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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 197

CLASSIFICATION OF COPPERS
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1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 197, *Classification of Coppers*, was drawn up by Technical Committee ISO/TC 26, *Copper and Copper Alloys*, the Secretariat of which was held by the American Standards Association, Inc. (ASA) until June 1960 and, since this date, by the Deutscher Normenausschuss (DNA).

In preparation for the first meeting of ISO/TC 26, held in Stockholm, in June 1955, the Secretariat presented a draft proposal concerning the subject of this ISO Recommendation. This document was examined during the meeting and then turned over to a Working Group for thorough study; the latter proposed a number of changes. The document was revised accordingly, and was approved by the Technical Committee, in plenary session, as a Draft ISO proposal. In November 1957, this draft proposal was circulated for vote by letter ballot to the members of the Technical Committee.

During its second meeting, held in Harrogate, in June 1958, the Technical Committee examined the results of the vote and the comments received, and prepared a revised draft proposal taking into account the amendments presented by various Member Bodies. On this basis, after full discussion, the draft proposal revised in this way was approved as a Draft ISO Recommendation.

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On 26 June 1959, the Draft ISO Recommendation (No. 312) was distributed to all the ISO Member Bodies and was approved by the following Member Bodies:

| | | |
|-----------|-------------|----------------|
| Australia | Ireland | Portugal |
| Belgium | Israel | Romania |
| Burma | Italy | Spain |
| Canada | Japan | Sweden |
| Chile | Mexico | Switzerland |
| Finland | Netherlands | Turkey |
| Germany | New Zealand | United Kingdom |
| Greece | Norway | U.S.A. |
| India | Poland | Yugoslavia |

One Member Body opposed the approval of the Draft: France.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in May 1961, to accept it as an ISO RECOMMENDATION.

CLASSIFICATION OF COPPERS

1. SCOPE

This ISO Recommendation contains a classification of the various types of coppers currently available in cast refinery shapes and wrought products in commercial quantities. It is not a specification for the various types.

2. BASIS OF CLASSIFICATION

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- 2.1 The table shows the refinery shapes currently produced. In each type the specific coppers are not necessarily available in a complete range of sizes in the form shown, nor from any one supplier in all forms.
- 2.2 The specifications indicated for cast refinery shapes and for wrought copper products may cover more than one of the types given in the table or may include only part of the range covered by one of the types shown in the classification.

3. DEFINITIONS

The definitions which appear in Appendix 1 to this classification cover the terms used in designating the various types of coppers, but do not include definitions of the types of coppers as such.

The definitions which appear in Appendix 2 are also given for the various forms of refinery shapes.

4. CLASSIFICATION OF COPPERS

TABLE

| U.S.A. designation | Type of coppers (see section 3 and Appendix 1) | Forms in which available from refiners (see Appendix 2) | | | |
|----------------------------|---|--|---------|-------|-----------------------|
| | | Wire bars | Billets | Cakes | Ingots and ingot bars |
| CATH | Electrolytic cathode | available in cathodes only | | | |
| Tough pitch coppers | | | | | |
| ETP * | Electrolytic tough pitch | × | × | × | × |
| FRHC * | Fire-refined high-conductivity tough pitch | × | × | × | × |
| FRTP | Fire-refined tough pitch | — | × | × | × |
| ATP | Arsenical, tough pitch | — | × | × | — |
| STP * | Silver-bearing, tough pitch | × | × | × | × |
| SATP | Silver-bearing arsenical, tough pitch | — | × | × | — |
| SETP | Selenium-bearing, tough pitch | — | — | — | — |
| TETP | Tellurium-bearing, tough pitch | — | — | — | — |
| CAST | Casting | — | — | — | × |
| Oxygen-free coppers | | | | | |
| OF * | Oxygen-free, without residual deoxidants | × | × | × | ** |
| OFS * | Oxygen-free, silver-bearing | × | × | × | — |
| OFTE | Oxygen-free, tellurium-bearing | — | — | — | — |
| Deoxidized coppers | | | | | |
| DHP | Phosphorized, high residual phosphorus | × | × | × | — |
| DLP *** | Phosphorized, low residual phosphorus | — | × | × | — |
| DPS | Phosphorized, silver-bearing | — | × | × | — |
| DPA | Phosphorized, arsenical | — | × | — | — |
| DPTE | Phosphorized, tellurium-bearing | — | — | — | — |

× Commercial availability.

• High-conductivity coppers.

** Croppings of other forms available and can be used as ingots.

*** Type DLP can be furnished as a high-conductivity copper, if agreed between supplier and purchaser.

APPENDIX 1

DEFINITIONS OF TERMS USED IN CLASSIFICATION OF COPPERS

Copper. For the purpose of this classification, copper containing not more than approximately 0.5 per cent of alloying elements is included in the term "copper".

TERMS RELATING TO METHOD OF REFINING

Electrolytic copper. Copper refined by electrolytic deposition, including cathodes, direct product of the refining operation, refinery shapes, cast from melted cathodes, and, by extension, fabricators' products made therefrom.

Usually when this term is used alone, it refers to electrolytic tough pitch copper without elements other than oxygen being present in significant amounts.

Fire-refined copper. Copper fire-refined by the use of a furnace process only, including refinery shapes, and, by extension, fabricators' products made therefrom.

Usually when this term is used alone, it refers to fire-refined tough pitch copper without elements other than oxygen being present in significant amounts.

TERMS RELATING TO CHARACTERISTICS DETERMINED BY METHOD OF CASTING OR PROCESSING

Tough pitch copper. Copper either electrolytically or fire-refined, cast in the form of refinery shapes, containing a controlled amount of oxygen for the purpose of obtaining a level set in the casting.

By extension, the term is also applicable to fabricators' products made therefrom.

Oxygen-free copper. Electrolytic copper, free from cuprous oxide, produced without the use of residual metallic or non-metallic deoxidizers.

By extension, the term is also applicable to fabricators' products made therefrom.

Deoxidized copper. Copper cast in the form of refinery shapes, free from cuprous oxide, through the use of metallic or non-metallic deoxidizers.

By extension, the term is also applicable to fabricators' products made therefrom.

TERMS RELATING TO SPECIFIC KINDS OF COPPERS

High-conductivity copper. Copper which, in the annealed condition, has a minimum electrical conductivity of 100 per cent IACS.

Casting copper. Fire-refined tough pitch copper, usually cast from melted secondary metal into ingot and ingot bars only and used for making foundry castings, but not wrought products.

Phosphorized copper. General term applied to copper deoxidized with phosphorus. The most commonly used deoxidized copper.

High residual phosphorus copper. Deoxidized copper with residual phosphorus present in amounts (usually 0.013 to 0.050 per cent) generally sufficient to decrease significantly the conductivity of the copper.

Low residual phosphorus copper. Deoxidized copper with residual phosphorus present in amounts (usually 0.004 to 0.012 per cent) generally too small to decrease appreciably the conductivity of the copper.

Arsenical copper, Selenium-bearing copper, Silver-bearing copper, Tellurium-bearing copper. Copper containing the designated element in amounts as agreed upon between the supplier and the consumer. Any of these alloyed coppers can be produced as tough pitch, oxygen-free or deoxidized varieties. The forms commonly supplied are indicated in the table.

APPENDIX 2

DEFINITIONS OF REFINERY SHAPES

Wire bar. Refinery shape for rolling into rod (and subsequent drawing into wire), strip or shape.

Approximately 85 to 125 mm (3½ to 5 in) square in cross-section, usually from 1 000 to 1 350 mm (38 to 54 in) in length and weighing from 60 to 190 kg (135 to 420 lb). Tapered at both ends, when used for rolling into rod for subsequent wire drawing, and may be unpointed, when used for rolling into strip. Cast either horizontally or vertically.

Cake. Refinery shape for rolling into plate, sheet, strip or shape.

Rectangular in cross-section of various sizes. Cast either horizontally or vertically, with range of weights from 65 to 1 800 kg (140 to 4 000 lb) or more.

Billet. Refinery shape primarily for tube manufacture.

Circular in cross-section, usually 75 to 250 mm (3 to 10 in) in diameter and lengths up to 1 300 mm (52 in); weight from 45 to 680 kg (100 to 1 500 lb).

Ingot and ingot bar. Refinery shapes employed for alloy production (not fabrication).

Both used for remelting. Ingots usually weigh from 9 to 16 kg (20 to 35 lb) and ingot bars from 22 to 32 kg (50 to 70 lb). Both usually notched to facilitate breaking into smaller pieces.

Cathode. Unmelted flat plate produced by electrolytic refining.

The customary size is about 1 000 mm (3 ft) square and about 13 to 22 mm (½ to 7/8 in) thick, weighing up to 130 kg (280 lb).

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