

## **SUGGESTED**

### **MANHOLE FRAME SEALING SPECIFICATION**

**(Rehabilitation and or New Construction)**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

This section includes the materials and procedures required for the internal or external sealing of the frame chimney joint area of manholes and the entire chimney area of the structure as shown on the attached drawings.

##### **1.02 WORK REQUIRED**

- A. A 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, the seal shall be installed after this work has been completed. If coating the entire manhole with a rubber membrane inclusive of the chimney area, the work shall be started at the bottom of the structure and finish at the top or chimney area.
- B. Brick, Block, Precast, Fiberglass or Plastic Manholes - When frame sealing is required on these structure's an internal or external flexible frame seal, meeting the requirements of this specification, shall be used to seal the entire chimney of the manhole. The seal shall extend from the frame down to the top of the cone.
- C. The structure shall be prepared in accordance with this specification to receive the frame seal. Moisture on the structure is acceptable.

##### **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 downward and outward from the bottom of the manhole frame to the required barrel of the manhole or barrel 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 72 hours 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 25 year design life. The seal shall also be designed so that it can be installed in manholes where the diameter of the frame and chimney differ by up to 50%. The installation of the Frame seal shall not be limited by the the angle of the frame, cone or corbel.

- B. Performance Requirements - The manhole frame seal shall be capable of repeated vertical movement of the frame of not less than 3 inches (76 mm) and repeated horizontal movement of not less than 1 inch (25 mm) after installation and throughout its design life.

## 1.05 SUBMITTALS

- A. **Test Report** - A test report from an approved 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 installed. The test shall be performed under ambient temperature. 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 test should be carried out on a manhole frame with a vertical inside sealing surface and a manhole frame with a tapered inside sealing surface i.e. "Louisiana frame" from New Orleans. The Engineer reserves the right to observe the testing.

1. The manhole frame shall be raised 3 inches (76 mm) and moved laterally 1 inch (25 mm). The frame shall be held in this position for a minimum of 100 hours, after which time it is returned to its resting position.
2. The same test unit is then placed in a water tank filled to just below the top of the frame (See Drawing TU 001) The frame shall be raised 3 inches (76 mm) and lowered back down. This shall be repeated thirty times. The frame is then raised 3 inches (76 mm) and held in that position while the frame is moved laterally 1 inch (25 mm). The frame is then returned to its resting position to complete the test. This test should be done on a manhole frame with a vertical inside surface and a manhole frame with a tapered inside surface (See Drawing VTF 001)

The seal shall remain in place and watertight throughout the duration of the test. Any leakage of the seal shall be cause for failure. Any seal that fails the test may be reworked and retested.

- B. **Certification** - 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 1.04 A and the applicable material requirements of Section 2.01, A and B. The manufacturer of all manhole frame seals shall also submit to the Engineer certified test results witnessed by a recognized testing agency indicating that the frame seals met the requirements as set forth in Section 1.05 A.

## 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. Spray Grade should not be applied when ambient temperature is below 45 Deg. F. Uncured product is subject to damage if frozen. The seal shall be applied to the substrate of the manhole and frame and meet ASTM 903 Peel Strength. Any seals failing this test shall be reworked as necessary and retested at no additional cost to the owner.

If the seal installation does not pass the 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

The frame seals shall consist of a spray applied rubber seamless durable membrane, this frame seal is applied to the surfaces of the chimney and frame at a thickness of 180 mils (4,57 mm or 0.18 inches). The seal shall extend from the inside of the manhole frame down to the cone or corbel of the manhole. Measurement spacers shall be installed to insure the correct thickness of material is applied. The Frame Seal shall be self healing. The Frame Seal shall be water based, odorless, non toxic, free of VOC's and Free of Flammable Solvents. This Frame seal shall meet the following ASTM Requirements:

#### INFLOW SOLUTIONS - PREMIUM LIQUID RUBBER

##### ASTM TESTING

A.	<b>ELONGATION AT BREAK</b>	1650%	<b>ASTM D412</b>
	<b>TENSILE STRENGTH AT BREAK</b>	DID NOT FAIL. MAX REACHED	<b>ASTM D412</b>
	<b>RECOVERY</b>	90%	<b>ASTM D412</b>
	<b>PEEL STRENGTH</b>	DID NOT PEEL FROM SUBSTRATE	<b>ASTM 903</b>
	<b>LOW TEMPERATURE@ 22 DEG F</b>	GREATER THAN 500% ELONGATION	<b>ASTM D412-92</b>
	<b>HIGH TEMP., AGING FOR 48 DAYS @ 176 DEG F</b>	GREATER THAN 300%MIN NO DETERIORATION OR FAILURE	<b>ASTM D240</b>
	<b>SERVICE TEMPERATURE</b>	-35 DEG F. TO 185 DEG F. NO DETERIORATION OR FAILURE	<b>ASTM D412-92 ASTM D746</b>
	<b>WATER ABSORPTION</b>	Wt. CHANGE 1.02% MAXIMUM	<b>ASTM E96</b>
	<b>PERMEANCE</b>	0.16 grains/hr/ft. sq./in Hg (perms)	<b>ASTM E96</b>
	<b>RESISTANCE TO STATIC HEAD</b>	150 psi HEAD WATER NO LEAKS	<b>CALDERS TESTERS HYDRO STAND 10 - 30K</b>
	<b>OZONE EXPOSURE (41 DAYS @ @ 199 PPM MAINTAINED @ 95 deg F.</b>	PERIOD EQUIVALENT TO 14 YEARS EXPOSURE IN OUTDOORS AMBIENT ENVIRONMENT. NO DETERIORATION OR FAILURE	<b>ASTM G19 ASTM D756</b>
	<b>SALT FOG EXPOSURE (@95 deg F. for 1,000 hours)</b>	NO DETERIORATION OR FAILURE	<b>ASTM B117-90</b>
	<b>CATHODIC DISBONDMENT</b>	NO DISBONDMENT	<b>ASTM G8</b>
	<b>CLASS A FIRE RATING</b>	PASSED	<b>ASTM E108-94</b>
	<b>ULTRAVIOLET LIGHT EXPOSURE</b>	PERIOD EQUIVALENT TO 45 YEARS NO DETERIORATION OR FAILURE TEST STILL IN PROGRESS	<b>ASTM G26</b>

**ACCELERATED AGING TEST**

PERIOD EQUIVALENT TO 45 YEARS  
NO DETERIORATION OR FAILURE  
EXPOSURE IN OUTDOOR AMBIENT  
ENVIRONMENT. TEST IN PROGRESS

**ASTM D573**  
**ASTM D412**

**NOISE REDUCTION**

98% @ 205 MILS

**ASTM E1007**  
**ASTM E492**

**B. ACCEPTABLE MANUFACTURERS**

1. Inflow Solutions Inc.
2. Pre-Approved Equal

**2.02 EQUIPMENT**

The equipment used shall be equipment recommended and approved by the manufacturer necessary to install the seal.

**2.02 REPAIR MORTAR**

The repair mortar shall be a one component, quick set, high strength, non shrink, polymer modified cementitious patching mortar, which has been formulated for vertical or overhead use. It shall not contain any chlorides, gypsum, 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.

**2.03 CEMENTITIOUS GROUT**

Cementitious grout shall be premixed, non metallic, high strength, non shrink grout which meets the requirements of ASTM C-191 and C-827 as well as CRD-C588 and C621. 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 MEASUREMENTS**

Rough estimates should be made by reviewing the plans and specifications or field measurements to establish the quantity of material needed.

**3.02 SURFACE PREPARATION**

The surface shall be clean of dirt, oil, grease and free of loose impediments. The surface may be moist but any running water must be sealed or contained through relief pipes that are commonly used in grouting work. Wire brush the area to be sealed. Structural repair shall be completed before any seal is applied. Stainless steel bands are not required to hold the seal in place. The seal is held in place by the chemical bond between the two surfaces. The seal may be applied to any approved surface and at any angle. detail surface preparation shall be in accordance with the frame seal manufacturer's instructions.

### **3.03 APPLICATION TECHNIQUE**

The seal or membrane shall be spray applied in liquid form and air cured to form a seamless monolithic membrane. The application shall be via a plural component spray gun and delivery equipment as approved by the manufacturer. The sealing system shall be supplied and installed by an approved applicator who is trained and certified by the manufacturer. The spray gun and associated delivery equipment shall be set up such so that the separate emulsion and catalyst are combined in two even fan patterns with no precipitation of either component. It shall produce a non-liquid coating exhibiting a finely textured surface with the characteristic of uniformly releasing the water carrier contained within the emulsion.

- A. CURING - The product shall cure to 80% within a few minutes of application. The nominal standard cure time is 72 hours at 70 Deg. F. with average humidity levels.
- B. REPAIRS - If the seal or membrane suffers damage, it shall be repaired by repeating the application process and overlapping the damaged area that has been trimmed and cleaned. the Premium Liquid Rubber Roller/Brush product can be used in multiple coats or in combination with Geo Textile Fabric

### **3.04 REALIGN MANHOLE FRAME**

Manhole frames that are misaligned from the chimney or cone/corbel that prevent access to the structure 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 in Section 2.03, 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.

## **PART 4 MEASUREMENT AND PAYMENT**

### **4.01 MANHOLE FRAME SEAL AND EXTENSIONS**

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 or external flexible rubber seal along with surface preparation work needed to facilitate it's installation. Measurement shall be based on the actual number needed and a per foot price.

### **4.02 REALIGN MANHOLE FRAME**

- A. Paved Areas - This item shall be paid at a unit price bid for frame alignment-paved, and shall include the cost of all saw cutting, pavement removal, disposal and replacement, excavation, backfill and cleaning and reinstallation of the existing frame or the installation of a new frame if determined necessary by the Engineer.
- 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 frame or the installation of a new frame if determined necessary by the Engineer.

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