

# TECHNICAL REQUIREMENTS AND SPECIFICATIONS

## Non-Structural Rehabilitation of Manhole Frame-Chimney Using Manufactured Frame-Chimney Seal System (As Provided by NPC)

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### Forward

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This specification covers work, materials and equipment required for rehabilitation of and/or protecting the frame chimney area of concrete, brick, and block manholes to prevent inflow/infiltration, deterioration and/or frame casting offset using a manufactured mechanical seal. Procedures for surface preparation, cleaning, application and QA/QC testing are described herein.

### Part 1 - General

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#### 1.01 SECTION INCLUDES

- A. Materials and procedures for the internal sealing of the frame-chimney joint area of precast concrete brick, block fiberglass and plastic manholes as listed in the attached table and/or shown on the the enclosed system maps.

#### 1.02 WORK REQUIRED

- A. An Internal manhole frame-chimney seal, meeting the requirements as specified herein shall be installed in all manholes identified in this project. If excavation is required to repair, rebuild, or replace a manhole, or if any 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 on brick or block manholes is required, an internal flexible rubber frame-chimney 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 – An internal flexible rubber frame-chimney seal and where necessary overlapping extension or extensions, meeting the requirements of this specification shall be used to seal the entire chimney from at a minimum the bottom 2 inches of the frame casting down to at a minimum the top 2 inches of the manhole cone.

### 1.03 DEFINITIONS / REFERENCES

- A. Chimney - The variable height, vertical section built from concrete, HDPE or Plastic rings, and/or brick and block that supports and adjusts 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 casting.
- B. Cone or Corbel – That portion of the manhole structure which slopes upward and inward from the main body/barrel of the manhole to the required chimney or frame diameter. “Corbel” refers to brick or block while “cone” refers to a Precast concrete section.
- C. ASTM – The published standards of the American Society for Testing and Materials, West Conshohocken, PA
- D. ASTM C 923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

### 1.04 SYSTEM DESCRIPTION

- A. Design Requirements – The manhole frame-chimney seal shall be designed to prevent inflow/infiltration of water through the above described area of the manhole throughout a 25 year design life. The seal system shall be designed to with the ability to be installed in manholes with a diameter differential of up to 20% between the frame casting and manhole chimney or cone.
- B. Performance Requirements – The frame-chimney seal shall prevent leakage of water into the manholes at the joints between the frame casting and manhole cone/corbel and be capable of repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than ½ inch after installation and throughout its design life

### 1.05 SUBMITTALS

- A. The following items shall be submitted:
- B.
  - 1. Manufacturer’s Technical specification sheet on the product to be used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.
  - 2. Test Report – A test report from an independent testing organization supporting that the seal meets the performance

requirements of Section 1.04, B shall be submitted by each seal manufacturer and/or supplier.

3. Certification – The manufacturer of the frame-chimney seal shall submit a written certification stating that their product meets the design life requirements of Section 1.04 A, and the applicable material requirements of Section 2.01 A & B.
4. Installation Procedures – recommended installation procedures as supplied by the frame-chimney seal manufacturer shall be submitted.

#### 1.06 QUALITY ASSURANCE

- A. Acceptance Testing – Manhole frame-chimney seals shall be visually inspected after installation to insure the seal is properly positioned, tight against the manhole and frame-casting surfaces, that no voids or visible leakage points exist and that the bands have been locked in place. Leakage shall mean freely dripping water coming from the interface between the seal and the manhole frame casting and cone/corbel.

Seal or Seals which do not pass visual inspection shall be reworked as necessary and inspected at no additional expense.

#### 1.07 PROJECT DOCUMENTATION

- A. The Installer shall document the manholes as the seals are installed.
- B. Photos of the manholes before and after seal installation shall be provided clearly identifying the manhole number, date and time.
- C. The photos shall be placed in plastic photo sleeves and compiled in a 3-ring binder. An index shall be included with each binder providing photo number, basin number, manhole number and date. Installer shall document the manholes as the seals are installed.
- D. Two copies of the photo binders shall be submitted to the Owner/Engineer at the earliest possible date.

### **PART 2 - PRODUCTS**

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#### 2.01 FRAME-CHIMNEY SEAL

Frame-Chimney Seals shall consist of a flexible rubber sleeve, extension or extensions, and stainless steel expansion bands conforming to the following requirements.

- A. Rubber Sleeve and Extension – The flexible rubber sleeve and extension shall be extruded or molded from a high grade rubber compound conforming to the applicable material requirements of ASTM C 923. Recommended materials are EPDM or Polyisoprene. The sleeve shall be corrugated with a minimum unexpanded vertical height of 8 inches, 10 inches or 12 inches respectively and a minimum thickness of 3/16 inches. The upper and lower section of the sleeve that compress against the frame casting and manhole chimney or cone shall have an expansion band recess capable of restraining the band during expansion and after installation.

The top section of the extension shall have a minimum thickness of 3/32 inches and shall be shaped to fit behind the sealing area of the rubber sleeve under the expansion band recess area. The remainder of the extension shall meet the material requirements of ASTM C 923. The bottom section of the extension shall contain an expansion band recess matching the rubber sleeve.

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

- B. Expansion Bands – The expansion bands used to compress the sleeve against the manhole shall be integrally formed from 16 gauge stainless steel, Type 304 or 316 conforming to ASTM C 923, with no permanent welded attachments and shall have a minimum width of 1 inch and a maximum width of 1-3/8 inches. The expansion band shall be designed to generate sufficient pressure that when expanded, compresses the rubber sleeve against the manhole preventing inflow/infiltration.

The expansion bands shall have a minimum adjustment range of 2 -1/2 diameter inches. The tool used to expand the band shall have the capacity to develop the necessary force to provide compression of the rubber sleeve and a watertight seal. The band shall be permanently held in the expanded position with a latching mechanism that engages in one of the slots in the overlapping end of the band.

## 2.02 MANUFACTURER

- A. NPC, Inc., Milford, New Hampshire, toll-free 800-626-2180, or 603-673-8680, or fax 603-673-7271

## 2.03 EQUIPMENT

- A. The contractor/installer shall have the manufacturer's recommended installation/expansion tool as well as any other equipment or tools required to install the frame-chimney seals.

## 2.04 REPAIR MORTAR, CEMENTITIOUS GROUT

- A. Repair mortar shall be a single component, ready to use with water high strength, non-shrink polymer modified Cementitious patching mortar for vertical or overhead use. It shall not contain calcium chloride, added gypsum, metallic particles, lime or high alumina cements.

Repair mortar shall have the following minimum requirements:

Compressive Strength	ASTM C 109	1 day	2800 psi
		7 day	4600 psi
		28 day	5800 psi
Flexural Strength	ASTM C 348	1 day	600 psi
		7 day	750 psi
		28 day	900 psi
	ASTM C 78	28 day	1500 psi
Slant Shear Bond Strength	ASTM C 882	7 day	1190 psi
		28 day	1640psi

- B. Cementitious Grout shall be premixed, non-metallic, controlled expansion, high strength, versatile non-shrink grout meeting the requirements of CRD-C588-70, CRD-C621-81, ASTM C 823-82 and ASTM C 191-79. When mixed to a mortar or “plastic” consistency, it shall have minimum 1 day compressive strength of 6000 psi and a 28 day compressive strength of 9000 psi.

### **PART 3 – EXECUTION**

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All work to be performed shall be in strict accordance with the ENGINEER’s specifications and recommendations, including installation and application of all products as required and in accordance with the manufacturer’s recommended instructions.

#### **4.01 FIELD MEASUREMENTS**

- A. The contractor/installer shall be responsible for field measuring each manhole to determine the information required on the manufacturer’s “Manhole Measurement Worksheet”. This information is required to determine the proper size rubber sleeve, the need for and size of any extensions and the size and number of expansion bands required to complete the installation.

#### **4.02 SURFACE PREPARATION**

- A. The contractor/installer shall inspect the areas of the frame casting for rust, scale or debris and the manhole chimney and cone area for any

loose or protruding mortar, brick or concrete that would interfere with the installation of the seal.

- B. The contractor/installer shall remove any rust scale or dirt from the inside area of the manhole frame casting and clean the chimney and or cone/corbel area by wire brushing.
- C. The contractor/installer shall be responsible to ensure all surfaces under the sealing area behind the expansion bands be reasonably smooth, circular, vertical and free of any defects that would prevent the rubber sleeve from achieving a watertight seal.
- D. The contractor/installer shall repair any defects using repair mortar meeting the requirements of Section 2.4 and provide a 2 inch to 3 inch wide surface for the sleeve and/or extension to compress against.
- E. Surface preparation methods shall be in accordance with the frame-chimney seal manufacturer's recommended instructions.

#### 4.03 REALIGN MANHOLE FRAME

- A. All manhole frame castings that are misaligned from the chimney or cone/corbel by 3 inches or more shall be excavated and realigned.
- B. It shall be the responsibility of the contractor/installer to ensure the frame casting is thoroughly cleaned before reinstallation.
- C. The frame casting shall be set in a bed of cementitious grout that meets the requirements of Section 2.4, mixed to a mortar or "plastic" consistency.
- D. The frame casting shall be set so that the top of the cover is flush with the existing pavement or ground surface.

#### 4.04 Installation of Frame-Chimney Seal

- A. The internal frame-chimney seals and/or extensions shall be installed in accordance with the manufacturer's recommended instructions.

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### **SECTION 5 – MEASUREMENT & PAYMENT**

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#### 5.1 Manhole Frame-Chimney Seal

- A. This item shall be paid at the unit price bid per manhole frame-chimney seal and shall include the cost of furnishing and installing an internal

frame-chimney seal and all required surface preparation needed to achieve a watertight installation.

- B. Measurement shall be based on the actual number of seals installed

## 5.2 Manhole Frame-Chimney Seal Extensions

- A. This item shall be paid at the unit price bid per manhole frame-chimney seal extension and shall include the cost of furnishing and installing an internal frame-chimney seal extension and all the required surface preparation needed to achieve a watertight installation.

- B. Measurement shall be based on the actual number of seals installed.

## 5.3 Realigned Manhole Frame Casting

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

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

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

END OF SECTION