

Standard Specifications for ELECTRODEPOSITED COATINGS OF NICKEL AND CHROMIUM ON COPPER AND COPPER-BASE ALLOYS¹



ASTM Designation: B 141 - 58

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This Standard of the American Society for Testing Materials is issued under the fixed designation B 141; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

These specifications were prepared jointly by the American Electroplaters' Society, the National Bureau of Standards, and the American Society for Testing Materials.

Scope

1. These specifications cover requirements for electroplated coatings on copper articles (Note 1) including a final coating of nickel or chromium where both appearance and protection against corrosion of the basis metal are important. Three types of coating (Notes 2 and 3) are covered: namely,

Type FC,
Type KC, and
Type QC.

NOTE 1.—In these specifications the term "copper" is used, for brevity, to include copper and alloys containing 50 per cent or more of copper.

¹ Under the standardization procedure of the ASTM, these specifications are under the jurisdiction of the ASTM Committee B-8 on Electrodeposited Metallic Coatings.

² Accepted by the Societies, June, 1958.

Prior to adoption as standard, these specifications were published as tentative from 1941 to 1945, being revised in 1945.

NOTE 2: *Explanation of Symbols.*—The initial letters, *F*, *K*, and *Q* were adopted as arbitrary designations of grades of plating. The second letter *C* refers to copper as the basis metal; other basis metals are indicated by the letters *B* for brass, *S* for steel, and *Z* for zinc.

NOTE 3: *Classification.*—The conditions of exposure and use of plated copper are so varied that it is not possible to predict the average life of articles plated in accordance with type *FC*, type *KC*, or type *QC*, or to predetermine just which type of plating should be specified for a given article. Such a selection must be based upon the experience of the manufacturers and the users.

It is recognized that uses exist for which thicker coatings than those of type *FC* will be required.

For articles that are intended for a short period of use, no standard specification for plating is recommended. It is suggested, however, that subject to the prevailing manufacturing conditions, certain minimum requirements be agreed upon by the manufacturer and the purchaser in order to insure that the plated coatings render a useful service.

Manufacture

2. The copper to be plated shall be substantially free from flaws or defects that will be detrimental to the final finish. It shall be subjected to such polishing, cleaning, dipping, and plating procedures as are necessary to yield deposits with the desired appearance and quality. The use of copper as an initial layer is optional, but does not affect the required thickness of nickel or chromium. The coatings shall have a bright or dull finish as specified, shall be adherent and free from blisters, and substantially free from pits or other surface defects.^{2a}

Thickness of Coatings

3. Coatings on the finished articles shall conform to the following requirements as to thickness on significant surfaces:

| | Thickness of Coating, ^a in. | | |
|---------------------------------------|--|---------------------------|---------------------------|
| | Type FC | Type KC | Type QC |
| Nickel, ^a min. | 0.00050 (13 μ) | 0.00030 (7.6 μ) | 0.00010 (2.5 μ) |
| Chromium, (if required), min. | 0.000010 ^b (0.25 μ) | 0.000010 (0.25 μ) | 0.000010 (0.25 μ) |

NOTE.—1 μ (micron) = 0.0000394 in.

0.001 in. = 1 mil = 25 μ (microns).

^a The term nickel as used in these specifications includes nickel-cobalt alloys in which the nickel is the major constituent.

^b Chromium coatings 0.000050 in. (1.3 μ) or more in thickness are likely to cause cracking of nickel deposits on brass. An effort should therefore be made to obtain the required minimum thickness of chromium with as low a maximum thickness as practicable.

^c The thicknesses given in this table are based on tests and experience with composite coatings in which matte nickel was deposited from a Watts type bath and buffed prior to conventional bright chromium plating. If these conditions are altered, different thicknesses may be required to give equivalent performance.

^{2a} Nickel deposited by chemical reduction and otherwise meeting the requirements of the particular application may be accepted under these specifications.

Significant Surfaces

4. In general, significant surfaces (Note 4) are those surfaces that are visible and subject to wear or corrosion or both, or surfaces on which the coating is otherwise functionally necessary. The designation of significant surfaces shall be agreed upon by the manufacturer and the purchaser and may be indicated on the drawings. Surfaces on which a controlled deposit ordinarily cannot be obtained, such as holes, recesses, bases of angles, and similar areas, are normally exempt from the requirements for significant surfaces, unless they are specifically designated as such. When such areas are designated as significant surfaces, and the thickness requirements must be met, the manufacturer and the purchaser shall recognize the necessity for either thicker deposits on the more accessible surfaces or for special racking. Special racks may involve the use of conforming, auxiliary, interior, or bi-polar electrodes.

NOTE 4.—It is suggested that significant surfaces generally may be defined as those parts of the visible surface that can be touched with a $\frac{3}{8}$ -in. diameter sphere or with a sphere of a diameter agreed upon by the manufacturer and the purchaser.

Selection of Samples

5. Out of each lot of similar parts, a number of samples shall be selected at random. The size of the lot and the number of samples to be selected shall be agreed upon by the manufacturer and the purchaser. All of the samples selected shall be visually examined for any defects referred to in Section 2.

Number of Tests

6. The number of test specimens subjected to each test shall be agreed upon by the manufacturer and the purchaser. The thickness of chromium shall be determined in accordance with Section 7(a) and the thickness of nickel in accordance with Section 7(b) or (c).