JRS Presents......

Minimum Thickness / Remaining Life App

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## Main Screen Functions

- **Minimum Shell Thickness (in.)**
- **Minimum Head Thickness (in.)**
- **Type of head**
  - Hemispherical
- **Material**
  - Carbon Steel Grade 60
- **Stress value:** 17100
- **MAWP (PSI)**
- **Diameter (in.)**
- **Joint Efficiency (%)**

### Table

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<thead>
<tr>
<th>Minimum Thickness</th>
<th>Pressure Allowed</th>
<th>Remaining Life</th>
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<tr>
<td>7</td>
<td>8</td>
<td>9, ↑</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6, ↓</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3, CLR</td>
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<tr>
<td>0</td>
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</tbody>
</table>

**NEXT**
Example 1 – Routine Air Tank

Minimum Shell Thickness (in.)
Minimum Head Thickness (in.)

Type of head: Hemispherical
Material: Carbon Steel Grade 60
Stress value: 17100
MAWP (PSI):
Diameter (in.):
Joint Efficiency (%):

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↑ indicates increasing, ↓ indicates decreasing, CLR indicates clear, NEXT indicates next step.
Example 1 – Entering Actual Thickness

Minimum Shell Thickness (in.): 0.118
Minimum Head Thickness (in.): 0.094
Type of head: Hemispherical
Material: Carbon Steel Grade 60
Stress value: 17100
MAWP (PSI): 200
Diameter (in.): 20
Joint Efficiency (%): 100

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(Up, Down, CLR, NEXT)
Example 1 – Determining Remaining Life

Calculated Pressure Allowed (PSI)

337.945

*This application should not be used to increase MAWP

Current Thickness of Shell (in.)

Current Thickness of Head (in.)

Minimum Thickness | Pressure Allowed | Remaining Life
--- | --- | ---
7 | 8 | 9
4 | 5 | 6
1 | 2 | 3
0 | 00 | .

RESET
Unique or Irregular vessels

• Cases where vessels are constructed outside of ASME Code Section VIII Div. 1

OR

• They exceed parameters allowed by the code to use the standard formulas. For instance...
Unique or Irregular vessels

(15) UG-32 FORMED HEADS, AND SECTIONS, PRESSURE ON CONCAVE SIDE

(a) The minimum required thickness at the thinnest point after forming of ellipsoidal, torispherical, hemispherical, conical, and torconical heads under pressure on the concave side (plus heads) shall be computed by the appropriate formulas in this paragraph, except as permitted by Mandatory Appendix 32. Heads with bolting flanges shall meet the requirements of UG-15.1. In addition, provision shall be made for any of the loadings listed in UG-22. The provided thickness of the heads shall also meet the requirements of UG-16, except as permitted in Mandatory Appendix 32.

(b) The symbols defined below are used in the formulas of this paragraph:

- \( D \) = Outside diameter of the head skirt; or inside length of the major axis of an ellipsoidal head; or inside diameter of a conical head at the point under consideration, measured perpendicular to the longitudinal axis

- \( D_i \) = Inside diameter of the conical portion of a torconical head at the point of tangency to the knuckle, measured perpendicular to the axis of the cone

- \( D = 2r(1 - \cos \alpha) \) = Effective thickness of any joint in the head; for hemispherical heads this includes head-to-shell joint; for welded vessels, use the efficiency specified in UW-12

- \( L \) = Inside spherical or crown radius. The value of \( L \) for ellipsoidal heads shall be obtained from Table UG-27.

- \( P \) = Internal design pressure (see UG-21)

- \( r \) = Inside knuckle radius

of 0.90D.

(d) Torispherical Heads: With \( t/L > 0.062 \). The required thickness of a torispherical head for the case in which the knuckle radius is 6% of the inside crown radius and the inside crown radius equals the outside diameter of the skirt [see (c)] shall be determined by

\[
t = \frac{0.085PL}{SE - 0.1P} \quad \text{or} \quad P = \frac{SE}{0.085L + 0.1t}
\]  

(2)

NOTE: For torispherical heads with \( t/L < 0.062 \), the rules of 14(d) shall also be met.

Torispherical heads made of materials having a specified minimum tensile strength exceeding 70,000 psi (485 MPa) shall be designed using a value of \( S \) equal to 20,000 psi (138 MPa) at room temperature and reduced in proportion to the reduction in maximum allowable stress values at temperature for the material (see UG-23).

(e) Hemispherical Heads: When the thickness of a hemispherical head does not exceed \( 0.356L \), or \( P \) does not exceed \( 0.665SE \), the following formulas shall apply:

\[
t = \frac{PL}{2SE - 0.2P} \quad \text{or} \quad P = \frac{2SE}{L + 0.2t}
\]  

(3)

(f) Conical Heads and Sections (Without Transition Knuckle). The required thickness of conical heads or conical shell sections that have a half apex angle \( \alpha \) not greater than 30 deg shall be determined by

\[
t = \frac{pp}{2 \cos \alpha[SSE - 0.5P]} \quad \text{or} \quad P = \frac{2SE \cos \alpha}{D + 1.2t \cos \alpha}
\]  

(4)
Example 2 – Irregular Vessels
Vessel is below minimum thickness

If the vessel is determined to be below minimum thickness, the app will calculate the MAWP for the thickness provided.

This may be useful if the owner wishes to appeal to the state to use the vessel at a reduced pressure.
Example 3 – Vessels below Minimum Thickness

Minimum Shell Thickness (in.): 0.118
Minimum Head Thickness (in.): 0.094

Type of head: Hemispherical
Material: Carbon Steel Grade 60
Stress value: 17100

MAWP (PSI): 200
Diameter (in.): 20
Joint Efficiency (%): 100

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QR Code

SCAN ME
Bigger stuff coming.....

POWERED BY NBBI

SEE YOU IN NEW ORLEANS!!!