

SECTION 02650

MANHOLE REHABILITATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Without intending to limit or restrict the extent of work involved, the Work includes rehabilitating existing manholes to eliminate infiltration as follows:
 - 1. Plugging and waterproofing manhole walls and bases.
 - 2. Resetting existing and setting new manhole frames and covers.

1.02 RELATED SECTIONS

- A. Trenching, Backfilling, and Compacting: Section 02221.
- B. Paving and Surfacing: Section 02500.
- C. Manholes: Section 02601.

1.03 QUALITY ASSURANCE

- A. Source Quality Control:
 - 1. Maintain uniform quality of products and component compatibility by using the products of one manufacturer.
 - 2. Shop Tests:
 - a. In accordance with the General Requirements, materials stated herein require periodic testing according to methods referenced, or as required by Owner's Representative.

1.04 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) Standards as referenced throughout these Specifications.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C191 – Time of Setting of Hydraulic Cement by Vicat Needle, Test Method for.
 - 2. ASTM C478 – Precast Reinforced Concrete Manhole Sections, Spec. for.
 - 3. ASTM C596 – Drying Shrinkage of Mortar Containing Portland Cement, Test Method for.
 - 4. ASTM C827 – Early Volume Change of Cementitious Mixtures, Test Method for.
- C. Federal Specifications:
 - 1. Fed. Spec. FF-S-325 – Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge Expansion Anchors) Class 1 (One-Piece Steel Expander with Cone Taper Integral with Stud).

2. Fed. Spec. SS-S-210A – Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints (Type 1 Rope Form).

1.05 SUBMITTALS

- A. Shop Drawings and Product Data:
 1. Manufacturer's published detail drawings, modified to suit design conditions if required, and Contractor prepared drawings as applicable.
 2. Manufacturer's descriptive literature and specifications covering the product specified. Include installation information.
- B. Certificates: Certified records or reports of results of shop tests; such records or reports to contain a sworn statement that shop tests have been made as specified, and that materials and construction are in compliance with these Specifications.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport, store, and handle Products specified herein in a manner recommended by the respective manufacturers of such.
- B. Deliver waterproofing materials to the job site in original, unopened packages, clearly labeled with the manufacturer's identification and printed instructions. Store and handle material in accordance with recommendations of the manufacturer and the American Concrete Institute of Cement and Cement Products.

1.07 SITE CONDITIONS

- A. Existing Conditions:
 1. Owner Obligations: The Owner will be responsible for the following:
 - a. Locating manholes and other repairs.
 - b. The right of, and access to, all manhole locations.
- B. Environmental Requirements:
 1. Do not perform the Work of this Section when weather conditions or the condition of materials are such, in the opinion of the Owner's Representative, that work cannot be performed satisfactorily.
- C. Protection:
 1. If public safety is endangered during the progress of the rehabilitation work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.
 2. Signs, signals, and barricades used shall conform to requirements of Federal, State, and local laws, rules regulations, precautions, orders, and decrees.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. **Waterproof Plugging Material:** Composed of a blend of Portland cement and water or a liquid chemical additive which becomes an extremely rapid setting plastic material and effectively stops hydrostatic water infiltration, ensuring a non-shrink, watertight seal.
1. **Acceptable Manufacturers:**
 - a. IPA Systems Inc.; IPANEX-RAPID
 - b. IPA Systems Inc.; Octoplug.
 - c. Or Equal.
- B. **Waterproof Patching Material:** Fast-setting blend of fine textured cement powders for waterproof joint or crack sealing and patching larger repair areas.
1. **Acceptable Manufacturers:**
 - a. Preco Industries Ltd.; Preco-Patch.
 - b. U.S. Grout Corporation; Five Star.
 - c. IPA Systems Inc.; Octocrete.
 - d. Or Equal.
- C. **Waterproof Coating:** Brush applied cementitious waterproof coating.
1. **Acceptable Manufacturers:**
 - a. Preco Industries Ltd.; Brush-Bond.
 - b. U.S. Grout Corporation; Five Star.
 - c. IPA Systems Inc.; DryCon.
 - d. Or Equal.
- D. **Non-Shrink Non-Metallic Grout:** As specified in Section 03600.
- E. **Preformed Plastic Sealing Compound:** Fed. Spec. SS-S-210A, Type 1, Rope Form, of either bitumastic base compound or butyl rubber base compound, and shipped protected in a removable two-piece wrapper. Size cross-section of rope form to provide squeeze-out of material around entire interior and exterior circumference when joint is completed.
1. K.T. Snyder Company, Inc.; RUB-R-NEK.
 2. Hamilton Kent Manufacturing Company; KENT-SEAL NO. 2.
 3. Or Equal.
- F. **Precast Grade Rings:** As specified in Section 02601, Paragraph 2.02D.
- G. **Expansion Anchor and Fastener:** Stainless Steel, UL listed, one piece stud (bolt) with integral expansion edges, nut and washer, and meeting physical requirements of Fed. Spec. FF-S-325, Group II, Type 4, Class 1. Stud of AISI Type 303 or 304 stainless and nut and washer of AISI Type 316 stainless.
1. **Acceptable Manufacturers:**
 - a. Hilti Fastening Systems; KWIK-BOLT.
 - b. U.S.E. Diamond, Inc.; SUP-R-STUD.
 - c. Molly Fastener Group; PARABOLT.
 - d. Or Equal.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Prior to performance of the actual work, carefully inspect the sites and locate those manholes designated to be rehabilitated.

3.02 PREPARATION

- A. Earthwork: Perform excavation and backfilling for manhole rehabilitation as previously specified in Trenching, Backfilling and Compacting: Section 02221.
- B. Surface Preparation:
 - 1. Cleaning: Clean surfaces by blast cleaning, acid or detergent washing, or other method approved by the Owner's Representative.
 - 2. Roughening: Mechanically roughen surfaces by blast cleaning in accordance with manufacturer's instructions.
 - 3. Surface Wetdown: All surfaces should be thoroughly wet down, saturated, moist, and all free-standing and excess water removed before applying waterproofing.

3.03 PERFORMANCE

- A. Repairing Cracks, Spalled Areas, and Patching Holes:
 - 1. Cracks not subject to movement exceeding 1/10-inch in width shall be routed out to a minimum depth of 1-inch and patched with waterproofing.
 - 2. Cracks with active leaks shall be sealed with waterproof plug.
 - 3. Honeycombed or spalled concrete areas and holes shall be patched with waterproofing.
 - 4. Missing or damaged bricks shall be replaced as required at no additional cost.

3.04 APPLICATION OF WATERPROOFING

- A. Mix and apply materials in accordance with manufacturer's instructions and recommendations.
- B. Thoroughly mix waterproofing, using equipment recommended by manufacturer, leaving no lumps or unmixed materials. Do not exceed manufacturer's recommendations for proportions of materials.
- C. Apply waterproofing at temperatures of 40°F and above. Do not apply waterproofing on frozen surfaces.
- D. Apply waterproofing in one coat, no less than 1/4-inch thick, completely filling voids, holes, cracks, leaving no pinholes or uncovered areas.
 - 1. Waterproofing may be applied by trowel unless manufacturer specifies otherwise.
 - 2. Material shall be applied continuously starting at top and including the base around all incoming sewer lines.

- E. Proper curing and protection of waterproofing:
 - 1. Protect waterproofing from excessive evaporation during hot or windy conditions, by moist curing for the first four hours or by applying an approved curing compound. Under normal conditions, no curing is required.
 - 2. For maximum wear resistance, cover waterproofing with polyethylene immediately after hardening. Contact manufacturer for specific guidance for best results. Protect waterproofing from non-pedestrian traffic for 24 hours.
 - 3. Protect waterproofing from freezing, rain, and hydrostatic pressures until it reaches its normal four hour strength (1,000 psi).

3.05 SEALING OF ACTIVE LEAKS

- A. Open crack or holes by cutting to a minimum depth of 1-inch; for severe leaks, increase depth to a minimum 1-1/2 to 2-inches. Dovetail joint is preferable. Leave surfaces rough and remove all loose materials.
- B. For severe leaks, install rubber hose in the lowest portion of the crack or hole to relieve the pressure.
- C. Mix and apply waterproof plug in accordance with manufacturer's instructions.
- D. Force material into crack or hole with maximum pressure. If necessary, use external force to hold waterproof plug in place until a firm set takes place. Finally, remove hose and seal.
- E. Finish off surface and render flush with a minimum 1/4-inch coat of waterproofing.

3.06 LIMITS OF WATERPROOFING APPLICATION

- A. Leaking Manhole Joint: Waterproofing shall be applied around the entire circumference of any manhole joint which has been patched or plugged under this Contract. Waterproofing shall extend six (6) inches in each direction from the centerline of the joint.
- B. Leaking Manhole Base: Waterproofing shall be applied to the entire base of any manhole base which has been patched or plugged under this Contract.
- C. Leaking Manhole Section: Waterproofing shall be applied to an entire manhole section if any part of that section has been patched or plugged under this Contract. Waterproofing limits shall extend vertically six (6) inches downward from the centerline of the bottom joint of the section and six (6) inches upward from the centerline of the top joint of the section.
- D. Manhole Joint: Waterproofing shall be applied around the entire circumference of all joints within a manhole, which are above any patch or plug applied under this Contract. Waterproofing shall extend six (6) inches in each direction from the centerline of the joint.
- E. Brick Manholes: If a leaking manhole is of brick construction, the entire manhole shall be waterproofed.

3.07 REPAIR/REPLACEMENT AND ADJUSTMENT OF MANHOLE FRAMES AND COVERS

- A. When installing new frames or readjusting existing frame in paved areas, cut pavement in a circular pattern around the manhole frame. Make limits of cut not to exceed one foot beyond the upper lip of the manhole frame.
- B. The means and methods of performing operations are the sole responsibility of the Contractor.
 - 1. Debris Removal: Dispose of demolition debris off site in a lawfully approved landfill area.
 - 2. Salvage:
 - a. Carefully remove existing manhole frames and covers.
 - b. If the existing manhole frame and cover assemblies are to be replaced by new frames and covers, the existing assemblies shall remain the property of the Owner.
Transport to and store at a location designated by the Owner at no additional cost.
 - 3. Before entering any manhole, the Contractor shall comply with applicable local, state, and federal regulations governing manhole entry. Ultimate responsibility for compliance with all applicable regulations lies solely with the Contractor.
 - 4. Traffic control is the Contractor's responsibility and must comply with all local, state and federal regulations.
 - 5. After completing manhole height adjustment, a warning device must be placed on the manhole to prevent motorists from striking the manhole. The warning device must be maintained on the manhole unit until the paving is brought to the finished elevation of the manhole.
 - 6. The joints between the manhole frame, precast grade ring(s), and manhole cone shall be watertight and the frame and grade ring(s) shall be securely attached to the manhole cone after paving is completed.
 - 7. The flow channel in the manhole shall be completely covered before starting work on the manhole. Before removing the cover from the channel, all debris shall be cleaned from the manhole base and cover, and removed from the manhole.
 - 8. The finished top elevation of manholes within the paving project area shall be at least 1/4-inch, but no greater than 1/2-inch below the finished elevation of the new paving.
- C. Resetting Existing or Setting New Manhole Frames:
 - 1. Remove the existing frame from the cone and salvage as specified previously.
 - 2. Remove damaged brick or precast concrete grade rings and mortar, and repair the top of manhole walls where necessary to provide sound base for placing concrete grade rings or for setting the frame.
 - 3. All loose mortar or non-shrink grout shall be removed from the manhole cover frame and manhole cone before resetting the frame.
 - 4. All material used to backfill around manholes shall be thoroughly compacted. Disposal of excess material is the Contractor's responsibility.
 - 5. If a manhole frame requires to be lowered, work shall be performed in such a manner as to minimize damage to the manhole. After removing sufficient material from the manhole cone, place a leveling bed of non-shrink grout on the manhole cone before placing the manhole frame.
 - 6. Frame and Cover Installation: As specified in Section 02601.
 - 7. In unpaved areas, the frame shall be securely attached to the manhole with four 3/4-inch diameter stainless steel expansion anchors.
- D. Excavation and Backfill: As specified in Section 02221.
 - 1. Allow the grout and mortar to set up prior to backfilling.

2. Backfill around the frame with 2A stone compacted in place to the depth required for pavement restoration.

E. Pavement Restoration: As specified in Section 02500.

END OF SECTION