



# TEST REPORT

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**Report Number:** 321-20187

**Project No.:** 33668

**Report Issued:** June 12, 2020

**Client:** MIFAB Incorporated  
1321 West 119<sup>th</sup> Street  
Chicago, IL 60643

**Contact:** Michael Whiteside

**Source of Samples:** The samples were shipped to IAPMO R&T Lab from MIFAB Incorporated, and received in good condition on January 28, 2020, and May 18, 2020.

**Date of Testing:** March 11, 2020 through June 11, 2020.

**Sample Description:** Shielded Hubless Couplings (Class I – Industrial/Commercial/Residential).

Models: MI-QXHUB-X

X = 1-1/2", 2", 3", 4", 5", 6" 8", 10" & 12" sizes.

**Scope of Testing:** The purpose of the testing is to determine if the samples tested of the Shielded Hubless Couplings meet all applicable requirements of FM Class number 1680-1989, entitled, "Approval Standard for Couplings Used in Hubless Cast Iron Systems for Drain, Waste or Vent, Sewer, Rainwater or Storm Drain Systems Above and Below Ground, Industrial/Commercial and Residential".

**Conclusion:** the samples tested of the Shielded Hubless Couplings, models noted above, from MIFAB Incorporated, COMPLY with all applicable requirements of FM Class number 1680-1989, EXCEPT section 4.1.1.

Tested by,

Reviewed by,

Lawrence S. Owens, Test Technician

Sean Vuu, P.E., Manager, Specialty Projects

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**Primary Standard:** FM Class Number 1680-1989, clauses tested / evaluated:

IV GENERAL REQUIREMENTS

V PERFORMANCE REQUIREMENTS

**Test Results:** All tests and evaluations were conducted per the written procedures specified in the standard.

**FM Class Number 1680-1989:**

**IV GENERAL REQUIREMENTS**

**4.1 Markings – PENDING**

4.1.1 Each Approved coupling shall be permanently marked on its external surface with, at minimum:

- manufacturer's name or trademark "MIFAB"
- model or type designation (unique to the Approved model) "MI-XHUB-X (X = 1-1/2", 2", 3", 4", 5", 6", 8" 10" & 12")"
- corresponding nominal pipe sizes
- FM Approval Mark (see Appendix C) – **NOT PRESENT**

**The couplings are not marked with the rated pressure in psi.**

4.1.2 All information need not appear on each piece of multicomponent coupling assembly; however, all information required by Paragraph 4.1.1 shall be visible without disassembly of an installed coupling, and the coupling shall be so designed that it shall not be possible to assemble coupling components to produce an incompletely marked assembly.

4.1.3 The sealing sleeve compound shall be per ASTM C564-70. Manufacturers may submit alternate materials if performance equal to that of ASTM C564-70 can be demonstrated.

4.1.4 The sealing sleeve shall be marked with raised letters. This marking shall consist of nominal pipe size, manufacturer's identifying mark, mold number, cavity number, material identification, and the FM Approval Mark.

**4.2 Instructions – COMPLIED**

Each shipment shall be packaged with complete installation instructions, including any dimensional requirements, fastener torque requirements, and specific torqueing sequence.

**4.3 Physical or Structural Features**

**4.3.1 Materials – COMPLIED.**

All materials are suitable for the intended service.

Sealing sleeve materials are suitable for continuous service in the temperature range of 0° to 180°F. They are pliable, smooth, and free of obvious surface porosity and mold flash.

**4.3.2 Pressure Rating – COMPLIED.**

All couplings are designed for a Class I rated working pressure as listed in Paragraph 1.2.2.

**4.3.3 Sizes – COMPLIED.**

The dimensions of the couplings allow their use with standard hubless cast iron soil pipe and fittings used in drain, waste, vent, storm and sanitary systems, as defined in Cast Iron Soil Pipe Institute (CISPI) 301-85

**4.3.4 Connections – COMPLIED**

A. The couplings can be readily installed with no possibility of incorrect assembly.

B. When required by the given design, couplings mesh together properly with no interference.

Assemblies do not cause a pocket or recess with a lip, or reduction in pipe area, or cause an obstruction in flow path. No special tools are required for coupling assembly, except torque wrenches, which are specifically allowed.

#### 4.3.5 Test Pipe – FOLLOWED.

Because of the inconsistencies in different lots and brands of hubless pipe, both in surface finish, dimension, and porosity, as well as the irregular coating applied, all tests in this standard shall be run using the modified steel pipes or fabricated segments described below.

Steel pipes or fabricated steel segments used during testing shall be machined to the maximum and minimum outside diameters (in pairs) of CISPI Standard 301-85 and shall have 0.015 in. deep grooves circumferentially around the pipe. The grooves shall have a 60° included vee angle and be spaced at 3/16 in. intervals the width of the area covered by the coupling sleeve. The surface of the maximum and minimum diameter areas shall be 125 rms between vee grooves. Surfaces shall be uncoated during testing and shall be solvent-cleaned prior to assembly.

#### 4.3.6 Underground Installation – INFORMATIONAL.

The Approval of couplings per the requirements of this Standard extends to underground service only when systems are laid on a continuous, firm bed, or on concrete or other adequate supports. Restraints, thrust blocks, and other supports may be necessary to prevent damaging external loads from being transmitted to couplings.

Joints shall be made up and torqued per manufacturer's instructions. Any required clamps, restraints, or supports shall be installed or framed prior to careful placement of backfill and shall conform to the requirements of the authority having jurisdiction.

#### 4.4 Drawings/Plans/Specifications required with samples – COMPLIED

Couplings submitted for testing are true production samples and free of sharp edges, burrs or other imperfections likely to injure the installer or interfere with proper assembly of the unit.

In addition to the production samples, the manufacturer provided complete detail and assembly drawings.

## V PERFORMANCE REQUIREMENTS

### 5.1 Hydrostatic Strength

#### 5.1.1 Requirement – COMPLIED.

The couplings withstood 150 percent of its rated working pressure (1.5 x 15 psi) without leaking.

#### 5.1.2 Test/Verification – FOLLOWED.

A minimum of one coupling of each size under examination shall be assembled in conformance with the manufacturer's instructions onto a test module which restrains the pipe from separation. A set of test pipes with one piece machined to the maximum diameter and one to the minimum diameter as described in Paragraph 4.3.5 shall be used. Each test assembly shall be pressurized to 1.5 times the rated working pressure of the coupling for 5 minutes.

### 5.2 Blockage

#### 5.2.1 Requirement – COMPLIED

The couplings did not leak when operating for extended periods of time at rated working pressure (15 psi).

#### 5.2.2 Test/Verification – FOLLOWED.

A minimum of one of each size of coupling under investigation shall be mounted on a set of test pipes, be pressurized at the rated working pressure for a period of not less than 8 hours and examined for leakage. Leakage within the 8-hour period shall be considered a failure of that coupling size which leaked.

A fixture which restrains the pipes from separation may be used if such restraint is specified in the manufacturer's installation instructions.

### 5.3 Bending Moment

#### 5.3.1 Requirement – COMPLIED

The couplings did not leak or otherwise fail when subjected to specified bending moments.

#### 5.3.2 Test/Verification – FOLLOWED.

Couplings shall be assembled as described below and subjected to the required bending moments listed in Table 1. The required moments are calculated from the application of a factor of two (2) to the moment produced by a water-filled hubless cast iron pipe on a coupling which is adjacent to a pipe hanger, with the next hanger broken on the maximum allowable hanger spacing of 10 feet.

Couplings 10 inches nominal size and smaller shall be mounted per manufacturer's instructions between two pieces of test pipe at least 5 feet long each. The outboard ends of the pipes shall be closed. The assembly shall be set on supports 24 inches apart with the coupling centered as indicated in Figure 1. The assembly shall be filled with water and hydrostatically pressurized to the rated working pressure of the coupling and held at that pressure for the duration of the test. The load shall be applied vertically on both sides of the coupling with a bridge within 1 inch of the maximum gripping dimension of the coupling, until the maximum bending moment as listed in Table 1 is reached. With this test configuration, the moment arm is taken to be 1 foot and the load which must be applied to the coupling is numerically equal to twice the required moment in English System units. No leakage shall occur at the maximum bending moment.

Pipes may be axially restrained in a fashion which does not interfere with application of the bending load, if such restraint is specified in the manufacturer's installation instructions.

### 5.4 Deflection Angle

#### 5.4.1 Requirement – COMPLIED

Each coupling withstood a deflection of 1 inch per lineal foot of pipe, without leakage, while pressurized to the rated working pressure.

#### 5.4.2 Test/Verification - FOLLOWED.

Each nominal size of coupling 10 inches or smaller shall be mounted per manufacturer's instructions between two pieces of test pipe. The outboard ends of the pipes shall be closed. The assembly shall be filled with water and hydrostatically pressurized to the rated working pressure of the coupling for the duration of the test. One pipe shall be rigidly supported while the opposite end of the other pipe shall be raised 1 in. per lineal foot of pipe. No leakage shall be permitted. Then the pipe shall continue to be raised until a failure (leakage or otherwise) occurs and the maximum deflection shall be recorded for information. Couplings larger than 10 inches nominal size shall be tested on a case-by-case basis.

Findings: Each coupling withstood a deflection of 1 inch per lineal foot of pipe, without leakage, while pressurized to the rated working pressure. The leakage at maximum deflection of the samples tested is recorded below.

| Size<br>(in.)   | Deflection at the<br>point of leakage<br>(in•ft) |
|-----------------|--|
| 1.5             | 3.50   |
| 2               | 4.25   |
| 3               | 3.25   |
| 4               | 3.25   |
| 5               | 4.75   |
| 6               | 3.25   |
| 8               | 2.50   |
| 10              | 2.25   |
| 12 <sup>†</sup> | —  |

<sup>†</sup>Couplings larger than 10 inches nominal size shall be tested on a case-by-case basis.

## 5.5 Sealing Sleeve

### 5.5.1 Requirement – COMPLIED

The sealing sleeves did not crack or permit leakage when subjected to temperature and vibration exposure as noted below.

### 5.5.2 Test/Verification – FOLLOWED.

A. One sealing sleeve of each material under examination shall be subjected to high temperature exposure and one to low temperature exposure. Samples subjected to the temperature exposure tests shall be installed per manufacturer's instructions in coupling-pipe assemblies during exposure. One sample shall be exposed to a vibration environment while pressurized to the rated working pressure.

B. A sample nominal 3-inch coupling shall be installed between two pieces of 6 to 12 inch (152 to 305 mm) long test pipe. The high temperature exposure shall consist of 180°F (82°C) oven-air exposure of 45 days. After exposure, the assembly shall be allowed to cool to ambient air temperature. It shall then be pneumatically pressurized to the rated working pressure and submerged in water. No leakage shall occur. The sealing sleeve, after removal from the housing assembly, shall not crack when squeezed together from any two opposite points.

C. A sample nominal 2-inch coupling shall be installed between two pieces of 6 to 12 inch (152 to 305 mm) long test pipe. The low temperature exposure shall consist of 0°F (-18°C) air exposure for 4 days. After exposure, the assembly shall be submerged in a pail of 0°F (-18°C) antifreeze and pneumatically pressurized to the rated working pressure. No leakage shall occur. The assembly shall then be allowed to warm to ambient temperature and shall then be disassembled. The sealing sleeve shall not crack when squeezed together from any two opposite points.

D. A sample nominal 4 inch coupling shall be assembled according to Figure 2. connecting two 6 to 12 inch (152 to 305 mm) pipes with closed outer ends. The assembly shall be approximately one-half full of water, pneumatically pressurized to the rated working pressure and subjected to 0.020 inch (0.51 mm) full stroke vibration at a frequency constantly varying between 18 and 37 Hertz for 5 hours. At the conclusion of the vibration test, the assembly shall be hydrostatically pressurized to the rated working pressure for 5 minutes. No leakage shall be evident.

Findings: The sealing sleeve did not leak. In addition, after removal from the housing assembly, shall not crack when squeezed together from any two opposite points.

## 5.6 Clamp Strength

### 5.6.1 Requirement – COMPLIED

The clamp assemblies did not separate from the housing when over-tightened.

### 5.6.2 Test/Verification – FOLLOWED.

Sample clamp assemblies in nominal 2, 4, 6 and 8 inch sizes, as described in Paragraph 2.1, without elastomer sleeves, shall be placed over pipes and tightened to 115 percent (92 in•ft) of the manufacturer's highest rated installation torque. Strip clamps shall not separate from the housing during this test. Other designs shall be evaluated on a case-by-case basis.

Findings: the samples did not separate from the housing.

| Size<br>(in.) | Manufacturer's<br>torque rating<br>(in•ft) | Point of failure<br>(in•ft) |
|---------------|--|-----------------------------|
| 2             | 80   | 106                         |
| 4             | 80   | 130                         |
| 6             | 80   | 114                         |
| 8             | 80   | 146                         |

## 5.7 Thrust Test

### 5.7.1 Requirement – COMPLIED<sup>†</sup>

The pipe sections did not separate more than 0.150 inch when assembled and tested according to the procedure below.

### 5.7.2 Test/Verification – FOLLOWED.

One coupling of each diameter was assembled per Figure 3 onto two steel pipes or test segments as described in Paragraph 4.3.5. The assembly shall be filled with water and the hydrostatic pressure increased at the rate of 1 psi every 30 seconds until the following test pressure is reached. The test pressures shall be as below.

Findings: the pipe sections did not separate more than 0.150 in. when assembled and tested according to the procedure noted above. Actual separation of the individual models tested is recorded below:

| Size<br>(in.)   | Applied pressure<br>(psi) | Separation<br>(in) |
|-----------------|---------------------------|--------------------|
| 1.5             | 15                        | 0.003              |
| 2               | 15                        | 0.005              |
| 3               | 15                        | 0.011              |
| 4               | 15                        | 0.020              |
| 5               | 15                        | 0.013              |
| 6               | 15                        | 0.028              |
| 8               | 10                        | 0.034              |
| 10              | 6                         | 0.038              |
| 12 <sup>†</sup> | —                         | —                  |

<sup>†</sup>12" in not referenced in the table, noted in section 5.7.2.

## 5.8 Salt Spray – COMPLIED

### 5.8.1 Requirement

The clamp assemblies did not corrode or deteriorate when exposed to a salt fog environment as specified in 5.8.2.

### 5.8.2 Test/Verification – FOLLOWED

One sample nominal 4 inch coupling assembly was mounted per manufacturer's instructions on two pieces of pipe approximately 14 inches long. The assembly was then placed in a salt spray (fog) environment as specified by ASTM B117-85, "Standard for Salt Spray (Fog) Testing". The salt solution consisted of  $5 \pm 1$  percent by weight of common salt (sodium chloride) dissolved in demineralized water. The chamber temperature shall be maintained at 92°F - 97°F.

Following 10 days exposure to the salt spray, the sample was permitted to air dry for 2 to 4 days. A visual inspection was made for deterioration or impending failure. The corrosion was not severe, so the assembly was washed with tap water and dried with a compressed air spray. A visual inspection was then made again to look for deterioration or impending failure of any component. No failure was observed.

The coupling and sealing sleeve was removed from the pipe and examined again. Then the coupling and sealing sleeve were reassembled to the pipe and hydrostatically tested to the rated working pressure (15 psi) for 5 minutes. The coupling exhibited no indications of failure.

