

SECTION 075  
SPECIFICATIONS - MANHOLE REHABILITATION

1.0 General

The rehabilitation of manholes shall be performed where specified. Manhole rehabilitation involves the repair and modification of existing sewer system structures without structure removal and replacement. Manhole rehabilitation shall be performed in accordance with the specifications below.

The Contractor shall demonstrate to the Engineer experience in the application of the proposed manhole rehabilitation system. In lieu of experience, throughout the duration of the project, the Contractor shall secure the support and expertise of the manhole rehabilitation system manufacturer to assure proper handling and installation of the product.

2.0 Sewer System Operation and Manhole Rehabilitation

The rehabilitation of manholes shall be performed without disrupting sewer service or operation. If necessary, the Contractor shall make provisions to isolate manholes to be rehabilitated from sewer flows. Any methods proposed to isolate manholes shall be approved by GPSD.

The Contractor shall consider the possibility and possible impact of wet weather flows upon both flow isolation measures and the rehabilitation process. Prior to the commencement of the manhole rehabilitation process including manhole preparation, the Contractor shall take all measures necessary to protect the manhole from potential damage from water intrusion, infiltration and surcharging. The Contractor shall be responsible for correcting any damage that occurs during the rehabilitation process.

3.0 Manhole Cleaning

Prior to the manhole rehabilitation, manholes shall be cleaned thoroughly throughout the entire circumference and vertical length of the manholes. However, final cleaning shall not be performed until all specified demolition and removal tasks have been completed including, but not limited to, the removal of the existing bench and trough, the cutting of protruding piping, the removal of existing manhole steps, the removal of root intrusions and the removal and replacement of the existing manhole casting and lid (if specified by the Engineer).

Cleaning shall be performed in accordance with Subsection 3.2 of Section 093 of these Specifications except those portions that pertain to water supply, protruding service connections and compensation. Furthermore, the objective of manhole cleaning is not only that stated in Subsection 3.2 of Section 093 but also the preparation of manholes for rehabilitation in accordance with manufacturer recommendations made part of applicable manhole rehabilitation systems. Manhole cleaning shall remove all loose materials as well as all roots, broken mortar, dirt, waste materials, bricks, broken and shaved pieces of piping materials, etc.

The Contractor shall prevent large materials not in normal suspension from entering the connecting piping of cleaned manholes. If this occurs, the Contractor shall be responsible for removal of materials from the sewer system to the satisfaction of GPSD. The Contractor shall be responsible for all materials removed from cleaned and rehabilitated manholes.

The Contractor shall be responsible for the supply of all water used in the cleaning of manholes and the reconstruction or rehabilitation of manhole components.

#### 4.0 Manhole Bench and Trough Reconstruction

Reconstruction of manhole benches and troughs shall be performed where specified and in accordance with these Specifications.

##### 4.1 Bench and Trough Removal

Prior to the commencement of bench and trough reconstruction, the existing bench and trough shall be removed to a depth sufficient to allow bench and trough reconstruction and support but not enough to compromise the support and integrity of the manhole. Materials unsuitable to serve as base material for bench and trough reconstruction shall be removed if removal does not jeopardize the integrity of the manhole structure. Afterwards, the manhole shall be thoroughly and completely cleaned; all loose materials and debris shall be taken from the manhole and disposed of by the Contractor.

##### 4.2 Manhole Trough Reconstruction

Bench and trough reconstruction shall be performed immediately after the removal of the existing bench and trough and before commencement of manhole barrel rehabilitation. Water shall not be allowed to either collect in the bottom of the manhole or exit by seepage through the manhole bottom; at all times, the Contractor shall maintain a system to assure that water is either removed from the manhole or allowed to flow into the exit piping of the manhole.

Reconstruction of manhole troughs shall be performed by installing modified replacement piping in the manhole trough. Sizing and configuration of replacement piping shall be governed by the size of the sewers connecting to the respective manhole as well as the angles of sewer pipes connecting to the manhole at the trough. Pipe and fittings used to reconstruct troughs shall be PVC, SDR 26, and modified in accordance with these Specifications. Trough piping shall have the top of the piping from the springline up to and including the crown removed except for that minimal portion of piping necessary to construct joints between the existing sewer piping and the trough piping.

Depending upon the configuration of the sewers connecting to the manhole at the trough, tees and wyes may be used to reconstruct a trough that will convey all sewage coming into a manhole out through the exit piping. Fittings may be used where directed by GPSD.

The slope of the reconstructed trough shall be consistent and continuous throughout the entire reconstructed trough. The slope shall be governed by the differential between the lowest manhole outlet pipe invert and the invert of the lowest manhole influent pipe that introduces flow into the manhole. If the manhole has two outlets, the trough shall be reconstructed relative to the lowest outlet pipe invert. If there are multiple influent pipes, those influent pipes that are more than four (4) inches above the lowest influent pipe shall not be connected to the replacement trough.

Where specified by GPSD, the Contractor shall construct inside drop systems in accordance with Section 043 of these Specifications. If possible, internal drop systems shall be constructed such that their bottoms are allowed to rest on the manhole bench; however, reconstructed manhole benches must be completely constructed with all materials cured prior to the placement of internal drop systems.

If there are no pipes other than that effluent pipe to which the replacement trough is joined, then the Contractor shall construct a trough pipe from the manhole outlet to the interior of the manhole at a minimum slope of one (1) percent. The length of the pipe shall be sufficient to provide access to the connecting sewer for normal sewer operating, inspecting and cleaning equipment. The trough pipe shall be blocked at the end opposite of its connection to the outlet piping to prevent materials from the bench reconstruction from slipping into the trough and to provide a solid end around which a bench can be reconstructed.

Joints between the reconstructed manhole trough and the existing piping connected to the manhole under reconstruction shall be made using a flexible-type coupling in accordance with these Specifications. When modifying piping to serve as part of a replacement trough, the Contractor shall leave just enough length of the upper-half of the pipe to allow for construction of joints with the existing sewers. If necessary, the Contractor shall remove a minimal amount of manhole wall material around existing sewers to be connected to the replacement trough to allow for connection of a flexible-type coupling. Voids left by the removal of manhole wall materials for the purpose of constructing joints between replacement troughs and existing sewers shall be filled with hydraulic cement during the reconstruction of the manhole bench and to the satisfaction of GPSD.

When installing replacement troughs, the new piping shall be properly supported at all times to avoid collapsing and inconsistent piping grades through the manhole. Pipes may be supported using concrete blocks. Reconstructed troughs shall be embedded in several inches of concrete to provide a cradle for the installed piping.

#### 4.3 Manhole Bench Reconstruction

Manhole benches shall be reconstructed only after the existing benches and troughs have been properly removed and the trough piping has been reconstructed. If the depth of the manhole walls relative to the existing bench is sufficient, the thickness of the concrete of reconstructed benches shall be no less than six (6) inches throughout the entire area of the reconstructed bench. Benches shall be reconstructed such that there is a consistent surface grade of one percent (1.0%) minimum from the inside edges of the manhole walls to the edge of the trough piping.

Benches shall be reconstructed using a high-early strength, Portland-cement concrete batched and delivered in accordance with the current IDOT Specifications for Class of Concrete PP, a fast-setting polymer modified concrete and masonry repair mortar system such as the Octocrete and Octocrete U systems as manufactured by IPA Systems, a fast-setting, high-early strength, Portland-based resurfacing material such as Underlayment No. F-120 or Underlayment No. F-120FS both manufactured by Sauereisen; a rapid-setting, high-early strength, cementitious patching material such as Strong-Seal QSR as manufactured by The Strong Co., Inc., Quadex

Hyperform as manufactured by Quadex Sewer Rehabilitation Products; or an equal approved prior to the receipt of bids. Materials used in bench reconstruction shall be a low slump and quick initial set time product. When the area of bench reconstruction is wet, a water-tolerant product designed specifically for underwater installations such as Octocrete U shall be used.

Materials used during bench reconstruction shall be hand-applied into all crevices and voids within the area of the bench reconstruction. Materials shall be worked into the areas between the bricks of a brick manhole.

The Contractor shall finish the reconstructed bench by brooming it's surface to create a rough finish and increase slip resistance. Brooming shall yield a pattern of grooves from the interior of the manhole wall to the reconstructed channel to assist drainage and solids removal.

## 5.0 Manhole Barrel Rehabilitation

The objectives of manhole barrel rehabilitation are to structurally reinforce the structure, to improve manhole access and, where specified, to protect the manhole against corrosion. Manhole barrel rehabilitation shall be performed where specified only after preparations in accordance with both the recommendations of the rehabilitation system manufacturer and these Specifications have been completed.

If manhole bench and trough reconstruction or manhole casting and frame removal and replacement are also specified, the barrel rehabilitation shall be performed only after completion of these tasks. Manhole barrel rehabilitation including preparation shall only commence after a reconstructed bench is cured sufficiently to both convey water out of the manhole without damaging the reconstructed bench and support loads without damage including loads from ladders, personnel or other equipment used during the process of manhole barrel preparation and reconstruction.

### 5.1 Preparation of Manhole Barrels

#### 5.1.1 Removal of Intruding Pipes

Where existing pipes intrude into manholes greater than six (6) inches, the pipes shall be trimmed so that their intrusion is not greater than six (6) inches but not less than two (2) inches. Pipe intrusion shall be measured from the inside edge of the manhole wall near the entrance of the intruding pipe to the greatest extent of the pipe into the manhole.

Cut edges of intruding pipes that have been trimmed shall be consistent across the circular face of the cut. Intruding pipe cuts shall be made parallel to the inside manhole surface.

The Contractor shall take care to utilize cutting or trimming methods that will not break or fracture intruding pipes. The cut edge of pipes shall not be jagged or fractured. Methods chosen by the Contractor shall not break or damage the portion of an intruding pipe that is to remain.

### 5.1.2 Removal of Intruding Roots

Where roots intrude into a manhole, they shall be removed in accordance with Subsection 3.2 of Section 093 of these Specifications. Additionally, if roots intrude into a manhole through a connecting pipe, they shall be removed and disposed of such that they no longer intrude into the manhole.

### 5.1.3 Filling Voids in Manholes

Prior to the commencement of manhole rehabilitation, all voids and areas where manhole materials are missing shall be filled with materials and methods in accordance with these Specifications and in accordance with the recommendations of the manufacturer of the manhole barrel rehabilitation system. Preparation of the manhole for planned manhole rehabilitation shall be the purpose of filling voids in the manhole.

Voids shall be filled using one of the following: a dry polymer modified concrete and masonry repair mortar system such as the Octocrete and Octocrete U systems as manufactured by IPA Systems; a fast-setting, high-early strength, Portland-based resurfacing material such as Underlayment No. F-120 or Underlayment No. F-120FS both manufactured by Sauereisen; a rapid-setting, hydraulic water plug such as InstaPlug No. F-180 as manufactured by Sauereisen, Strong-Plug as manufactured by The Strong Co., Inc., Mainstay ML-10 as manufactured by Madewell Products Corporation, Permacast Plug as manufactured by ConShield Technologies, Inc. or Quadex Quad-Plug as manufactured by Quadex Sewer Rehabilitation Products; a rapid-setting, high-early strength, cementitious patching material such as Strong-Seal QSR as manufactured by The Strong Co., Inc., Quadex Hyperform as manufactured by Quadex Sewer Rehabilitation Products or Permacast Patch as manufactured by ConShield Technologies, Inc.; or an equal approved prior to the receipt of bids. Where bricks are missing from brick manholes, replacement bricks may be used in combination with the void-repair systems. Installation shall be in accordance with the recommendations of the manufacturer and these Specifications.

If deemed necessary by the Engineer, the Engineer shall specify materials and methods for filling voids that extend outside of manhole walls into the surrounding materials.

Great care shall be taken in the installation of materials intended to fill voids. All voids shall be completely filled with the replacement material leaving no air pockets or unfilled void areas. The Contractor shall trowel material into voids to assure elimination of air pockets.

The Contractor shall choose installation methods that do not compromise the complete filling of voids or allow the shifting of installed materials after installation.

After installation of the replacement materials, the Contractor shall smooth the surface of the applied material such that the surface is consistent with the shape of the interior manhole surface.

## 5.2 Manhole Barrel Rehabilitation

Where specified, manhole barrel rehabilitation shall be performed using one of the following products: Drycon as manufactured by IPA Systems; Substrate Resurfacer No. F-121 as manufactured by Sauereisen; Reliner MSP Cement as distributed by Standard Cement Materials, Inc.; MS-2A as manufactured by The Strong Co., Inc.; Quadex QM-1s Restore or Quadex Aluminaliner both manufactured by Quadex Sewer Rehabilitation Products; CEMTEC Calcium Aluminate Repair Mortar as manufactured by A.W. Cook Cement, Inc.; Mainstay ML-72 Sprayable Microsilica Cement Mortar as manufactured by Madewell Products Corporation; Permacast MS-10,000 as manufactured by ConShield Technologies, Inc., or an equal approved by the Engineer prior to the receipt of bids.

For each container of material brought to the site(s) of work, the anticipated yield of the included quantity of material shall be stamped or printed on the container or an attached label by the manufacturer. If it is not, yield information shall be provided to the Engineer by the manufacturer in a format acceptable to the Engineer prior to the commencement of manhole barrel and corbel rehabilitation.

Installation of this material shall be by either hand or sprayed on using a mobile rotary-sprayer pump and in accordance with the recommendations of the manufacturer.

The material shall be applied in at least two coats of different colors to allow determination of the thoroughness of the application. Each coat shall be not less than ½ inches thick at any given location on the rehabilitated surface. The surface of each layer of applied materials shall be consistent and without irregularities including bulges or depressions; additional materials shall be used where necessary to compensate for existing irregularities in manhole internal surfaces to produce consistent layers that meet or exceed the desired minimum thicknesses. The contrast of the colors of the material coats with one another and with the existing manhole surface shall be significant enough to make evident by visual inspection any locations of missing or thin materials. Visual inspections of the material and determination of the thoroughness of the application shall be made during the installation of the coating in question. All areas where the installation is determined to be inadequate shall be promptly filled and made compliant with the installation recommendations of the manufacturer.

Locations where there is insufficient materials including voids, crevices and holes shall not be filled with materials taken from other locations on the rehabilitated manhole barrel. Rather, materials shall be added from a supply of materials not part of that material previously applied to the manhole barrel.

Material shall be worked via hand into all crevices, voids and parts of the interior manhole surface. Care shall be taken to work material into voids between existing bricks vacated by mortar materials, into areas around the entire circumference of connecting pipes and up to the bottom of existing or replacement castings. Care shall also be taken not to allow materials to be deposited into connecting pipes.

Manhole barrel rehabilitation materials shall be applied throughout the entire vertical length of manholes from the bench to the bottom of the casting. Materials shall not be applied to the

interior surface of the manhole castings. Where the manhole has been constructed monolithically on top of a brick sewer, manhole rehabilitation materials shall not be applied during wet-weather and shall be applied from the bottom of the casting down to the level of dry-weather flow.

A joint between the coats of the manhole barrel rehabilitation product and the manhole bench (if one exists in a given manhole) shall be constructed by overlapping both coats of the manhole rehabilitation product over the manhole bench. The overlapping materials of each coat shall be tapered to the manhole bench.

The surface of the first coat of material shall be left rough to facilitate the bonding between the two coats.

The second coat of material shall be applied promptly after the application of the first coat to facilitate bonding of the two coats; however, the application of the second coat shall not compromise the structural integrity of the first coat and henceforth shall not be applied until the first coat has sufficient time to assure structural stability. A cumulative thickness of not less than one-inch (1") of coating shall be consistently applied over the entire circumference and vertical distance defined in these specifications. The surface of the applied, final coat shall be made consistently smooth via troweling.

If multiple products are to be utilized and distributed by the same equipment, said equipment shall be thoroughly washed and made free of materials preceding mixing and application of another product.

### 5.3 Manhole Barrel Rehabilitation using a Cured-In-Place Fiberglass Reinforced Plastic Liner

Where specified by the Engineer, manhole barrel rehabilitation shall be performed by application of a fiberglass cloth and epoxy liner such as PerpetuWall as provided by Protective Liner Systems or an equal approved prior to the receipt of bids. Such liners shall be applied in accordance with these Specifications and the specifications and directions of the manufacturer and shall not be less than 180 mils thick through the entire circumference and vertical height of a given manhole. Application shall include the entire interior manhole wall from, but not including, the manhole bench and trough to the manhole casting. Neither the manhole bench and trough nor the casting and lid shall receive coating with a fiberglass cloth and epoxy liner.

Application of fiberglass cloth and epoxy liners shall only be performed after completion of the reconstruction of manhole benches and troughs (if specified), replacement of manhole casting and lids (if specified) and manhole barrel rehabilitation. Fiberglass cloth and epoxy liners shall only be applied to rehabilitated manhole barrels after the cementitious manhole rehabilitation material is fully cured.

Preparation of manholes for the installation of a fiberglass cloth and epoxy liners shall be per the recommendations of the fiberglass cloth and epoxy liner manufacturer.

## 6.0 Manhole Frame and Cover Removal and Replacement

Manhole frames and covers shall be removed and replaced where specified by GPSD. Removal and replacement of manhole frames and covers shall be in accordance with Section 043 of these Specifications.

END SECTION

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