

# AERONAUTICAL MATERIAL SPECIFICATIONS

AMS 2232C

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SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

## TOLERANCES Carbon Steel Sheet, Strip, and Plate

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. The term "excl" is used to apply only to the higher figure of the specified range.
3. **THICKNESS:** Thickness is measured at any place on widths less than 1 in.; at any place 0.375 in. and over from an edge on widths 1 in. and over.

### 3.1 Cold Rolled Sheet:

TABLE I

| Nominal Thickness<br>Inch | Tolerance, Inch, Plus and Minus<br>Width Ranges, Inches |            |            |            |            |            |            |            |
|---------------------------|---------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|
|                           | Over<br>15                                              | Over<br>24 | Over<br>32 | Over<br>40 | Over<br>48 | Over<br>60 | Over<br>70 | Over<br>80 |
|                           | to<br>24                                                | to<br>32   | to<br>40   | to<br>48   | to<br>60   | to<br>70   | to<br>80   |            |
|                           | and<br>under                                            | incl       | incl       | incl       | incl       | incl       | incl       | 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       | .006       | .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       |
| .1375 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 1A

| Nominal Thickness<br>Inch | Tolerance, Inch     |                    |                    |                    |                  |                  |                  |                  |                  |                  |
|---------------------------|---------------------|--------------------|--------------------|--------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                           | Width Range, Inches |                    |                    |                    |                  |                  |                  |                  |                  |                  |
|                           | 0.50 to<br>1 excl   | 1 to<br>3 excl     | 3 to<br>5 incl     | 5 to<br>6 incl     | 6 to<br>9 incl   | 9 to<br>12 incl  | 12 to<br>16 incl | 16 to<br>20 incl | 20 to<br>24 excl |                  |
| .005 and Under            | +.0005<br>-.0005    | +.00125<br>-.0005  | +.00125<br>-.0005  | +.0015<br>-.0005   | -----            | -----            | -----            | -----            | -----            | -----            |
| Over .005 to .009, incl   | +.00075<br>-.00075  | +.00150<br>-.00075 | +.00150<br>-.00075 | +.00175<br>-.00075 | +.002<br>-.001   | +.002<br>-.001   | +.0025<br>-.001  | +.0025<br>-.001  | +.0025<br>-.001  | +.0025<br>-.001  |
| Over .009 to .010, incl   | +.001<br>-.001      | +.00175<br>-.001   | +.00175<br>-.001   | +.002<br>-.001     | +.002<br>-.001   | +.002<br>-.001   | +.0025<br>-.001  | +.0025<br>-.001  | +.0025<br>-.001  | +.0025<br>-.001  |
| Over .010 to .011, incl   | +.001<br>-.001      | +.002<br>-.001     | +.002<br>-.001     | +.002<br>-.001     | +.0025<br>-.001  | +.0025<br>-.001  | +.003<br>-.001   | +.003<br>-.001   | +.003<br>-.001   | +.003<br>-.001   |
| Over .011 to .012, incl   | +.001<br>-.001      | +.002<br>-.001     | +.002<br>-.001     | +.0025<br>-.001    | +.0025<br>-.001  | +.0025<br>-.001  | +.003<br>-.0015  | +.0035<br>-.0015 | +.0035<br>-.0015 | +.0035<br>-.0015 |
| Over .012 to .019, incl   | +.001<br>-.001      | +.002<br>-.001     | +.002<br>-.001     | +.0025<br>-.001    | +.003<br>-.0015  | +.003<br>-.0015  | +.0035<br>-.0015 | +.0035<br>-.0015 | +.0035<br>-.0015 | +.0035<br>-.0015 |
| Over .019 to .025, incl   | +.001<br>-.001      | +.002<br>-.001     | +.0025<br>-.0015   | +.003<br>-.0015    | +.003<br>-.0015  | +.003<br>-.0015  | +.004<br>-.002   | +.004<br>-.002   | +.004<br>-.002   | +.004<br>-.002   |
| Over .025 to .028, incl   | +.001<br>-.001      | +.003<br>-.0015    | +.003<br>-.0015    | +.0035<br>-.0015   | +.004<br>-.002   | +.004<br>-.002   | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  |
| Over .028 to .031, incl   | +.0015<br>-.0015    | +.003<br>-.0015    | +.003<br>-.0015    | +.0035<br>-.0015   | +.004<br>-.002   | +.004<br>-.002   | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  |
| Over .031 to .034, incl   | +.0015<br>-.0015    | +.003<br>-.0015    | +.0035<br>-.002    | +.004<br>-.002     | +.004<br>-.002   | +.004<br>-.002   | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  |
| Over .034 to .039, incl   | +.002<br>-.002      | +.0035<br>-.002    | +.0035<br>-.002    | +.004<br>-.002     | +.004<br>-.002   | +.004<br>-.002   | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  | +.0045<br>-.002  |
| Over .039 to .049, incl   | +.002<br>-.002      | +.0035<br>-.002    | +.004<br>-.0025    | +.0045<br>-.0025   | +.0045<br>-.0025 | +.0045<br>-.0025 | +.0055<br>-.003  | +.0055<br>-.003  | +.0055<br>-.003  | +.0055<br>-.003  |
| Over .049 to .065, incl   | +.002<br>-.002      | +.0035<br>-.002    | +.004<br>-.0025    | +.0045<br>-.0025   | +.0045<br>-.0025 | +.0045<br>-.0025 | +.0055<br>-.003  | +.0055<br>-.003  | +.0055<br>-.003  | +.0055<br>-.003  |
| Over .065 to .068, incl   | +.002<br>-.002      | +.004<br>-.002     | +.0045<br>-.0025   | +.005<br>-.0025    | +.005<br>-.0025  | +.005<br>-.0025  | +.006<br>-.003   | +.006<br>-.003   | +.006<br>-.003   | +.006<br>-.003   |
| Over .068 to .099, incl   | +.002<br>-.002      | +.004<br>-.002     | +.0045<br>-.0025   | +.005<br>-.0025    | +.0055<br>-.003  | +.0055<br>-.003  | +.0065<br>-.0035 | +.0065<br>-.0035 | +.0065<br>-.0035 | +.0065<br>-.0035 |
| Over .099 to .160, incl   | +.002<br>-.002      | +.004<br>-.002     | +.005<br>-.003     | +.0055<br>-.003    | +.0055<br>-.003  | +.0055<br>-.003  | +.0075<br>-.0045 | +.0075<br>-.0045 | +.0075<br>-.0045 | +.0075<br>-.0045 |
| Over .160 to .250, excl   | +.002<br>-.002      | +.005<br>-.003     | +.0055<br>-.0035   | +.006<br>-.0035    | +.006<br>-.0035  | +.006<br>-.0035  | +.0075<br>-.0045 | +.0075<br>-.0045 | +.0075<br>-.0045 | +.0075<br>-.0045 |

TABLE II

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3.4 Hot Rolled Plate:

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TABLE III

| Nominal Thickness (T)<br>Inches | Tolerance, Inch, Plus<br>Width Ranges, Inches |                     |                     |                     |                     |
|---------------------------------|-----------------------------------------------|---------------------|---------------------|---------------------|---------------------|
|                                 | 48<br>and<br>under                            | 48 to<br>60<br>excl | 60 to<br>72<br>excl | 72 to<br>84<br>excl | 84 to<br>96<br>excl |
| Under 0.250                     | 0.094T                                        | 0.107T              | 0.120T              | 0.133T              | 0.160T              |
| 0.250 to 0.3125, excl           | 0.080T                                        | 0.094T              | 0.107T              | 0.120T              | 0.133T              |
| 0.3125 to 0.375, excl           | 0.067T                                        | 0.080T              | 0.094T              | 0.107T              | 0.120T              |
| 0.375 to 0.4375, excl           | 0.060T                                        | 0.067T              | 0.080T              | 0.094T              | 0.107T              |
| 0.4375 to 0.500, excl           | 0.054T                                        | 0.060T              | 0.067T              | 0.080T              | 0.094T              |
| 0.500 to 0.625, excl            | 0.054T                                        | 0.054T              | 0.060T              | 0.067T              | 0.080T              |
| 0.625 to 0.750, excl            | 0.054T                                        | 0.054T              | 0.054T              | 0.060T              | 0.067T              |
| 0.750 to 1.000, excl            | 0.047T                                        | 0.054T              | 0.054T              | 0.054T              | 0.060T              |
| 1.000 to 2.000, incl            | 0.047T                                        | 0.047T              | 0.054T              | 0.054T              | 0.054T              |

Note. Minus tolerance shall be 0.010 in. for all thicknesses and all widths.

4. WIDTH:4.1 Cold and Hot Rolled Sheet:TABLE IV

| Nominal Width<br>Inches | Tolerance, Inch<br>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 V

| Nominal Width<br>Inches   | Tolerance, Inch<br>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                              |

4.3 Hot Rolled Plate:

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TABLE VI

| Nominal Width<br>Inches | Tolerance, Inch, Plus<br>Thickness Ranges, Inches |                         |                         |                         |
|-------------------------|---------------------------------------------------|-------------------------|-------------------------|-------------------------|
|                         | Under<br>0.375                                    | 0.375 to<br>0.625, excl | 0.625 to<br>1.000, excl | 1.000 to<br>2.000, incl |
| Under 20                | 1/8                                               | 1/8                     | 3/16                    | 1/4                     |
| 20 to 36, excl          | 3/16                                              | 1/4                     | 5/16                    | 3/8                     |
| 36 and over             | 5/16                                              | 3/8                     | 7/16                    | 1/2                     |

Note. Minus tolerance shall be 1/8 in. for all widths and all thicknesses.

5. LENGTH:5.1 Sheet and Strip:TABLE VII

| Nominal Length<br>Inches | Tolerance, Inch<br>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                        |

5.2 Plate:

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TABLE VIII

| Nominal Length<br>Inches | Nominal Width<br>Inches | Tolerance, Inch |       |
|--------------------------|-------------------------|-----------------|-------|
|                          |                         | Plus            | Minus |
| Under 120                | Under 60                | 1               | 1/4   |
| Under 120                | 60 to 84, excl          | 1               | 1/4   |
| Under 120                | 84 to 96, excl          | 1-1/8           | 1/4   |
| 120 to 240, excl         | Under 60                | 1-1/8           | 1/4   |
| 120 to 240, excl         | 60 to 84, excl          | 1-1/4           | 1/4   |
| 120 to 240, excl         | 84 to 96, excl          | 1-3/8           | 1/4   |

6. STRAIGHTNESS:6.1 Sheet and Strip:

- 6.1.1 Widths Over 1.5 Inches: Shall be of such straightness that the maximum edgewise curvature (depth of arc) shall be not greater than 0.250 in. in any 8 ft of length or 0.03125 in. x length in feet for shorter lengths.