

**GGG-P-453a**

April 8, 1965

**SUPERSEDING**

Fed. Spec. GGG-P-453

September 1955

**FEDERAL SPECIFICATION**  
**PLATE, SURFACE, CAST IRON**

*This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.*

**1. SCOPE AND CLASSIFICATION**

1.1 **Scope.** This specification covers cast iron surface plates for general inspection and layout work.

1.1.1 *Federal specification coverage.* This specification does not include all types, grades, and sizes of cast iron surface plates which are commercially available, but only those generally used by the Federal Government.

**1.2 Classification.**

1.2.1 *Types and grades.* Surface plates covered by this specification shall be of the following types and grades, as specified (see 6.2):

- Type I—Single surface.
  - Grade A—Fine scraped.
  - Grade B—Scraped.
  - Grade C—Fine planed.
  - Grade D—Planed.
  - Grade E—Ground.
- Type II—Double surface.
  - Grade A—Fine scraped.
  - Grade B—Scraped.
  - Grade E—Ground.

**2. APPLICABLE SPECIFICATIONS, STANDARDS, AND OTHER PUBLICATIONS**

2.1 **Specifications and standards.** The following specifications and standards, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

*Federal Specifications:*

- PPP-B-601—Boxes, Wood, Cleated-Plywood.
- PPP-B-621—Boxes, Wood, Nailed and Lock-Corner.
- PPP-F-320—Fiberboard; Sheet, Stock and Cut Shapes.
- PPP-T-76—Tape, Pressure-Sensitive Adhesive Paper (For Carton Sealing).

*Federal Standards.:*

- Fed. Std. No. 102—Preservation, Packaging, and Packing Levels.
- Fed. Std. No. 123—Marking For Domestic Shipment (Civilian Agencies).
- Fed. Test Method Std. No. 151—Metals; Test Methods.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and

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Standards from established distribution points in their agencies.)

*Military Specifications:*

MIL-C-104—Crates, Wood, Lumber and Plywood-Sheathed, Nailed and Bolted.

MIL-P-116—Preservation, Method of.

MIL-P-3420—Packaging Materials, Volatile Corrosion Inhibitor, Treated, Opaque.

*Military Standards:*

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes.

MIL-STD-129—Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

**2.2 Other publications.** The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

*National Bureau of Standards (NBS) Handbook:*

H-28—Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., 20402.)

*American Standards Association (ASA) Standard:*

B46.1—Surface Texture.

(Application for copies should be addressed to the American Standards Association, 10 East 40th Street, New York, N. Y., 10016.)

(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 Illustrations.** The illustrations shown herein are descriptive and not restrictive, and are not intended to preclude the purchase of surface plates otherwise conforming to this specification.

**3.2 Construction.** Construction shall be free from any characteristics or defects that may render the surface plate unsuitable or inefficient for the purpose intended.

**3.3 Material.** The plates covered by this specification shall be made of fine grain gray iron or iron alloy castings.

**3.3.1 Castings.** All castings shall be of uniform quality free from defects, scale, and mismatching. In no event shall such processes as welding, peening, or filling with cold solders or metallic pastes be used for reclaiming any casting.

**3.3.1.1 Seasoning.** All castings used in the fabrication of the surface plates covered by this specification after rough machining shall be stress relieved before final finishing. Stress relieving procedures shall be manufacturer's standard which will produce surface plates of the accuracy specified herein.

**3.4 Hardness.** The finished surface plates shall have a Brinell hardness of not less than 180 when tested as specified in 4.4.1.

**3.5 Working surface.** The working surface of all surface plates covered by this specification shall extend beyond the ribbing a minimum of one inch, exclusive of fillets, to permit the use of clamps. The working surface shall be of the following grades as specified (see 6.2).

**3.5.1 Grade A.** Grade A working surfaces shall be fine precision scraped with relief spots to prevent the sticking of precision in-

struments and gage blocks. The spotting cavities shall be from 0.0002 to 0.0003 inch in depth with a concentration of 15 to 18 spotting cavities per square inch and a 20 to 40 percent bearing.

**3.5.2 Grade B.** Grade B working surface shall be scraped with relief spots to prevent the sticking of precision instruments and gage blocks. The spotting cavities shall be from 0.0002 to 0.0004 inch in depth with a concentration of 8 to 11 spotting cavities per square inch and 10 to 40 percent bearing.

**3.5.3 Grade C.** Grade C working surface shall be smooth planed using a broad-nosed tool with a maximum crossfeed of 3/8 inch. No tool groove shall exceed 0.0005 inch in depth.

**3.5.4 Grade D.** Grade D working surface shall be planed with a broad-nosed tool with a maximum crossfeed of 5/8 inch. No tool groove shall exceed 0.001 inch in depth.

**3.5.5 Grade E.** Grade E working surface shall be precision ground to a surface finish of 32 microinches arithmetic accuracy (AA) or better in conformance with ASA B46.1.

**3.6 Accuracy.** The bearing areas of the working surfaces shall not deviate from a mean plane by more than that specified in table I when tested as specified in 4.4.2. No adjacent square foot areas shall vary with each other by more than the following:

Grades A and E . . . . .	0.0001 inch.
Grade B . . . . .	.0002 inch.
Grade C . . . . .	.0003 inch.
Grade D . . . . .	.0005 inch.

**3.6.1 Side edges.** The side edges of the top shall be parallel to each other and square with the end edges within 0.0005 per linear foot and all edges shall be square with the working surface within 0.0005 inch in the full thickness of the top.

TABLE I. *Requirements for bearing areas*

Bearing area of working surfaces		Maximum permissible deviation of bearing areas from mean plane plus or minus			
Above	To and including	Grades A and E	Grade B	Grade C	Grade D
Square inches	Square inches	Inch	Inch	Inch	Inch
—	12	0.0001	0.0002	—	—
12	24	.0001	.0004	—	—
24	36	.0002	.0006	0.0006	0.0012
36	48	.0002	.0008	.0008	.0015
48	60	.0002	.0010	.0010	.0020
60	72	.0003	.0012	.0012	.0025
72	84	.0003	.0014	.0015	.0030

**3.7 Handling provisions.** Each plate shall be provided with lifting handles or other devices in accordance with the size of plate for lifting and transporting. The lifting device shall be so located as to reasonably balance the plate when suspended.

**3.8 Screw thread.** All screw threads used on surface plates shall be in accordance with the coarse thread series, classes 2 and 2A/2B as specified in H28.

**3.9 Finish.** External surfaces shall be smooth and clean with all edges rounded or beveled. The side and end edges of the working surfaces and the bearing pads shall be smooth machine finished to 125 microinch AA or better in accordance with ASA B46.1.

**3.10 Painting.** Unless otherwise specified (see 6.2), all surfaces not machined shall be painted in accordance with manufacturer's standard practice.

**3.11 Ribbing.** Ribbing, of sufficient thickness, shall be incorporated into the design of surface plates to assure maximum flatness, squareness, and stability of all working surfaces.

**3.12 Type I, single surface plates.** Type I surface plates shall be a single casting with diagonal cross ribbing providing three point bearing support at the junction of the rib-

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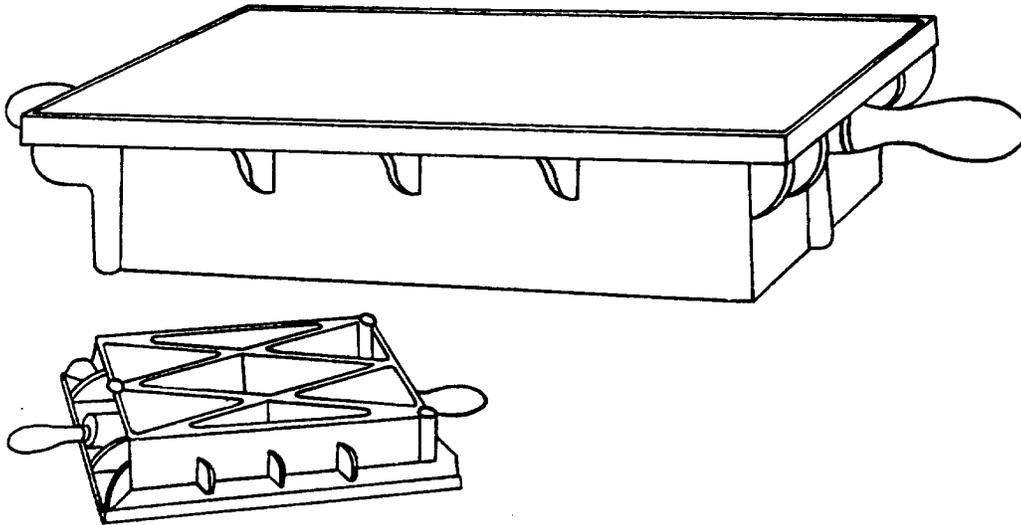


FIGURE 1. Type I surface plate

bing. Type I surface plates shall have a single working surface. Accuracy of the working surface shall conform to the requirements specified herein for the grade specified (see 6.2). Type I surface plates shall be similar to figure 1, and shall conform to the dimensions and weights of table II for the size specified (see 6.2).

TABLE II. Type I surface plate, sizes, dimensions and weights

Size		Thickness of top (min.)	Depth (min.)	Weight (min.)
Width	Length			
Inches	Inches	Inches	Inches	Pounds
3-1/2	4	5/16	1-5/8	3
8	12	3/8	2-1/2	20
12	12	3/8	3-7/16	40
12	18	7/16	3-3/4	64
18	18	7/16	4-7/16	100
18	24	1/2	4-5/8	150
24	24	1/2	5-13/16	210
24	36	9/16	6-5/8	325
36	48	5/8	7	1000
36	72	3/4	9	1500
48	96	1-1/8	10	3000
48	144	1-1/2	12	6000

3.12.1 *Covers.* All type I, grades A, B, and E surface plates shall be furnished with

a properly fitted wooden cover so designed as to protect the edges as well as the working surface. Each cover shall be given at least two coats of varnish or shellac.

3.13 *Type II double surface plates.* Type II double surface plates shall have working surfaces on the top and bottom. Surface plates of this type shall be approximately 10 inches wide by 14 inches long by 2-3/8 inches in depth, weigh approximately 40 pounds, and be in substantial agreement with figure 2. The working surface of type II double surface plates shall be grade A, B, or E, as specified (see 6.2).

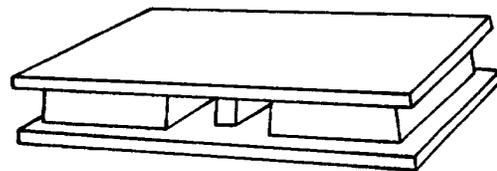


FIGURE 2. Type II surface plate

3.14 *Nameplate.* Unless otherwise specified (see 6.2), a metal nameplate perma-

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nently and legibly marked with the following information shall be securely attached to each surface plate in a prominent location:

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 Type  
 Grade  
 Size  
 Manufacturer's serial number  
 (Manufacturer's name or trademark)

**3.15 Workmanship.** The workmanship of the surface plates shall be of a quality prevailing among manufacturers normally producing surface plates of the type and sizes specified herein.

#### 4. SAMPLING, INSPECTION, AND TEST PROCEDURES

**4.1 Responsibility for inspection.** Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 that supplies and services conform to prescribed requirements.

**4.2 Sampling for quality conformance inspection.**

**4.2.1 Lot.** All surface plates of the same type, grade, and size presented at the same time shall be considered a lot for the purposes of inspection.

**4.2.2 Sampling for examination and tests.** A random sample of surface plates shall be selected for each lot offered for quality conformance inspection in accordance with MIL-STD-105, inspection level II.

**4.3 Quality conformance inspection.** Each of the sample surface plates selected in accordance with 4.2.2 shall be inspected to verify compliance with this specification. In-

spection for quality conformance shall be as follows:

- (a) Examination (see 4.3.1).
- (b) Tests (see 4.3.2 and 4.4).
- (c) Examination of preservation, packaging, packing, and marking (see 4.5).

**4.3.1 Examination.** Each of the surface plates selected in accordance with 4.2.2 shall be examined for conformance with the requirements of this specification. Examination shall be conducted as specified in table III. The acceptable quality levels (AQL) shall be as indicated in table III. Any surface plate containing one or more defects shall not be offered for delivery and if the number of nonconforming plates exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

TABLE III. *Classification of defects in accordance with MIL-STD-105*

Categories	Defects
<i>Critical:</i>	None defined.
<i>Major:</i>	AQL = 1.5 percent defective.
101	Surface plates not the grade and type specified.
102	Construction of surface plates not free from any characteristic or defect that might render the plate unsuitable or inefficient for the purpose intended.
103	External surfaces of plates not smooth and clean, all edges not rounded or beveled; the side and end edges of the working surfaces and the bearing pads not smooth machine finished.
104	Castings not free from harmful blowholes, porosity, hard spots, shrinkage or other injurious defects; castings not thoroughly cleaned of all scale, molding sand and other extraneous materials; evidence of flaws in castings repaired by plugging, peening or welding except as authorized.
105	The working surfaces of all surface plates extend beyond the ribbing less than the specified minimum.

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TABLE III. *Classification of defects in (accordance with MIL-STD-105 (cont'd))*

Categories	Defects
<i>Major:</i>	
106	Ribbing not incorporated into the design of the surface plates as specified; ribbing not of sufficient thickness to assure maximum flatness, squareness and stability of all working surfaces.
107	Type I single surface plates nonconforming, not with diagonal cross ribbing; dimensions of plates not as specified or less than the specified minimum (as applicable); surface plates not designed with three point bearing supports; bearing supports not located as specified.
108	Type II double surface plates nonconforming, dimensions not as specified; working surfaces not as specified.
109	Each surface plate not provided with lifting handles or other lifting devices as specified; lifting devices not located so as to assure reasonable balance of the plate when lifted.
<i>Minor:</i>	AQL = 2.5 percent defective.
201	Fitted wooden covers not furnished with all type I, grades A, B, and E surface plates as specified; wooden covers not painted as specified.
202	All unmachined surfaces of plates not painted as specified.
203	Marking of manufacturer's name or trademark and serial number, and type, grade and size of surface plate, missing, nonconforming, illegible or not permanent; nameplate not securely attached to each surface plate as specified.
204	Evidence of flaws or blemishes of the finished surface plate that might affect the serviceability or appearance.
205	Threaded parts nonconforming, form and class of fit not specified; threads missing, stripped, crossed, torn, or damaged.

4.3.2 *Tests.* Each of the sample surface plates selected in accordance with 4.2.2 shall be tested in accordance with 4.4 to determine compliance with the requirements of this specification. The AQL shall be 1.5

percent defective. Any plate failing the test shall not be offered for delivery and if the nonconforming plates in any one sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.4 *Test procedures.*

4.4.1 *Hardness test.* Hardness of the surface plate shall be determined in conformance with method 242 of Fed. Test Method Std. No. 151 using a 3,000 kg. load and a 10 mm. diameter ball. Readings shall be taken on sections adjacent to the working surface. Preparation of test surfaces shall be made in accordance with method 242 of Fed. Test Method Std. No. 151. Failure of the plate to meet the minimum requirements of 180 Brinell hardness number shall be cause for rejection.

4.4.2 *Accuracy test of working surfaces.* Accuracy of the working surfaces shall be determined by checking flatness of the working surface for conformance with the tolerances specified herein (see 3.6). Methods used in determining conformance shall be an approved method, standard with industry and acceptable to the procuring agency. Failure to meet the accuracy requirements specified shall be cause for rejection.

4.4.3 *Side edge parallelism and finish.* Parallelism of side edges and squareness of the working surface with side edges shall be determined to comply with the requirements of 3.6.1. Finish of the side edges shall be tested to determine compliance with the 125 microinch AA as specified in 3.9. Failure to meet these requirements shall be cause for rejection.

4.4.4 *Bearing areas.* The percentage of bearing area shall be determined by very lightly coating the working surface with Prussian blue or other suitable material, then rubbing over the surface with another plate of known accuracy to bring out the high spots. A plate of glass or other suitable flat transparent material that has previously been ruled into small predetermined

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squares shall then be laid on the working surface and the percent of bearing determined as well as the number of spots per square inch. Bearing areas of the working surfaces shall not exceed the requirements specified in table I for the grade and size tested. Failure to meet these requirements shall be cause for rejection.

**4.4.5 Weight test.** Each sample plate shall be weighed to determine compliance with the minimum weight requirements of table II and 3.13 for the type and size being tested. Failure to meet the minimum weight requirements shall be cause for rejection.

**4.5 Inspection of preparation for delivery requirements.** An inspection shall be made to determine that the packing and marking comply with the requirements in section 5. Defects shall be scored in accordance with table IV. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL shall be 2.5 defects per hundred units.

TABLE IV. *Classification of preparation for delivery defects*

Examine	Defects
Markings (exterior)	Omitted; incorrect; illegible; improper size, location, sequence.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components as incomplete closure of container, loose strapping, or inadequate nailing.

## 5. PREPARATION FOR DELIVERY

For civil agency procurement, the definitions and application of levels of packaging and packing shall be in accordance with Fed. Std. No. 102.

**5.1 Packaging.** Packaging shall be level A, B, or C, as specified (see 6.2).

### 5.1.1 Level A.

**5.1.1.1 Cleaning and drying.** The plate shall be cleaned by process C-5 and dried by procedure D-1 in accordance with MIL-P-116.

**5.1.1.2 Preservative application.** All unpainted and unprotected surfaces of the plates subject to corrosion shall be coated with type P-8 preservative in accordance with MIL-P-116.

**5.1.1.3 Unit packaging.** All surfaces coated with preservative shall be covered with material conforming to MIL-P-3420, type II, class 1. A sheet of fiberboard with the fiberboard meeting the requirements of PPP-F-320, covering the entire precision surfaces (top and bottom when applicable) shall be utilized. The fiberboard shall be secured with tape conforming to PPP-T-76.

**5.1.2 Level B.** The plates shall be preserved and packaged as specified in 5.1.1.

**5.1.3 Level C.** The plates shall be packaged in accordance with the suppliers commercial practice.

**5.2 Packing.** Packing shall be level A, B, or C, as specified (see 6.2).

**5.2.1 Level A.** The plates shall be individually packed in a close-fitting box conforming to PPP-B-601, type III, or PPP-B-621, class 2. Blocking and bracing shall be provided. The box shall be closed and strapped in accordance with the appendix to the box specification. When the gross weight exceeds 250 pounds, skids shall be provided in accordance with the box specification. A crate conforming to MIL-C-104 shall be provided for plates whose net weight exceeds 500 pounds.

**5.2.2 Level B.** The plates shall be packed as specified in 5.2.1 except the boxes shall be the domestic type.

**5.2.3 Level C.** The plates shall be packed to insure carrier acceptance and safe delivery at destination in containers complying with the rules and regulations applicable to the mode of transportation.

**GGG-P-453a****5.3 Marking.**

**5.3.1 Civil agencies.** In addition to markings required by the contract or order, the shipping containers shall be marked in accordance with Fed. Std. No. 123.

**5.3.2 Military activities.** In addition to markings required by the contract or order, the shipping containers shall be marked in accordance with MIL-STD-129.

**6. NOTES**

**6.1 Intended use.** The surface plates covered by this specification are for use in inspection and layout work and to provide a true and rigid surface for assembly work.

**6.2 Ordering data.** Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type and grade (see 1.2, 3.5, 3.12 and 3.13).
- (c) Size of working surface (see 3.12 and 3.13).
- (d) Painting, if different (see 3.10).
- (e) Nameplate requirements, if different (see 3.14).
- (f) Level of preservation, packaging, and packing required (see 5.1).
- (g) Special marking, if required (see 5.3).

**6.3 Transportation description.** Transportation descriptions and minimum weights applicable to this commodity are:

**Rail:**

Plates, layout surface or surface, steel.  
Carload minimum weight 30,000 pounds.

**Motor:**

Plates, layout surface or surface, steel.  
Truckload minimum weight 30,000 pounds, subject to Rule 115, National Motor Freight Classification.

**MILITARY CUSTODIANS:**

Army—WC  
Navy—SH  
Air Force—67

**Reviewer:**

Army—WC  
Navy—SH  
Air Force—67

**User:**

Navy—WP, YD

**CIVIL INTEREST:**

National Bureau of Standards  
Department of Commerce  
Department of the Interior  
Veterans Administration  
General Services Administration

**Preparing activity:**

Navy—SH

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.