ASTM B 504	-Measuring Thickness of Metallic Coatings by the Coulometric Method
ASTM E 8	-Tension Testing of Metallic Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), the contractor (processor) shall furnish sample unit(s) for first article inspection and approval (see 4.3).

3.2 Materials and operating conditions. The materials used shall produce platings which shall conform to the requirements of this specification. The deposition of chromium-molybdenum shall be from a chromic acid type bath supplemented with a molybdate salt. Bath composition and operating conditions shall produce a satisfactory bond between the base metal and the coating.

3.3 General requirements.

3.3.1 High tensile steel parts. Unless otherwise specified, steel parts having an ultimate tensile strength greater than 1655 MPa (200,000 psi) shall not be plated without specific approval of the acquiring activity (see 6.2).

3.3.2 Stress relief treatment. All steel parts having an ultimate tensile strength of 1034 MPa (150,000 psi) and above, which are machined, ground, cold formed, or cold straightened shall be heat treated at a temperature 28°C (50°F) below the tempering temperature for the specified alloy for 3 hours or longer, prior to cleaning and plating for the relief of damaging residual tensile stresses. When peening is required (see 3.4.3 and 3.4.5), thermal stress relief shall be performed, prior to shot or rotary flap peening. Stress relief of titanium parts shall be in accordance with MIL-H-81200.

3.3.3 Surface preparation.

3.3.3.1 Cleaning. Unless otherwise specified (see 6.2), all steel parts shall be cleaned in accordance with MIL-S-5002. Other base metals shall be cleaned by methods which shall not damage the substrate and shall not interfere with adhesion of the deposit. Vapor blasting is preferred for cleaning titanium parts.

3.3.3.2 Activating. Unless otherwise specified (see 6.2), all steel parts shall be activated by electrolytic etching in a chromic acid type bath. Titanium parts shall be activated in accordance with ASTM B 481, process no. 1, except for the pickling step, 2.2.1.2, which shall be omitted.

3.3.4 Plating application. Unless otherwise specified (see 6.2), the plating shall be applied after all base metal heat treatments and mechanical operations, such as machining, brazing, welding, forming and perforating of the article, have been completed.

3.3.5 Hydrogen embrittlement relief. All coated steel parts having a Rockwell hardness of C40 and higher shall be baked at a minimum temperature of 191° ± 14°C (375° ± 25°F) for three hours or more, within four hours after plating, to provide hydrogen embrittlement relief (see 6.4). The baked parts, when tested in accordance with 4.5.6, shall not crack or fail by fracture (see footnote 7/ of table II). Plated springs and other parts, subject to flexure, shall not be flexed prior to hydrogen embrittlement relief treatment.

3.3.6 Diffusion heat-treat cycle. All coated titanium parts shall be heat treated to facilitate adhesion of the deposit and to provide hydrogen embrittlement relief. This diffusion cycle shall be compatible with the previous heat-treat history of the base metal and shall be selected in accordance with MIL-H-81200, unless otherwise specified (see 6.2). Titanium alloys not covered by MIL-H-81200, shall be vacuum heat treated at a temperature of 760°C (1400°F) for 3 hours.

3.3.7 Coverage. Unless otherwise specified (see 6.2), the plating shall cover all surfaces including roots of threads, corners and recesses.

3.3.8 Boundaries. If parts are not to be ground following plating, boundaries of chromium-molybdenum plating which cover only a portion of the surface shall be free from beads, nodules, jagged edges and other irregularities.

3.3.9 Finish. A gray matte finish, relatively smooth and free from blackened or frosty areas, shall be acceptable. Shading will vary depending on the molybdenum content of the deposit.

3.4 Processsing of steel parts. Unless otherwise specified, steel parts shall be processed as follows, as specified by the acquiring activity (see 6.2):

3.4.1 Class 1. Parts shall be plated or plated and processed to specific dimensions in accordance with procedures and criteria specified by the acquiring activity. Parts not covered by procedural instructions which do not specify baking procedures shall be baked in accordance with 3.3.5 after plating.

3.4.2 Class 2. Plated parts below Rockwell hardness C40, which are subjected to static loads or designed for limited life under dynamic loads, or combination thereof, need not be peened prior to plating.

3.4.3 Class 3. Plated parts, below Rockwell hardness C40, which are designed for unlimited life under dynamic loads, shall be peened in accordance with MIL-S-13165 or MIL-R-81841 prior to plating. Unless otherwise specified in the applicable drawings, the peening shall be accomplished on all surfaces for which the plating is required and on all immediate adjacent surfaces when they contain notches, fillets, or other abrupt changes in section size where stress will be concentrated.

3.4.4 Class 4. Plated parts, Rockwell hardness C40 or above, which are subjected to static loads or designed for limited life under dynamic loads or combinations thereof, shall be baked in accordance with 3.3.5 after plating. The load for the static load test (see 4.5.6, embrittlement relief test) shall be as specified in the contract, order, or applicable drawing (see 6.2).

3.4.5 Class 5. Plated parts, Rockwell hardness C40 or above, which are designed for unlimited life under dynamic loads, shall be peened in accordance with MIL-S-13165 or MIL-R-81841, prior to plating. Unless otherwise specified in the applicable drawing, the peening shall be accomplished on all surfaces for which the plating is required and on all immediate adjacent surfaces when they contain notches, fillets, or other abrupt changes in section size where stress will be concentrated. The plated parts shall be baked in accordance with 3.3.5 after plating. The load for the static load test (see 4.5.6, embrittlement relief test) and the dynamic load conditions shall be as specified in the contract, order, or applicable drawing (see 6.2).

3.5 Detail requirements.

3.5.1 Thickness. The minimum, maxiumum, or range of thickness for chromium-molybdenum plating shall be as specified in the contract, purchase order, or on the applicable drawing (see 6.2). If a thickness is not specified, the minimum thickness for the finished part shall be 0.0005 inch or 0.5 mil (0.013 mm). The thickness requirement shall apply after all metal finishing and post-plating grinding operations have been completed. The maximimum practical limit for plating on titanium without an intermediate heat treatment is 2.0 mil (0.52 mm). The maximum practical limit for plating on steel is 5.0 mil (1.30 mm).

3.5.2 Adhesion. The adhesion of the plating and any underplate shall be such that, when examined at a magnification of approximately 4X, neither the plating nor any electrodeposited underplate shall show separation from the base metal or from each other at their common interface(s) when subjected to the adhesion test specified in 4.5.3. The interface between a plating and the base metal is the surface of the base metal before plating. The formation of cracks in the base metal or the plate, which do not result in flaking, peeling, or blistering of the plate, shall not be cause for rejection.

3.5.3 Hardness. The minimum hardness of a cross-section of the plating, when subjected to the microhardness test specified in 4.5.4, shall be Vickers hardness number (VHN) 200 for pulse or direct plating on Ti, and shall be VHN 400 for direct plating on steel.

3.5.4 Porosity. The chromium-molybdenum plating, by being as free from porosity as possible, shall be capable of protecting steel parts from corrosion due to pits, pores, or cracking. When subjected to the porosity test specified in 4.5.5, specimens shall show no more than a total of 15 isolated spots or pits, none larger than 1/32 inch (0.79 mm) in diameter, in a total of 967.8 sq cm (150 sq. in.) of test area grouped from five or more test pieces; nor more than five isolated spots or pits, none larger than 1/32 inch (0.79 mm) in a total of 193.6 sq cm (30 sq. in.) from one or more test pieces, except those areas within 1/16 inch (1.59 mm) from identification markings and contact marks after processing.

3.6 Workmanship.

3.6.1 Base metal. The base metal shall be free from visible defects that shall be detrimental to the appearance or protective value of the plating. The base metal shall be subjected to such cleaning and plating procedures as necessary to yield deposits specified herein.

3.6.2 Plating. The plating shall be smooth, fine grained, adherent, uniform in appearance, free from blisters, pits, nodules, excessive edge build-up and other defects. The plating shall show no indication of contamination or improper operation of equipment used to produce the deposit, such as excessively powdered or darkened plating, build-up and other defects. The size and number of contact marks shall be at a minimum, consistent with good practice. The location of contact marks as indicated in the applicable drawing shall be in areas of minimum exposure to service environmental conditions where important to the function of the part. Superficial staining, which has been demonstrated as resulting from rinsing or slight discoloration resulting from baking operations to relieve embrittlement, as specified above (see 3.3.5), shall not be cause for rejection. All details of workmanship shall conform to the best practice for high quality plating.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).

b. Quality conformance inspection:

(1) Process control inspection (see 4.4.1).

(2) Lot sampling inspection (see 4.4.2).

4.3 First article. The first article inspection of the chromium-molybdenum plating shall consist of the embrittlement relief test, 3.3.5 (see 4.3.1 and 4.5.6).

4.3.1 First article samples. Unless otherwise specified, as soon as practicable after award of the contract, the contractor (processor) shall demonstrate that the process that shall be used shall result in freedom from hydrogen embrittlement damage by preparing and testing specimens for conformance to the requirements of this specification and MIL-S-5002 for production process control. The processor shall prepare four round notched steel specimens, as specified in 4.4.2.3.2.3, from four individual heats for a total of 16 specimens (see 6.2.2). The specimens shall be the same steel alloy as that which is to be plated on a production basis. The specimens shall be heat treated to the maximum tensile strength representing production usage. The specimens shall be given the same pretreatment and treatment proposed for production. The process shall be considered satisfactory if there is no indication of failure or cracking of the plating on all the specimens. The test results and production control information shall be forwarded to the contracting officer for approval. Until approval has been received, the parts shall not be plated. When a processor is in continuous production of plating from contract to contract, requiring of first article inspection may be waived at the discretion of the Government acquiring activity (see 6.2).

4.4 Quality conformance inspection. The quality conformance inspection shall consist of the following:

a. Process control inspection.

b. Lot sampling inspection.

4.4.1 Process control inspection.

4.4.1.1 Control records. When specified in the contract or order (see 6.2), the processor shall maintain a record of the history of each processing bath, showing all additional chemicals or treatment solutions to the unit, the results of all chemical analyses performed and the quantity of parts plated during operation. Upon request of the acquiring activity, such records, as well as reports of the test results, shall be made available. These records shall be maintained for not less than one year after completion of the contract or purchase order.

4.4.1.2 Analytical inspection. The equipment, procedures, and operations employed by the processor shall be capable of producing high quality electrodeposited chromium-molybdenum plating as specified in this document. Analytical inspections of the process shall be conducted in accordance with the recommended frequency and procedures of the material supplier as may be appropriate for the processing method.

4.4.1.3 Process control tests.

4.4.1.3.1 Frequency of tests. To assure continuous control of the process, as required by MIL-S-5002, and to minimize the possible occurrence and acceptance of items with detrimental hydrogen embrittlement during production, specimens shall be prepared and tested in accordance with table I. The test specimens shall be prepared in accordance with 4.4.2.3.1 through 4.4.2.3.2.3, as applicable, conforming to MIL-S-5000. The tested specimens shall conform to the requirements of this specification. These tests shall be conducted at least once a month or more frequently if required by the acquiring activity. These tests are conducted to determine conformance of the electrodeposited platings with the requirements of this specification and are acceptable as evidence of the properties being obtained with the equipment and procedures employed.

TABLE I. Process control tests and specimens.

Test	Requirement	Paragraph Specimen size	Test
Thickness	3.5.1	4.4.2.3.2.1	4.5.2.1
Adhesion	3.5.2	4.4.2.3.2.1	4.5.3
Hardness	3.5.3	4.4.2.3.2.1	4.5.4
Porosity	3.5.4	4.4.2.3.2.2	4.5.5
Hydrogen embrittlement relief	3.3.5	4.4.2.3.2.3	4.5.6

4.4.1.3.2 Test specimens. The test specimens for the process control inspection shall be prepared in accordance with 4.4.2.3 through 4.4.2.3.2.2, as applicable, for the thickness, adhesion, hardness and porosity tests specified in table I. Specimens for the process control embrittlement relief tests shall be four round notched steel specimens of alloy steel 4340 conforming to MIL-S-5000 (see 4.4.2.3.1 and 4.4.2.3.2.3). The specimens shall be heat treated to the maximum tensile strength from one or more heats and shall be prepared in accordance with 4.4.2.3.1 and 4.4.2.3.2.3.

4.4.2 Lot sampling inspection. The lot sampling inspection shall consist of the examinations and tests specified in table II.

4.4.2.1 Inspection lot.

4.4.2.1.1 Plated items. An inspection lot size shall be expressed in units of one plated item. An inspection lot shall consist of all the plated items of the same base metal composition, class, deposition form and finish, plated and treated under the same conditions and are approximately the same size and shape. The sample unit shall be one plated item.

4.4.2.1.2 Packaging. An inspection lot shall be expressed in units of one fully prepared shipping container, containing plated items. An inspection lot shall consist of shipping containers fully prepared for delivery from essentially the same materials and components. The sample unit shall be one shipping container, containing plated items, fully prepared for delivery with the exception that it need not be sealed.

4.4.2.2 Sampling for examinations and tests of the plated items. The sampling size, acceptance criteria, examinations and tests required for the plated items shall be as specified in table II.

TABLE II. Sample size, acceptance criteria, examinations and tests of the electrodeposited chromium-molybdenum plating.

Inspection	Paragraph		Sample size	Acceptance criteria
	Requirement	Method		
Visual examination	3.3.7, 3.3.8, 3.3.9 and 3.6.2	4.5.1.1	1/	1/
Plating Thickness (non-destructive)	3.5.1	4.5.2.1	1/	1/
Destructive tests:				
Plating: thickness 3/	3.5.1	4.5.2.2	2/	2/
Adhesion 4/	3.5.2	4.5.3	2/	2/
Hardness 5/	3.5.3	4.5.4	2/	2/
Porosity 5/	3.5.4	4.5.5	6/	6/

TABLE II. Sample size, acceptance criteria, examinations and tests of the electrodeposited chromium-molybednum plating (continued)

Inspection	Paragraph		Sample size	Acceptance criteria
	Requirement	Method		
Hydrogen embrittlement relief 7/	3.3.5	4.5.6	2/	2/
Packaging	5.1	4.5.1.2	8/	8/

1/ Sampling for visual examination and non-destructive plating thickness test shall be conducted in accordance with MIL-STD-105, Inspection Level II with an acceptable quality level (AQL) of 1.5 percent defective or table III, as specified by the acquiring activity (see 6.2).

2/ When sampling and testing for the destructive tests specified in table II is not at the option of the contractor (processor), five random samples of the plated items for each destructive test, except for the porosity test (see footnote 6/), shall be selected from each lot or separately plated specimens, prepared in accordance with 4.4.2.3 through 4.4.2.3.2.3, as applicable, may be used, when applicable. If the number of items in a lot is five or less, the number of samples to be tested shall be as specified by the acquiring activity (see 6.2). The acceptance number shall be zero, rejection number 1 for each test.

3/ Separate specimens (see 4.4.2.3.1 and 4.4.2.3.2.1) shall not be used for determining the destructive plating thickness of the items.

4/ The items used for the destructive thickness test, if of suitable size and form, may be used as the test pieces for the adhesion test.

5/ The destructive tests for hardness and porosity shall only be conducted when specified in the contract (see 6.2).

6/ Five separately plated samples, prepared as specified in 4.4.2.3.1 and 4.4.2.3.2.2, shall be used in lieu of the plated items in the lot. The acceptance number shall be zero, rejection number 1.

7/ Unless otherwise specified (see 6.2), the hydrogen embrittlement relief test shall only be conducted on those plated parts having a tensile strength of or heat treated to a tensile strength level of 1655 MPa (200,000 psi). Any cracking or failure by fracture shall be cause for rejection.

8/ Sampling for packaging shall be conducted in accordance with

MIL-STD-105, Inspection Level S-2 with an AQL of 2.5 percent defective.

TABLE III. Sampling for visual examination and non-destructive tests.

Lot size	Sample size	Acceptance criteria	
		Acceptance no.	Rejection no.
15 or less	7 1/	0	1
16 to 40	10	0	1
41 to 110	15	0	1
111 to 300	25	1	2
301 to 500	35	1	2
501 and over	50	2	3

1/ All the plated items in lot sizes of 7 or less shall be selected for visual examination and non-destructive plating thickness test.

4.4.2.3 Test specimens.

4.4.2.3.1 Preparation. When the plated articles are of such form, shape, size and value as to prohibit use thereof, or are not readily adaptable to a test specified herein, or when destructive tests of small lot sizes are required, the test shall be conducted using separate specimens that were plated concurrently with the articles represented. The separate specimens shall be of a base metal equivalent to that of the article represented. "Equivalent" base metal includes chemical composition, grade, condition and finish of surface, prior to plating. For example, a cold-rolled steel surface should not be used to represent a hot-rolled steel surface. Due to the impracticality of forging or casting separate test specimens, hot-rolled specimens may be used to represent forged and cast steel articles. The separate specimens may also be cut from the scrap casting when ferrous alloy castings are being plated. These separate specimens may be introduced into a lot at regular intervals, prior to the cleaning operations, prior to plating, and shall not be separated therefrom until after completion of plating. Conditions affecting the plating of specimens, including the spacing, plating media, bath agitation, temperature, etc., in respect to other objects being plated, shall correspond as nearly as possible to those affecting the significant surfaces of the articles represented. Separate specimens shall not be used for thickness measurements, unless the necessity for their use has been demonstrated.

4.4.2.3.2 Size.

4.4.2.3.2.1 Thickness, adhesion and hardness tests. If separate specimens for thickness, adhesion and hardness tests are required, they shall be strips approximately 25 mm (1 inch) wide, 102 mm (4 inches) long and 1 mm (0.04 inch) thick.

4.4.2.3.2.2 Porosity test. If separate specimens for the porosity test are required, they shall be panels not less than 254 mm (10 inches) in length, 76 mm (3 inches) in width and approximately 1 mm (0.04 inch) thick.

4.4.2.3.2.3 Embrittlement relief test. Separate specimens for the embrittlement relief test shall be round notched specimens with the axis of the specimen (load direction) perpendicular to the short traverse grain flow direction. The configuration shall be in accordance with figure 8 of ASTM E 8 for rounded specimens. Specimens shall have 60 deg "V" notch located approximately at the center of the gage length. The cross-section area, at the root of the "V", shall be approximately at the center of the gage length. The cross-section area, at the root of the "V", shall be approximately equal to half the area of the full cross-section area of the specimen's reduced section. The "V" shall have a 0.254 ± 0.0127 mm (0.010 ± 0.0005 inch) radius of curvature at the base of the notch (see 6.2.2).

4.5 Test methods.

4.5.1 Visual examinations.

4.5.1.1 Plated items. Every plated item selected as a sample unit from the lot, shall be visually examined to determine conformance with the requirements of 3.3.7, 3.3.8, 3.3.9 and 3.6.2.

4.5.1.2 Packaging. Each of the fully prepared shipping containers, containing plated items, selected as a sample unit from the lot, shall be examined to determine that the preservation, packaging and packing conform to this specification (see 5.1).

4.5.2 Plating thickness.

4.5.2.1 Non-destructive. The non-destructive plating thickness shall be determined in accordance with ASTM B 499. An eddy current type gage may be used in determining the non-destructive plating thickness on titanium alloys.

4.5.2.2 Destructive. The destructive plating thickness shall be determined in accordance with ASTM B 487 or ASTM B 504.

4.5.2.3 Fastener hardware. In addition to 4.5.2.1 and 4.5.2.2, as applicable, the plating thickness on fastener hardware shall be determined at the locations defined in MIL-STD-1312.

4.5.3 Adhesion. The adhesion of the plating shall be determined by the plating's ability to withstand final grinding operations. As an alternate, the plated item or specimen shall be clamped in a vise and the projecting portion bent back and forth until rupture occurs. The adhesion is unsatisfactory if the edge of the ruptured plating can be peeled back or when examined at 4X magnification, separation between the plating and the base metal can be seen at the point of rupture.

4.5.4 Hardness. The hardness of the plating shall be determined with a Vickers indentor and 100 gram load. A minimum of three hardness determinations shall be conducted to establish the hardness of the base metal over an area at least 3.175 mm (0.125 inch) from the outer surface or at mid radius of the cross section, whichever is less. Starting at 0.025 mm (0.001 inch) from the outer surface, the hardness of the plating shall be determined at 0.013 mm (0.0005 inch) intervals, in a staggered pattern, until the pre-established base metal hardness has been reached. The hardness determinations shall be plotted versus distance from the outer surface. The point at which the hardness value shows a vast decrease shall be considered as the limits of the chromium-molybdenum plating. (See 3.5.3).

4.5.5 Porosity. Prior to determining porosity of chromium-molybdenum on steel by the ferroxyl test, the specimen surface shall be cleaned to remove any oil or grease. Any surface contamination shall be removed in accordance with MIL-S-5002 using an acceptable solvent. A filter paper shall be saturated by dipping in the heated ferroxyl solution. The solution shall be heated to 82° to 94°C (180° to 200°F). The saturated filter paper shall then be applied to the flat surface of the specimen or plated item, as applicable. After 10 minutes, the saturated filter paper shall be removed from contact with the specimen or item. The plated surface and the filter paper shall be examined. Dark blue spots are an indication of defective plating and that corrosion of the base metal will occur at the pores. Contact may further be assured by the use of a soft bristle brush moistened with the ferroxyl solution. For a permanent record, the filter shall be dried. The composition of the ferroxyl solution shall be as follows:

Potassium ferricyanide ($K_3Fe(CN)_6$)	1 gm
Sodium chloride (NaCl)	10 gm
Agar	10 gm
Water (distilled or deionized) to make	1 liter

4.5.6 Hydrogen embrittlement relief. Compliance with 3.3.5 shall be determined with samples of plated parts taken as specified in 4.4.2.3.1, 4.4.2.3.2.3 and footnote 2/ of table II, as applicable. Parts such as spring pins, lock rings, etc., which are installed in holes or rods, shall be similarly assembled using the applicable parts specifications or drawings tolerances which impose the maximum sustained tensile load on the plated part. The selected samples shall be subjected to a sustained tensile load equal to 115 percent of the maximum design yield load for which the part was designed. Parts which require special fixtures, extreme loads to comply with the above requirements, or where the maximum design yield load is not known, shall be represented by separate specimens prepared in accordance with 4.4.2.3.1 and 4.4.2.3.2.3. The notched samples shall be subjected to a sustained tensile load equal to 75 percent of the ultimate notch tensile strength of the material. The articles, parts or specimens shall be held under load for at least 200 hours and then examined for cracks or fracture.

5. PACKAGING

5.1 Preservations, packaging and packing. Preservation, packaging and packing methods for electrodeposited plated parts or articles employed by a supplier shall be such as to preclude damage during shipment and handling.

6. NOTES

6.1 Intended use. Chromium-molybdenum plating is used for wear and abrasion resistance and such incidental corrosion protection of parts as the specified thickness of the plating may afford. Heavy deposits of the plating may be used for buildup of worn or undersized parts, or for salvage purposes, and to provide protection against corrosive chemical environments.

6.2 Ordering data. Acquisitioners should select the preferred options permitted herein and include the following information in acquisition documents.

a. Title, number and date of this specification.

b. Class of plating (see 1.2).

c. When plating is to be applied, if other than specified (see 3.3.1, 3.3.4 and 3.4 through 3.4.5).

d. Surface preparation, if other than specified (see 3.3.3 through 3.3.3.2).

e. Heat-treat cycle, if other than specified (see 3.3.6).

f. Coverage, if other than specified (see 3.3.7).

g. Surface finish, if particular finish required (see 3.3.9).

h. Thickness of plating, as specified (see 3.4, 3.4.1 and 3.5.1).

i. Control record requirement (see 4.4.1.1).

j. Whether first article is waived (see 4.3.1).

k. Sampling plan (see footnote 1/ of table II).

l. Number of samples for destructive testing (see footnote 1/ of table III).

6.2.1 Base metal data. The manufacturer of the base metal parts should record and maintain on file the following data:

a. Hardness of steel parts (see 3.3.1, 3.3.2, 3.3.5 and 3.4).

b. Heat treatment for stress relief, whether has been performed or is required (see 3.3.2).

c. Tensile loads required for embrittlement relief test, if applicable (see 3.3.5 and 4.5.6).

6.2.2 Hydrogen embrittlement test samples. The manufacturer of the base metal parts should provide the plating facility with notched specimens (see 4.4.2.3.2.3) to be plated for conformance to 3.3.5 and required for first article inspection (see 4.3.1), for process control inspection (see 4.4.1.3.2) and lot conformance inspection (see table II, footnote 7/ of table II, footnote 1/ of table III and 4.5.6).

6.3 Stress relief. There is a hazard that hardened and tempered cold-worked or cold-straightened steel parts may crack during cleaning and plating. Such parts shall have a suitable heat treatment for stress relief, prior to cleaning and plating (see 3.3.2).

6.4 Baking time. For high strength steels (Rockwell hardness C40 and above), it may be beneficial to extend the baking time to 23 hours to ensure complete hydrogen embrittlement relief (see 3.3.5).

6.5 Contract data requirements. When this specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of 7-104.9(n) of Defense Acquisition Regulations (DAR), the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR-7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with contract requirements. Deliverable data required by the specification is cited in the following paragraphs:

Paragraph	Data requirement	Applicable DID
4.3.1	First article inspection reports	DI-T-5329 - Inspection Test Reports
4.4.1	Process control inspection	DI-T-5329 - Inspection Test Reports

6.6 First article. When a first article is required, it shall be tested under the appropriate provision of 7-104.55 of the Defense Acquisition Regulation. The first article should be a pre-production sample. The contracting officer should include specific instructions for examinations, tests and approval of the first article.

Custodians:
Army - ME
Navy - AS

Preparing activity:
Navy - AS
(Project number MFFP-0213)

Review activities:
Army - CR, MI, ME, AR, AV
Defense Supply Agency - IS

User activities:
Army - AT, GL
Navy - SH

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CHROMIUM-MOLYBDENUM PLATING (ELECTRODEPOSITED)

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

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