SECTION 02721 - GROUT FOR SLIPLINED SANITARY SEWERS

City of San Diego, CWP Guidelines

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NTS: This section is intended only for use with Section 02720 - Sliplining Sanitary Sewers. Match the maximum grout pressure criterion in this section with the same criterion in Section 02720.

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PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing grout in the annular space between the slipliner pipe and the host sewer.

1.2 RELATED SECTIONS

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

1.	Section 02720	Sliplining Sanitary Sewers

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 SPECIFICATIONS AND STANDARDS

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

ASTM C 109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)
ASTM C 138	Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
ASTM C 144	Masonry Mortar
ASTM C 150	Portland Cement
ASTM C 403	Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
ASTM C 495	Test Method for Compressive Strength of Lightweight Insulating Concrete

ASTM C 618	Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement Concrete
CRD C 621	Non-shrink Grout

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in accordance with Section 01300 - Contractor Submittals:

1. In addition to the submittals listed in SSPWC subsection 500 - 3.1.10, the CONTRACTOR shall submit:

a. A detailed description of equipment and operational procedures for the annular grouting operation, including mixing and pumping schedule, rates of pumping, and methods to monitor the effectiveness of the grouting.

b. A detailed description and drawing indicating locations of surface mixing equipment, subsurface injection points, flowlines, waste grout recovery, and grout pressure limiting equipment.

B. During pressure grouting operations, maintain and submit daily logs of grouting operations including pressure, grout volume pumped, and such other data as required by the CONSTRUCTION MANAGER.

PART 2 -- PRODUCTS

2.1 GROUT DESIGN

A. In addition to the performance parameters of SSPWC subsection 500-3.1.4, grout shall be pumpable through a 2-inch diameter hose for a distance of 1000 feet with a maximum pressure of [12] psi at the point of placement.

2.2 MATERIALS

A. **Cement:** The cement shall comply with ASTM C 150. Pozzolans and other cementitious materials are permitted.

B. **Fly Ash:** The fly ash shall comply with ASTM C618. Either Type C or Type F shall be used.

C. Sand, if used, shall conform to ASTM C144, except as modified below:

U.S. Standard Sieve Size	Percent Passing by Weight
No. 16	100
No. 30	60-85
No. 50	10-35
No. 100	5-25
No. 200	0-10

D. **Water:** Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the grout.

E. **Admixtures:** Admixtures shall be selected by the manufacturer of the grout to meet the performance requirements, to improve pumpability, to control set time, and to reduce segregation.

PART 3 -- EXECUTION

3.1 PREPARATION

A. CONSTRUCTION MANAGER shall be notified at least 24 hours in advance of grouting operations.

B. Grouting equipment and procedures shall be selected and operated with sufficient safety and care to avoid damage to existing underground utilities and structures.

3.2 EQUIPMENT

A. **Mixers and Pumps:** The grout shall be delivered to the injection point at a steady pressure with a nonpulsating centrifugal or triplex pump at the mix tank. Means shall be provided to increase or decrease the water-cement ratio. The system shall mix the grout to a homogeneous consistency. Means of accurately measuring grout component quantities, pumping pressures, and volumes pumped shall be provided.

B. **Pressure Gauges:** Contractor shall provide one pressure gauge at the point of injection and one pressure gauge at the grout pump. Grouting shall not proceed without appropriate gauges in place and in working order. Pressure gauges shall be equipped with diaphragm seals having a working range between 1.5 to 2.0 times the design grout pressure and an accuracy within 0.5 percent of full range. Gages shall be of the type and be certified and calibrated according to SSPWC subsection 500-3.1.7.

C. The application system shall have sufficient gages, monitoring devices, and tests to determine the efficiency and effectiveness of the grouting work and provide means of accurately determining the amount of grout injected. The Contractor shall be prepared to modify or change his operation should the grouting not perform as proposed. Such modifications and changes shall be done in a timely manner to avoid unnecessary delay to the completion of the Project.

3.3 GROUTING

A. Grout shall be placed in the annular space between the slipliner pipe and the host sewer. The annular space shall be completely filled without exceeding the manufacturer's recommended pipe deflection or exceeding the grout pressure recommended by the pipe manufacturer, or without exceeding [12] psi at the point of placement.

B. Prepare a test section according to SSPWC subsection 500-3.1.9 for the CONSTRUCTION MANAGER review.

C. Procedure

1. Bulkheads shall be placed at the ends of each pipeline segment to seal the annular space from sewage flow. Bulkheads shall not be removed until after the grout has set.

2. The slipliner pipe shall be equipped with a weir to fill the slipliner pipe to prevent flotation during the grouting operation.

3. Standing or running water in the annular space shall be removed or controlled to maintain the correct water ratio of the grout mixture. The annular space shall be grouted by injecting grout from one end of the pipeline segment, allowing it to flow toward the other end. The annular space shall be vented to assure uniform filling of the void space.

4. Pressure on the annular space shall be limited to prevent damage to the liner and shall not exceed 5 psi. Regardless of the pressure, the Contractor shall be solely responsible for any damage or distortion to the slipliner pipe due to grouting.

5. Grout shall be pumped until a grout of within 0.3 pounds per gallon of proposed grout injection density discharges from the end opposite the injection point.

6. The drilling of access holes from the surface to facilitate backfilling shall not be allowed.

3.4 FINAL CLEANUP

A. No hardened grout shall be permitted in the slipliner pipe after completion of grouting operations.

3.5 TESTING

A. **Density:** During placement of the grout, the density shall be measured in accordance with ASTM C 138 a minimum of twice per hour. Adjust the mix as required to obtain the density.

B. Sampling

1. Take four test specimens for each 100 cubic yards of grout or for each four hours of placing.

2. Test in accordance with ASTM C 495 except:

a. The specimens shall be 3 inch by 6 inch cylinders covered after casting to prevent damage and loss of moisture. Moist cure specimens for a period up to 7 days prior to a 28-day compressive strength test.

b. Do not oven dry specimens that are load tested. Specimens may be tested at any age to monitor compressive strength. The material may require special handling and testing techniques.

- END OF SECTION -