# SECTION 02531
## LINE STOPS/BYPASS ON SANITARY SEWER FORCE MAIN SYSTEMS

**1.0 GENERAL**

1.1 Description of Work

A. The Contractor shall furnish all labor, supervision, material (except as herein provided), tools, equipment, supplies, and services; and, shall perform all Work necessary for the installation of line stopping fittings and equipment and bypass piping on HRSD sanitary sewer force main systems as indicated in the Contract Documents. Contractors shall utilize a qualified Line Stop subcontractor. Contractors shall not self-perform line stops.

1.2 Qualifications

A. Refer to Article 3 – Qualifications of Bidders of "Section 00200 - Instructions to Bidders".

1.3 Submittals

Submittals shall be made by the Contractor in accordance with the procedures set forth in "Section 01340 – Submittals" and as described below:

A. Documentation of Experience/Qualifications: Refer to Article 3 – Qualifications of Bidders of "Section 00200 - Instructions to Bidders".

B. Calculations – Submit velocity and head loss calculations for proposed line stop/bypass configuration based on flow/pressure data furnished by the Owner. Total head loss shall between line stop units shall include losses through the tapping sleeve, plugging head, line stop housing unit, all bends and fittings, and the bypass piping.

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C. Measurements: Submit all field measurements taken to verify pipe outside and inside diameter, wall thickness, etc.

D. Manufacturer's catalog cuts, technical data, operation and maintenance data, and/or shop Contract Documents are required for the following components (shop drawings shall be drawn to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work):

1. Sketches and drawings of line stop equipment including dimensions and weights
2. Field sketch of line stop locations based on exploratory excavation
3. Written procedure for installing and operating line stop equipment
4. Tapping fittings
5. Completion plug
6. Coatings for completion plug and flange
7. HDPE bypass piping and fittings
8. Automatic air vents
9. Section view of line stop equipment showing folding plugger engaged in stop position

**2.0 PRODUCTS**

2.1 Line Stop Fittings

A. General: Stopper head, line stop fitting, completion plug, and blind flange shall be pressure rated at 150 PSI. All line stop equipment shall be suited for vacuum conditions.

B. Stopple insertion head gaskets: Contractor must have, at their disposal numerous size stopple cups/gaskets in ¼" increments. Contractor will be required to bring a minimum of three (3) stopple cups/gaskets to the job site: One (1) will be of a size that is anticipated to fit the inside diameter of the pipe, the other two (2) will be ¼" larger and ¼" smaller than that size. Contractor must have the ability to obtain any size stopple cup/gasket within 24 hours of tapping the pipe. Contractor shall submit stopple head gasket material, size and etc for Owner/Engineer review and approval. Field modifications to the stopple gasket will be prohibited without detailed written explanation of proposed modification and approval of HRSD.

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C. After completion of fabrication, all fittings shall be coated both internally and externally with a heavy coat of corrosion resistant metal primer of fusion bonded epoxy coating per AWWA C-213.

D. Tapping Fittings for Concrete Cylinder Pipe

1. The tapping sleeve shall be manufactured in three (3) sections and have a separate gland which permits the installation of the sleeve prior to cutting of the pre-stressing wires. The lower half of the tapping sleeve shall have multiple straps that are contoured to the outside pipe diameter and will bolt the top half of the sleeve that has also been contoured to the outside diameter of the pipe. The top half will be provided with foam outer seals, two (2) grout outlet horns and an outer neck flange assembly. The third component shall consist of the inner neck flange assembly that is provided with a contoured elastomeric ring neck seal and terminating in a locking flange to permit recovery of the temporary control valve under pressure at the completion of the project.

2. Tapping Saddle Body: The tapping saddle body shall be ASTM-283 Grade C or ASTM A-36 steel. The back portion of the saddle shall use support straps that draw the saddle plate to the pipe surface in a uniform manner. Straps will be manufactured from rolled steel in accordance with ASTM A-36.

3. Outer Neck Assembly and Bottom Draw Flange: The outer neck assembly that is connected to the upper saddle plate shall be ASTM-283 Grade C or ASTM A-36 steel. The bottom draw flange shall be in accordance with AWWA C-207-B minimum thickness and shall mate to the top draw flange of the inner neck assembly. Flange material shall be ASTM-283 Grade C or ASTM A-36.

4. Inner neck assembly will be manufactured from ASTM A-283 Grade C or ASTM A-36 steel. The interior of the inner neck assembly shall be factory coated with cement mortar or a minimum of 15 mils of epoxy paint in accordance with AWWA C-213. The inner neck assembly shall be fabricated having two flanges: a top draw flange facing downward and a tapping flange facing upward. The top draw flange will mate to the outer neck assembly bottom draw flange. A pressure plate (ASTM A-283 Grade C) shall be gusseted to the top draw flange. The tapping flange used to connect the temporary control valve will be fitted at the factory with a completion plug flange.

5. The gasket for sealing to the gland-nozzle assembly to pipe's steel cylinder shall have a broad flat sealing surface. Gasket material shall be Buna-N with a Shore A durometer range between 50-70.

6. The inner neck flange will be provided from the factory, with an internal locking mechanism that permits recovery of the temporary control valve used in hot tapping/stopping process upon project termination.

7. Fasteners: All external bolting, studs and nuts that shall become a permanent part of the fitting installation shall be corrosion resistant, high strength, low alloy (AWWA C-111, ANSI 21.111).

E. Tapping Fittings for Reinforced Concrete Pipe/Ductile Iron/Cast Iron/Asbestos Cement Pipe

1. All tapping saddles will be two-piece, made with full front and back. Steel run sections will conform to and re-enforce the existing pipe. All steel for saddles will conform to ASTM A-283 Grade C or ASTM A-36 steel. Saddles will have a recess for installation of a Buna-N rubber gasket around the hot tapping outlet. All bolts will be corrosion resistant alloy material (per AWWA C-111, ANSI 21.11). There shall be a ¾" test outlet placed into the nozzle branch outlet, at the factory for site pressure testing, after saddle has been installed. Plug threads shall be coated to prevent galling.

2. Tapping saddle body shall be ASTM A-283 Grade C or ASTM A-36 steel. Saddle plate thickness shall be in accordance with the design criteria for the entire fitting. A minimum wall thickness for saddle plates shall be 0.375". All welding of materials shall be in accordance with applicable code standards. Saddle plates shall be designed to permit longitudinal bolting of the top and bottom halves around the pipe.

3. Nozzles attached to the saddle plates and used for hot tapping shall be constructed of A-106 Grade B steel or ASTM A-283 or A-36 steel. Nozzle thickness will be as a minimum standard steel pipe wall thickness (0.250").

4. Fasteners: All external bolting, studs and nuts that shall become a permanent part of the fitting installation shall be corrosion resistant, high strength, low alloy (AWWA C-111, ANSI 21.111).

F. Line Stop Housing

1. For instances where the bypass is proposed through the line stop housing, the use of any type of flow-through style strainer that is placed into the flow path once the folding plugger is extended into its stopped position will not be permitted.

2.2 Completion Plugs:

A. All flanges used for line plugging will be manufactured from ASTM-A-105 grade or equal and shall be machined to accept completion plug.
B. The completion plug shall be manufactured from carbon steel plate in accordance with ASTM A-36 with circumferential groove to contain a compressible "O" ring to seal pressure tight against the bore of the flange. Completion plug locking mechanisms shall consist of ring segments or steel leaves that lock from or into the flange bore. Set screw style locking mechanisms that tighten against wedges set against the completion plug and have removable thread inserts within the tapping fitting flange are also acceptable. Set screws set directly against completion plugs and/or without removable thread inserts within the tapping fitting flange will NOT be acceptable.
C. Blind flanges for mating with line plugging flanges shall be in accordance with ASTM A-181 or ASTM A-105 grade steel. Minimum thickness shall be AWWA C-207, Class D.
D. Flange gaskets shall be of non-asbestos composition and will be designed to mate to the inner bore and inner bolt circle of the line plugging flange. All gaskets will be at least 0.125" minimum thickness.

2.3 Temporary Bypass Piping:

A. Bypass piping shall be watertight HDPE pipe joined by butt-fusion method in strict accordance with the manufacturer's recommendations.
B. Bypass piping shall be DR 17 minimum HDPE piping.
C. Approximate location of the bypass piping is shown on the plans. The exact location of the bypass piping shall be determined by the Contractor following field investigations.
D. An automatic 2-inch air vent shall be placed on the bypass piping at any localized high points to vent air during start-up and operation.
E. The bypass piping shall include a tee and branch valve for controlled dewatering of residual sewage after the bypass piping is taken out of service.
F. In-line isolation valves shall be provided on the bypass piping at each line stop location.

## 3.0 EXECUTION

3.1 Line Stop Installation Requirements

A. Refer to Specification Sections "01040 – Coordination" and "01520-Maintenance of Pipeline and Pumping Operations" for meeting and coordination requirements.

B. Prior to starting any work related to the line stops, the Contractor shall perform explorations on the existing force main pipe to determine joint locations and the locations for the line stops. A sketch of the field verified information shall be included in the shop drawings. The Contractor shall locate the proposed line stop such that there is a minimum of one (1) full stick of pipe between the line stop and the force main connection point.

C. If other utilities or obstructions encroach the line stop fitting zone, the Contractor shall notify the company performing the line stop for exact clearance required for drilling, plugging and completion machines.

D. The length of pipe receiving the line stop fitting must be completely free and clear of corporation stops, air release valves, joints or any other irregularities that would prevent the installation of the line stop fitting.

E. The line stop fitting shall be tested after being installed before the final concrete collar is poured around the force main.

1. Coordinate with Owner and Owner's Representative for allowable test pressure.
2. Allowable leakage shall be zero and test duration shall be one (1) hour.
3. The line stop fitting shall be tested and accepted prior to tapping the force main. The pressure test shall be performed in the presence of the Owner's representative.

F. For the initial installation and pressure equalization of the line stops, if necessary, the Contractor is permitted to tap a section of the existing force main that is to be abandoned. Additional taps of the new or existing force main that is to remain in service will not be permitted.

G. The line stop unit shall be equipped with a pressure gauge to monitor line pressures on the active side of the force main for the duration of the line stop.

H. Modification to the line stop assembly (Stopplehead, Cup, tower, etc) after the initial insertion shall be submitted and approved by HRSD or Engineer before completing any modification.

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I. Insertion of the line stops shall be coordinated with HRSD staff. After any failed attempt to stop flow, the contractor shall provide HRSD and the engineer with a written action plan for review and approval.

1. Action plan consists of, but is not limited to the following:
   i. Reason for failed stop
   ii. Modification and/or adjustments to be completed
   ~~G.~~iii. Contingency, work flow, alarming, and timeline adjustments

~~H.~~J. Once line stops are inserted, the Contractor shall work continuously until connections are made and service is returned to the force main.

~~I.~~K. A completion plug and blind flange shall be installed on the line stop fitting (on the force main that is to remain in service) prior to backfilling.

~~J.~~L. GPS coordinates of the center of the blind flange shall be obtained by the Contractor and recorded on the Record Drawings and Valve Guides.

3.2 Concrete Support/Reaction Blocking Requirements

A. The shear key floor, concrete support blocking, and reaction blocking are provided as a means of thrust restraint and support of the line stop fitting, valves, equipment, etc. The Contractor shall use care at all times when performing work on or near the HRSD force main to prevent differential settlement, excessive loading, etc., which may damage the force main.

B. Line stop Blocking Basis of Design: Operating Pressure = ~~30~~ XX **PSI**. *{to be confirmed by Engineer}*

C. All concrete shall be air entrained. High early strength, VDOT Class A3 (minimum). The Contractor is to prepare test cylinders and provide certified testing to ensure the required compressive strength is reached prior to mounting the tapping machine and line stop equipment.

D. Thrust surface area of floor is based upon bearing against undisturbed soil of 1,500 PSF minimum bearing strength. Contractor shall verify actual soil conditions and increase bearing surface area as required. Reduction of the bearing surface area will not be permitted.

E. All exposed joints of the force main must be supported with concrete support piers.

F. Concrete support and reaction blocking for line stop fitting shall be poured immediately after pressure test of assembled line stop fitting. Blocking must engage shear keys in concrete floor. Top of blocking shall be poured to cover the top of the line stop fitting where possible and not encroach onto lower bolts of the gate valve.

G. The Contractor shall utilize straps instead of chains, cables, or unpadded forks to handle pipe.

3.3 Bypass Piping Installation Requirements

A. Prior to connecting bypass piping to line stop housing, bypass piping shall be tested at ~~50~~ XX PSI.

B. The Contractor shall provide a means for minimizing pipe movement during pressurization and operation.

C. Test pressure shall be applied to the bypass piping for three (3) hours to allow for initial expansion of the pipe. After three (3) hours, reduce initial test pressure by 10% and monitor pressure for one (1)

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Are we basing this off of what happened with Rangeline? Need explanation/discussion with other line stop companies on multiple insertions.
What is the current industry standard on number of insertion tries before making modification/adjustment.

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hour. If the test pressure remains steady (to within 5% of target value) for one (1) hour, no leakage is indicated.

END OF SECTION