall be attached to HDPE pipe and upon pullback, conductivity must exist along the entire length of pipe (i.e. between fittings, valves, etc.) per Colorado Springs Utilities standards.

General Guidelines for Horizontal Directional Drilling

The designer will achieve the most efficient design for an application by consulting with an experienced contractor and a qualified engineer. Here are some general considerations that may help particularly in regard to site location

for PE pipes:

1. Select the crossing route to keep it to the shortest reasonable distance.
2. Find routes and sites where the pipeline can be constructed in one continuous length; or at least in long multiple segments fused together during insertion.
3. Although compound curves have been done, try to use as straight a drill path as possible.
4. Avoid entry and exit elevation differences in excess of 50 feet; both points should be as close as possible to the same elevation.
5. Locate and pothole all buried structures and utilities within 10 feet of the drill-path for mini-HDD applications and within 25 feet of the drill-path for maxi-HDD applications. Crossing lines are typically exposed for exact location.
6. Observe and avoid above-ground structures, such as power lines, which might limit the height available for construction equipment
7. As pipe diameter increases, large volumes of drilling fluids must be pumped requiring more/larger pumps and mud cleaning and storage equipment.
8. Space requirements for Maxi-HDD rigs can range from a 100 feet wide by 150 feet long entry plot for a 1000 foot crossing, up to 200 feet wide by 300 feet long area for crossing of 3000 or more feet.
9. On the pipe side of the crossing sufficient temporary space should be rented to allow fusing and joining of the polyethylene carrier pipe in a continuous string beginning about 75 feet beyond the exit point with a width of 35 to 50 feet depending on the pipe diameter. Space requirements for coiled pipe are considerably less. Large pipe sizes require larger and heavier construction equipment which need more maneuvering room (use of polyethylene minimizes this though). The initial pipe side "exit" location should be about 50' Wide x 100' Long for most crossings up to 100' Wide x 150' Long for equipment needed in large diameter crossings.
10. A set of "As-Built", "As-Constructed" drawings based on the final course followed by the reamer and the installed pipeline shall be sent to Infrastructure Records at the end of the job. The gravity forces may have caused the reamer to go slightly deeper than the pilot hole and the buoyant pipe may be resting on the crown of the reamed hole. The as-built drawings are essential to know the exact pipeline location and to avoid future third party damage.

8.02 By-pass Pumping (Reference Wastewater Construction Detail drawing C 1-9)

GENERAL

(a) Description

- A. The work covered under this section of the Standards includes furnishing all plant, labor, equipment, permits, and materials necessary to implement a temporary pumping system for the purpose of diverting existing sewer or drain flow around a work area for the duration of the project.
- B. The contractor shall field verify bypass pumping flow requirements prior to installation of bypass pumping equipment.
- C. The bypass system shall provide provisions for maintaining vehicular and pedestrian access, avoiding damage to existing trees, preventing leakage from hoses, and minimizing noise from pumps.
- D. It shall be the responsibility of the contractor to provide protection for the entire bypass system including but not limited to piping, piping connections, pumps and ancillary equipment. Materials utilized for bypass pumping shall be appropriated for use for the intended operation and service. Protection for the bypass piping shall be performed through positive protection means, including but not limited to burial. The contractor shall be responsible for any damage caused by the contractors failure to provide adequate protection to the bypass system.
- E. The contractor shall prepare an emergency response plan to be followed in the event of a spill or release of sanitary sewage during the work. This plan shall be developed to minimize the impacts of the spill or release and include containment, cleanup and rinsate collection. The contractor shall indicate the availability of the required materials and equipment for emergency response.
- F. Process: When it is identified that a wastewater by-pass pumping operation will be needed to complete the work shown on these plans a by-pass pumping plan shall be prepared by the contractor and submitted to the Utilities Wastewater Planning and Design for review and approval prior to the start of work. A copy of the by-pass pumping plan shall be on the work site at all times and shall be included in the plans sent to Pipeline Inspections.

For assistance contact the Wastewater Planning and Design: Daniel Tippie 668-8765

(b) Submittals

For the flow bypassing method(s) utilized during pipe inspection, rehabilitation or reconstruction, the contractor shall submit the following information specific for each bypass setup within 10 days prior to construction:

- 1. A detailed plan and description outlining all provisions and precautions to be taken by the contractor regarding the handling of existing pipeline flows. This plan should include schedules, locations, capacities of equipment, materials, sizing and selection data, location of nearby waterways, rinsate procedures, manufacturer catalog cut sheets and calculations and all other incidental items necessary and/or required to insure the proper protection of these facilities, including protection of the access and bypass pumping locations from

damage due to discharge flows. Drawings indicating the location of the equipment, piping layouts and pumping and discharge manholes shall be included.

2. Copy of all permits required to perform the work.
3. a. Certification of workmen trained for fusing and installing HDPE pipe, if required. The contractor shall maintain records of trained personnel, and shall certify that training was received no more than twelve (12) months before commencing construction.

b. Record that the workmen have been trained in all aspects of the By-pass pumping operation and spill response.
4. Record of measurement or verification of sanitary sewer flow rates.
5. Emergency spill or release plan, including site specific requirements.

(c) Design Requirements

Bypass pumping systems shall have sufficient capacity to pump the peak flows indicated and as verified by the contractor. It shall be the contractors responsibility to verify or measure flows and design the pumping system adequately. The contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow and temporary discharge piping to ensure than the total flow of the sewer or drain can be safely diverted around the section to be repaired. Bypass pumping systems shall be manned at all times while operating.

The contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of emergency or breakdown. One standby pump for each pump utilized, providing 100% redundancy.

The bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of the work.

The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

The contractor shall maintain sewer and drain flows around the work area in a manner that will not cause surcharging of sewers or drains, or cause damage to and will protect public and private property from damage and flooding.

The contractor shall protect water resources, wetlands and other natural resources.

(d) Responsibility for Overflows or Spills

It shall be the responsibility of the contractor to schedule and perform his work in a manner that does not cause or contribute to incidence of overflows or spills of sewage from the sewer system.

In the event that the contractor's work activities contribute to overflows or spills, the contractor shall immediately take the appropriate action to contain and stop the overflow, and notify Colorado Springs Utilities Dispatch at 719.448.4800, then the Project Engineer/Inspector. Clean up shall include rinsate collection and disinfection of the area affected by the spill.

In the event of a wastewater spill or release caused by the contractor or subcontractor, or by the negligent work performed by either as reasonably determined by Springs Utilities, Springs Utilities has the right to assess damages of five thousand dollars (\$5,000.00) per day per incident or spill, or five dollars (\$5.00) per estimated gallon of wastewater spilled or released, whichever is greater. The damages assessed will be initiated upon notification of the spill or release and continue until final cleanup of the spill or release is completed to the satisfaction of Springs Utilities. The damages assessed will be deducted from the retainage.

Assessment of environmental damages does not release the contractor from any liabilities or claims. The contractors' liability for environmental damages shall be in addition to the contractors' liability for cleanup, civil or criminal charges, third party claims and or other claims as a result of any spill or release of wastewater associated with the contractors or subcontractor or their work performed.

The contractor will indemnify and hold harmless Springs Utilities for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the contractor, including the legal, engineering and administrative expenses of the owner in defending such fines and claims.

MATERIALS

The contractor shall use High Density Polyethylene (HDPE), Aluminum, or flexible piping as approved by Colorado Springs Utilities. All piping shall have a minimum pressure rating of one hundred (100) psi, per these Wastewater Line Extension and Service Standards.

Polyethylene Plastic Pipe shall be high density solid wall polyethylene pipe and meet the applicable requirements of ASTM F714 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, ASTM D1248, ASTM D3550.

1. The pipe shall be homogenous throughout and shall be free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.
2. Dimensions Ratios: The minimum wall thickness of the polyethylene pipe shall be DIPS-SDR 17 throughout. (Based on a Working Pressure of 100 psi)

Flexible hoses and associated couplings and connectors shall be abrasion resistant suitable for the intended service and shall be rated for the external and internal loads anticipated including test pressures. External loading design shall incorporate all anticipated traffic loadings, including traffic impact loading.

1. At a minimum, hose subject to traffic loading shall be composed of a system, such as traffic ramps or covers, but not limited to, capable to withstanding H-20 loading criteria. System shall be installed and maintained to meet H-20 loading requirements while in use or as directed by Springs Utilities.

Delivery, Storage and Handling

Transportation, handling, and storage of the polyethylene pipe and fittings shall be as recommended by the manufacturer. If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Inspector at the contractor's expense, before proceeding further. Deliver, store and handle other materials as required to prevent damage.

EXECUTION

(a) Preparation

- A. The contractor is responsible for locating any existing utilities in the area that the contractor selects to locate bypass pipelines. The contractor shall locate bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the owner. The contractor is responsible for all costs associated with relocating utilities and obtaining permits.
- B. The contractor shall protect existing facilities from damage, during pumping activities.

(b) Installation - General

Plugging or blocking of flows shall incorporate a primary and secondary plugging device. All plugs shall be labeled with the contractor's name. When plugging is no longer required for performance of the work, it is to be removed in a manner that permits flows to slowly return to normal without surge, surcharge or other major disturbance. All plugs using air pressure shall have monitoring gages at the surface so that they can be visually monitored at all times.

The installation of bypass piping is prohibited in all wetland areas. The pipeline must be located off streets and sidewalks. Where bypass piping crosses streets, driveways, sidewalks and/or other public ways, the contractor must place provisions to permit normal pedestrian and vehicular traffic reasonable access to concourses.

Bypass piping to be installed for a period of greater than five working days shall be placed in trenches and covered with temporary pavement or metal traffic covers. Upon completion of the bypass pumping operations, the contractor shall remove all piping, restore all property to pre-construction condition and restore all pavement. The contractor is responsible for obtaining any permits and/or permission for placement of the temporary pipeline within public and private ways.

The contractor shall not divert flow to new sewer or manhole prior to completion and acceptance of the work, unless approved by Colorado Springs Utilities.

(c) HDPE Piping

The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint in strict accordance with the manufacturer's instructions and ASTM D 2657. Threaded or solvent-cement joints and connections are not permitted.

All equipment and procedures used shall be used in strict compliance with the manufacturer's instructions and recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment.

The butt-fused joint shall be true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe.

All joints shall be subject to acceptance by Colorado Springs Utilities prior to insertion. Defective areas of the pipe shall be cut out and the joint fused in accordance with the procedures stated above. Trial fusion tests of the pipe shall be performed as directed by Colorado Springs Utilities. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be twelve (12") inches (min) or thirty (30) times the wall thickness in length with the fusion in the center, and one (1") inch (min) or one-half (1.5) times the wall thickness in width. The contractor shall bend the test strap until the ends of the strap touch. If the fusion fails at the joint, the contractor shall perform a new trial fusion to be cooled completely and tested. The contractor shall not commence installation of pipe until a trial fusion has passed the bent strap test

Any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by Colorado Springs Utilities and/or his representative shall be discarded and not used.

HYDROSTATIC PRESSURE TEST

1. Each bypass pumping system setup shall be hydrostatically tested using potable water prior to use. Unless otherwise indicated, water for testing bypass pipelines shall be furnished by the Owner; however, the Contractor shall obtain all required permits and shall make all necessary provisions for conveying the water from the Owner – designated source to the point of use.
2. The bypass system shall be equipped with air release valves and filled at a rate which will not cause any surges or exceed the rate at which air can be released through the air valves. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling. Once the system has been successfully filled and all air purged, the piping system exclusive of the pump(s) shall be pressurized to 150% of the calculated working pressure, or 40 psi, whichever is greater, measured at the lowest point along the alignment, and hydrostatically tested for a minimum of 30 minutes.
3. During the test, the entire system shall be visually inspected for leaks and monitored for pressure drop. Any leaks encountered shall be repaired at the contractors cost, and the hydrostatic pressure test restarted until the system successfully passes the test. Potable water used during the test shall be discharged to the sanitary sewer system at a controlled rate to minimize surcharging of the collection system.

(a) Cleanup and bypass removal

Prior to dismantling the bypass system, the Contractor shall remove all sewage from the bypass piping system using pipeline pigs, flushing with water, and then to be discharged into the sanitary sewer system at a controlled rate to minimize surcharging of the collection system, or by other methods approved by Colorado Springs Utilities.

8.03 Rehabilitation of Sanitary Sewer Mains and Services by the Pipe Bursting and Trenchless Pipe Replacement Methodologies

It is the intent of this specification to define the approved methods and materials for trenchless rehabilitation of existing sanitary sewer mains and services by the Pipe Bursting and Trenchless pipe replacement method.

These standards shall be for rehabilitating sanitary sewer mains and laterals by the pipe bursting process. The work covered in this section includes materials, tools, equipment, and required incidentals and performing all operations in connection with the complete rehabilitation of the existing deteriorated sanitary sewer system piping.

The Pipe Bursting and Trenchless Pipe Replacement process is defined as the reconstruction of sanitary sewer pipe by the bursting of the host pipe and inserting new High Density Polyethylene (HDPE) Pipe of specified size and SDR. The High Density Polyethylene Pipe shall extend the full length of the existing pipe to be replaced and shall provide a structurally sound, impermeable, jointless pipe.

The Contractor shall complete all work in strict accordance with all applicable current OSHA standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the Contractor's responsibility to comply with OSHA Standards and Regulations pertaining to all aspects of the work.

- (a) The contractor shall be certified by the pipe bursting system patent owner, that such a company is a fully trained and licensed user of the pipe bursting system. The contractor is to provide documentation that they are fully trained certified and licensed user of the pipe bursting system.
- (b) Polyethylene pipe jointing shall be performed by personnel trained in the use of butt-fusion equipment and recommended methods for new pipe connections. Personnel directly involved with installing the new pipe shall receive training in the proper methods for handling and installing he polyethylene pipe. A qualified representative in polyethylene pipe methods shall perform training.
- (c) The contractor shall hold Springs Utilities harmless in any legal action resulting from patent infringements.

When required for acceptable completion of the pipe rehabilitation or replacement, the Contractor shall provide by-pass pumping (as described above and with reference to Wastewater Construction drawing C 1-9) for continuous sewage flow around the section(s) of pipe designated for the installation of replacement pipe. The pump by-pass lines shall be of adequate capacity and size to handle the flow in accordance with the "Line Extension and Service Standards"- Wastewater specifications.

Materials:

A. General:

High-density polyethylene pipe in accordance with Wastewater Line Extension and Service Standards, Chapter 5, shall be used in pipe bursting or trenchless pipe replacement installations. All piping system components shall be the products of one manufacturer and shall conform to the latest edition of ASTM D1248, ASTM D2837, ASTM D3350, and ASTM F714. Any variance to these standards shall be approved by Colorado Springs Utilities.

B. Piping and Bends:

Piping and Bends shall be extruded from the same polyethylene compound and shall conform to the following requirements:

1. The Polyethylene resin shall meet or exceed the requirements of ASTM D3350 for PE 3408 material with a cell classification of 335434C, or better.
2. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black, well dispersed by pre-compounding in a concentration of not less than 2 percent.
3. The maximum allowable hoop stress shall be 800 psi at 73.4 degrees F.
4. The pipe manufacturer shall be listed with the Plastic Pipe Institute as meeting the recipe and mixing requirements of the resin manufacturer for the resin used to manufacture the pipe in this project.
5. The pipe and bends shall have a minimum standard dimension ratio (SDR17) wall thickness as specified by these Wastewater Line Extension and Service Standards. Any variance from these Wastewater Line Extension and Service Standards is with written approval of Colorado Springs Utilities, Water and Wastewater Standards.
6. Joining shall be performed by thermal butt-fusion in accordance with the manufacturer's recommendation.
7. Sanitary sewer pipe exterior shall have a green striping color. Sanitary sewer pipe interior shall be light in color for internal video inspection.
8. For a list of Colorado Springs Utilities approved manufactures, reference Chapter 5 of the Wastewater Line Extension and Service Standards.

C. Procedures:

1. General:

All polyethylene pipes shall be cut, fabricated, and installed in strict conformance with the pipe manufacturer's recommendations. Joining, laying, and pulling of polyethylene pipe shall be accomplished by personnel experienced in working with polyethylene pipe.

2. Transportation:

Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged.

3. Storage:

Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects, which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature condition. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.

4. Handling Pipe:

The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Rope, fabric, or rubber-protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at butt-fused joints. Sections of the pipes with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.

The open ends of all sections of joined and /or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section.

Waterproof caps of approved design may be used but they shall be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and will be fastened to the pipe in such a manner that the wind cannot blow them loose.

Where possible, the pipe shall be raised and supported at a suitable distance back from the open end such that the open end will be below the level of the pipe at the point of support.

Construction Procedures

A. General:

The following construction procedures shall be performed as a minimum. Additional procedures shall be performed to accommodate actual conditions. The general procedure shall include but not limited to the following.

1. Hydraulically clean existing piping.
2. Video inspection of existing piping and locate existing laterals.
3. Perform point repairs, where applicable.
4. Perform Pipe Bursting process.
5. Perform air test, if necessary.
6. Reconnect existing active laterals.
7. Video inspection of rehabilitated pipe.

B. Pre-installation:

The following pre-installation procedures shall be completed, per NASSCO standards as a minimum.

1. Cleaning Existing Piping:

Existing piping scheduled to be rehabilitated/replacement shall be hydraulically cleaned prior to video taping.

2. Video Inspection:

A video (television) internal inspection of the cleaned existing piping shall be performed to assure that the piping is clean and conditions acceptable for pipe bursting. Prior to beginning the project, the contractor shall submit one (1) video tape of the internal piping to Colorado Springs Utilities for review and another one (1) once the contract is complete for record purposes. All videos shall be of good quality and shall include good sound quality; identification of the area videoed to include cross streets reference, addresses, time and date. (where necessary) Each video shall be marked with the name and number of the contract, name of contractor, description and location of view. Bypass pumping and piping shall be performed by the Contractor when required to adequately view the existing piping conditions (see section above). All internal video inspection shall be performed in accordance with these "Line Extension and Service Standards"- Wastewater specifications.

3. Line Obstructions/ Point Repairs:

Point repairs or obstruction removals shall be performed by the contractor where video (television) inspections reveal heavy solids, dropped joints, sags in lines, or collapsed pipe, that cannot be removed by conventional sewer cleaning equipment and prevent completion of the pipe bursting process. Point repairs shall be performed in accordance with applicable sections of these "Line Extension and Service Standards"- Wastewater specifications, under the supervision of Colorado Springs Utilities.

C. Pipe Bursting and Trenchless Pipe Replacement Installation:

(Reference Wastewater Construction Detail drawing C 1-10)

The Contractor shall submit a detailed description of the proposed techniques and procedures for rehabilitating the existing piping. The Contractor shall submit details to the Engineer for approval prior to beginning work. The format shall generally conform to the following:

(a) Excavate Service Connections:

All active service connections shall be excavated to allow for reconnection once the replacement pipe is installed.

(b) Guidance System:

The Pipe Bursting and Trenchless Pipe Replacement guidance system shall be inserted into the existing hose pipe through the entire section of pipe to be rehabilitated/ replaced.

(c) Insertion:

Once the guidance system is installed, the new HDPE pipe and the pipe bursting and trenchless pipe replacement equipment shall be attached to the guidance system and then pulled back through the existing host pipe. A tracer wire is to be connected to the new pipe.

(d) Finished Pipe:

The finished replacement pipe shall be continuous over the entire length from manhole to manhole and be free from visual defects such as foreign inclusions, dry spots, pinholes, bellies, wrinkles and other deformities. The replacement pipe passing through or terminating in a manhole shall be carefully cut out in a shape and manner approved by the Engineer. The invert and benches shall be streamlined and improved for smooth flow. The replacement pipe shall also meet the leakage requirements of pressure testing as specified. Any defect which will affect the integrity or strength of the pipe discovered during the warranty period shall be repaired at the Contractor's expense.

Construction Methods

A. Sealing and Benches in Manhole:

The replacement pipe shall be installed with a tight fitting seal with the existing manholes to prevent inflow and infiltration. The top half of the pipe within the manhole shall be neatly cut off and not broken or sheared off, at least four inches away from the manhole walls. The channel in the manhole shall be a smooth continuation of the pipe(s) and shall be merged with other lines or channels, if any. Channel cross-section shall be U-shaped with a minimum height to springline of pipe diameter for eight (8") inch, and two (2") inch above springline for 10" dia. pipe and larger (Reference detail drawing C 6-1). The replacement pipe in the manhole shall be sealed and tested as specified above before proceeding on to the next manhole section and all manholes shall be individually inspected for replacement pipe cut-offs, benches and sealing works.

B. Service Reconnections: (To be read in conjunction with checklist, end of chapter)

The exact location and number of service connections shall be determined from videotapes and/or in the field. It shall be the Contractor's responsibilities to accurately field locate all existing service connections whether in service or not. The Contractor shall reconnect all service connections to the replacement pipe including those from unoccupied, abandoned, or vacant lots, unless directed otherwise by Colorado Springs Utilities Inspector. The Contractor shall be responsible for restoring/ correcting, without any delay, all missed or faulty reconnections, as well as for any damage caused to property owners for not reconnecting the services soon enough or for not giving notice to the owners. All services, which are reconnected to replacement pipe, shall be shown on the "As Built, As Constructed Drawings" with the exact distance from the nearest downstream manhole.

1. All existing service connections shall be excavated at the exact location as exposed.
2. A pre-fabricated polyethylene saddle or electro-fusion coupling with Colorado Springs Utilities approved equal fitting shall be installed over the cut out/connection to the sanitary sewer main. The saddle shall be a one-piece saddle equipped with a neoprene gasket so

that a complete seal is accomplished when the strap-on saddle is tightened with two (2) stainless steel bands, one on each side. The stub-out attached to the saddle must protrude into the HDPE pipe a distance equal to the wall thickness of the liner. The new lateral shall be connected to the existing service line by a rubber coupling with stainless steel bands, per Colorado Springs Utilities Wastewater Line Extension and Service Standards.

3. The flexible coupling shall be secured to the existing service lateral and new stub and / or stack with stainless steel bands. The entire exposed service connection shall be encased in cement stabilized sand a minimum of 6” below and 12” above and on the sides of the pipe. The service connections shall be tested by the Contractor and approved by Colorado Springs Utilities Inspector before backfilling.
4. A service reconnection by excavation shall consist of the removal and replacement of any cracked, offset, or leaking existing service line up to a distance of eight feet (8 ft.) from the center of the new liner measured horizontally. Eight (8) inch diameter services shall be connected to the lined sanitary sewer main by the construction of a new manhole.

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**Checklist for Up-grading/Replacement of Service Lines
with Trenchless Technology.**

Address of Work Area _____

City _____ State _____ Zip _____

Contractor _____

Sub-Contractor (if required) _____

Permit Number _____ Date Issued _____

Detailed site service plans for up-grading/replacement service lines for trenchless technology applications shall be prepared in accordance with the requirements of these standards and shall be approved by Colorado Springs Utilities prior to start of construction. All wastewater permit charges due must be paid before repair or alteration are made. (Information on the Tariff sheets is located on Colorado Springs Utilities web site under **Customer Service → Rates and Regulations → Tariffs - 33. Wastewater Permit Fee.** (City Code 12.5.410 C: Service line; Maintenance of:)

Trenchless technology. Boring, micro tunneling, lining of service pipelines, requires prior approval by Colorado Springs Utilities. The contractor shall be responsible for the construction and installation of the service line to ensure that the line has no high or low sections within the line. The contractor shall be responsible to repair any deficiency found during inspection, before approval is granted by Colorado Springs Utilities.

Administration (To be submitted to Colorado Springs Utilities Planning and Engineering - Wastewater for approval)

1. Pre-construction video of existing service line
2. Copy of existing site survey drawing, showing existing features existing service and connection to main, inverts of main and building connection (per Colorado Springs Utilities Wastewater Line Extension and Service Standards). Label existing and proposed utilities crossing proposed sanitary sewer and water line, i.e. gas, electric and storm drain
3. Proposed site improvement including pipe material, grade and clean-outs
4. Specification of proposed method to be used (approved by Colorado Springs Utilities, Planning and Engineering -Wastewater).
5. Type of existing/proposed pipe material (i.e. DIP, PVC, etc.) grade, diameter of pipe.
6. Soils report (if necessary)
7. Proposed timetable of site repair/replacement work.
8. Approved signature block from Colorado Springs Utilities on proposed site plan.

<hr style="border: none; border-top: 1px solid black; margin-bottom: 5px;"/> <div style="display: flex; justify-content: space-between;">SignatureDate</div> <p style="text-align: center;">Colorado Springs Utilities</p>
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Site Work

1. Coordinate with Colorado Springs Utilities Inspector to be on site during repair/replacement work.
2. New (plastic) pipe shall be installed with tracer wire.
3. New clean-outs shall be installed at 100’ intervals (if required)
4. Main line connection to be inspected by Colorado Springs Utilities Inspector. At no time shall the liner or pipe extend into the utilities main sewer line at the connection point.

As Built Drawing and Report

1. “As-built” to be on record with Infrastructures Records with all approvals.
2. Post construction color video of new service line. (Color shows defects in pipe)
3. Signature of Site Inspector, once work has been inspected and completed.

Site Inspector Signature	Date
Colorado Springs Utilities	