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## Addendum # 1 -- 21-010.0-CIP -- E-Mail Coversheet 2021 Sanitary Sewer Manhole Rehabilitation Program

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Please sign, date and return by e-mail to [hgeorge@dublin.oh.us](mailto:hgeorge@dublin.oh.us) to verify receipt of this addendum. Attach signed copy of addendum to bid package when submitting a bid.

Received by: \_\_\_\_\_ Date: \_\_\_\_\_



Date of Addendum  
**Jun 07, 2021**

**City of Dublin -- Division of Engineering**  
5800 Shier-Rings Road Dublin OH 43016  
Phone (614) 410-4640 Fax (614) 761-650

**ADDENDUM NO. 1  
to the contract for**

**2021 Sanitary Sewer Manhole Rehabilitation Program  
21-010.0-CIP**

**Bid Date: June 10, 2021**

**TO PROSPECTIVE BIDDERS:**

The bid document has been updated to include the following Supplemental Specifications

**Supplemental Specifications**

SS-7 Cementitious Grouting  
SS-10 Manhole Rehabilitation

**Addendum Approved By:**

Paul A. Hammersmith, PE  
Director of Engineering/City Engineer

6-7-21  
Date

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**Terminus for Addendum No. 1  
Certification by Bidder**

Bidder shall sign and date one copy of this Addendum No. 1 and submit with his proposal as evidence of receipt and evaluation of same in his bid analysis.

**Signed:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Company:** \_\_\_\_\_

## SECTION SS-7

### CEMENTITIOUS GROUTING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

Plans, videotapes and logs and general provisions of the Contract, including Section 100, General Provisions of the City of Dublin Construction and Material Specifications (CMS) apply to this work.

##### 1.2 DESCRIPTION OF WORK

The Contractor shall provide all labor, materials, and equipment necessary to perform repairs as specified within or as designated by the Engineer. Use of this material is contingent upon approval of the Engineer.

##### 1.3 QUALITY ASSURANCE

###### A. Codes.

Perform all work in compliance with the most recent federal, state, and local codes.

###### B. Standards.

All work shall be in compliance with the National Association of Sewer Service Companies (NASSCO).

###### C. Contractor's Qualifications.

The pressure grouting Contractor shall be a firm having a minimum of 5 years continuous successful experience in pressure grouting similar to that required for this Project.

##### 1.4 SUBMITTALS

Furnish the grout manufacturer's product data, test reports, point repair installation instructions, materials certifications, preparatory work and a list of at least three references for point repairs similar in scope to that required for this project.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

Cement shall be stored in weather tight enclosures to protect against moisture and contamination.

## **PART 2 - EXECUTION**

### **2.1 GENERAL**

Not Used.

### **2.2 MATERIALS**

- A. Portland cement shall conform to CMS 701.01.
- B. Sand shall conform to CMS 703.03.
- C. Water shall be potable.

### **2.3 EQUIPMENT**

If pumping, the grout pump shall be of the positive displacement type and shall be capable of producing adequate pressure to penetrate the area and depth required. The Contractor shall furnish gauges to monitor working pressure.

### **2.4 COORDINATION**

Cementitious grouting shall be performed only as needed and approved by the Engineer.

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

Grouting operations shall be performed under low-pressure conditions and the ground surface above the grouting operations monitored to verify grout is not heaving or surfacing through the cracks or joints in the street.

### **3.2 BATCHING AND MIXING**

The grout mixture shall be proportioned generally in the ratio of one 94 lb. bag of Portland cement to 7.5 gallons (1 cubic foot) of water. This mix can be adjusted by varying the water-cement ratio as grouting proceeds to ensure adequate penetration behind the structure wall, but at no time shall the water-cement ratio of the grout mixture exceed 0.80. All changes in grout mix design must be approved by the Project Engineer prior to use. Grout yield shall be 1.48 cf/bag unless noted.

### **3.3 PLACEMENT**

- A. Preparatory Work  
The Contractor shall take necessary steps to ensure that the areas designated for repair are suitable and prepared for cementitious grouting prior to commencement of work.
- B. Quantity  
In order to control the quantity of material placed, pressured grouting shall be accomplished in multiple stages. Grout placed in each stage must not exceed 10 bags of cement per void detected. A 12-hour minimum time interval shall elapse between successive stages. Voids shall be resounded and probed after each stage. Only those areas still indicating void spaces behind the manhole wall will be regouted.
- C. Adjacent Facilities  
The Contractor shall take precautions to prevent grout from entering lateral sewers, ductbanks, conduits, or other adjacent structures, and shall monitor working pressures to avoid damage or displacement of the sewer, adjacent structures, or the ground surface. The Contractor shall be responsible for the cost of replacement, repair, or cleanup of utilities or structures adversely affected by grouting procedures.
- D. Grouting Pressure  
The machine used for grouting shall be capable of providing a pressure up to 75 pounds per square inch (psi) in excess of any external water pressure. The Contractor shall provide gauges to monitor the working pressures during grouting operations, with a gauge recommended at the injection site on the structure. The pressure shall not exceed that which would distort the structure wall, damage or fill adjacent utilities, lift or displace the overburden.
- E. Pavement Upheaval  
The Contractor shall replace any pavement in like and kind that is upheaved by pressure grout injection at no additional cost to the City.

### **3.5 CLEAN UP**

The Contractor is responsible for containing and removing all excess grout from the sewer and project area. In no case will the Contractor be allowed to flush excess grout from his/her equipment into the sewer or downstream to adjacent facilities.

### **3.6 MEASUREMENT AND PAYMENT**

- A. General  
This item of work shall include all grout, preparatory work, clean up, and appurtenant work necessary to complete Cementitious Grouting as required.
- B. Payment

The payment for this work shall be made at the agreed price per each cementitious manhole rehabilitation, following completion and acceptance.

**END OF SECTION**

## SECTION SS-10

### MANHOLE REHABILITATION

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#### PART 1 – GENERAL

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##### 1.1 SUMMARY

- A. The Contractor shall provide all labor, materials, operation, and equipment necessary to rehabilitate manholes in accordance with the plans, as specified within, or as designated by the Engineer. This item shall include all structural restoration; elimination of inflow and/or infiltration; manhole step replacement; base and channel repair; excavation; removal and disposal of all excess materials; restoration; backfill; permanent and temporary pavement replacement; clearing and grubbing; resetting, replacing, and/or raising casting to grade; and dewatering required for manhole rehabilitation.

Refer to standard drawings MR-1 for specific information on manhole rehabilitation and reconstruction as listed herein. All existing frames and covers shall be removed and replaced as needed or directed by Engineer.

- B. Related Sections:  
1. SS-7, Cementitious Grouting

##### 1.2 REFERENCES

Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. ASTM C109/C109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
2. ASTM C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
3. ASTM C321, Standard Test Method for Bond Strength of Chemical-Resistant Mortars
4. ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
5. ASTM C478, Standard Specification for Precast Reinforced Concrete Manhole Sections

6. ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete
7. ASTM C496/C496M, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
8. ASTM C596, Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement
9. ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
10. ASTM D638, Standard Test Methods for Tensile Properties of Plastic
11. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastic
12. ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
13. ASTM D790, Standard Test Method for Flexural Properties of Unreinforced/Reinforced Plastics
14. ASTM C882/C882M, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
15. ASTM C1244/C1244M, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
16. ASTM D2240, Standard Test Method for Rubber and Durometer Hardness
17. ASTM F2414, Standard Practice for Sealing Sewer Manholes Using Chemical Grouting
18. ASTM F2551-09, Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes
19. ASTM D2240, Standard Test Method for Rubber Property – Durometer Hardness
20. ASTM 4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
21. City of Dublin Standard Drawing MR-1.



B. Manufacturer's Recommendations

- 1.3 DEFINITIONS (Not Used)
- 1.4 SYSTEM DESCRIPTION (Not Used)
- 1.5 SUBMITTALS

**The following submittals (A-D) shall be made at the pre-construction meeting:**

- A. **Contractor Qualifications.** The Contractor shall submit a copy of the manufacturer's licensee certificate. If the Contractor is not licensed by the manufacturer, then a manufacturer's representative will be on-site. Contractor shall also submit a list of ten (10) similar regional projects completed within the last three (3) years including information such as number of manholes on project, manhole construction type, date completed, and project cost.
- B. **Material Certifications.** The Contractor shall furnish the manufacturer's product data, installation instructions, applicable referenced work standards (American Society for Testing and Materials [ASTM], American Concrete Institute [ACI], etc.), approved laboratory test reports that verify strength requirements of this specification, and materials certification for each product used prior to material installation.
- C. **Material Safety Data Sheets.** The Contractor shall submit Material Safety Data Sheets (MSDS) for all materials used for manhole rehabilitation.
- D. **Application Methods and Equipment.** The Contractor shall submit a written description of the material application methods including the equipment that will be used.

1.6 QUALITY ASSURANCE

- A. **Contractor's Qualifications.**
  - 1. The manhole rehabilitation Contractor shall be a firm having a minimum of 3 years of continuous successful experience in the rehabilitation of manholes similar to that required for this Project.
  - 2. The manhole lining Contractor shall be certified/trained by the lining material manufacturer to install their manhole liner if the material requires a certified applicator. The City reserves the right to require an on-site manufacturer's representative, knowledgeable in the use and application of the material, for a minimum of two (2) working hours for each supplied material. The material representative shall direct and instruct the Contractor and inspector on the proper application procedure.

3. The flexible chimney seal installer shall be certified/trained by the material manufacturer to install their product if the material requires a certified applicator. The City reserves the right to require an on- site manufacturer’s representative, knowledgeable in the use and installation/application of the material, for a minimum of two (2) working hours for each supplied material. The material representative shall direct and instruct the Contractor and inspector on the proper installation/application procedure.
4. All contractors conducting work on public utilities within the City of Dublin must be certified/licensed with the City. To obtain a license/certification contact:

City of Dublin  
 Building Standards  
 5200 Emerald Parkway  
 Dublin, Ohio 43017

<https://dublinohiousa.gov/building-standards/contractor-registration/>

1.7 DELIVERY, STORAGE AND HANDLING

- A. Cementitious materials shall be stored in weather tight, original packaging to protect against moisture and contamination.
- B. Polymer manhole lining materials shall be stored in unmixed containers in a sheltered area between 50 degrees and 95 degrees.

1.8 PROJECT/SITE CONDITIONS

- A. Do not work in the presence of excessive amounts of water. Bypass pumping is not anticipated with this project.
- B. Contractor shall use caution when working in sewers. During rain events, sewers may reach capacity quickly and/or head up.
- C. All work to be completed in conformance with all applicable safety standards, in particular OSHA Standard 29CFR1910.146, Permit Required Confined Space Entry.

1.9 SEQUENCING (Not Used)

1.10 SCHEDULING (Not Used)

1.11 WARRANTY

- A. Provide manufacturer’s standard written guarantees and warranties dated from time of Substantial Completion.

1.12 SYSTEM STARTUP (Not Used)

1.13 INSTRUCTION OF OWNER’S PERSONNEL (Not Used)

1.14 COMMISSIONING (Not Used)

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**PART 2 – PRODUCTS**

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## 2.1 MANUFACTURERS

- A. Cementitious Manhole Liner w/ Corrosion Resistance:
1. Standard Cements – Maximum CA
  2. Standard Cements – Reliner MSP
  3. BASF – EMACO S88-CI
  4. Milliken – GeoSpray
- B. Polymer Manhole Liner:
1. SprayRoq Protective Lining Systems – SprayWall
- C. Flexible Chimney Seal:
1. Cretex Specialty Products – Internal Chimney Seal
  2. NPC – FlexRib Frame Chimney Seals
  3. Sealing Systems Inc. – Flex-Seal Utility Sealant.
- D. Manhole Casting Riser Ring:
1. American Highway Products – Stainless Steel Manhole Riser

## 2.2 EXISTING EQUIPMENT

- A. The Contractor shall notify Steve Beros at (614) 410-4620, 48 hours in advance to coordinate the removal or relocation of any existing flow monitor. The Contractor shall provide the location and manhole structure number.

## 2.3 MATERIALS

Materials shall meet the following standards, CMSC specifications, or minimum strength requirements:

- A. **Grout.** Portland cement shall conform to CMSC 701.02; Sand shall conform to CMSC 703.03.
- B. **Manhole Steps.** Steps shall be reinforced polypropylene in accordance with CMSC 711.31.
- C. **Brick.** Brick used in sanitary structures shall be clay or shale brick and conform to CMSC 704.01.

- D. **Cast in Place Concrete.** Cast in place concrete shall be class “C” with a 28-day compressive strength of 4000 psi and conform to CMSC 499.
- E. **Reinforcing Steel.** Reinforcing steel shall be Grade 60 and in accordance with CMSC 509.
- F. **Mortar.** Cement shall conform to CMSC 701.01 through 701.07; Lime shall conform to CMSC 712.04; Sand shall conform to CMSC 703.03.
- G. **Water.** Water shall be potable.

2.4 MANUFACTURED UNITS

- A. **Manhole Frames and Covers.** Standard manhole frames and covers shall meet the requirements of Standard Drawing AA-S111 and SA-01. 36” castings shall be in accordance with Standard Drawing AA-S114 and shall contain a self-sealing gasket and concealed lift hole. Vent holes in any sanitary sewer cover will not be permitted.
- B. **Manhole Grade Rings.** Manhole grade rings shall conform to ASTM C-478 and Standard Drawing AA-S107.
- C. **Precast Manhole Sections.** Precast manhole sections shall be in accordance with ASTM C-478.

2.5 EQUIPMENT

- A. Equipment shall be as recommended by the manufacturer to ensure proper mixing and pumping and shall be clean and in good working order according to the recommendations for safe operation.

2.6	COMPONENTS	(Not Used)
2.7	ACCESSORIES	(Not Used)
2.8	MIXES	(Not Used)
2.9	FABRICATION	(Not Used)
2.10	FINISHES	(Not Used)
2.11	SOURCE QUALITY CONTROL	

- A. All prepackaged manhole lining materials shall have the date of manufacture clearly marked on the package and be unmixed. All material manufacture dates must be within the manufacturer’s recommended limits for installation.
- B. All manhole frame and covers shall be dated within 1 year of the installation date.

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**PART 3 – EXECUTION**

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3.1 ACCEPTABLE INSTALLERS (Not Used)  
3.2 EXAMINATION

A. The Contractor is to conduct QA on all materials delivered to the site to ensure that all items meet the required standards stated herein. All materials that do not meet the required standards shall be removed from the jobsite.

3.3 PREPARATION

a. **City of Dublin Notification.** When private property, wherein an easement exists, must be crossed to access a manhole, the City of Dublin shall distribute to the property owner a flier notifying them of the upcoming sanitary sewer manhole rehabilitation work. The flier shall briefly describe the extent of work, contractor performing the work, and generally describe that the work will occur within the next couple of weeks. Necessary tree removal shall be included in the unit bid price for under bid item SS-10, Cementitious Manhole Rehabilitation.

**Notification.** The Contractor shall notify, in writing, all adjacent landowners a minimum of one week in advance of work near their property.

B. **Debris Dam.** The Contractor shall place a device in the manhole to catch any debris that may be displaced into the manhole during the performance of the work. Work shall not proceed until this device is in place.

C. **Steps.** All steps shall remain in place from those manholes receiving lining.

D. **Cleaning.** Prior to any repair work inside the manhole, all interior wall and invert surfaces shall be cleaned and free of any loose material utilizing the following methods.

1. **Power washing.** Equipment shall be capable of producing a minimum of 5,000 pound per square inch (psi) water blast to remove all foreign matter, loose mortar, grease, oil residues, rust, scale and to etch the surfaces.

a. All surfaces **must be** dry before the application of the polymer lining material.

2. **Chipping.** If large deposits exist or power washing cannot remove all deposits, then the contractor shall remove the deposits by chipping. The contractor shall also remove all loose, broken or softened concrete/bricks to sound material. Any voids left by

chipping procedures in manhole walls or invert surfaces shall be repaired in accordance with section 3.06.A.3.

3. **Muriatic Acid.** If the power washing and/or chipping cannot be utilized due to structural conditions in the manhole or they do not remove all deposits, then a solution of muriatic acid (hydrochloric acid) shall be applied at a ratio of one part acid to ten parts water by spraying from above the manhole. The use of acid for cleaning purposes, no matter how diluted, is not permitted for polymer lining. After the acid solution is applied, it shall be washed off completely. The mixing, application, and removal of the acid solution shall be done in strict accordance with the manufacturer's specifications and safety procedures

**Waste Removal.** All waste materials resulting from the cleaning operation shall be removed from the manhole or site and be properly disposed of by the Contractor.

3.4	ERECTION	(Not Used)
3.5	INSTALLATION	(Not Used)
3.6	APPLICATION	

#### A. **Manhole Lining**

**Inspection.** The manhole walls shall be visually examined, sounded and/or probed to identify any infiltration points and any internal or external void areas prior to any material being applied to the walls.

1. **Stopping Infiltration.** Light infiltration into the manhole shall be stopped using a water plug material approved per the manhole liner manufacturer. If heavy infiltration is encountered, the Contractor may drill up to four 5/8-inch diameter holes around the base of the manhole to act as relief ports, allowing the water to seep into the manhole flow channel which will allow for the water plug material to be applied. Once the leaking walls have been sealed, the drilled relief holes shall be plugged with the specified water plug material. The cost of drilling these relief holes shall be included in the cost of the manhole rehabilitation items.
2. **Patching.** Internal voids (i.e., bricks missing in manhole walls, step removal damage, frames, pipes, and mortar joints) shall be patched with a patching mortar approved per the manhole liner manufacturer. All loose or defective material shall be removed from the area to be patched, exposing a sound substrate. The patching mortar shall be applied to a SSD surface. All repairs shall be made smooth and flush with the face of the manhole wall. External void areas shall be repaired in accordance with specification SS-7 cementitious grouting.

3. **Cementitious Manhole Lining.** *Where there is evidence of a sulfide condition in the manhole, the cementitious lining material shall offer a level of sulfide resistance compatible to what is deemed necessary by the Engineer. Varying levels of protection are offered by materials such as silica-fume enhanced Portland cement, calcium aluminate cement, and calcium aluminate aggregate in conjunction with calcium aluminate cement. The manhole wall surface shall be in a saturated, surface-dry condition immediately preceding application of the cementitious material, or in accordance with manufacturer's requirements.*

The cementitious lining may be applied with low pressure spray equipment or hand troweling methods (requires approval of Owner). If hand troweling is to be utilized, consult manufacturer for special requirements (e.g. scrubbing a bondcoat slurry onto the surface.) If the cementitious lining is to be spray applied, the contractor shall take care to prevent overspray from entering the sewer lines by means of a debris dam or other methods. The cementitious material thickness application shall be a minimum of 0.375-inches and not more than 2.0-inches per pass. The minimum acceptable finished thickness shall be 1-inch from the inside face of the manhole wall. The Contractor shall cure in accordance with the manufacturer's instructions following the application of the final cementitious layer. The cementitious lining shall be applied in not more than two passes from bottom to top. No more than 24-hours shall elapse between successive passes on each manhole. The second pass cannot be made until the first pass has achieved initial set. If more than 24 hours elapse between passes, then initial coat must be removed and the process restarted.

4. **Polymer Manhole Lining.** Application of the polymer manhole liner shall not be made unless the ambient temperature inside the structure is 50 degrees or higher and all surfaces that are to be coated are dry.

The polymer material shall be manually sprayed on to all surfaces by a trained technician who is experienced in the application of a spray applied resin and has been certified by the manufacturer. The minimum thickness to be applied is to be no less than 250 mils in order to support structural integrity and no more than 500 mils are to be applied in a single application. No more than 1,000 mils shall be applied in any one day of application. The water table level may require a thicker coating below its level for structural support. The contractor shall submit their design calculations for each manhole that is to be lined. If several coats are required, no more than 15 minutes shall be allowed between liner applications. All precautions should be taken to protect the surfaces between coats so that

additional cleaning will not be required. If portions of the manhole, such as the bench, invert, or below the water table, require a thicker coating than the areas above the water table, those areas shall be coated first so that the final coat is a monolithic liner from top to bottom for structural enhancement. No other products such as cement or grouts may be used as part of the structural reinstatement, however, said products may be used as part of the repair process prior to the sprayed application of the structure as specified in section 3.06.A.2-3. Application of the polymer material must be completed in one mobilization, unless a thickness of more than 1,000 mils is specified. The finished manhole shall be returned to full service immediately after the 60-minute initial curing period has lapsed.

3.7 CONSTRUCTION (Not Used)  
3.8 REPAIR/RESTORATION

A. **General.** The frame and cover shall be removed and replaced on all manholes being rehabilitated as needed or as directed by the Engineer. The contractor shall leave in place all manhole steps. A flexible chimney seal shall be installed on all manholes being rehabilitated.

B. **Rehabilitate Bench and Channel.** The entire bench and channel area shall be reconstructed using the rapid strength patching mortar required by the manhole liner manufacturer. The preparation work shall include all demolition of deteriorated concrete and removal of all deleterious material from the surfaces to be reconstructed and the removal of sound concrete such that the repair mortar shall not be less than 1-inch in thickness at any point as shown in the attached manhole rehabilitation drawings.

If active infiltration is present in the bench and channel area of the manhole, dewatering exterior to the manhole with a well point may be required in order to facilitate the reconstruction. The dewatering shall continue for a minimum of 8 hours following completion of the bench and channel repair work. Dewatering well point, if anticipated, will be listed as a pay item in the bid schedule.

Wastewater flow shall be maintained by methods which prevent contact with any of the repair work for a minimum of 8 hours following completion of the repair work.

The work on the bench and channel shall also include the work necessary to obtain a watertight seal at all pipe connections, drop inlet connections and between the base and manhole walls. The flow line through the manhole shall be shaped to match the invert of the sewer liner to prevent any flow obstructions in the manhole.

C. **Site Restoration.** The Contractor shall be aware of the conditions at



each manhole site. This shall include but not be limited to trees, shrubbery, landscaping, structures, fences, mail boxes, driveways, curbs, sidewalks, pavements, etc. The Contractor shall photograph all manhole areas prior to use. All pre-construction conditions shall be fully restored as close to its original condition as practicable.

- D. **Flexible Chimney Seals.** The Contractor shall field measure each manhole to ensure proper sizing of the chimney seal. The interior wall surfaces shall be circular and reasonably smooth to promote a positive seal. If the surface is rough, sloped, or irregular apply non-shrink patching mortar to prepare a uniform vertical surface for the sleeve to seal against. Any flaws in the manhole frame such as cracks, pits, or protrusions shall be repaired by either filling with mortar or grinding smooth. Installation of the chimney seal and expansion bands shall be in accordance with the manufacturer's recommendations.

3.9 RE-INSTALLATION (Not Used)  
3.10 FIELD QUALITY CONTROL

A. **Visual Inspection.**

- 1. **Pre-Inspection.** Manhole walls and invert surfaces will be visually inspected for infiltration, voids, all foreign matter, loose mortar, grease, oil residues, and deposits by the City Representative prior to the Contractor beginning any rehabilitation. Any visible leaks shall be stopped per SS-7 and all loose material or deposits shall be removed before work begins.
- 2. **Post-Inspection.** Manhole lining will be visually inspected for water tightness upon completion and at any time during warranty period. Any visible leaks or defects that appear shall be repaired to the Owner's satisfaction by the Contractor at no additional cost.

B. **Testing Requirements.**

- 1. Manhole liner shall be tested with a wet gauge as directed by the City's representative to verify prescribed thickness. Any area found with less than the prescribed thickness shall receive the additional material needed.
- 2. **Cementitious Liner.** The Contractor shall cast three (3) 2" x 2" cubes for strength verification from each day's line mix. After fabrication, the top of the cube mold is to be covered to protect the cubes from direct contact with moisture and then they are to be stored inside the structure where fabricated for 24 hours. After 24 hours the samples are to be removed from the structure and submitted to CMT. CMT will then transport the cubes to an approved laboratory for testing. The cube samples will be tested per ASTM C109/C109M and shall meet the following

compressive strength requirements:

- a. 2,000 psi at 24 hours
- b. 8,000 psi at 28 days

The City reserves the right to require the Contractor to take core samples and to patch the cored location at no additional cost.

- 3. Each manhole shall be sounded by the Contractor at seven (7) days. Inspector must witness these soundings performed by the Contractor. Defects will be corrected by the Contractor per the manufacturer's recommendation to the satisfaction of the Owner.

3.11 ADJUSTING (Not Used)  
3.12 CLEANING

- A. The Contractor shall be responsible for containing and removal of all the rehabilitation material, rebound, and loose material caused by manhole rehabilitation.

3.13 DEMONSTRATION (Not Used)  
3.14 PROTECTION (Not Used)  
3.15 SCHEDULES

- A. The cost of surface preparation, flow maintenance, step removal and replacement, water plug, and patching mortar, shall be included in the unit prices bid for the cementitious manhole rehabilitation.
- B. The accepted quantities of manhole rehabilitation items performed will be paid at the unit price for each respective item of the Contract.
- C. The vertical footage of the manhole lining material shall be measured from the spring line of the pipe to a distance 3" above the bottom of the manhole casting.

<u>ITEM</u>	<u>UNIT</u>	<u>DESCRIPTION</u>
SS-10	VF	Reconstruct manhole to grade
SS-10	VF	Manhole lining

END OF SECTION