

AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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T O L E R A N C E S

Carbon Steel Sheet and Strip

1. **PURPOSE:** To publish established manufacturing tolerances.
 2. **APPLICATION:** Tolerances shown herein apply, unless otherwise agreed upon by purchaser and vendor. These tolerances apply to all conditions and are based on individual measurements, unless otherwise noted.
 3. **THICKNESS:** Thickness is measured at any place on widths less than 1 inch; at any place 0.375 inch and over from an edge on widths 1 inch and over.
- 3.1 **Cold Rolled Sheet:**

TABLE I

| Nominal Thickness Inch | Tolerance, Inch, Plus and Minus Width Ranges, Inches | | | | | | | |
|---------------------------|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| | 15 | Over 15 | Over 24 | Over 32 | Over 40 | Over 48 | Over 60 | Over 70 |
| | and under | to 24 incl | to 32 incl | to 40 incl | to 48 incl | to 60 incl | to 70 incl | to 80 incl |
| .0112 and under | -- | -- | -- | .0015 | -- | -- | -- | -- |
| .0113 to .0141, incl | -- | -- | -- | .002 | .002 | -- | -- | -- |
| .0142 to .0194, incl | .002 | .002 | .002 | .002 | .002 | .002 | -- | -- |
| .0195 to .0254, incl | .003 | .003 | .003 | .003 | .003 | .003 | -- | -- |
| .0255 to .0313, incl | .003 | .003 | .003 | .003 | .003 | .0035 | .004 | .004 |
| .0314 to .0388, incl | .003 | .003 | .003 | .0035 | .0035 | .0035 | .004 | .004 |
| .0389 to .0508, incl | .004 | .004 | .004 | .004 | .004 | .004 | .005 | .005 |
| .0509 to .0567, incl | .005 | .005 | .005 | .005 | .005 | .005 | .006 | .006 |
| .0568 to .0709, incl | .005 | .005 | .005 | .005 | .005 | .005 | .006 | .006 |
| .0710 to .0821, incl | .005 | .005 | .006 | .006 | .006 | .007 | .007 | .007 |
| .0822 to .0971, incl | .006 | .006 | .006 | .007 | .007 | .008 | .009 | .009 |
| .0972 to .1419, incl | .006 | .007 | .008 | .009 | .009 | .010 | .010 | .011 |
| .1420 to .1874, incl | .006 | .007 | .008 | .009 | .010 | .010 | .011 | .012 |
| .1875 and over | .007 | .007 | .008 | .009 | .010 | .011 | .012 | .013 |

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3.2 Cold Rolled Strip: This table includes crown tolerances.

TABLE IA

| Nominal Thickness Inch | Tolerance, Inch Width Range, Inches | | | | | | | | | |
|---------------------------|--|--------------------|--------------------|--------------------|------------------|------------------|------------------|------------------|------------------|------------------------|
| | 0.50 to 1 excl | 1 to 3 excl | 3 to 5 incl | 5 to 6 incl | 6 to 9 incl | 9 to 12 incl | 12 to 16 incl | 16 to 20 incl | 20 to 24 excl | Over .20 to 24 excl |
| .005 and Under | +0.005 -0.005 | +0.0125 -0.005 | +0.0125 -0.005 | +0.015 -0.005 | +0.015 -0.005 | +0.015 -0.005 | +0.015 -0.005 | +0.015 -0.005 | +0.015 -0.005 | +0.015 -0.005 |
| Over .005 to .009, incl | +0.0075 -0.0075 | +0.0150 -0.0075 | +0.0150 -0.0075 | +0.0175 -0.0075 | +0.02 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.025 -0.01 |
| Over .009 to .010, incl | +0.01 -0.01 | +0.0175 -0.01 | +0.0175 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.025 -0.01 |
| Over .010 to .011, incl | +0.01 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.03 -0.01 | +0.03 -0.01 | +0.03 -0.01 |
| Over .011 to .012, incl | +0.01 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.025 -0.01 | +0.03 -0.015 | +0.03 -0.015 | +0.03 -0.015 | +0.03 -0.015 |
| Over .012 to .019, incl | +0.01 -0.01 | +0.02 -0.01 | +0.02 -0.01 | +0.025 -0.01 | +0.03 -0.015 | +0.03 -0.015 | +0.03 -0.015 | +0.035 -0.015 | +0.035 -0.015 | +0.035 -0.015 |
| Over .019 to .025, incl | +0.01 -0.01 | +0.02 -0.01 | +0.025 -0.015 | +0.03 -0.015 | +0.03 -0.015 | +0.03 -0.015 | +0.04 -0.02 | +0.04 -0.02 | +0.04 -0.02 | +0.04 -0.02 |
| Over .025 to .028, incl | +0.01 -0.01 | +0.03 -0.015 | +0.03 -0.015 | +0.035 -0.015 | +0.04 -0.02 | +0.04 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 |
| Over .028 to .031, incl | +0.015 -0.015 | +0.03 -0.015 | +0.03 -0.015 | +0.035 -0.015 | +0.04 -0.02 | +0.04 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 |
| Over .031 to .034, incl | +0.015 -0.015 | +0.03 -0.015 | +0.035 -0.02 | +0.04 -0.02 | +0.04 -0.02 | +0.04 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 | +0.045 -0.02 |
| Over .034 to .039, incl | +0.02 -0.02 | +0.035 -0.02 | +0.035 -0.02 | +0.04 -0.02 | +0.04 -0.02 | +0.04 -0.02 | +0.045 -0.025 | +0.045 -0.025 | +0.045 -0.025 | +0.045 -0.025 |
| Over .039 to .049, incl | +0.02 -0.02 | +0.035 -0.025 | +0.04 -0.025 | +0.045 -0.025 | +0.045 -0.025 | +0.045 -0.025 | +0.05 -0.03 | +0.05 -0.03 | +0.05 -0.03 | +0.05 -0.03 |
| Over .049 to .065, incl | +0.02 -0.02 | +0.035 -0.02 | +0.04 -0.025 | +0.045 -0.025 | +0.045 -0.025 | +0.045 -0.025 | +0.05 -0.03 | +0.05 -0.03 | +0.05 -0.03 | +0.05 -0.03 |
| Over .065 to .068, incl | +0.02 -0.02 | +0.04 -0.02 | +0.045 -0.025 | +0.05 -0.025 | +0.05 -0.025 | +0.05 -0.025 | +0.06 -0.035 | +0.06 -0.035 | +0.06 -0.035 | +0.06 -0.035 |
| Over .068 to .099, incl | +0.02 -0.02 | +0.04 -0.02 | +0.045 -0.025 | +0.05 -0.025 | +0.05 -0.03 | +0.055 -0.03 | +0.06 -0.035 | +0.06 -0.035 | +0.06 -0.035 | +0.06 -0.035 |
| Over .099 to .160, incl | +0.02 -0.02 | +0.04 -0.02 | +0.05 -0.03 | +0.055 -0.03 | +0.055 -0.03 | +0.06 -0.035 | +0.065 -0.045 | +0.065 -0.045 | +0.065 -0.045 | +0.065 -0.045 |
| Over .160 to .250, excl | +0.02 -0.02 | +0.05 -0.03 | +0.055 -0.035 | +0.06 -0.035 | +0.06 -0.035 | +0.065 -0.045 | +0.07 -0.05 | +0.07 -0.05 | +0.07 -0.05 | +0.07 -0.05 |

Note: The term "excl" is used to apply only to the higher figure of the specified range.

3.3 Hot Rolled Sheet:

TABLE II

Tolerance, Inch, Plus and Minus Width, Ranges, Inches

| Nominal Thickness Inch | Over | | 12 | | 15 | | 20 | | 32 | | 40 | | 48 | | 60 | | | |
|---------------------------|----------|----------------|---------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|----------|----------------|
| | to | incl | to | incl | to | incl | to | incl | to | incl | to | incl | to | incl | to | incl | | |
| 3.5 and under | 3.5 to 6 | 0.002 to 0.002 | 6 to 12 | 0.002 to 0.002 | 12 to 15 | 0.002 to 0.003 | 15 to 20 | 0.002 to 0.003 | 20 to 32 | 0.002 to 0.003 | 32 to 40 | 0.002 to 0.003 | 40 to 48 | 0.002 to 0.003 | 48 to 60 | 0.002 to 0.003 | 60 to 70 | 0.002 to 0.003 |
| 0.0141 and under | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 0.0142 to 0.0194, incl | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 0.0195 to 0.0254, incl | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 0.0255 to 0.0313, incl | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| 0.0314 to 0.0343, incl | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| 0.0344 to 0.0388, incl | -- | -- | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| 0.0389 to 0.0508, incl | -- | -- | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| 0.0509 to 0.0567, incl | -- | -- | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 | 0.005 |
| 0.0568 to 0.0709, incl | -- | -- | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| 0.0710 to 0.0821, incl | -- | -- | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| 0.0822 to 0.0971, incl | -- | -- | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |
| 0.0972 to 0.1419, incl | -- | -- | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| 0.1420 to 0.1799, incl | -- | -- | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| 0.1800 to 0.1874, incl | -- | -- | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| 0.1875 to 0.2299, incl | -- | -- | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 | 0.008 |

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4. WIDTH:

4.1 Cold and Hot Rolled Sheet:

TABLE III

| Nominal Width Inches | Tolerance, Inch Plus Only |
|-------------------------|------------------------------|
| 20 and under | 1/8 |
| Over 20 to 30, incl | 3/16 |
| Over 30 to 48, incl | 1/4 |
| Over 48 to 80, incl | 5/16 |
| Over 80 | 3/8 |

4.2 Cold Rolled Strip:

TABLE IV

| Nominal Width Inches | Tolerance, Inch Plus and Minus |
|---------------------------|-----------------------------------|
| Over 1/2 to 2, incl | 1/32 |
| Over 2 to 5, incl | 3/64 |
| Over 5 to 10, incl | 5/64 |
| Over 10 to 15, incl | 3/32 |
| Over 15 to 20, incl | 1/8 |
| Over 20 to 23 15/16, incl | 5/32 |

5. LENGTH:

TABLE V

| Nominal Length Inches | Tolerance, Inch Plus Only |
|--------------------------|------------------------------|
| 60 and under | 1/2 |
| Over 60 to 96, incl | 3/4 |
| Over 96 to 120, incl | 1 |
| Over 120 to 156, incl | 1-1/4 |
| Over 156 to 192, incl | 1-1/2 |
| Over 192 to 240, incl | 1-3/4 |

6. STRAIGHTNESS:

6.1 Widths Over 1.5 Inches: Shall be of such straightness that the maximum edge-wise curvature (depth of arc) shall not exceed 0.250 inch in any 8 feet of length or 0.03125 inch x length in feet for shorter lengths.

6.2 Widths 1.5 Inches and Under: Shall be of such straightness that the maximum edgewise curvature (depth of arc) shall not exceed 0.50 inch in any 8 feet of length or 0.0625 inch x length in feet for shorter lengths.