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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------|
| <b>NAVISTAR, INC.</b>                                                                                                                                                                                                                                                                                                                   |                                  |                                        |
| <b>Material, Parts, and Process Specifications<br/>(MPAPS)</b>                                                                                                                                                                                                                                                                          |                                  | NUMBER:<br><b>MPAPS F-3</b>            |
|                                                                                                                                                                                                                                                                                                                                         |                                  | Former Designation: <i>CEMS F-3</i>    |
| TITLE:<br><b>Composite Air Brake Push-to-Connect (PTC) Fittings</b>                                                                                                                                                                                                                                                                     |                                  | CURRENT REV No.:<br><b>1802</b>        |
|                                                                                                                                                                                                                                                                                                                                         |                                  | DATE:<br><b>Feb. 2018</b>              |
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| <b>PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION</b>                                                                                                                                                                                                                                                            |                                  |                                        |
| <i>This specification may involve hazardous materials, equipment, and procedures. This specification does not purport to address all of the safety issues associated with its use. The user is responsible to consult appropriate safety and health practices and to determine the applicability of regulatory limits prior to use.</i> |                                  |                                        |

## **1.0 APPLICATION**

This document contains design and performance requirements for composite air brake fittings.

## **2.0 SCOPE**

This specification covers general requirements, property and performance requirements, identification, quality, packing and shipping, and source approval and quality control requirements.

### **2.1 Restricted Chemical Substances**

Effective January 1, 2007, all product supplied to the requirements of this specification must comply with the requirements of the MPAPS B-50 specification.

## **3.0 CONTENTS**

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#### **4.0 REFERENCE DOCUMENTS**

Unless otherwise specified, the latest issue of all referenced standards shall apply. The following standards, specifications and regulations are referenced in this specification.

ISO 9001/TS 16949 – Quality Management Systems-- Requirements  
CFR Title 29, Part 1910 – Occupational Health and Safety Standards  
NAVISTAR ISQ-001-QM – Integrated Supplier Quality Requirements  
NAVISTAR D-13 – Supplier Packing and Shipping Standard.  
NAVISTAR EDS-A16 – Key Control Characteristics (KCC)  
NAVISTAR MPAPS B-50 – Restricted Chemical Substances  
NAVISTAR MPAPS F-2 - Fluid System Cleanliness Requirements  
NAVISTAR MPAPS F-7006 - Thermoplastic Tubing, Air Brake  
NAVISTAR MPAPS P-9543 - Engineering Test Report Requirements  
FMVSS 571.106 – Brake Hoses  
SAE J2494-3 - Performance Requirements for SAE J844 Non-Metallic Air Brake Tubing and Push to Connect Fitting Assemblies Used in Vehicular Air Brake Systems  
SAE J2494-2 - Dimensional Specifications for Non-Metallic Body Push-to-Connect Fittings Used on a Vehicular Air Brake System  
ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness  
ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension  
ASTM D297 - Standard Test Methods for Rubber Products—Chemical Analysis  
ASTM D573 - Standard Test Method for Rubber—Deterioration in an Air Oven  
ASTM D395 - Standard Test Methods for Rubber Property—Compression Set  
ASTM D471 - Standard Test Method for Rubber Property—Effect of Liquids  
ASTM D2137 - Standard Test Methods for Rubber Property - Brittleness Point of Flexible Polymers and Coated Fabrics

#### **5.0**

#### **5.0 MATERIALS**

The body of the fittings shall be made of a composite material that meets all SAE J2494-3 material test requirements and complies with MPAPS B-50.

#### **5.1 Composite Body Material Requirements**

The composite body material requirements are shown in Table 1 below, and will be composed of a Glass-filled Nylon 6,10, or Glass-filled Nylon 12.

| <b>Material Properties (conditioned)</b>   | <b>Minimum Requirement</b> |
|--------------------------------------------|----------------------------|
| Tensile Modulus                            | 4800 MPa                   |
| Elongation at Break                        | 7%                         |
| Tensile Strength at Break                  | 85 MPa                     |
| Charpy notched impact strength, Room Temp. | 18 kJ/m <sup>2</sup>       |
| Charpy notched impact strength, -30° C     | 11 kJ/m <sup>2</sup>       |

**Table 1: Properties for composite body**

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## 5.2 O-ring Material

O-rings will be made from a low-temp Nitrile. See Table 2 for physical properties and requirements.

| Physical Property                                                  | Requirement | ASTM Test Method |
|--------------------------------------------------------------------|-------------|------------------|
| <b><i>Original Properties</i></b>                                  |             |                  |
| Hardness, Shore A                                                  | 70 ± 5      | D2240            |
| Tensile strength, MPa (psi), min.                                  | 8 (1160)    | D412             |
| Ultimate elongation, pct., min.                                    | 200         | D412             |
| Specific gravity                                                   | Report      | D297             |
| Color                                                              | Blue        | N/A              |
| Cure System                                                        | Sulfur      |                  |
| <b><i>Heat Aging (70 hours at 100°C (212°F))</i></b>               |             |                  |
| Hardness change, pts., Shore A                                     | ±15         | D573             |
| Tensile strength change, pct.                                      | ±30         |                  |
| Ultimate elongation change, pct., max.                             | -50         |                  |
| <b><i>Compression Set, Solid (22 hours at 100°C (212°F))</i></b>   |             |                  |
| pct. of original deflection, max.                                  | 25          | D395 Method B    |
| <b><i>Fluid Aging, IRM 901 Oil (70 hours at 100°C (212°F))</i></b> |             |                  |
| Hardness change, pts., Shore A                                     | -5 to 10    | D471             |
| Tensile strength change, pct., max.                                | -25         |                  |
| Ultimate elongation change, pct., max.                             | -45         |                  |
| Volume change, pct.                                                | -10 to 5    |                  |
| <b><i>Fluid Aging, IRM 903 Oil (70 hours at 100°C (212°F))</i></b> |             |                  |
| Hardness change, pts., Shore A                                     | -15 to 5    | D471             |
| Tensile strength change, pct., max.                                | -45         |                  |
| Ultimate elongation change, pct., max.                             | -45         |                  |
| Volume change, pct.                                                | 0 to 40     |                  |
| <b><i>Low Temp Resistance (3min. at -55°C)</i></b>                 |             |                  |
|                                                                    | Pass        | D2137            |

**Table 2: Physical Properties and Requirements for O-ring Material**

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