SAE International	SURFACE VEHICLE STANDARD	SAE J1650 DEC2011
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Seamless Copper-Nickel 90-10 Tubing

RATIONALE

SAE J1650 is being stabilized because it is mature and not likely to change in the foreseeable future, technical expertise no longer resides within SAE FCCTC-C5 Metallic Tubing Committee and this SAE FCCTC-C5 Committee cannot find users for this type of tubing.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE Metallic Tubing Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. ***Scope***—This SAE Standard covers seamless copper-nickel tubing for use in hydraulic brake pressure conductors, general automotive applications, and other similar uses.

2. ***References***

2.1 Applicable Publication—The following publication forms a part of the specification to the extent specified herein. Unless otherwise indicated the lastest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J533—Flares for Tubing
SAE J1677—Tests and Procedures for SAE Low Carbon Steel and Copper Nickel Tubing

2.2 Related Publication—The following publication is provided for information purposes only and is not a required part of this document.

2.2.1 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 466M—Seamless Copper-Nickel Pipe and Tube (METRIC)

3. ***Manufacture***—This tubing shall be made from 90-10 copper-nickel and cold drawn to size. It shall then be annealed in such a manner as to produce product which will meet all of the requirements in this document.

4. ***Dimensions and Tolerances***—The standard nominal diameters and the applicable dimensions and tolerances are shown in Table 1.

TABLE 1—TUBING DIMENSIONS AND TOLERANCES[1]

Dash Size	Nominal Tubing OD mm	Outside Diameter[1] Basic mm	Outside Diameter[1] Tolerance ±mm	Wall Thickness Basic mm	Wall Thickness Tolerance[2]
–2	3.18	3.18	0.05	0.64	0.13
–3	4.76	4.78	0.08	0.71	0.08
–4	6.35	6.35	0.08	0.71	0.08
–5	7.94	7.92	0.08	0.71	0.08
–6	9.53	9.53	0.08	0.71	0.08
–7	11.11	11.13	0.10	0.76	0.08
–8	12.70	12.70	0.10	0.89	0.09
–9	14.29	14.27	0.10	0.89	0.09
–10	15.88	15.88	0.10	0.89	0.09

1. The actual outside diameter shall be the average of the maximum and minimum outside diameters as determined at any one cross section through the tubing.
2. The tolerances listed represent the maximum permissible deviation at any point.

5. ***Quality***—Finished tubing shall be clean, smooth, and round, both inside and outside, and shall be free from scale and harmful imperfections. Surface imperfections such as handling marks, die marks, or shallow pits shall not be considered harmful provided such imperfections are within the tolerances specified for diameter and wall thickness and do not affect the servicability of the tube.

6. ***Material***—Tubing shall be made from copper-nickel alloy UNS 70600.

7. ***Mechanical Properties***—The finished tubing shall have mechanical properties as tabulated in Table 2:

TABLE 2—MECHANICAL PROPERTIES

Properties	Values
Yield Strength, min (0.2% offset)	105 MPa
Tensile Strength, min	275 MPa
Elongation in 50 mm	14%
Hardness (Rockwell 30t scale), max	65

8. ***Performance Requirements***—The tubing shall satisfactorily meet the following performance tests. All tests are to be conducted in accordance with the procedures in SAE J1677.

8.1 Flaring Test—(See 5.5.2 of SAE J1677.)

8.2 Hardness Test—(See 5.6 of SAE J1677.)

8.3 Bending Test—(See 5.3 of SAE J1677.)

8.4 Pressure Proof Test—(See 5.8 of SAE J1677.) Where allowable fiber stress of material = 72 MPa.

8.5 Nondestructive Electric Test—(See 5.9 of SAE J1677.)

9. ***Test Certificates***—A certificate of compliance to the performance requirements shall be furnished to the purchaser by the producer if requested in the purchase agreement.

10. Cleanliness—The inside of the tubing shall be clean and free from any contamination which will impair the processing or serviceability of the tubing.

11. Corrosion Protection—The inside and outside of the finished tubing shall be protected against corrosion during shipment and normal storage. If a corrosion preventive compound is applied, it shall be such that after normal storage periods, it can readily be removed by cleaning agents normally used in manufacturing.

12. Notes

12.1 Marginal Indicia—The change bar (l) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE FLUID CONDUCTORS AND CONNECTORS TECHNICAL COMMITTEE S1—
AUTOMOTIVE AND HYDRAULIC TUBE AND FITTINGS

STABILIZED BY THE SAE METALLIC TUBING COMMITTEE