

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS C-3100
		Former Designation: TMS-3100
Tubing, Copper, Air Brake		CURRENT REV No.: 1608
		DATE: Aug. 2016
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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 covers a round, seamless, bright annealed copper tubing used for air brake lines.

2.0 SCOPE

This specification covers the manufacture, dimensions, quality, chemical composition, mechanical properties, grain size, performance requirements, identification, and certification. The requirements of SAE J1149 (Metallic Air Brake System Tubing and Pipe), Type 1, tubing shall apply unless otherwise specified.

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 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	ASTM B75	SAE J463
CFR Title 29, Part 1910	ASTM E8	SAE J1149
NAVISTAR Supplier Packing and Shipping Std. D-13	ASTM E18	
NAVISTAR Engineering Design Std A-16	ASTM E112	
NAVISTAR MPAPS B-50		

4.0 REQUIREMENTS

4.1 Manufacture

The tubing shall be seamless cold drawn to size and bright annealed.

4.2 Chemical Composition

The tubing shall be made from a deoxidized, residual phosphorus copper.

<u>Element</u>	<u>Weight %</u>	<u>4.3 Grain Size (ASTM E112)</u>
Copper	99.90 min	Minimum 0.015 mm
Phosphorus	0.015-0.040	

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4.4 Dimensions and Tolerances

Nominal	O.D.				Wall Thickness			
O.D.	Mm	±	in	±	mm	±	in	±
1/8	3.18	0.05	0.125	0.002	0.80	0.05	0.0315	0.002
3/16	4.75	0.05	0.187	0.002	0.80	0.05	0.0315	0.002
1/4	6.35	0.05	0.250	0.002	0.80	0.05	0.0315	0.002
5/16	7.92	0.05	0.312	0.002	0.80	0.05	0.0315	0.002
3/8	9.53	0.05	0.375	0.002	1.21	0.05	0.0475*	0.002*
1/2	12.70	0.05	0.500	0.002	1.21	0.05	0.0475*	0.002*
5/8	15.88	0.05	0.625	0.002	1.21	0.05	0.0475*	0.002*
3/4	19.05	0.06	0.750	0.0025	1.21	0.05	0.0475*	0.002*

* For tubing having O.D. of 3/8", 1/2" 5/8", or 3/4", a wall thickness and tolerance of 0.049"±0.003" is allowed.

5.0 QUALITY

Tubing shall be round, smooth, bright, clean and free from dirt, debris, oils, etc., on both the internal and external tubing surfaces. It shall be free from nicks, gouges, scale, corrosion products, seams, cracks, or any internal or external imperfection that may affect the performance of the tubing in an air system. The ends of the tubing shall be square-cut and free from burrs. Tubing will not exhibit sharp edges, cracks, or other defects harmful to product performance.

5.1 Mechanical Properties (ASTM E8)

Ultimate Tensile Strength	207 MPa (30,000 psi) min
Yield Strength (0.5% extension under load)	62 MPa (9,000 psi) min
Elongation in 50 mm (2 in)	40% min
Rockwell Hardness:	
0.38-0.89 mm (0.015-0.035 in) wall	65 HR15T max
0.91 mm (0.036 in) and up wall	55 HRF max

5.2 Performance Requirements

5.2.1 Flaring Test

5.2.1.1 Test Procedure: Cut specimen from tubing and square and deburr ends. Expand tubing over a polished mandrel with 60° included angle until average O.D. has been increased 40%.

5.2.1.2 Requirement: No splits or flaws.

5.2.2 Pressure Proof Test

5.2.2.1. Test Procedure: Test tubing at hydrostatic pressure equivalent to a yield (hoop) stress of 62 MPa (9000 psi) minimum (see table below).

NOTE: An electric eddy current test may be substituted for the pressure proof test providing the rejection limits are such that the hydrostatic requirements can be guaranteed.

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