SECTION 02714 - CONCRETE SEWER REHABILITATION BY HAND-WOUND PVC STRIP LINER

City of San Diego, CWP Guidelines

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NTS:

This Guide Specification addresses the use of Danby Pipe Renovation System to repair surfaces in sewers equal to and larger than 36 inches diameter and manholes. The System is not sensitive to the degree of corrosion of the existing concrete surface or whether any original PVC liner remains.

There is no known equal at this time.

The Drawings must indicate the extent of the circumference to be protected with PVC. Square brackets in the specification identify alternate wordings for partial coverage and for full coverage.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing restoration to [sewers][manholes] at locations indicated on the Drawings. Restoration shall employ a field-fabricated PVC profile wall strip liner behind which grout is placed.

B. The WORK of this Section requires that materials and installation procedures be from Danby of North America, Inc. No substitutions will be considered.

1.2 RELATED SECTIONS

A. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

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 REGULATORY REQUIREMENTS

A. The WORK of this Section shall comply with the current versions of the following:

1. Construction Safety Orders, Division of Industrial Safety, State of California.

2. California Department of Transportation Traffic Manual

1.5 SPECIFICATIONS AND STANDARDS

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

ASTM B 633	Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C 39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C 109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch or 50 mm Cube Specimens)
ASTM C 939	Test Method for Flow of Grout for Preplaced-Aggregated Concrete (Flow Cone Method)
ASTM C 1090	Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic Cement Grout
ASTM C 172	Practice for Sampling Freshly Mixed Concrete
ASTM D 1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM F 1698	Standard Practice for Installation of Poly (Vinyl Chloride) (PVC) Profile Strip Liner and Cementatious Grout for Rehabilitation of Existing Man-Entry Sewers and Conduits

1.6 SHOP DRAWINGS AND SAMPLES

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

1. Lining system material identification and construction details, including method of joining adjacent edges and ends of strips.

2. Certified laboratory reports from chemical resistance tests of PVC liner and sealant.

3. Layout and application sequencing plan showing individual strip dimensions and order of application.

4. Manufacturer's application instructions, including details of seams and terminations, Material Safety Data Sheets, maximum storage life and storage condition requirements, mixing and proportioning requirements, environmental requirements for worker safety such as ventilation, humidity, and temperature.

5. Grout formulation, including curing time and verification of compressive strength, apparent viscosity # 30 seconds, and shrinkage # 1 percent.]

6. Grouting plan, including description of equipment and injection points.

7. Manufacturer certification of applicators used for liner.

8. List of experience of grout subcontractor.

9. A written verification at least 2 days before commencing rehabilitation that the sewer [and manholes] [is] [are] free of obstructions and debris and [is] [are] in suitable condition for repairs.

[10. Drawings and design calculations demonstrating adequacy of the proposed temporary working platforms. For the purpose of calculations, assume a wastewater velocity of 6 ft per second and the pipe is flowing full.]

[11. Describe the means and time required to remove a platform system in an emergency.]

1.7 APPLICATOR QUALIFICATIONS

A. The CONTRACTOR or subcontractor performing the WORK of this Section shall be licensed and certified by the repair system manufacturer.

B. If a subcontractor is used, the subcontractor performing grout shall be experienced in grouting of annular spaces in sewer rehabilitation.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Rehabilitation shall be leakproof under a minimum external hydrostatic pressure [of 15 feet of water above the top of the pipe.][equal to the lateral pressure of saturated soils outside the pipe wall.]

2.2 MATERIALS

A. **PVC Sheet:** The sheet shall be made from unplasticized compounds having cell classification of 12334-B, 12454-B, or 13354-B in accordance with ASTM D 1784. Sheet shall have successfully passed the chemical resistance tests in SSPWC Subsection 210-2.3.3.

B. **Sealant:** Sealant for assembly of plastic panel joints shall be resistant to attack by hydrogen sulfide and strong acids and bases. Sealant shall be as recommended by the system manufacturer.

C. Sheet Terminations

1. Sealing the interface between the existing and newly applied PVC liner at the upstream and downstream circular end of the pipeline or at the vertical face of the manhole shall be accomplished by applying strips of PVC liner material that overlap the existing and new liner by at least one inch. The individual sections of liner shall then be fused together by welding. Prior to applying the overlapping strips of PVC liner material, the space between the new and existing PVC liner panels shall be completely sealed with **Secaflex 1A grout, or equal,** to prevent any wastewater from infiltrating through the abutted joint behind the newly installed liner. PVC liner material and welding shall comply with SSPWC Subsection 210-2.

[2. Liner termination near the bottom of the pipe shall be fastened with J-bar type channel strips of PVC, fastened 6 inches on center. Minimum strip length shall be 3 feet with 7 fasteners. Anchor bolts for fastening the J-strips to the wall shall be 3/8-inch diameter Rawl Carbon Steel Spikes No. 5552 or equal. The anchor bolts shall provide a minimum of 3-inch embedment into

the pipe wall. Prior to the installation of the anchor bolt, the anchor bolt shall be fitted with a washer. Anchor bolts shall be formed from heat treated carbon steel equivalent to Grade 8.2 and shall be plated in accordance with ASTM B 633, SC1, Type III.]

D. **Joiner Strips:** As manufactured by the manufacturer.

E. **Grout:** The grout shall consist of portland cement, water, flyash or lime, and admixtures. Dispersant may be added to lower the viscosity for increased pumpability. The formulation shall be submitted by the CONTRACTOR to the CONSTRUCTION MANAGER prior to starting the work. Grout components shall be clean, fresh and stored in a dry condition. Premixed grouts, if used, shall be used in accordance with the manufacturer's specification. The grout shall have compressive strength of 5000 psi in 28 days. All grouting equipment shall be kept clean and free of grout buildup.

PART 3 -- EXECUTION

3.1 PRODUCT, DELIVERY, STORAGE, AND HANDLING

A. Materials shall be shipped in packaging as needed to protect the material from damage during transport. Packaging shall be plainly labeled to show manufacturer's name, product name, batch number, date of manufacture, quantity of contents, and storage requirements.

B. Stored materials shall be protected from excessive heat, cold, and weathering. PVC sheeting shall be protected from debris contamination. PVC sheeting shall be handled so that no kinks, gouges, or other defects develop. Defective sheeting shall be removed from the Site and be replaced at no additional cost to the OWNER.

3.2 WORKING CONDITIONS

A. The CONTRACTOR is hereby notified that the sewer is a permit required confined space.

B. Wastewater will continue to flow through the [sewer][manholes] during rehabilitation, and the CONTRACTOR shall be prepared to perform Work during prevailing flow conditions in the sewer [using working platforms as indicated below] or to divert the sewage as indicated below. Rehabilitation operations shall not be performed if weather conditions are such that anticipated wastewater flows can exceed diversion pumping capacity or depths that permit proper and safe work within the sewer. Operations shall be conducted only when the wastewater level in the pipe is at a minimal depth.

C. The CONTRACTOR shall employ means and methods which prevent blockage and minimize surcharge of wastewater in upstream manholes and tributary pipelines.

3.3 DIVERSION PUMPING

A. Install and operate diversion pumping equipment to maintain sewage flow and to prevent backup or overflow.

B. Design all piping, joints and accessories to withstand twice the maximum system pressure or 50 psi, whichever is greater. A spare pump and piping shall be at the Site, ready for use in case of a breakdown.

C. In the event of accidental spill or overflow, the CONTRACTOR shall immediately stop the overflow

and shall take action to clean up spillage and disinfect the spill area to the satisfaction of the CONSTRUCTION MANAGER.

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NTS: If the sewer to be repaired is 84 inches in diameter or larger, consider including the working platform-related requirements which are at several locations in this Section.

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[3.4 WORKING PLATFORMS

A. The CONTRACTOR shall provide temporary working platforms for repairs located above the springline of the pipe. Platforms shall be designed to withstand the hydraulic forces created by sewage flow. Platforms shall be sized and located to retain debris larger than ½-inch from [cleaning and] hydroblasting operations.]

3.5 CLEANING AND SURFACE PREPARATION

A. Cleaning and Debris Removal

1. Prior to cleaning the concrete surfaces and installing the new liner systems, the CONTRACTOR shall remove all accumulated debris, foreign materials, and corrosion products and dispose of it in compliance with all Federal, State and local regulations. Debris shall include sludge, dirt, sand, rocks, grease, roots, and other solid or semi solid materials.

2. The CONTRACTOR shall employ suitable equipment to collect all debris dislodged during cleaning operations. At a minimum, debris shall be removed prior to the end of each day and shall be disposed of daily at an approved off-site location. Hauling containers shall be watertight.

3. Active leaks, if present, shall be sealed by application of hydraulic plug material.

B. **Surface Preparation:** The CONTRACTOR shall prepare the concrete surface by water blasting to produce a clean, contamination-free, hard, roughened surface.

3.6 INSPECTION

A. The CONTRACTOR shall inspect the [sewer][manhole] surface to determine the nature and location of obstacles or protrusions which prevent or will adversely impact the quality of the liner. The CONTRACTOR shall remove such obstacles and protrusions.

3.7 INSTALLATION

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NTS: The CONTRACTOR shall use the first version of paragraph A below where less than the full circumference of the pipe is to be lined. The second version of paragraph A shall be used where the full circumference will be lined.

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[A. Anchor J-strips on a bead of sealant onto the pipe wall to support and seal the bottom edge of the panels on both sides of the pipe. Cut and trim the PVC panels to length as necessary to cover the

required partial circumference of the pipe and to produce the required annular space between the PVC panels and the host pipe. Place the panels perpendicular to the pipe axis against the pipe wall and support system and lock them together by pressing and locking the joiner strip into place.]

[A. Pull coiled PVC paneling down through the manhole and wind it spirally around the pipe circumference, producing the required annular space between the PVC panel and the pipe wall. Lock and seal adjacent strip edges together by pressing the joiner strip into place. Ends of paneling shall be joined by H-connectors containing sealant in the grooves.]

3.8 GROUTING

A. **General:** The entire annular space between the outside of the liner and the inside of the existing pipe shall be grouted in strict accordance with the liner system manufacturer's instructions. Grouting of the annular space shall be done in such a manner as to prevent bulging, deformity, damage or collapse of the liner.

B. **Bulkheads**

1. The CONTRACTOR shall bulkhead the upstream and downstream ends of the annular space between manholes prior to conclusion of each days work, as appropriate to prevent recontamination of the cleaned and prepared concrete and liner surfaces by flowing wastewater.

2. The upstream bulkhead shall have two vents at the springline and two vents at the crown. The vents shall allow air to be displaced out of the annular space by the grout. In addition, grout holes may be drilled in the PVC lining at appropriate points and grout pumped into them until satisfactory fill is obtained. Grout holes in the PVC liner and vent holes in the bulkhead shall be sealed with PVC plugs prior to the conclusion of each days work.

3. Vents at the crown shall be plugged after placing the final lift.

3.9 FIELD TESTING

A. The liner will be inspected by the CONSTRUCTION MANAGER for proper adhesion, air pockets, edges or seam defects, rips, tears, and punctures. The CONTRACTOR shall remove and replace defects; and it shall retest them.

[3.10 TELEVISION INSPECTION

A. Sewer [and manhole surfaces] shall be inspected by closed circuit television (CCTV) to document the condition of rehabilitated surfaces in accordance with Section 02735.]

** END OF SECTION **