
JRS Presents.....

Minimum Thickness / Remaining Life App

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History with Ohio State University



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Main Screen Functions

Verizon 4:51 PM 100%

☰ JRS RESET

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 (%)

Minimum Thickness	Pressure Allowed	Remaining Life	
7	8	9	↑
4	5	6	↓
1	2	3	CLR
0	00	.	NEXT

Example 1 – Routine Air Tank

Verizon 4:39 PM 76%

☰ JRS RESET

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 (%)

Minimum Thickness	Pressure Allowed	Remaining Life
7	8	9 ↑
4	5	6 ↓
1	2	3 CLR
0	00	. NEXT

Example 1 – Entering Actual Thickness

Verizon 8:20 AM 82%

☰ JRS RESET

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**

Minimum Thickness	Pressure Allowed	Remaining Life
7	8	9 ↑
4	5	6 ↓
1	2	3 CLR
0	00	. NEXT

Example 1 – Determining Remaining Life

Verizon 8:22 AM 81%

☰ JRS RESET

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	CLR
0	00	.	NEXT

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 forming²² of ellipsoidal, torispherical, hemispherical, conical, and toriconical heads under pressure on the concave side (plus heads) shall be computed by the appropriate formulas in this paragraph,²³ except as permitted by [Mandatory Appendix 32](#). Heads with bolting flanges shall meet the requirements of [UG-35.1](#). 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 = inside 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 toriconical head at its point of tangency to the knuckle, measured perpendicular to the axis of the cone
 $= D - 2r(1 - \cos \alpha)$

E = lowest efficiency 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-37](#).

P = internal design pressure (see [UG-21](#))

r = inside knuckle radius

of $0.90D$.

(d) *Torispherical Heads With $t_s/L \geq 0.002$* . 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 (i)] shall be determined by

$$t = \frac{0.885PL}{SE - 0.1P} \quad \text{or} \quad P = \frac{SEt}{0.885L + 0.1t} \quad (2)$$

NOTE: For torispherical heads with $t_s/L < 0.002$, the rules of 1-4(f) 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:

$$t = \frac{PL}{2SE - 0.2P} \quad \text{or} \quad P = \frac{2SEt}{L + 0.2t} \quad (3)$$

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

$$t = \frac{PD}{2 \cos \alpha (SE - 0.6P)} \quad \text{or} \quad P = \frac{2SEt \cos \alpha}{D + 1.2t \cos \alpha} \quad (4)$$



Example 2 – Irregular Vessels

Verizon 8:41 AM 78%

☰ JRS RESET

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 (%) 100

Minimum Thickness	Pressure Allowed	Remaining Life	
7	8	9	↑
4	5	6	↓
1	2	3	CLR
0	00	.	NEXT

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

Verizon 8:50 AM 77%

☰ JRS RESET

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**

Minimum Thickness	Pressure Allowed	Remaining Life
7	8	9 ↑
4	5	6 ↓
1	2	3 CLR
0	00	. NEXT

QR Code



Bigger stuff coming.....

JRS



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**SEE YOU IN
NEW ORLEANS!!!**