REHABILITATION SPECIFICATION
FOR
MANHOLE FRAME-CHIMNEY SEALING WITH MECHANICAL SEAL
(As Provided by Cretex Specialty Products)

PART 1 GENERAL

1.01 SECTION INCLUDES

This section includes the materials and procedures required for the internal sealing of the frame-chimney joint area of brick and block manholes and the entire chimney area of precast, fiberglass and plastic manholes, as shown on the attached drawings.

1.02 WORK REQUIRED

A. An internal manhole frame seal, as specified herein shall be installed in all manholes within the areas included in this project. If excavation is required to repair, rebuild, or replace a manhole; or if manhole linings or coatings are required, the seal shall be installed after that work has been completed.

B. Brick or Block Manholes - When frame sealing is required on brick or block manholes, an internal flexible rubber frame seal, meeting the requirements of this specification, shall be used to seal the frame-chimney joint area of the manhole.

C. Precast, Fiberglass or Plastic Manholes - When frame sealing is required on precast, fiberglass or plastic manholes, a internal flexible rubber frame seal and where necessary, an interlocking extension or extensions, meeting the requirements of this section, shall be used to seal the entire chimney area of the manhole. The seal and extension or extensions shall extend from the manhole frame down to the top of the manhole cone.

1.03 DEFINITIONS

A. Chimney - The cylindrical variable height portion of the manhole structure used to support and adjust the finished grade of the manhole frame. The chimney extends from the top of the corbel or cone to the base of the manhole frame.

B. Cone or Corbel - That portion of the manhole structure which slopes upward and inward from the barrel of the manhole to the required chimney or frame diameter. "Corbel" refers to a section built of brick or block, while "cone" refers to a precast, fiberglass or plastic section.

C. Pre-Approved Equal - A product that meets the applicable material, performance and design life requirements of this specification and has been approved by the Engineer for use on this project a minimum of seven days prior to bid opening.

1.04 SYSTEM DESCRIPTION

A. Design Requirements - The manhole frame seal shall be designed to prevent leakage of water through the above described portions of the manhole throughout a 50 year design life. The seal shall also be designed so that it can be installed in manholes where the diameters of the frame and chimney differ by up to 20%.

B. Performance Requirements - The manhole frame seal shall prevent leakage of water through the above described portions of the manhole and shall be capable of repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than 1/2 inch after installation and throughout its design life.

1.05 SUBMITTALS

A. Test Report - A test report from an approved independent testing agency, showing that the seal meets the performance requirements of Section 1.04,B, shall be provided by each frame seal manufacturer or supplier. The report shall include the results of the following test performed on a test unit on which the frame seal is attached. The test unit shall consist of a watertight base unit, at least 1 unsealed grade ring or brick course and a differentially moveable, unsealed, manhole frame. The Engineer reserves the right to observe the testing.

1. The manhole frame shall be raised 2 inches and moved laterally 1/2 inch. The frame shall be held in this position for a minimum of 100 hours, after which it is returned to it's normal position.

2. The same test unit is then placed in a water tank filled to just below the top of the frame. The frame shall then be raised 2 inches and lowered back down through a minimum 30 cycles. The frame is then raised 2 inches and held in that position while the frame is moved laterally 1/2 inch. The frame is then returned to its normal position to complete the test.

The seal shall have remained in place and watertight throughout the duration of the test. Any displacement, dislodgement or leakage of the seal shall be cause for failure. Any seal that fails the test may be reworked and retested.

B. Certification (Affidavit of Compliance) - The manufacturers of all manhole frame seals shall submit a notarized certification to the Engineer stating that their product meets the design life requirements of Section l.04, A and the applicable material requirements of Section 2.01, A&B.

C. Manufacturers product technical data, specification, measuring procedure and installation/surface preparation instructions.

1.06 QUALITY ASSURANCE

A. Acceptance Testing - Manhole frame seals shall be visually inspected after installation to insure that the seal is properly positioned, tight against the manhole and frame surfaces, that no voids or leakage points exist and that the bands are securely locked in place. Any seals failing this test shall be reworked as necessary and retested at no additional cost to the owner. Any seals not passing this visual inspection may, at the Contractor's option, be tested for leakage using a method approved by the Engineer.

PART 2 PRODUCTS

2.01 FRAME SEAL

Frame seals shall consist of a flexible internal rubber sleeve, extensions, wedge strips and stainless steel expansion bands, all conforming to the following requirements:

A. Rubber Sleeve and Extension - The flexible rubber sleeve, extensions and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable material requirements of ASTM C-923, with a minimum 1500 psi tensile strength, maximum 18% compression set and a hardness (durometer) of 48+5.

The sleeve shall be double, triple or quadruple pleated with a minimum unexpanded vertical height of 8 inches, 10 inches or 13 inches respectively and a minimum thickness of 3/16 inches. The top and bottom section of the sleeve that compresses against the manhole frame/casting and the chimney/cone shall have an integrally formed expansion band recess and a series of sealing fins to facilitate a watertight seal. These

sealing fins shall have teardrop holes or air pockets to allow the sealing area to conform to minor irregularities that may be encountered on the surfaces of the manhole masonry or frame.

The top section of the extension shall have a minimum thickness of 3/32 inches and shall be shaped to fit into the bottom band recess of the sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inches. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the rubber sleeve.

Any splice used to fabricate the sleeve and extension shall be hot vulcanized and have a strength such that the sleeve shall withstand a 180 degree bend with no visible separation.

The continuous wedge strip used to adapt the rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess and have an integral band restraint. The length of the wedge strip shall be such that, when its ends are butted together, it will cover the entire inside circumference of that band recess needing slope adjustment.

B. Expansion Bands - The expansion bands used to compress the sleeve against the manhole shall be integrally formed from 16 gauge stainless steel conforming to the applicable material requirements of ASTM C-923, Type 304, with no welded attachments and shall have a minimum width of 1-3/4 inches.

The bands shall have a minimum adjustment range of 2-1/2 diameter inches and the mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal. The band shall be permanently held in this expanded position with a positive locking mechanism. Any studs and nuts used for this mechanism shall be stainless steel conforming to ASTM F-593 and 594, Type 304.

C. Acceptable Manufacturers
1. Cretex Specialty Products
2. Pre-Approved Equal

2.02 EQUIPMENT

The contractor shall have a manufacturer's recommended expansion tool, removal tool and all other equipment/tools necessary to install the frame seals.

2.03 REPAIR MORTAR

Repair mortar shall be a one component, quick set, high strength, non shrink, polymer modified cementitious patching mortar which meets the requirements of ASTM C-109, C-348, C-78 and C-882. The repair mortar shall be formulated for vertical or overhead use and shall not contain any chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents nor shall it promote the corrosion of any steel that it may come in contact with.

2.04 CEMENTITIOUS GROUT

Cementitious grout shall be a premixed, non metallic, high strength, non-shrink grout which meets the requirements of ASTM C-191 and C-827 as well as CRD-C-588 and C-621. When mixed to a mortar or "plastic" consistency, it shall have minimum one day and 28 day compressive strength of 6,000 and 9,000 psi, respectively.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

The Contractor shall field measure manholes to determine the information required on the manufacturer's "Sizing and Ordering" procedure. This information is needed to obtain the proper size of bands, the size and shape of the rubber sleeve and the need for and size of any extensions.

3.02 SURFACE PREPARATION

All loose and protruding mortar and brick that would interfere with the seal's performance shall be removed and the appropriate areas of the manhole frame, chimney and or cone/corbel cleaned by wire brushing. All sealing surfaces shall be reasonably smooth, circular, vertical and be clean and free of any loose material or excessive voids. Repair mortar, conforming to the requirements of Section 2.03, shall be used to prepare a uniformly vertical 3"-4" wide surface for the sleeve and extensions to seal against, if an adequate surface does not exist.

Surface preparation, including providing a vertical surface on a cone where none exists, shall be in accordance with the frame seal manufacturer's recommended instructions.

3.03 REALIGN MANHOLE FRAME

All manhole frames that are misaligned from the chimney or cone/corbel by greater than 3 inches shall be excavated and realigned. All existing frames shall be thoroughly cleaned before reinstallation. The frames shall be set in a bed of cementitious grout conforming to the requirements of Section 2.04, mixed to a mortar consistency. The frames shall be set so that the tops of the covers are flush with the adjoining pavement or ground surface.

3.04 INSTALLATION OF FRAME SEAL

The internal frame seals and extensions shall be installed in accordance with the manufacturer's recommended instructions.

PART 4 MEASUREMENT AND PAYMENT

4.01 MANHOLE FRAME SEAL

This item shall be paid at the unit price bid per manhole frame seal and shall include the cost of furnishing and installing an internal rubber seal along with the surface preparation work needed to facilitate it's installation. Measurement shall be based on the actual number of 8 inch, 10 inch or 13 inch seals installed.

4.02 MANHOLE FRAME SEAL EXTENSION

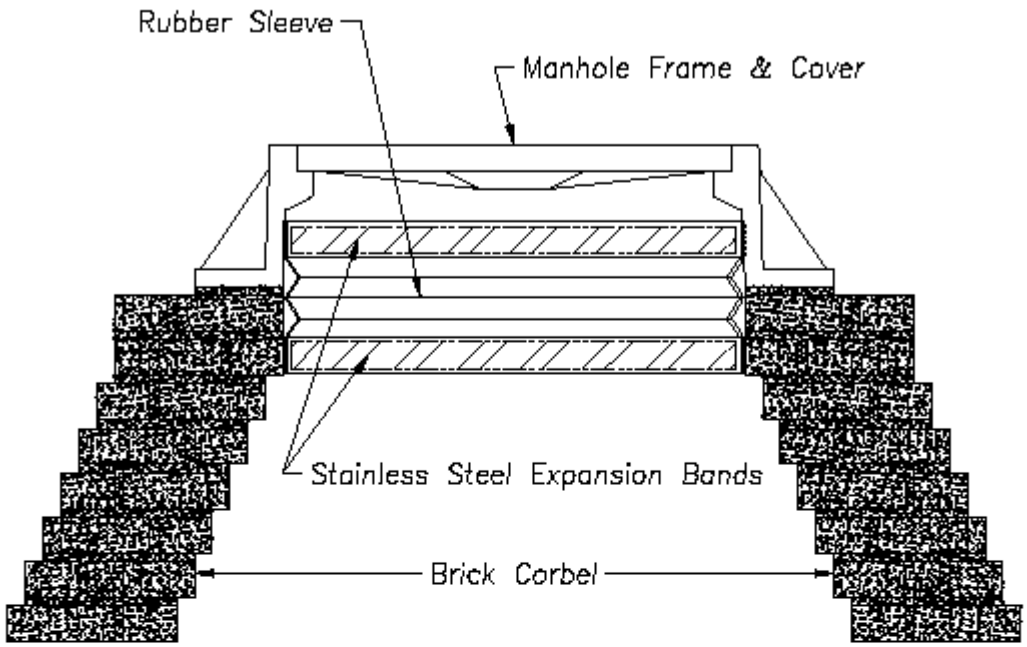
This item shall be paid at the unit price bid per manhole frame seal extension and shall include the cost of furnishing and installing an internal rubber extension along with the surface preparation work needed to facilitate its' installation. Measurement shall be based on the actual number of 7 inch or 10 inch extensions installed.

4.03 REALIGN MANHOLE FRAME

A. Paved Areas - This item shall be paid at the unit price bid for frame realignment-paved, and shall include the cost of all saw cutting, pavement removal, disposal and replacement, excavation, backfill and the cleaning and reinstallation of the existing frame.

B. Unpaved Areas - This item shall be paid at the unit price bid for frame realignment-unpaved, and shall include the cost of excavation, cleaning and reinstallation of the frame, backfill and surface restoration.

Measurement of each item shall be based on the actual number of each type of frame realignment.



BRICK MANHOLE WITH INTERNAL SEAL

1. The rubber sleeve is available in heights of 8.5" (Standard) a 10" (Wide) & a 13" (Extra Wide). The same expansion bands are used on all three.

2. Non-shrink cementitious repair mortar shall be used to prepare a 3" – 4" wide, uniformly vertical bottom sealing surface. All sealing surfaces shall be reasonably smooth, circular, clean and free of any loose material or excessive voids.

3. If the manhole does not have a chimney and the frame sits directly on top of the corbel, a sealing surface shall be made on the second course of the corbel. The diameter of this bottom sealing surface shall not exceed that of the frame by more than 20%.

INTERNAL MANHOLE CHIMNEY SEAL
BRICK

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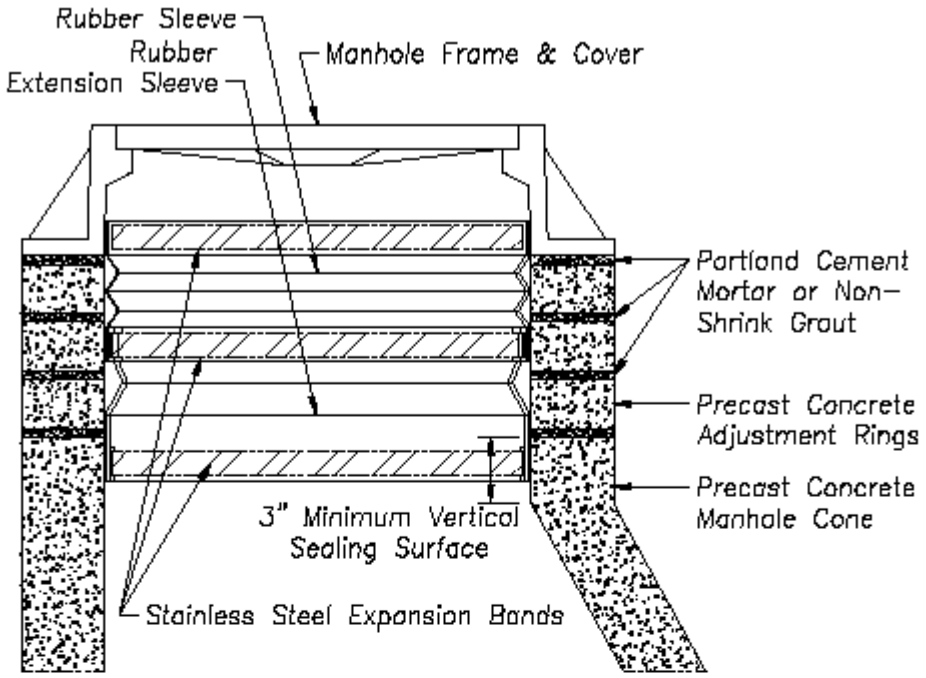

PRECAST MANHOLE WITH INTERNAL SEAL

1. The rubber sleeve is available in heights of 8.5" (Standard) a 10" (Wide) & a 13" (Extra Wide). The same expansion bands are used on all three.

2. See the chimney height table below for seal and extension combinations needed to span from the frame to the top of the cone on manholes with various chimney heights. Frame offsets or diameter differentials will reduce these span heights.

3. The top of the cone shall have a minimum of 3" high vertical sealing surface that is smooth and free of any form offsets or excessive honeycomb.

CHIMNEY HEIGHT TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:		
	W/ STANDARD SEAL	W/ WIDE SEAL	W/ EXTRA WIDE SEAL
Seal Only	0" to 4.5"	2" to 7.5"	6" to 12"
Seal + 7" Extension	Over 4.5" – 10.5"	Over 7.5" – 13.5"	Over 12" – 18"
Seal + 10" Extension	Over 10.5" – 13"	Over 13.5" – 16"	Over 18" – 20.5"
Seal + Multi Extensions	Over 13"	Over 16"	Over 20.5"
Add 6" of coverage for each additional 7" Extension. Add 8.5" of coverage for each additional 10" Extension.			

INTERNAL MANHOLE CHIMNEY SEAL W/EXTENSIONS
PRECAST