

Standard Specification for Providing Structural Bench Repair, Bench Creation or Adjustment in Sewer Manholes

GENERAL

1.1 GENERAL INFORMATION

This specification describes the material, equipment and procedure for the purpose of repairing an existing bench, adjusting the height, or creating a new bench section in a concrete, brick or Fibreglas sewer manhole and other underground structures. Repair or renewal with specified materials is considered a structural repair.

An approved contractor shall furnish the complete installation of the cement material. All of the cleaning, preparation and application procedures shall be in accordance with the manufacturer's recommendation.

1.2 SEWER MANHOLE BENCH REPAIR

This specification addresses both manholes with existing benches to be repaired or adjusted and manholes with no bench currently in place. The two processes are similar but the manhole with no current bench requires special attention to be paid to the depth of the material being applied and how it should be cured. For both applications, leaking should be stopped with the use of a specified infiltration control material.

Condition 1

No bench present. Clean the repair area and apply the bench repair material from the bottom of the manhole to the height and slope required. If the bench requires more than 3 inches of cement material the repair process will be conducted in multiple steps.

Condition 2

For benches that need to be repaired or adjusted. Clean the repair area and apply the bench repair material to the required height and slope.

This specification addresses: bench renewal, a partial reconstruction, the creation of a bench and the sealing of the bench section in a concrete, brick or Fibreglas manhole.

1.3 REFERENCES

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| A. ASTM C39 | Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens |
| B. ASTM C109 | Standard Test Method for Compressive Strength of Hydraulic Cement Mortar (Using 2 inch or 50 mm cubes). |
| C. ASTM C321 | Standard Test Method for Bond Strength of Chemical Resistant Mortars. |
| D. ASTM C496 | Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens |
| E. ASTM C596 | Standard Test Method for Drying Shrinkage of Mortars Containing Hydraulic Cement |

F. ASTM C827	Standard Test Method For Change in Height
G. ASTM C1107	Standard Specification for Packaged Dry, Hydraulic Cement Grout
H. ACI 302	Guide for Concrete Floors and Slab Construction
I. ACI 308	Standard Practice for Curing Concrete
J. ACI 503 R	Adhesion Concrete
K. AASHTO T 277	Chloride Permeability

1.4 SUBMITTALS

Submit the following information to the engineer.

1. Product data, including manufacturer and brand name.
2. Laboratory tests results to verify 28-day compressive strength in accordance with Test Method ASTM C39/M or ASTM C109.
3. The manufacturer shall provide a list of similar sewer manhole projects with a five-year history. Include the Owner's name, the contact name, the project description and date put into service.

1.5 WORKER SAFETY

Worker safety is of the utmost importance. Sewer manholes are permit required confined spaces as defined by OSHA 29 CFR 1910.146. The following equipment is required as a minimum by OSHA. Testing and monitoring equipment, ventilation personal protective equipment, tripod, harness, wench, ladders, and any other equipment necessary for safe entry into and rescue from permit spaces. OSHA also requires an attendant to be present at all times to monitor the entrant.

1.6 DELIVERY, STORAGE AND HANDLING

Store the cement materials under normal, cool, dry conditions. No modification should be made to the manufacturer's recommendations for handling, mixing, placing and finishing of this product.

PART 2 - MATERIAL SECTION

2.1 REPAIR MATERIALS

BENCH REPAIR MATERIAL

Use Fast Set Bench Repair (FSR), a dry factory blended, fast setting, and shrink compensating cement material, or an approved equal to build the bench. The high-strength cement material must be resistant to temperature fluctuations, have a minimum of 8,000 psi compressive strength (28 days), and a volume change of less than 0.02 percent, while containing no calcium chloride,

gypsum, or high lime. The set time should be between 8 to 15 minutes (final set in 30 minutes).

For the best results, use a mechanical mixer with an appropriate mixing blade. Pre-mix the cement material thoroughly (in the original container for one minute). Place approximately 3 quarts of clean potable water into the container and mix the dry cement material on low RPM, 3-5 minutes or until a uniform consistency is achieved. Mix only enough material that can be placed within the working time. For placements greater than 3 inches in depth, the cement material may be extended up to 30%, by weight, with clean dry 3/8 inch pea gravel. Do not blend excess water into the mixture as this will cause bleeding and segregation. Apply the cement material by hand or with a trowel, level and smooth. Repair the bench area to the required pipe diameter by adjusting, reforming, or creating the height required. Keep the cement material damp. Follow the manufacturer's application instructions. Standard Cement Materials Inc., Fast Set Bench Repair (FSR), is an approved material.

Physical Properties Bench Repair Materials Requirements:

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|----------------------------------|------------|------------|
| 1. Compressive strength, (1 day) | ASTM C109 | >2,800 psi |
| (28 day) | ASTM C109 | >8,000 psi |
| 2. Bond strength | ASTM C321 | > 140 psi |
| 3. Percent expansion | ASTM C1107 | <1.20% |

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2.2 INFILTRATION CONTROL MATERIAL

Stop all active leaks with Custom Plug a single component, dry, factory blended, fast setting Hydraulic cement material specifically formulated for stopping water and minor infiltration, or approved equal. The cement material should set in 60-90 seconds. No modification should be made to the manufacturer's written recommendations for handling, mixing, placing and finishing of this product. Standard Cement Materials Inc., Custom Plug, is an approved material.

Physical Properties Infiltration Control Materials Requirements:

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|----------------------------------|-----------|------------|
| 1. Compressive strength, (1 day) | ASTM C39 | >3,500 psi |
| (28 day) | ASTM C39 | >5,500 psi |
| 2. Volume Change | ASTM C827 | No loss |
| 3. Tensile Strength | ASTM C496 | >500 psi |

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2.3 LINING MATERIAL

Use Reliner MSP™ a blend of Portland cement, dry pozzolanic materials and a densified microsilica powder admixture, or approved equal as the wall lining material. The high-strength cement material must be resistant to temperature fluctuations, have a minimum of 8,000 psi compressive strength (28 days), and a volume change of less than 0.09 percent, while containing no calcium chloride, gypsum, or high lime. The set time should be between 3 to 5 hours at 70 degrees F. Standard Cement Materials Inc., Reliner MSP™, is an approved material.

Physical Properties Lining Materials Requirements:

1. Compressive strength, (1 day)	ASTM C109	>2,800 psi
(28 day)	ASTM C109	>8,000 psi
2. Bond strength	ACI 503R	> Substrate failure
3. Drying Shrinkage	ASTM C596	< -0.09
4. Chloride Permeability	AASHTO T 277	< 400 Coulombs

2.4 Water shall be clean and potable.

2.5 Do not use other materials or add any admixtures to this product.

PART 3 - PREPARATION SECTION

3.1 CLEANING PROCEDURE

1. All surfaces shall be free of dirt, oil, grease, laitance and other contaminants. Remove obstructions, loose materials and all unsound concrete from benches before cleaning. Use a high-pressure washer to remove all foreign materials from the sewer manhole bench area prior to applying the cement material. Use a minimum of 3500-psi at a minimum of 2-½ gallons per minute. Wash the bench area to be repaired thoroughly.

PART 4 - EXECUTION SECTION

4.1 APPLICATION

1. Determine which flow control options will be required for each specific manholes situation. For low to moderate flows plugging the manholes may be sufficient. For higher flows, flow-through plugs may suffice. For larger flows by-pass pumping may be required. In all situations the flow must be controlled long enough for the cement material to properly set.

The volume of material needed to build spring line and full pipe benches varies greatly. See Diagram 1 for estimated material volume.

Dampen the entire surface area of the bench, allowing no noticeable free water droplets or running water to remain. Set form boards if required. Begin at the top edge of the bench, apply the cement material in one layer up and around to the wall. Place the cement material along the wall to include the top edge of the bench area. Apply the cement material in such a manner so as to produce a gradual slope to the bottom of the wall. Build the bench up to a uniform height at the circumference. Insure that the thickness of the bench shall increase by no less than 1 inch per foot, with a maximum of 1.5 inches, from the top of the invert and continues in the direction of the wall so as to provide the required slope. For full pipe bench repair, form smooth, U-shaped inverts, which have a depth equal to the pipe diameter. For spring line bench repair, form smooth, U-shaped inverts, which have a depth equal to the one half of the pipe diameter. Follow the slope up and along the entire length of the wall. Invert channels will be constructed to provide a smooth flow transition that sweeps into the direction of flow. Use a stainless steel trowel to compact the cement material into all the voids, level and smooth the surface. Trim all sewer pipes that enter or exit the manhole so that they have a smooth edge and are flush with the manhole wall.

Allow the cement material to set approximately 30 minutes being subjected to active flow. Contact your approved material supplier for help with this product selection and information.

PART 5 - CURING SECTION

5.1 HOT WEATHER PLACEMENT

1. Follow ACI 302 "Guide for Concrete Floors and Slab Construction" and ACI 308 "Standard Practice for Curing Concrete" to ensure that problems due to decreased bleeding, shrinkage cracking, is minimized. Protect the cement material from dry, hot, severe weather extremes and freezing. If the ambient temperature is over 90 degrees F, then take precautions to keep the mixing water cool. Cool the water to a temperature equal to or below 70 degrees F. Use block ice if necessary. No application shall be made when ambient temperatures are less than 40 degrees F and when freezing temperature is expected within 24 hours.
2. Allow the cement material to cure. Ambient conditions will govern specific cases. Any washed out areas should be cleaned and repaired again.

PART 6 - WARRANTY

All of the work shall be guaranteed to be free of defects for a period of one year after the completion of the work. The contractor at no additional cost to the owner will repair any defects discovered within the 1-year period.

END OF SECTION

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Standard Cement Materials Inc.
Houston, Texas
888. 278-1337
Email: sales@standardcement.com