SECTION 02710 - STRUCTURAL MANHOLE REHABILITATION

City of San Diego, CWP Guidelines

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NTS: This Section covers a patented process for structural rehabilitation of round manholes without excavation or removing the frame. The process is called Permaform, and Action Products Marketing Corporation of Johnston, IA holds the patent. The process forms a new Ameron T-Lock protected 3-inch thick cast-in-place wall of high strength concrete inside the old manhole.

If the reinforcing steel in the original manhole is gone, replace the manhole rather than rehabilitate it according to this process. Although bench repair is not part of the patented process, optional language is included in this section for the Specifier's use if bench repair is necessary.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing a structurally independent concrete wall within the existing manhole with a PVC liner sheet cast integrally onto its surface.

B. The CONTRACTOR is cautioned that sewage will continue to flow to the manhole and that the WORK must be performed under permit required for confined space entry conditions.

1.2 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated the current editions of the following apply to the WORK of this Section.

1.	ACI 318	Building Code Requirements for Reinforced Concrete
2.	ASTM C 94	Ready-Mixed Concrete
3.	ASTM C 827	Test Method for Early Volume Change of Cementitious Mixtures
4.	CRD C 621	Corps of Engineers Specification for Non-Shrink Grout

1.3 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01090 - REFERENCE STANDARDS.

1.4 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Evidence of installer certification.

2. **Mix Design:** Prior to beginning the WORK and within 14 days of the Notice to Proceed, submit preliminary concrete mix designs listing the proportions and gradations of all components. Include mill tests for cement, admixture identification and chloride ion content, and aggregate gradation.

1.5 INSTALLER QUALIFICATIONS

A. The CONTRACTOR or subcontractor performing the WORK of this Section shall be certified by Action Products Marketing Corporation.

PART 2 -- PRODUCTS

2.1 FORMS

A. Forms shall be segmented and stackable, of steel construction, with sufficient strength and rigidity to retain concrete without shifting or collapse.

B. The assembled forms shall have the appropriate dimensions to allow the required wall thickness.

C. Wall thicknesses in both vertical cylindrical and tapered portions of the manhole shall be 3 inches. Wall thickness in the chimney may taper to 1 - 1/2 inches if the CONSTRUCTION MANAGER agrees.

D. Forming system shall be Permaform as patented by Action Products Marketing Corporation. (800) 662-6465.

2.2 MATERIALS

A. **Concrete for Walls:** Concrete shall be composed of cement, aggregate, water, and admixtures in proportions and amounts determined by trial batch to produce concrete of the required strength and density, shrinkage, and consolidation properties. Proportions shall be changed at no additional cost to the OWNER if necessary to meet the required results. Concrete shall comply with ACI 318 and ASTM C 94 unless indicated otherwise.

1. Compressive Strength: 4,000 psi at 28 days
2. Cement: Portland Cement, Type II
3. Maximum Water to Cement Ratio: , by weight
4. Air Content: Between 3 and 5 percent
5. Slump: 5 inches, plus and minus 1-inch
6. Maximum Aggregate Size: 5/8-inch
7. Superplasticizer: May be used

B. **Sealing Grout:** Sealing grout shall be prepackaged non-shrink, cement-based grout, non-gas liberating, non-metallic, requiring only addition of water. Manufacturer's instructions shall be printed on each bag or other container in which materials are packaged. The specific formulations shall be as necessary to achieve the following:

1. Compressive Strength: 5,000 psi at 28 days
2. Shrinkage: 0.0 percent when tested according to ASTM C 827 in the plastic state and 0.0 percent when tested according to CRD C 621 in the hardened state
3. Expansion: 4 percent max when tested in the plastic state and 0.2 percent in the hardened state

C. **PVC Liner Sheet:** Plastic liner conforming to SSPWC subsection 210-2.

D. **Hydraulic Plug:** Quick-setting grout material for sealing flowing leaks through manhole structures.

[E. **Bench-Forming Concrete:** Lean concrete with the following characteristics:

1. Compressive Strength: 2,000 psi at 28 days
2. Cement: Portland cement, Type V
3. Maximum Water to Cement Ratio: 0.60 by weight
4. Maximum Aggregate Size: 1-inch]

PART 3 -- EXECUTION

3.1 CLEANING

A. Remove loose dirt, grease, and debris from floor and interior walls of manhole using high pressure water.

3.2 LEAKS AND REPAIRS

A. Active leaks, if present, shall be sealed by application of Hydraulic Plug material.

[B. Repair and reshape manhole inverts and benches according to the requirements of Section 03300. Inverts shall be U-shaped and have a minimum depth of 1/2 pipe diameter. Benches shall be sloped and have smooth surfaces without defects that allow debris to accumulate.]

3.3 REHABILITATION

A. Lower into place, assemble, and bolt forms to construct a 3-inch thick wall from the bench up to the frame. Provide blockouts through forms for inlet and outlet sewer pipes. Seal forms at bench surfaces with sealing grout to prevent leakage of concrete through forms during placement.

B. Fit preformed and pre-welded PVC liner sheet to forms, maximizing the number of joints which will be factory welded and minimizing the number of joints to be field welded.

C. Place and consolidate concrete in the forms to enclose PVC liner ribs and fill pockets, seams, and cracks in the annular space, but do not vibrate excessively to cause segregation of concrete components.

D. Remove forms after concrete has cured sufficiently to avoid slump or damage. Do not damage PVC liner sheet when removing forms.

E. Field weld PVC liner joints according to SSPWC subsection 311-1.5.

F. Provide gas-tight sealing between the liner sheet and inlet and outlet sewer pipes.

3.4 FIELD TESTING

A. **Continuity Testing:** The CONSTRUCTION MANAGER will check for holes through PVC liner sheet by spark testing at no less than 15,000 volts in conformance to SSPWC

subsection 311-1.10. All areas of liner sheet which fail the spark test shall be repaired and will be retested. The CONTRACTOR shall assist the CONSTRUCTION MANAGER in field testing according to SSPWC subsection 311-1.10.

B. **Joint Integrity:** Welded joints shall have no visible cracks, separations, or unfused areas. The CONSTRUCTION MANAGER may check for separation and unfused areas by probing with a putty knife or similar semi-sharp flat object. Separations and unfused areas shall be repaired to the CONSTRUCTION MANAGER's satisfaction.

** END OF SECTION **