

**AEROSPACE  
MATERIAL  
SPECIFICATION****AMS 2204E**

Superseding AMS 2204D

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**TOLERANCES****Aluminum Alloy Standard Structural Shapes**

1. **SCOPE:** This specification covers established manufacturing tolerances applicable to aluminum alloy standard structural shapes ordered to inch/pound dimensions. Standard structural shapes are shapes in certain standard alloys, tempers, sizes, and sections such as angles, channels, Tees, Zees, I-Beams, and H-Beams commonly used for structural purposes. These tolerances apply to all conditions, unless otherwise noted. The term "excl" applies only to the higher figure of the specified range.
2. **CROSS-SECTIONAL DIMENSIONS:**
  - 2.1 **Structural Shapes Where Depth, Flange Width, or Stem Height is Less Than 8.000 Inches:** Depth tolerance applies only at web. Depth across other points is controlled by angularity tolerance.

**TABLE I**

| Specified Dimension | Shape                                              | Tolerance, Inch or Percent of Specified Dimension    |
|---------------------|----------------------------------------------------|------------------------------------------------------|
| Thickness           | Angles, Channels, Tees, Zees, I-Beams, and H-Beams | $\pm 2.5\%$ or $\pm 0.010$ in., whichever is greater |
| Flange Width        | Angles and Zees                                    | $\pm 2.5\%$ or $\pm 1/16$ in., whichever is greater  |
|                     | Channels, Tees, I-Beams, and H-Beams               | $\pm 4\%$                                            |
| Depth               | Zeas and H-Beams                                   | $\pm 2.5\%$ or $\pm 1/16$ in., whichever is greater  |
|                     | Channels and I-Beams                               | $+3/32$ in., $-1/16$ in.                             |
| Stem Height         | Tees                                               | $\pm 2.5\%$ or $\pm 1/16$ in., whichever is greater  |

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- 2.2 Structural Shapes Where Depth, Flange Width, or Stem Height is 8.000 to 15.000 in., Incl: Depth tolerance applies only at web. Depth across other points is controlled by angularity tolerance.

TABLE II

| Specified Dimension | Shape                          | Tolerance, Inch or Percent of Specified Dimension    |
|---------------------|--------------------------------|------------------------------------------------------|
| Thickness           | I-Beams, H-Beams, and Channels | $\pm 3\%$ or $\pm 0.015$ in., whichever is greater   |
|                     | Angles, Tees, and Zees         | $\pm 2.5\%$ or $\pm 0.015$ in., whichever is greater |
| Flange Width        | I-Beams, Channels, and Tees    | $\pm 4\%$                                            |
|                     | H-Beams                        | $\pm 4\%$ or $\pm 1/4$ in., whichever is greater     |
|                     | Angles                         | $\pm 2.5\%$ or $\pm 3/16$ in., whichever is greater  |
|                     | Zees                           | $\pm 2.5\%$ or $\pm 3/32$ in., whichever is greater  |
| Depth               | I-Beams, Channels, and Zees    | $\pm 2.5\%$ or $\pm 1/4$ in., whichever is greater   |
|                     | H-Beams                        | $\pm 3\%$ or $\pm 1/4$ in., whichever is greater     |
| Stem Height         | Tees                           | $\pm 2.5\%$ or $\pm 1/4$ in., whichever is greater   |

## 3. LENGTH:

TABLE III

| Specified Depth, Flange Width, or Stem Height (Whichever is Greater) Inches | Tolerance, Inch, Plus Only |                     |                     |         |
|-----------------------------------------------------------------------------|----------------------------|---------------------|---------------------|---------|
|                                                                             | Length Ranges, Feet        |                     |                     |         |
|                                                                             | Up to 12, incl             | Over 12 to 30, incl | Over 30 to 50, incl | Over 50 |
| Up to 3.000, excl                                                           | 1/8                        | 1/4                 | 3/8                 | 1       |
| 3.000 to 8.000, excl                                                        | 3/16                       | 5/16                | 7/16                | 1       |
| 8.000 and over                                                              | 1/4                        | 3/8                 | 1/2                 | 1       |

4. STRAIGHTNESS (Allowable deviation from straight): When weight of shape on flat surface minimizes deviation.

TABLE IV

|   |                                                                                |                          |
|---|--------------------------------------------------------------------------------|--------------------------|
| Ø | In total length or in any measured segment of one foot or more of total length | 0.025 in. x length in ft |
|---|--------------------------------------------------------------------------------|--------------------------|

5. TWIST: When weight of shape on flat surface minimizes deviation.

Ø

TABLE V

| Specified Depth, Flange Width, or Stem Height (Whichever is Greater) Inches | Allowable Deviation from Straight Degrees                                      |               |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------|
|                                                                             | In total length or in any measured segment of one foot or more of total length |               |
| Up to 1.500, excl                                                           | 1                                                                              | per ft; 7 max |
| 1.500 to 3.000, excl                                                        | 0.5                                                                            | per ft; 5 max |
| 3.000 and over                                                              | 0.25                                                                           | per ft; 3 max |

6. ANGULARITY:

TABLE VI

| Nominal Leg, Web or Flange Thickness (Whichever is Smaller) Inches | Allowable Deviation from Specified Angle, Degrees, Plus and Minus |  |
|--------------------------------------------------------------------|-------------------------------------------------------------------|--|
| Up to 0.188, excl                                                  | 2                                                                 |  |
| 0.188 to 0.750, excl                                               | 1.5                                                               |  |
| 0.750 and over                                                     | 1                                                                 |  |

7. FLATNESS:

TABLE VII

| Ø | Surface Width Inches      | Allowable Deviation from Flat, Inches |
|---|---------------------------|---------------------------------------|
|   | Up to 1.000, incl         | 0.004                                 |
|   | Over 1.000 to 6.000, excl | 0.004 x width (in.)                   |
|   | In any 1 in. of width     | 0.004                                 |