

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS F-6012
		Former Designation: TMS-6012
TITLE: Power Steering High Pressure Hose		CURRENT REV No.: 1702
		DATE: Feb. 2017
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<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 specification outlines the minimum requirements for a hose reinforced with a wire braid which is used in power steering pressure systems or equivalent hydraulic systems. The operating temperature shall be -40 to +150°C (-40 to +302°F).

2.0 SCOPE

This specification covers the general, property and performance, quality, source approval and quality control requirements for a hose purchased with end fittings and used as a flexible connector in power steering systems requiring hose with 1/2" or smaller ID (-8 dash size and smaller). The hose shall be classified according to the maximum working pressure of the hydraulic system, as follows:

Nominal ID	Type	Maximum Working Pressure		Bend Radius	
		MPa	psi	cm	in
(-4) ¼ in	III	34.5	5000	7.6	3.0
	I	17.2	2600	12.7	5.0
(-8) 1/2 in	II	Obsolete (See Note)			
	III	21.0	3000	12.7	5.0
	I	18.0	2600	12.5	4.9
(-6) 3/8 in	II	Obsolete (See Note)			
	III	21.0	3000	6.5	2.6
	I	25.0	2600	9.0	3.5
(-3) 3/16 in	II	Obsolete (See Note)			
	III	21.0	3000	4.5	1.8

Note – Do not use Type II in new designs. For existing drawings that specify Type II, Type I or III may be substituted.

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.

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3.0 REFERENCE DOCUMENTS

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

Quality System Standard ISO 9001 or TS-16949	NAVISTAR MPAPS F-2	ASTM D471
CFR Title 29, Part 1910	NAVISTAR MPAPS G-20	ASTM D865
NAVISTAR Supplier Packing and Shipping Std. D-13	NAVISTAR MPAPS G-22	ASTM D1418
NAVISTAR Engineering Design Std. A-16	NAVISTAR MPAPS G-9009	ASTM D2240
NAVISTAR MPAPS A-0 Part II	NAVISTAR MPAPS P-9543	ISO 8033
NAVISTAR MPAPS A-45	ASTM B117	MIL-L-2104
NAVISTAR MPAPS B-21	ASTM D380	SAE J343
NAVISTAR MPAPS B-50	ASTM D395	SAE J517
NAVISTAR MPAPS B-6810	ASTM D412	

4.0 REQUIREMENTS

4.1 Hose Construction

The hose shall be constructed with a smooth bore inner tube of suitable synthetic rubber reinforced with plies of braided fabric and/or steel and covered with a black (unless otherwise specified) oil and weather resistant synthetic rubber or textile cover.

4.2 Fittings

4.2.1 Material

Fittings shall be made from steel, Code 0-115, per MPAPS A-0, Part II, and meet the dimensional requirements shown on the engineering drawing.

4.2.2 Finish

Unless otherwise specified:

- Zinc plating, Class 6A, per MPAPS G-20
- Zinc-nickel plating, Class ZNi-C2 or ZNi-C3, per MPAPS G-22

For crimped socket products, use the corrosion requirements from section 4.7.8.2.

4.3 Tubing

4.3.1 Material

Tubing will be steel tubing, single-wall, electric-resistance welded (ERW) low carbon steel, Grade F, per MPAPS A-45 Part II with flash height controlled to 380 µm (0.015 inch) max.

4.3.2 Tubing Finish

4.3.2.1 Paint

Steel tubing will be painted per MPAPS G-9009, Class II__ (NAV 0001 BLK).

4.3.2.2 Optional finish

Unless otherwise specified:

- Zinc plating, Class 8A, MPAPS G-20 †
- Zinc-nickel plating, Class ZNi-C2 or ZNi-C3, per MPAPS G-22

† Suitable for use only on tubes that are plated after forming.

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4.3.3 Interior Surfaces: Plating on the inside of tubes and fittings is not required.

4.3.4 Tube Design

Steering tube designs are dependent upon the space available in the engine compartment, the proximity of the parts to be connected, and need to avoid interference with other engine compartment components and connectors. Tube design uses the XYZ-Tube program in the Unigraphic Grip Program System. All radii are specified to the centerline of the tube and all dimensions are given from the centerline and intersecting points. Three sizes of steel tubing are used (see Table 1 for tube size, wall thickness and bend radii). Terminology and Design Factors for Tube Bending are indicated in Figures 1 and 2. Recommended Centerline Bend Radii are identified in Table 1; variation from these radii must be approved by Navistar Engineering. In cases where the dimension is shown as a range, the larger number is preferred for ease of manufacture and cost, but the smaller number may be used when design constraints require its use.

TABLE 1. STANDARD SIZES AND BEND RADII FOR STEEL TUBING

Size Outer Diameter	Wall Thickness	Centerline Bend Radii
6.35 mm (1/4 inch)	0.89 mm (.035 inch)	12.70 mm (0.50 inch)
12.70 mm (1/2 inch)	1.24 mm (.049 inch)	25.40 mm (1.00 inch)
12.70 mm (1/2 inch)	2.08 mm (.082 inch)	25.40 mm (1.00 inch)

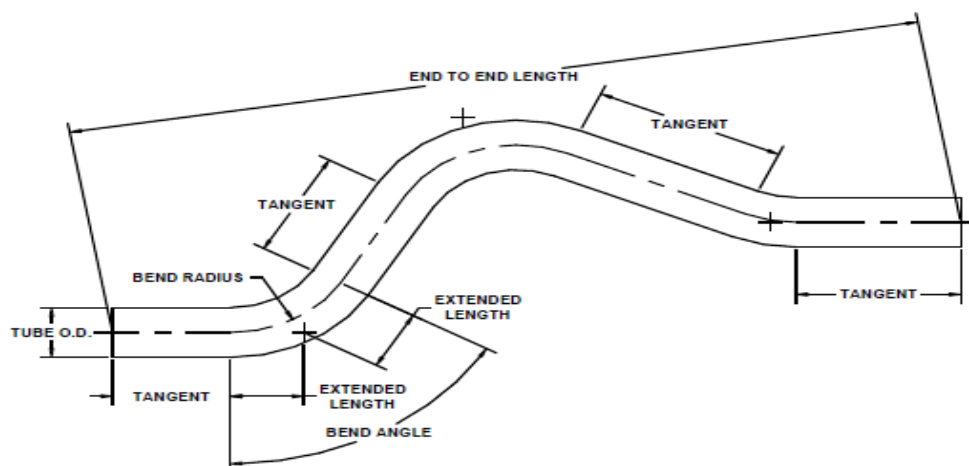


Figure 1. Tube Bending Terminology