

Section 29 - Rehabilitation of Sanitary Sewer Systems

A. Introduction –In this section, information is presented on processes for rehabilitation projects. Separate sections are also included on cleaning, closed-circuit television (CCTV), diversion pumping, and general items, which apply to most rehabilitation projects. The FIRM shall also be familiar with the *HRPDC Regional Construction Standards* latest edition for the sanitary sewer system rehabilitation means and methods.

B. General Evaluation Criteria

1. The FIRM shall consider and evaluate all appropriate technologies including conventional techniques in the preliminary engineering report (PER) stage.
2. When sizing new piping or bypass systems, the FIRM should seek input from the HRSD Project Manager who will contact appropriate personnel. HRSD has numerous resources available to aid in development of design calculations including both modeled and metered data. If HRSD does not have flow monitoring data, flow monitoring data collection should be considered to determine bypass sizing.
3. Evaluate carefully the special features of existing lines to be rehabilitated (i.e. concrete pipe cradles, previous repair history, etc.) that may have a strong bearing on the techniques or processes recommended.
4. Evaluate potable water needs and availability for installation and testing.
5. Consider space required for installation equipment.
6. Require final acceptance leakage testing or other approved method to verify deflection and minimum internal diameter requirements as applicable to rehabilitation method.
7. Evaluate effect of ground water infiltration on methods proposed.

C. Sanitary Sewer System Rehabilitation

1. Cleaning – All gravity sewers must be cleaned before any rehabilitation process can be utilized. The following items should be considered and specified in cleaning.
 - a. Estimate the amount of material that needs to be removed from the line.
 - b. Outline or require the Contractor to submit a detailed procedure for removal of obstructions and capturing any loose material removed when cleaning pipe and structures such as manholes and wet wells.
 - c. Consider where and how the cleaned material will be disposed.

- d. Consider the need to build sediment traps to capture grit or the requirement for diversion pumping during cleaning operations.
 - e. Require close communication with HRSD and locality stakeholders who will be impacted by cleaning or lining operations.
 - f. Consider structural integrity of pipe to be cleaned before choosing method of cleaning.
2. Closed-Circuit Television Video (CCTV) – CCTV inspection is required for all rehabilitation projects. HRSD generally has a pre-design CCTV of each proposed project. Require the following minimum requirements for performing CCTV.
- a. Require videos immediately following cleaning and at the completion of the project. If lining is not installed immediately after cleaning, the pipe shall be inspected immediately prior to installation of liner with additional cleaning as required. Evaluate laterals and other points of concern per NASSCO requirements.
 - b. Specify the maximum amount of water in the pipe when CCTV is performed. Determine if diversion pumping is required or alternate water removal/inspection method.
 - c. Recommend that the FIRM be present during the CCTV process. Specify that Contractor shall complete the post-CCTV of each section and receive FIRM approval prior to moving to the next section.
 - d. NASSCO PACP, MACP and LACP shall be adhered to for the coding and reporting of any defects encountered during CCTV operations.
3. Diversion Pumping
- a. HRSD will provide the maximum flows and average flows to be handled by diversion pumping. For low flow collection systems as determined by HRSD, exceptions to the requirements of master specification section 01520 – Maintenance of Pipeline and Pumping Operations will be considered.
 - b. Specify the maximum dB limits for the diversion pumping equipment.
 - c. No leaking is allowed on diversion piping or pumping equipment.
 - d. Maintain sewer service to all customers along the line.
 - e. Consider routing for diversion pipe during the PER or design phase. This should typically include approval from the locality where the work is taking place, as well as identification of private property needs.

4. Gravity Sewer Rehabilitation – The following methods have been used or considered by HRSD. Other methods may be considered as appropriate in this rapidly changing market. During the PER phase of design the FIRM shall evaluate rehabilitation methods for suitability and shall perform pipeline assessment certification program (PACP), manhole assessment certification program (MACP) and/or lateral assessment certification program (LACP) inspections on the proposed sections of gravity pipeline designated for rehabilitation in accordance with National Associations of Sewer Service Companies (NASSCO) guidelines.

a. Cured In Place Pipe (CIPP)

- i. The FIRM shall specify minimum liner thickness. The minimum may be different for different CIPP processes.
- ii. CIPP shall be designed based on the assumption the host pipe is fully deteriorated.
- iii. Determine if material samples are required for post-cure testing. If so, determine how samples will be obtained.
- iv. Provide performance specification for the liners. Require a Professional Engineer, licensed in the Commonwealth of Virginia, to seal the liner structural design.
- v. Utilize existing standards such as ASTM, NASTT, NASSCO, PRC, etc. wherever applicable.
- vi. Require verification tickets for each liner section installed. Each ticket should include resin manufacturer and type, time and date of wet-out and other critical information.
- vii. Provide a water tight seal between the liner and the existing pipe at the manhole.
- viii. Rework the flow line through the manhole to account for the thickness of the liner.
- ix. Require that all water / wastewater be removed from pipe prior to and during installation of liner.
- x. Require that all inflow into pipe (groundwater, laterals and side lines) shall be stopped prior to installation of liner.
- xi. Require that diversion pumping system be activated and flow removed from pipe during cleaning and CCTV inspection.

- xii. Require a detailed submittal from the contractor that provides design assumptions, calculation, material properties, and proposed installation approach.
 - xiii. Continuous temperature monitoring system (Zia Systems or approved equal) and a redundant temperature monitoring system such as thermocouples, shall be utilized as an additional QA/QC measure during the curing process.
 - xiv. Require final submittal of all temperature data.
 - xv. Require inspection to be performed by an ITCP (Inspector Training and Certification Program) CIPP certified inspector.
 - xvi. Require submission of all relevant CIPP submittal documents listed in the NASSCO ITCP CIPP documentation (latest version).
- b. Folded and Reformed Liners
- i. Specify minimum thickness required.
 - ii. Evaluate available material types.
 - iii. Require that diversion pumping system be activated and flow removed from pipe during cleaning.
- c. Formed In Place Pipe (FIPP)
- i. Specify grouting procedures to be used.
 - ii. Where man entry is possible, require tapping test with a hammer as a part of the final inspection.
 - iii. Require that diversion pumping system be activated and flow removed from pipe during cleaning.
- d. Sliplining
- i. To be considered on a case by case basis
 - ii. Engineer should review all pipe material available for sliplining and make recommendatons
 - iii. Require grouting of the annular space for all sliplining projects. Engineer to calculate theoretical volume of grout needed and to include in Bid Documents

/ Technical Specifications a means for the Contractor to measure quantity actually used.

- iv. Design and detail a watertight bulkhead between the slipliner and the host pipe at the manholes.
 - v. Require certified fusion welder if HDPE or fusable PVC is used. Engineer recommendation is required for proposed material and joining method.
 - vi. Require removal of internal beads flush with pipe wall on HDPE pipe before installing the liner.
 - vii. Specify minimum SDR or other appropriate thickness.
 - viii. Evaluate whether diversion pumping is required for installation or if liner can be installed under flow.
- e. Pipe Bursting can be considered and Engineer should evaluate benefits and risks.
5. Lateral Reinstatement – When external excavation is required, Insert–A-Tee is a good installation method which has been used on previous projects. When laterals are internally reinstated and lined, one piece main and lateral systems as manufactured by BLD or LMK (or approved equal) are a good method of reinstating linings. The lining system should include a method of providing a permanent seal between the host pipe and liner at both the lateral to main connection, and the upstream portion of the lateral. This is a developing area and considerable research should be performed before making recommendations.
6. Manhole Rehabilitation – This section covers rehabilitation of manholes and junction chambers.
- a. Utilize diversion pumping if work below the bench is required.
 - b. Modify the inverts to provide a smooth flow line through the manhole.
 - c. Raise the bench to the top of the pipe, forming a “U” channel through the manhole and provide sufficient slope to make benches self cleaning when benches must be modified.
 - d. Require a system to capture and remove cleaning material from the manhole without entry into the flow line.
 - e. Stop all leaks in the manhole before resurfacing, repair, or lining materials are applied.
 - f. Evaluate conditions of the frames and covers. The Contractor shall provide frames and covers as required.

- g. Remove any steps entirely (minimum one inch recess), and do not replace. Restore surfaces before applying coatings.
 - h. Sanitary manholes are often exposed to environments with various degrees of aggressiveness thereby degrading the concrete and reinforcing, and shortening the useful life of the structures. Choosing the appropriate protective measure should be determined during the preliminary engineering evaluation of the project. For Protective Coatings and Liners for manholes, the FIRM shall evaluate the current conditions of the structure and report findings in accordance with NASSCO MACP Guidelines. Any protective system must be applied in strict accordance with the protective system Manufacturer's recommendations.
7. Post Construction & Rehabilitation Evaluation for Gravity Sewer Mains and Manholes
- a. Existing gravity sewer mains or storm mains that are within 36" vertical clearance of the pipeline to be burst shall be CCTV inspected prior to any pipe bursting and following completion of pipe installation by the Contractor as a record for potential future settling or misalignment issues.
 - b. For manhole rehabilitation projects, bonding of the coating material will be checked during the inspection and photo documentation will be provided. Special care will also be taken to inspect the bulkheads between the host pipe and the rehabilitated pipes in the manholes.

End of Section