



Designation: B467 – 88 (Reapproved 2003)

Standard Specification for Welded Copper-Nickel Pipe¹

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1. Scope

1.1 This specification covers welded copper-nickel alloy pipe for general engineering purposes. The following alloys are covered:²

| Copper Alloy UNS No. ² | Previously Used Designation | Nominal Composition, % Copper | Nickel |
|--------------------------------------|--------------------------------|----------------------------------|--------|
| C70600 | 706 | 90 | 10 |
| C71500 | 715 | 70 | 30 |

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:³

B153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing

B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

E8 Test Methods for Tension Testing of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys

E243 Practice for Electromagnetic (Eddy-Current) Examination of Copper and Copper-Alloy Tubes

E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

E527 Practice for Numbering Metals and Alloys in the

Unified Numbering System (UNS)

2.3 *Other Documents*:

American Welding Society Specification A5.6⁴

American Welding Society Specification A5.7⁴

3. Terminology

3.1 *Definitions*:

3.1.1 *welded pipe*—product made from sheet, strip, or plate with a seam made by welding.

3.1.2 *flash or bead*—weld metal that protrudes beyond the normal wall, both inside and outside.

3.1.3 *scarfing*—the removing of flash or bead by a cutting operation.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *capable of*—as used in this specification, the test is not mandatory under the terms of this specification unless definitely specified in the purchase order; however, should subsequent testing by the purchaser establish that the material does not meet these requirements, the material may be rejected.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Copper Alloy UNS No. (Section 1 and Table 1),

4.1.2 Temper (Section 9),

4.1.3 Radiographic examination (Section 11),

4.1.4 Dimensions: diameter and wall thickness (see 12.3, section 12.4, and section 12.5),

4.1.5 Lengths: whether specific or stock (see section 12.6),

4.1.6 Quantity of each size,

4.1.7 If the product is to be subsequently welded (see Table 1 and Footnote D), and

4.1.8 Packing and marking (Section 20).

5. Types of Welded Pipe

5.1 *As-Welded*—Pipe that has been welded with no further work performed other than straightening or cutting to length, or both.

5.2 *Welded and Annealed*—Welded pipe that has been annealed to produce a uniform grain size appropriate to the specified annealed temper.

¹ This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.04 on Pipe and Tube.

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² The UNS system for copper and copper alloys (see Practice E527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix “C” and a suffix “00.” The suffix can be used to accommodate composition variations of the base alloy.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard’s Document Summary page on the ASTM website.

⁴ Available from The American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126.

TABLE 1 Chemical Requirements

| Copper Alloy UNS No ^A | Composition, % | | | | | | | | |
|-------------------------------------|---------------------|---------------------|------------------------|----------|------------------------|-------------------|----------------|--------------------|-------------------------|
| | Copper ^B | Nickel ^C | Lead, ^D max | Iron | Zinc, ^D max | Manganese, max | Sulfur, max | Phosphorus, max | Other Named Elements |
| C70600 | remainder | 9.0–11.0 | 0.05 | 1.0–1.8 | 1.0 | 1.0 | 0.02 | 0.02 | ^D |
| C71500 | remainder | 29.0–33.0 | 0.05 | 0.40–1.0 | 1.0 | 1.0 | 0.02 | 0.02 | ^D |

^A New designation established in accordance with Practice E527.

^B Silver counting as copper.

^C Cobalt counting as nickel.

^D When the product is for subsequent welding applications and so specified by the purchaser, zinc shall be 0.50 % max, lead 0.02 % max, and carbon 0.05 % max.

5.3 *Welded and Cold Drawn*—Welded pipe with internal flash removed by scarfing, and subsequently cold drawn to conform to the specified temper.

5.4 *Fully Finished*—Welded pipe with internal and external flash removed by scarfing and the pipe or tube subsequently cold drawn over a mandrel and annealed as necessary to conform to the specified temper.

6. Chemical Composition

6.1 The material shall conform to the chemical requirements specified in Table 1.

6.2 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between manufacturer or supplier and purchaser.

6.2.1 For copper alloys in which copper is specified as the remainder, copper may be taken as the difference between the sum of all the elements analyzed and 100 %.

6.2.1.1 When all the elements in Table 1 are analyzed, their sum shall be 99.5 % minimum.

7. Flash

7.1 If the pipe is made by the high-frequency welding process, the external flash shall always be removed. The internal flash shall be treated as one of the following:

7.1.1 *IFI*—Internal flash to remain in the “as-welded” condition,

7.1.2 *IFR*—Internal flash to be removed by scarfing, or

7.1.3 *IFD*—Internal flash to be displaced.

7.2 Unless otherwise specified, the IFI condition will be furnished.

8. Filler Material

8.1 Filler material, if used in the welding process, shall conform to classification ECuNi of AWS Specification A5.6 or RCuNi of AWS Specification A5.7.

9. Temper

9.1 The pipe shall be supplied in any one of the following tempers as specified and shall meet the mechanical requirements of Table 2, Table 3, and Table 4:

9.1.1 As welded from annealed sheet, strip, or plate (WM50),

9.1.2 As welded from cold-worked sheet, strip, or plate (WM00, WM01, WM02, etc.).

9.1.3 Welded and annealed (WO50),

9.1.4 Welded and cold drawn in either light drawn (Copper Alloy UNS No. C70600 only) or hard drawn, stress relieved (WR00), (WR04), or

TABLE 2 Mechanical Requirements of As-Welded and Fully Finished Pipe When Furnished in the Annealed Temper (WO61)

| Copper Alloy UNS No. | Outside Diameter, in. (mm) | Tensile Strength, min, ksi ^A (MPa ^B) | Yield Strength at 0.5 % Extension Under Load, min, ksi ^A (MPa ^B) | Elongation in 2 in. (50.8 mm), min, % |
|----------------------|----------------------------|---|---|---------------------------------------|
| C70600 | up to 4½ (114), incl | 40 (275) | 15 (105) | 25.0 |
| | over 4½ (114) | 38 (260) | 13 (90) | 25.0 |
| C71500 | up to 4½ (114), incl | 50 (345) | 20 (140) | 30.0 |
| | over 4½ (114) | 45 (310) | 15 (105) | 30.0 |

^A ksi = 1000 psi.

^B See Appendix X2.

TABLE 3 Mechanical Requirements of Welded and Cold-Drawn and Fully Finished Pipe in Drawn Tempers

| Copper Alloy UNS No. | Outside Diameter, in. (mm) | Tensile Strength, min, ksi ^A (MPa ^B) | Yield Strength at 0.5 % Extension Under Load, min, ksi ^A (MPa ^B) | Elongation in 2 in. (50.8 mm), min, % |
|----------------------|---|---|---|---------------------------------------|
| C71500 | up to 2 (50.8), incl, for wall thicknesses up to 0.048 (1.21 mm), incl. | 72 (495) | 50 (345) | 12.0 |
| | for wall thicknesses over 0.048 in. (1.21 mm) | 72 (495) | 50 (345) | 15.0 |

^A ksi = 1000 psi.

^B See Appendix X2.

TABLE 4 Mechanical Requirements of As-Welded Pipe

| Copper Alloy UNS No. | Condition | Outside Diameter, in. (mm) | Tensile Strength, min, ksi (MPa) | Yield Strength at 0.5 % Extension Under Load, min, ksi (MPa) |
|----------------------|-------------------------------|----------------------------|----------------------------------|--|
| C70600 | welded from annealed strip | up to 4½ (114), incl | 45 (310) | 30 (205) |
| | welded from cold-rolled strip | up to 4½ (114), incl | 54 (375) | 45 (310) |

9.1.5 Fully finished as annealed (WO61) light drawn (Copper Alloy UNS No. C70600 only), or hard drawn, stress relieved (WH00, WH04).

10. Dimensions and Permissible Variations

10.1 For purposes of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the specified limiting values for any dimension may be cause for rejection.

NOTE 1—Blank spaces in the tolerance tables indicate that the material is not generally available or that no tolerance has been established (see Appendix X1).