Designation: A 786/A 786M – 05

# Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates[1]

This standard is issued under the fixed designation A 786/A 786M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope*

1.1 This specification covers carbon, low-alloy, high-strength low-alloy, and alloy steel hot-rolled floor plates for flooring, stairways, transportation equipment, and general structural purposes. While it is generally provided in the as-rolled condition, floor plate also may be provided in the heat-treated condition, depending on the material specification. Rolled floor plates have raised figures at regular intervals on one surface of the plate.

1.2 Floor plate is available in dimensions that meet the classification size limits for sheet, heavy thickness sheet coil, or plate. Maximum thickness for product delivered under this specification is 1 in. [25 mm].

1.3 When the steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service will be utilized. See Appendix X3 of Specification A 6/A 6M for information on weldability.

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system are not exact equivalents; therefore, each system is to be used independently of the other, without combining values.

## 2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 6/A 6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A 36/A 36M Specification for Carbon Structural Steel

A 131/A 131M Specification for Structural Steel for Ships

A 242/A 242M Specification for High-Strength Low-Alloy Structural Steel

A 514/A 514M Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding

A 568/A 568M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A 570/A 570M Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality

A 572/A 572M Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel

A 573/A 573M Specification for Structural Carbon Steel Plates of Improved Toughness

A 588/A 588M Specification for High-Strength Low-Alloy Structural Steel with 50 ksi [345 MPa] Minimum Yield Point to 4 in. [100 mm] Thick

A 606/A 606M Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance

A 635/A 635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for

A 659/A 659M Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled

A 709/A 709M Specification for Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges

A 829/A 829M Specification for Alloy Structural Steel Plates

A 830/A 830M Specification for Plates, Carbon Steel, Structural Quality, Furnished to Chemical Composition Requirements

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A 1011/A 1011M Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability

A 1018/A 1018M Specification for Steel, Sheet and Strip, Heavy-Thickness Coil, Hot-Rolled, Carbon, Commercial,

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.02 on Structural Steel for Bridges, Buildings, Rolling Stock and Ships.

Current edition approved Sept. 1, 2005. Published October 2005. Originally approved in 1981. Last previous edition approved in 2000 as A 786/A 786M – 00b.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard.**

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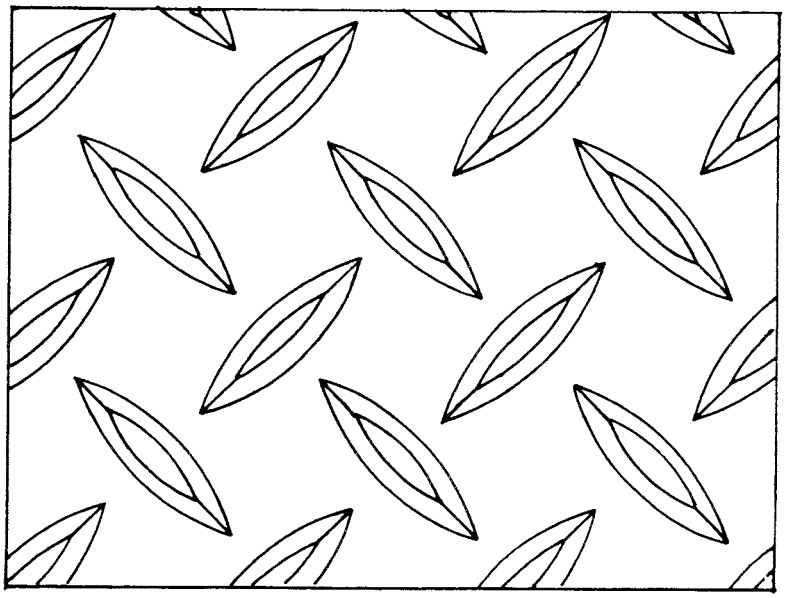
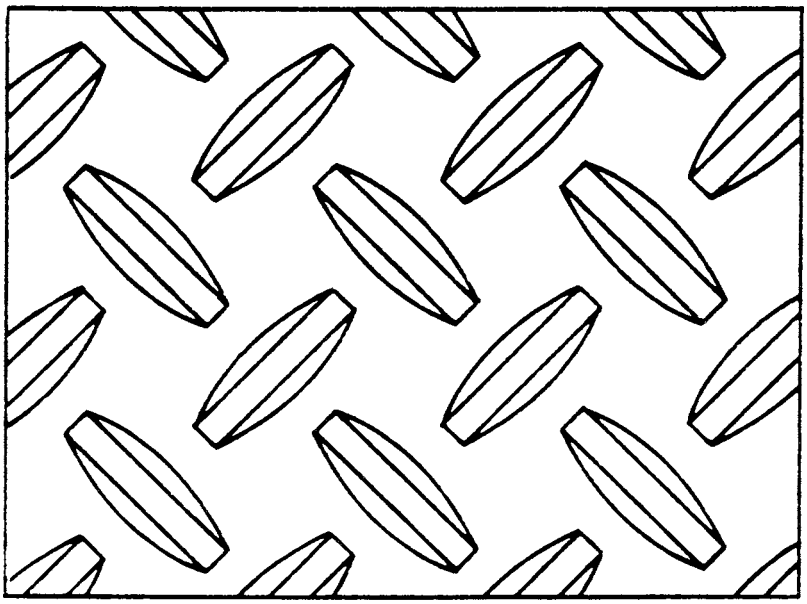


Pattern No. 2



Pattern No. 4

**FIG. 1 Floor Plate Patterns (Full Scale)**

Drawing, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability

## 3. Terminology

3.1 *Definitions*—For definitions of terms used in this specification, refer to Terminology A 941.

## 4. Surface Pattern

4.1 Individual floor plate patterns are unique to each manufacturer and are not identical in dimension or appearance to patterns manufactured by other manufacturers, although there may be a close resemblance. Typical patterns are shown in Fig. 1. Manufacturers generally produce only one of the patterns shown.

4.2 Pattern size, shape, and minimum pattern height are not addressed in this specification due to the differences in individual manufacturer's patterns and production methods. Where a need for these attributes exists, purchasers should consult the manufacturer.

## 5. Ordering Information

5.1 Information items to be considered, if appropriate, for inclusion in purchase orders are as follows:

5.1.1 Quantity (weight [mass] or number of pieces),

5.1.2 ASTM designation and year of issue,



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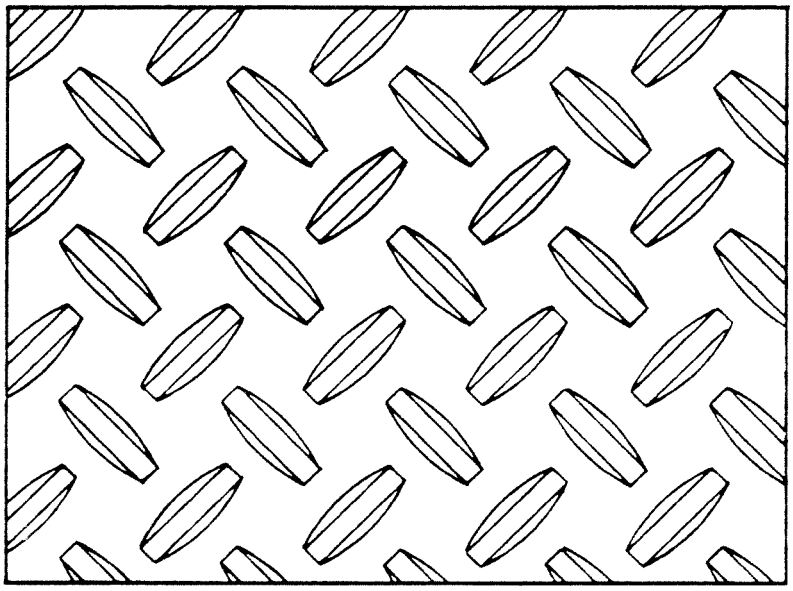

Pattern No. 5

**FIG. 1** *(continued)*

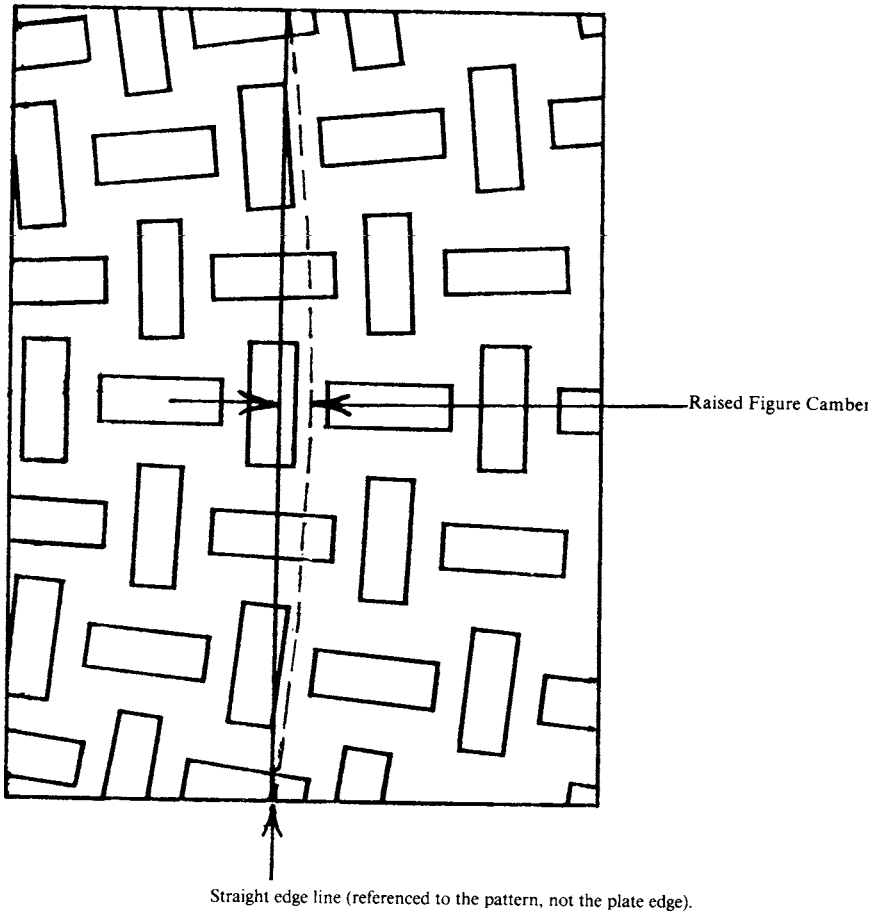


**FIG. 2 Camber for Raised Figures for Floor Plates (see Table 4 or Table A1.3)**

5.1.3 Chemical composition limits or ASTM material designation and grade (if applicable) and year of issue (if neither



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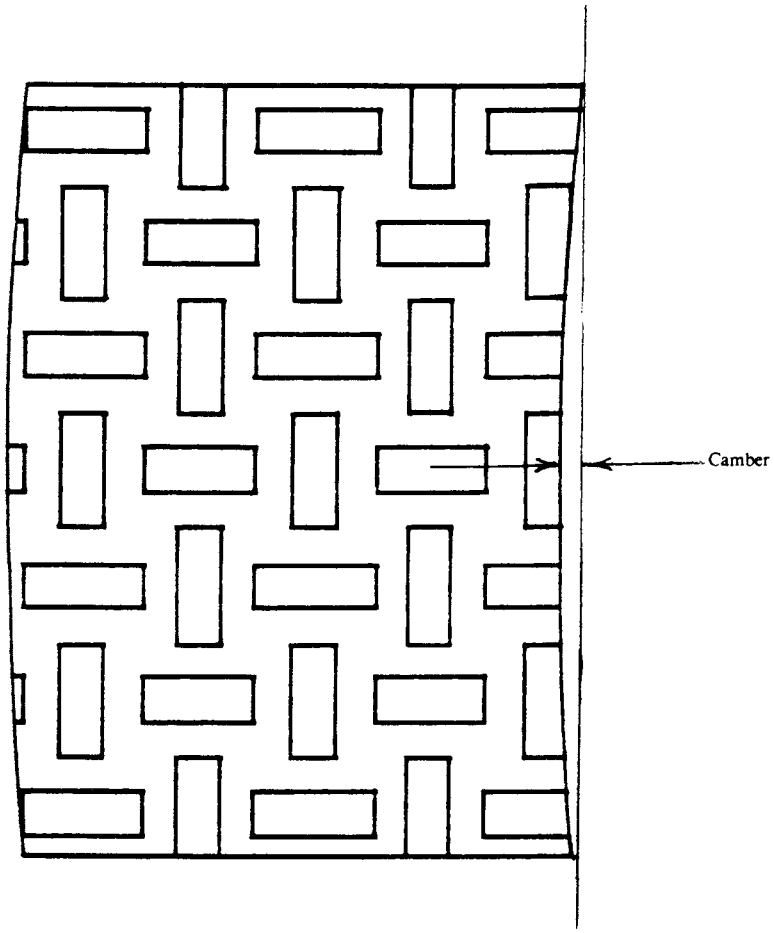


**FIG. 3 Camber for Rectangular Sheared Floor Plates and Gas-Cut Floor Plates (see Table 5 or Table A1.4)**

is specified, the product will be supplied 0.33 % maximum carbon, by heat analysis, and without specified mechanical properties).

5.1.4 Dimensions (decimal thickness, width, and either cut length of plate or coil size and weight [mass] requirements as applicable),

5.1.5 Condition, if other than as-rolled,

5.1.6 Product form (plate, sheet, or coil) and pattern from Fig. 1. As indicated in 4.2, if specific pattern attributes, or some alternative pattern, are desired, the purchaser will need to consult with the manufacturer,

5.1.7 Product analysis (See 9.3),

5.1.8 Copper-bearing steel, if required (See 9.4)

## 6. General Requirements

6.1 Except as otherwise specified, product furnished under this specification as plate shall conform to the applicable requirements of Specification A 6/A 6M.

6.2 Except as otherwise specified, product furnished under this specification as sheet shall conform to the applicable requirements of Specification A 568/A 568M.

6.3 Except as otherwise specified, product furnished under this specification as coil shall conform to the applicable requirements of Specification A 635/A 635M.

6.4 In case of any conflict in requirements with this specification and a referenced material specification, the requirements of this specification shall prevail.

## 7. Material

7.1 ASTM specifications that are currently available for floor plate production include, but are not limited to, the following specifications: A 36/A 36M, A 131/A 131M, A 242/A 242M, A 514/A 514M, A 570/A 570M, A 572/A 572M, A 573/A 573M, A 588/A 588M, A 606, A 659/A 659M, A 709/A 709M, A 829/A 829M, A 830/A 830M, A 1011/A 1011M, and A 1018/A 1018M.

## 8. Manufacture

8.1 The steel shall be made by any process that conforms to the requirements of the material specification specified in the purchase order (see 5.1.3), if any.

## 9. Chemical Composition Limits

9.1 *Specified to Chemical Composition Limits Only*—The heat analysis shall conform to the chemical limits specified in the purchase order.

9.2 *Specified to an ASTM Specification*—The heat analysis shall conform to the chemical requirements listed in the applicable specification.



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**TABLE 1 Permitted Variations in Thickness for Floor Plates**

NOTE 1—Thickness to be measured at ⅜ to ¾ in. from the longitudinal edge.
NOTE 2—For thickness measured at any location other than that specified in Note 1, the permitted variations over specified thickness shall be 1¾ times the amounts in this table, rounded to the nearest 0.010 in. for sheets, and to the nearest 0.01 in. for plates.
NOTE 3—Where ". . ." appears in this table, there is no requirement.

| Specified Thickness, in. | Permitted Variation Over and Under Specified Thickness for Sheets, in.[A] | Permitted Variation Over Specified Thickness for Plates, in.[B] |
|---|---|---|
| To 0.080, incl | 0.012 | . . . |
| Over 0.080 to 0.125, incl | 0.014 | . . . |
| Over 0.125 to 0.190, incl | 0.015 | 0.03 |
| Over 0.190 to 0.250, incl | 0.017 | 0.04 |
| Over 0.250 to 0.395, incl | 0.018 | 0.05 |
| Over 0.395 to 1.000, incl | 0.020 | 0.05 |

[A]The specified thickness range captions also apply when rolled floor plate is specified to a minimum thickness, in which case the permitted variations are all over and equal to twice the tabular values.
[B]Permitted variation under specified thickness, 0.01 in.

9.3 Where specified in the purchase order, product analyses shall be performed at the frequency specified in the purchase order, and such analyses shall conform to the applicable specified limits for heat analysis, subject to the permitted variations in product analysis in Specification A 6/A 6M.

9.4 If copper-bearing is specified in the purchase order, the material shall contain at least 0.20 % copper, by heat analysis.

## 10. Tensile Properties

10.1 The material as represented by the test specimen shall conform to the requirements for yield point or yield strength, and tensile strength in the ordered specification. The tension test shall be conducted on specimens with the raised figures present. Thickness is measured at a position between the raised figures in an area unaffected by the pattern.

10.2 Percent elongation, and reduction of area where applicable, are not required for rolled floor plate.

## 11. Permitted Variations

11.1 For plates and sheets, the permitted variations in dimensions shall be as given in Tables 1-3, Fig. 2, Table 4, Fig. 3, Table 5, Fig. 4, and Table 6 [Tables A1.1 to A1.6], inclusive.

## 12. Certification

12.1 *Test Reports*—Test reports shall be furnished as required by Specification A 6/A 6M, and shall include the ASTM designation and year of issue of this specification and the applicable ASTM material designation.

12.2 *Identification*—Identification markings shall indicate the designation (year of issue not required) of this specification and the applicable ASTM material designation.

## 13. Keywords

13.1 alloy; carbon; floor plate; flooring; high-strength low-alloy; pattern; raised figures; stairways; steel; structural steel; transportation equipment



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**TABLE 2 Permitted Variations in Width and Length for Floor Plates**

| Specified Dimension, in. | | Permitted Variations Over Specified Width and Length for Specified Thicknesses Given in Inches, in.[A] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Under 0.375 | | 0.375 to 0.625, excl | | 0.625 to 1.000, incl | |
| Width | Length | Width | Length | Width | Length | Width | Length |
| To 96, incl | Under 120 | 3/8 | 1/2 | 7/16 | 5/8 | 1/2 | 1 |
| | 120 to 240, excl | 3/8 | 3/4 | 1/2 | 7/8 | 5/8 | 1-1/8 |
| | 240 to 360, excl | 3/8 | 1 | 1/2 | 1-1/8 | 5/8 | 1-1/2 |
| | 360 to 480, incl | 7/16 | 1-1/4 | 1/2 | 1-3/8 | 5/8 | 1-5/8 |
| | Over 480 | 1/2 | 1-1/2 | 9/16 | 1-1/2 | 3/4 | 1-3/4 |

[A]Permitted variations under specified width and length:
1/4 in., for specified thicknesses of 0.188 in. and over; and
1/8 in., for specified thicknesses under 0.188 in.

**TABLE 3 Permitted Variations from a Flat Surface for Rectangular, Circular, and Sketch Floor Plates[A]**

NOTE 1—When the longer dimension is under 36 in., the permitted variation from a flat surface shall not exceed 1/4 in. When the longer dimension is from 36 to 72 in., incl, the permitted variation from a flat surface shall not exceed 75 % of the tabular amount for the specified width, but in no case less than 1/4 in.

NOTE 2—These permitted variations apply to plates that have a specified minimum tensile strength of not more than 60 ksi or comparable chemical composition or hardness. The limits in this table are increased 50 % for floor plates that have a higher specified minimum tensile strength or comparable chemical composition or hardness.

NOTE 3—This table and these notes cover the permitted variations from a flat surface for circular and sketch floor plates, based upon the maximum dimensions of such plates.

NOTE 4—Where an ellipsis (...) appears in the table, that product has not been defined.

| Specified Thickness, in. | Permitted Variations from a Flat Surface for Specified Widths Given in Inches, in.[B,C] | | | | | | |
|---|---|---|---|---|---|---|---|
| | To 36, excl | 36 to 48, excl | 48 to 60, excl | 60 to 72, excl | 72 to 84, excl | 84 to 96, excl | 96 |
| To 0.100, excl | 3/4 | 7/8 | 1-1/16 | 1-3/8 | ... | ... | ... |
| 0.100 to 0.250, excl | 9/16 | 3/4 | 15/16 | 1-1/4 | 1-3/8 | 1-1/2 | 1-5/8 |
| 0.250 to 0.375, excl | 1/2 | 5/8 | 3/4 | 15/16 | 1-1/8 | 1-1/4 | 1-3/8 |
| 0.375 to 0.500, excl | 1/2 | 9/16 | 5/8 | 5/8 | 3/4 | 7/8 | 1 |
| 0.500 to 0.750, excl | 7/16 | 1/2 | 9/16 | 5/8 | 5/8 | 3/4 | 1 |
| 0.750 to 1.000, excl | 7/16 | 1/2 | 9/16 | 5/8 | 5/8 | 5/8 | 3/4 |
| 1.000 | 3/8 | 1/2 | 1/2 | 9/16 | 9/16 | 5/8 | 5/8 |

[A]For coils, the requirements of either Specification A 568/A 568M or Specification A 635/A635M apply.

[B]*Permitted Variation from a Flat Surface Along the Length*—The longer dimension specified is considered the length, and the permitted variation from a flat surface along the length shall not exceed the tabular amount for the specified width for plates up to 4000 mm in length, or in any 4000 mm for longer plates.

[C]*Permitted Variation from a Flat Surface Across the Width*—The permitted variation from a flat surface across the width shall not exceed the tabular amount for the specified width.

**TABLE 4 Permitted Raised Figure Camber for Floor Plates (see Fig. 2)**

| Permitted raised figure camber[A], in. = 3/8 × (number of feet of length/5) |
|---|

[A]Raised figure camber is the curvature of the raised figures in the length direction, measured over the entire length of the plate.

**TABLE 5 Permitted Camber for Rectangular Sheared Plates and Gas-Cut Floor Plates (see Fig. 3)**

| Specified Thickness, in. | Specified Width, in. | Permitted Camber[A], in. |
|---|---|---|
| To 1.000, incl | To 96, incl | 1/8 × (number of feet of length)/5 |

[A]Camber is the horizontal edge curvature in the length, measured over the entire length of the plate in the flat position.



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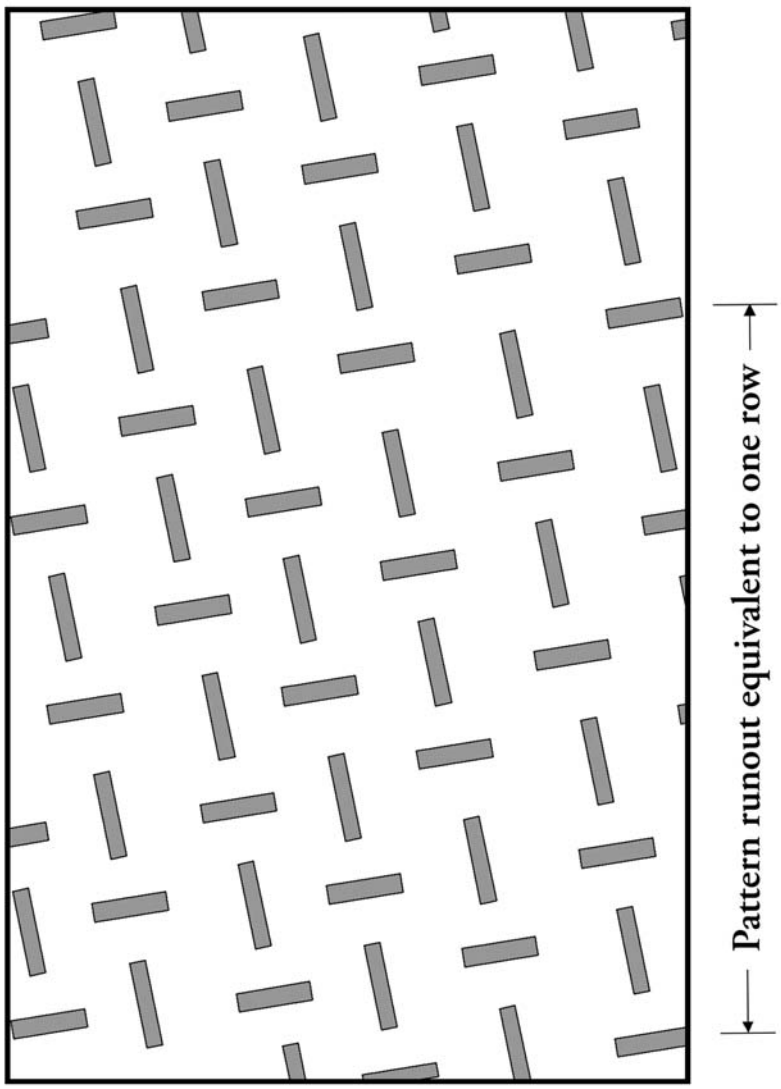


**FIG. 4 Description of Pattern Runout**

**TABLE 6 Permitted Pattern Runout for Raised Figures for Floor Plates Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel (see Fig. 4)**

| Permitted pattern runout[A] = three (3) rows in 10 ft |
|---|

[A]Pattern runout is the degree to which the pattern deviates from parallel to the longitudinal direction of the rolled plate.



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## SUPPLEMENTARY REQUIREMENTS

Supplementary requirements shall not apply unless specified in the purchase order or contract. Standardized supplementary requirements for use at the option of the purchaser are listed in Specification A 6/A 6M. Those that are considered suitable for use with this specification are listed by title:

S2. Product Analysis

## ANNEX

**(Mandatory Information)**

### A1. PERMISSIBLE VARIATIONS IN DIMENSIONS AND MASS IN SI UNITS

A1.1 Tables A1.1–A1.6 list permissible variations in dimensions and mass expressed in the International System of Units (SI) terminology.

**TABLE A1.1 Permitted Variations in Thickness for Floor Plates**

NOTE 1—Thickness to be measured at 10 to 20 mm from the longitudinal edge.

NOTE 2—For thickness measured at any location other than that specified in Note 1, the permitted variations over specified thickness shall be 1¾ times the amounts in this table, rounded to the nearest 0.1 mm.

NOTE 3—Where ". . ." appears in this table, there is no requirement.

| Specified Thickness, mm | Permitted Variation Over and Under Specified Thickness for Sheets, mm[A] | Permitted Variation Over Specified Thickness for Plates, mm[B] |
|---|---|---|
| Up to 2.0, incl | 0.3 | . . . |
| Over 2.0 to 3.2, incl | 0.4 | . . . |
| Over 3.2 to 4.8, incl | 0.4 | 0.8 |
| Over 4.8 to 6.4, incl | 0.4 | 1.0 |
| Over 6.4 to 10.0, incl | 0.5 | 1.3 |
| Over 10.0 to 25.0, incl | 0.5 | 1.3 |

[A]The specified thickness range captions also apply when rolled floor plate is specified to a minimum thickness, in which case the permitted variations are all over and equal to twice the tabular values.

[B]Permitted variation under specified thickness, 0.3 mm.

**TABLE A1.2 Permitted Variations in Width and Length for Floor Plates**

| Specified Dimension, mm | | Permitted Variations in Width and Length for Specified Thicknesses Given in Millimetres, mm[A] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Under 10.0 | | 10.0 to 16.0, excl | | 16.0 to 25.0, incl | |
| Width | Length | Width | Length | Width | Length | Width | Length |
| To 2400, incl | To 3000 | 10 | 13 | 11 | 16 | 13 | 25 |
| | 3000 to 6000, excl | 10 | 20 | 13 | 22 | 16 | 29 |
| | 6000 to 9000, excl | 10 | 25 | 13 | 29 | 16 | 38 |
| | 9000 to 12 000, incl | 11 | 32 | 13 | 35 | 16 | 41 |
| | Over 12 000 | 13 | 40 | 15 | 40 | 20 | 45 |

[A]Permitted variations under specified width and length:
6 mm, for thicknesses 5 mm and over; and
3 mm, for thicknesses under 5 mm.



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**TABLE A1.3 Permitted Variations from a Flat Surface for Rectangular, Circular, and Sketch Floor Plates[A]**

NOTE 1—When the longer dimension is under 900 mm, the permitted variation from a flat surface shall not exceed 6 mm. When the longer dimension is from 900 to 1800 mm, incl, the permitted variation from a flat surface shall not exceed 75 % of the tabular amount for the specified width, but in no case less than 6 mm.

NOTE 2—These permitted variations apply to plates that have a specified minimum tensile strength of not more than 415 MPa or comparable chemical composition or hardness. The limits in the table are increased 50 % for floor plates that have a higher specified minimum tensile strength or comparable chemical composition or hardness.

NOTE 3—This table and these notes cover the permitted variations from a flat surface for circular and sketch floor plates, based upon the maximum dimensions of such plates.

NOTE 4—Where an ellipses (...) appears in the table, product has not been defined.

| | Permitted Variations From a Flat Surface for Specified Widths Given in Millimetres, mm[B,C] | | | | | | |
|---|---|---|---|---|---|---|---|
| Specified Thickness, mm | To 900, excl | 900 to 1200, excl | 1200 to 1500, excl | 1500 to 1800, excl | 1800 to 2100, excl | 2100 to 2400, excl | 2400 and over |
| To 6.0, excl | 14 | 19 | 24 | 32 | 35 | 38 | 41 |
| 6.0 to 10.0, excl | 13 | 16 | 19 | 24 | 29 | 32 | 35 |
| 10.0 to 13.0, excl | 13 | 14 | 16 | 16 | 19 | 22 | 25 |
| 13.0 to 20.0, excl | 11 | 13 | 14 | 16 | 16 | 19 | 25 |
| 20.0 to 25.0, excl | 11 | 13 | 14 | 16 | 16 | 16 | 19 |
| 25.0 | 10 | 13 | 13 | 14 | 14 | 16 | 16 |

[A]For coils, the requirements of either Specification A 568/A 568M or Specification A 635/A 635M apply.

[B]*Permitted Variation from a Flat Surface Along the Length*—The longer dimension specified is considered the length, and the permitted variation from a flat surface along the length shall not exceed the tabular amount for the specified width for plates up to 4000 mm in length, or in any 4000 mm for longer plates.

[C]*Permitted Variation from a Flat Surface Across the Width*—The permitted variation from a flat surface across the width shall not exceed the tabular amount for the specified width.

**TABLE A1.4 Permitted Raised Figure Camber for Floor Plates (see Fig. 2)**

| Permitted raised figure camber[A], mm = 6 × (number of metres of length) |
|---|

[A]Raised figure camber is the curvature of the raised figures in the length direction, measured over the entire length of the plate.



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**TABLE A1.5 Permitted Camber for Rectangular Sheared Plates and Gas-Cut Floor Plates (see Fig. 3)**

| Specified Thickness, mm | Specified Width, mm | Permitted Camber[A], mm |
|---|---|---|
| To 25.0, incl | to 2400, incl | 2 × (number of metres of length) |

[A]Camber is the horizontal edge curvature in the length, measured over the entire length of the plate in the flat position.

**TABLE A1.6 Permitted Pattern Runout for Raised Figures for Floor Plates Carbon, Low-Alloy, High Strength Low-Alloy, and Alloy Steel (see Fig. 4)**

| Permitted pattern runout[A], in. = three (3) rows in 3 m |
|---|

[A]Pattern runout is the degree to which the pattern deviates from parallel to the longitudinal direction of the rolled plate.

## SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 786/A 786M – 00b) that may impact the use of this standard.

*(1)* Obsolete specifications were updated to current in sections 2.1 and 7.1.
*(2)* Sections 4.1, 5.1.6, and 5.1.8 were revised.
*(3)* Fig. 5 was updated.
*(4)* Table 3 and Table A1.3 were updated.
*(5)* Fig. 4 was revised.

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