

[INCH-POUND]
RR-G-1602D
February 29, 1996
SUPERSEDING
RR-G-1602C
June 29, 1989

FEDERAL SPECIFICATION

GRATING, METAL, OTHER THAN BAR TYPE (FLOOR, EXCEPT FOR NAVAL VESSELS)

The General Services Administration has authorized the use of this specification by all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers aluminum and steel floor gratings other than bar types.

1.2 Classification.

1.2.1 Types. The gratings will be of the following types as specified (see 6.2).

Type I - Steel, heavy.

Type II - Steel, light.

Type III - Aluminum, heavy.

Type IV - Aluminum, light.

2. APPLICABLE DOCUMENTS

2.1 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents which are current on the date of the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, 1000 23rd Avenue, Port Hueneme, CA 93043-4301.
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AMSC N/A

FSC 5670

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AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI - Z 1.4 - Procedures, Sampling and Tables for Inspection by Attributes

(Application for copies should be addressed to the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 90/A 90M - Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 370 - Mechanical Testing of Steel Products.

ASTM A 653/A 653M - Steel Sheet, Zinc-coated (Galvanized) or Zinc-iron Alloy-coated (Galvanized) by the Hot-Dip Process.

ASTM A 924/A 924M - Steel Sheet, Metallic-Coated by the Hot-Dip Process.

ASTM D 4675 - Guide for Selection and Use of Flat Strapping Materials

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

(Non-Government standards and other publications are normally available from the organizations which prepare or that distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.2.1 and 6.2).

3.2 Standard commercial product. The Grating shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which

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are a part of the manufacturer's standard commercial product, shall be included in the grating being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials", means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification.

3.3.1 Steel. Types I and II gratings shall be made of carbon steel, rolled or drawn, or high-tensile steel, rolled or drawn.

3.3.2 Aluminum. Types III and IV gratings shall be made of aluminum or aluminum alloy.

3.4 Construction. Gratings shall be so constructed as to meet the strength and load requirements of this specification. Gratings may be of metal planking, expanded metal, extruded sections, or of other suitable construction. When specified (see 6.2), the gratings shall have an antislip surface.

3.4.1 Metal planking. Grating of the kind called "metal planking" may be of types I, II, III, and IV. Planking sides shall be channel-shaped, extend downward from the surface, and provide the load-carrying beam action of the plank. Such grating shall be of one-piece construction and require no welding or fastening of component parts.

3.4.2 Openings. Unless otherwise specified (see 6.2), maximum dimensions of the openings shall be 1- by 3-1/2 inches (25.4- by 88.9 millimeters (mm)) for expanded metal gratings, 1-1/2 inch (38.1 mm) maximum diameter for circular openings, or 7/8- by 7-3/4 inches (22.23- by 196.85 mm) for other types of grating. Openings may be at any location except that side channels shall not be cut without providing extra support under the cut legs.

3.4.3 Tolerances. The following tolerances are permitted:

Length - +0 - 1/8 inch. (+0 -3.18 mm)

Depth of channels - $\pm 1/16$ inch (± 1.59 mm) (when measured from bottom of serrations, when present).

Width of grating panels - +0 -1/8 inch. (+0 -3.18 mm)

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3.4.4 Size. The size of the gratings shall be as specified (see 6.2).

3.5 Fasteners. When specified (see 6.2), fasteners furnished shall be of the type recommended by the manufacturer. Fasteners shall not extend above the surface of the gratings, and shall be of such construction as to provide means for holding and securing gratings to the supporting structure with adequate simplicity of installation and for removal and replacement in service.

3.6 Load and weight. The load and weight requirements of the gratings shall be as shown in table I.

3.6.1 Deflection. Deflection at rated loads shall not exceed 1/120 of the unsupported span when tested in accordance with 4.4.2.1 and 4.4.2.2

TABLE I. Load and weight requirements.

<u>TYPE</u>	<u>Uniform test load</u>		<u>Concentrated test load</u>		<u>Maximum weight</u>	
	<u>Lb per Sq Ft</u>	<u>Kg per Sq m</u>	<u>Lb per ft of Width</u>	<u>Kg per m of Width</u>	<u>Lb per Sq Ft*</u>	<u>Kg per Sq m*</u>
I	300	1464.6	900	1339.3	8.75	42.7
II	175	854.4	525	781.3	5.50	26.9
III	300	1464.6	900	1339.3	6.25	30.5
IV	150	732.3	450	669.7	4.65	22.7

*Finished unbanded, including paint, bearing bars, channels, and zinc coatings.

3.7 Antislip. When antislip surface is required (see 6.2), the minimum friction for foot traffic shall be as shown in table II.

TABLE II. Antislip values.

Minimum antislip values (Lb)*

<u>Condition</u>	<u>Steel</u>		<u>Aluminum</u>	
	<u>Lb</u>	<u>Kg</u>	<u>Lb</u>	<u>Kg</u>
Dry	110	49.9	105	47.6
Mud	110	49.9	95	43.1
Ice	80	36.3	75	34.0

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Grease	95	43.1	75	34.0
Detergent	108	49.0	95	43.1

*Minimum force, in pounds (lb) (Kg), acting to prevent a 175-lb (79.38 Kg) weight from slipping.

3.8 Finish.

3.8.1 Steel gratings. Unless otherwise specified (see 6.2), steel gratings shall hot-dip zinc coated, either after fabrication, in accordance with ASTM A123 , or before fabrication in accordance with ASTM A653/A653M and ASTM A924/A924M, G90. The average hot-dip zinc coating for the after fabricated shall be not less than 3.0 ounces per square foot (0.91 Kilogram per square meter (Kg/m²)) (total both sides).

3.8.2 Aluminum gratings. Unless otherwise specified (see 6.2), aluminum gratings shall have a standard mill fabricated finish.

3.9 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

3.10 Workmanship.

3.10.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to insure uniformity of size and shape.

3.10.2 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

3.10.3 Treatment and painting. Unless otherwise specified (see 6.2), the grating shall be treated and painted in accordance with the manufacturer's standard practice. All surfaces of the grating other than corrosion-resisting steel shall be protected against corrosion and present a neat appearance.

4. **QUALITY ASSURANCE PROVISIONS**

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4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Material inspection. The contractor is responsible for insuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

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

- a. First article inspection (see 4.2.1).
- b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one grating on the type specified when a first article is required (see 3.1 and 6.2). This inspection shall include the examination of 4.4 and the tests of 4.5. The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5, and the packaging inspection of 4.6. This inspection shall be performed on the samples selected.

4.2.3 Sampling. Sampling and inspection procedures shall be in accordance with ANZI Z1.4. All grating of the same type offered for delivery at one time shall be considered a lot for the purpose of inspection. Guidance for inspection level and Acceptable Quality Level (AQL) is provided in 6.4.

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4.3 Examination. Each grating selected shall be examined for compliance with the requirements specified in section 3 of this specification. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirement shall constitute one defect.

4.4 Tests.

4.4.1 Zinc coating. Each grating selected shall be tested in accordance with ASTM A 90/A 90M or ASTM A 370.

4.4.2 Load. Each grating selected shall be tested in accordance with the provisions of the following paragraphs.

4.4.2.1 Uniform load test. Each grating shall be supported by two supports having a bearing width not exceeding 1 inch and overhang not exceeding 6 inches. Supports shall be placed to provide a 3-foot (0.9 m) clear span for each grate size. A uniform load in accordance with table I (see 3.6.1), and the applicable type of grating shall be placed on the test span. Deflection shall be determined by a suitable gage. Deflection shall be measured as the average of the two deflection readings taken at midspan at both side channels. Maximum allowable deflection shall be as specified in 3.6.1.

4.4.2.2 Concentrated load test. Each grating shall be supported by two supports having a bearing width not exceeding 1 inch and overhang not exceeding 6 inches. Supports shall be placed to provide a 3-foot (0.9 m) clear span for each grate size. The grating shall be tested with the load specified for the applicable type in accordance with table I (see 3.6), and suspended from a bar placed midway between the supports. The bar shall not have a bearing width on the grating larger than 2 inches (50.8 mm). Deflection shall be determined by a suitable gage. Deflection shall be measured as the average of two deflection readings taken at mid-span at both side of channels. Maximum allowable deflection shall be as specified in 3.6.1.

4.4.3 Antislip. When antislip surface is required (see 3.7 and 6.2), each grating selected shall be tested in accordance with the provisions of the following paragraphs.

4.4.3.1 Test materials and conditions. The friction test shall be repeated for each of the five different types of sole materials in three directions for each surface condition of the grating. The 15 test results shall be averaged for comparison with the values shown in table II. The sole materials to be used are as follows: leather, boot rubber, shoe rubber, Neolite, and Hypolon. The three directions of movement shall be longitudinal, transverse, and diagonal. Surface conditions shall be simulated as follows: dry; mud (use a 1/8-inch (3.18 mm)) application of ball clay mud on (both sole material and grating); ice (pack grating in dry ice until 1/16-inch (1.59 mm)) of ice has collected on test surface); grease (National Lubricant and Grease Institute No. 4); and detergent (all-purpose synthetic laundry detergent; a cup in 2 gallons (7.57 liters)) of water).

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4.4.3.2 Test procedure. Place a 3-inch (76.2 mm) diameter sole material sample inside a holder made of 1/2-inch (12.7 mm) thick steel plate having a 3-inch (76.2 mm) diameter circle 1/16-inch (1.59 mm) deep. Sample edges should be beveled. Place the holder and sample in contact with the grating under test, sample holder should not hit grating when loaded. Place a dead weight load of 175 pounds (79.38 Kg) on the sample holder. Either the holder or grating will be moved for a distance of 1 inch (25.4 mm) at a constant rate of 2 inches (50.8 mm) per minute. The test machine shall be equipped with a continuous recorder to record the resistance offered by the grating to the material. The test result shall be the average between the maximum and minimum readings.

4.5 Preparation for delivery inspection. An examination shall be made to determine compliance with the requirements of section 5.

5. PACKAGING

5.1 Packing. Packaging requirements shall be specified in the contract or order.

6. NOTES

6.1 Intended use. The gratings covered by this specification are intended to cover trenches, drains, loading ramps, catwalks, stair treads, and platforms, and in certain areas, to be used as flooring.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type required (see 1.2.1).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. When first article is required (see 3.1 and 4.2.1).
- e. When dimensions of opening, are other than specified (see 3.4.2).
- f. Size of grating required (3.4.4).
- g. When fasteners are required (see 3.5).
- h. When antislip surface is required (see 3.7 and 4.4.3).
- i. When finish other than specified is required (see 3.8.1 and 3.8.2).
- j. When treatment and painting other than specified is required (see 3.10.3).
- k. Level of packing required (see 5.1).

6.3 First article. When a first article inspection is required, the item will be tested and should be a first article sample, or it may be a standard production item from the contractor's current

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inventory as specified in 4.2.1. The first article should consist of the type specified in 6.2. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

6.4 Sampling procedures.

6.4.1 Sampling for examination. Recommended inspection level is II and AQL is 2.5 (see 4.2.3).

6.4.2 Sampling for tests. Recommended inspection level is S-3 and AQL is 4.0 (see 4.2.3).

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS:

Custodians:

Navy - YD1

Air Force - 99

Review activity:

Air Force - 84

CIVIL AGENCY COORDINATING ACTIVITIES:

GSS - FSS

HHS - FEC

Preparing Activity

Navy - YD1

DOD Project 5670-0016

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.