



About this document

This document contains screenshots of software available from Cheresources.com. You can find this title in our online store at:

<http://www.cheresources.com/cheplusstore/catalogue.php>

Clicking the above link should activate your default browser and launch the site.

We recommend using our search feature to find the title.

If you haven't visited our site before, you can find the main page at:

<http://www.cheresources.com>

Thanks for visiting our site,

Chris Haslego
President
Cheresources, Inc.

© COPYRIGHT, 2005. CHERESOURCES, INC.

1422 Goswick Ridge Road
Midlothian VA 23114

Fax: 561-658-6489
Email: support@cheresources.com

***Content Based
Chemical Engineering***

Volumes & Surface Areas of Various Bin/Vessel Shapes

NOTE: Always begin a new case by retrieving the original file. Direct entry of data in cells that originally contain table lookups could cause functions to be lost, or incorrect calculations. I format cells requiring entry colored **RED**; calculated values are black.

- 1.) Enter vessel name at [C4].
- 2.) Enter description at [C5].
- 3.) Enter material specific gravity at [C7].
- 4.) Vessel Areas and Volumes are calculated based various entries.

Print out using direct Excel commands. This application is provided by Chemical Engineers Resource Website, vis cheresources.com for additional selections.

Print out using direct EXCEL commands.

<<<<<<<< **Psafety © January 2001, by Don Coffman** >>>>>>>>

The originator of these spreadsheet(s) specifically excludes all warranties, expressed or implied, as to the accuracy of the data and other information set forth and assumes NO liability for any losses or damage resulting from the use of the materials or application of the data.

Consistent with GOOD ENGINEERING PRACTICE, the burden rests with the USER of these spreadsheets to review ALL calculations, and assumptions. The USER IS FULLY RESPONSIBLE for the results or decisions based on calculations.

This Spreadsheet Requires MACROS to be ENABLED to ASSURE proper operation. See the Workbook Help Sheet for Additional Instructions on Use.

dmcoffman@aol.com

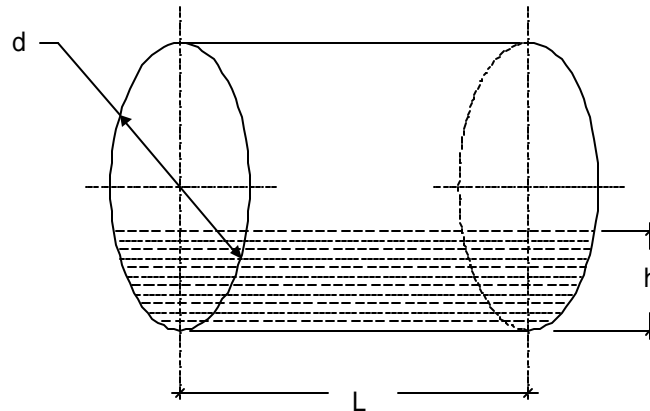
Tank & Bin Volume - Horizontal Cylinder Partially Filled

Tank : **EXAMPLE**

Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : **0.98**
 density : 61.152 lb/cu ft

d = **36.0** inches
 h = **24.0** inches
 L = **60.0** inches



..... volume

$$V := L \cdot \left(\frac{\pi \cdot d^2}{4} \right) = \begin{array}{l} 264.4 \text{ gallons, total filled volume} \\ 35.3 \text{ cu. ft., total filled volume} \\ 2,161.3 \text{ lbs., total filled volume} \end{array}$$

or, 187.2 gallons, partially filled
 or, 25.0 cu. ft., partially filled
 or, 1,530.6 lbs., partially filled

..... surface area

$$\text{Area}_{\text{CYL}} := \pi \cdot \left(\frac{\text{dia}}{12} \right) \left(\frac{\text{height}}{12} \right) = 18.85 \text{ sq. ft., cylinder}$$

$$\text{Area}_{\text{ENDS}} := 2 \cdot \left[\frac{\pi \cdot \left(\frac{\text{dia}}{2} \right)^2}{144} \right] = 14.14 \text{ sq. ft., ends (both)}$$

Total Area = 32.99 sq. ft., total

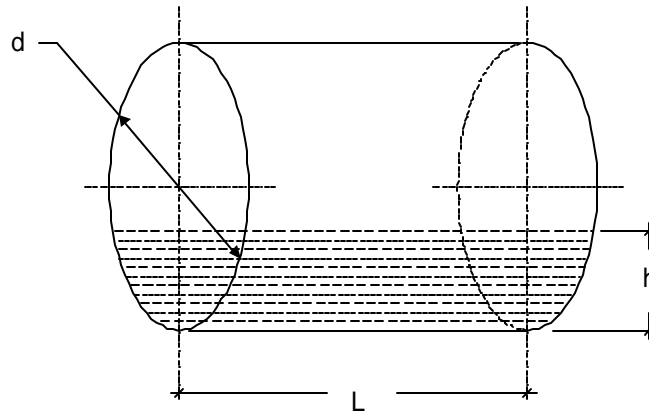
Tank & Bin Volume - Horizontal Cylinder Partially Filled

Tank : **EXAMPLE**

Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : **0.98**
 density : **980** kg/m³

d = **914.4** millimeter
 h = **609.6** millimeter
 L = **1524.0** millimeter



..... volume

$$V := L \cdot \left(\frac{\pi \cdot d^2}{4} \right) = \begin{array}{l} 1.0008 \text{ meter}^3, \text{ total filled volume} \\ 980.78 \text{ kgs.}, \text{ total filled volume} \end{array}$$

or, 0.7087751 meter³, partially filled
 or, 694.6 kgs., partially filled

..... surface area

$$\text{Area}_{\text{CYL}} := \pi \cdot \left(\frac{\text{dia}}{1000} \right) \cdot \left(\frac{\text{height}}{1000} \right) = 1.75 \text{ sq. meter, cylinder}$$

$$\text{Area}_{\text{ENDS}} := 2 \cdot \left[\frac{\pi \cdot \left(\frac{\text{dia}}{2} \right)^2}{1000000} \right] = 1.31 \text{ sq. meter, ends (both)}$$

Total Area = 3.06 sq. meter, total

Tank & Bin Volume - Vertical Cylinder

Tank : PVA Glue Silo

Description: Area calculation for explosion venting

material sp.gr. : 0.641
density : 39.9984 lb/cu ft

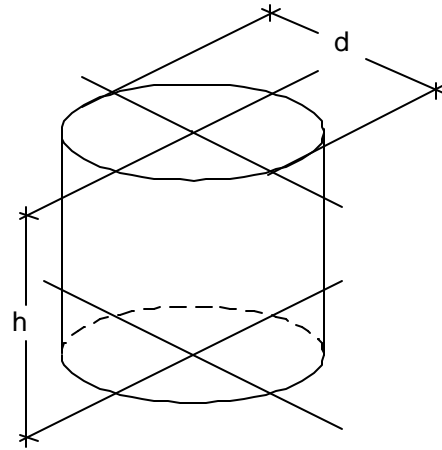
d = 120.0 inches
h = 360.0 inches

..... volume

$$V := h \cdot \left(\frac{\pi \cdot d^2}{4} \right) = 2,356.19 \text{ cu ft}$$

$$= 17,625.6 \text{ gal}$$

$$= 94,191.3 \text{ lbs}$$



..... surface area

$$\text{Area}_{\text{CYL}} := \pi \cdot \left(\frac{\text{dia}}{12} \right) \cdot \left(\frac{\text{height}}{12} \right) = 942.48 \text{ sq. ft., cylinder}$$

$$\text{Area}_{\text{ENDS}} := 2 \cdot \left[\frac{\pi \cdot \left(\frac{\text{dia}}{2} \right)^2}{144} \right] = 157.08 \text{ sq. ft., ends (both)}$$

$$\text{Total Area} = 1099.56 \text{ sq. ft., total}$$

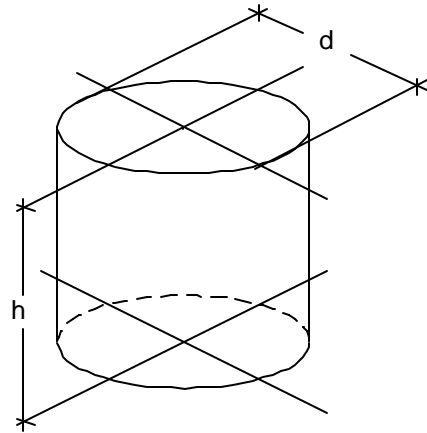
Tank & Bin Volume - Vertical Cylinder

Tank : PVA Glue Silo

Description: Area calculation for explosion venting

material sp.gr. : 0.641
density : 641 kg/m³

d = 3048.0 millimeter
h = 9144.0 millimeter



..... volume

$$V := h \cdot \left(\frac{\pi \cdot d^2}{4} \right) = 66.719998 \text{ meter}^3$$

$$= 42,767.5 \text{ kgs}$$

..... surface area

$$\text{Area}_{\text{CYL}} := \pi \cdot \left(\frac{\text{dia}}{1000} \right) \left(\frac{\text{height}}{1000} \right) = 87.56 \text{ sq. meter, cylinder}$$

$$\text{Area}_{\text{ENDS}} := 2 \cdot \left[\frac{\pi \cdot \left(\frac{\text{dia}}{2} \right)^2}{1000000} \right] = 14.59 \text{ sq. meter, ends (both)}$$

$$\text{Total Area} = 102.15 \text{ sq. meter, total}$$

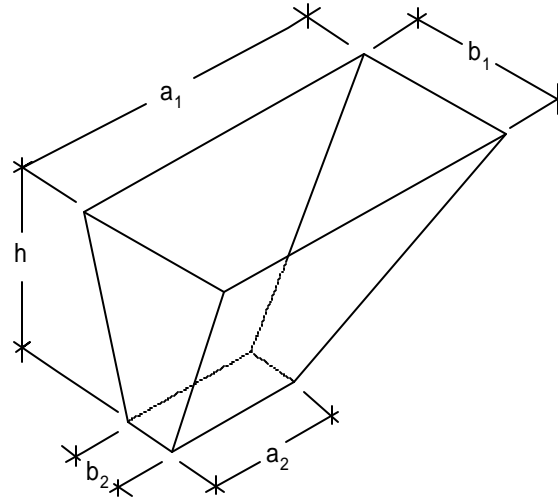
Tank & Bin Volume - Truncated Pyramid

Tank : **EXAMPLE**

Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : **1.2**
 density : **74.88** lb/cu ft

$a_1 = 48.0$ inches
 $a_2 = 23.0$ inches
 $b_1 = 34.0$ inches
 $b_2 = 12.0$ inches
 $h = 36.0$ inches



..... volume

$$A_1 = a_1 \cdot b_1 = 1632.0$$

$$A_2 = a_2 \cdot b_2 = 276.0$$

$$V = \left(\frac{h}{3} \right) \cdot (A_1 + A_2 + \sqrt{A_1 \cdot A_2}) = 17.9 \text{ cu ft}$$

$$= 134.0 \text{ gal}$$

$$= 1,341.2 \text{ lbs}$$

..... surface area

$$\text{Area}_{\text{SHELL}} = [(a_1 + a_2) \cdot h] + [(b_1 + b_2) \cdot h] / 144 = 29.25 \text{ sq. ft., shell}$$

$$\text{Area}_{\text{ENDS}} = [(a_1 \cdot b_1) + (a_2 \cdot b_2)] / 144 = 13.25 \text{ sq. ft., ends (both)}$$

$$= 42.50 \text{ sq. ft., combined area}$$

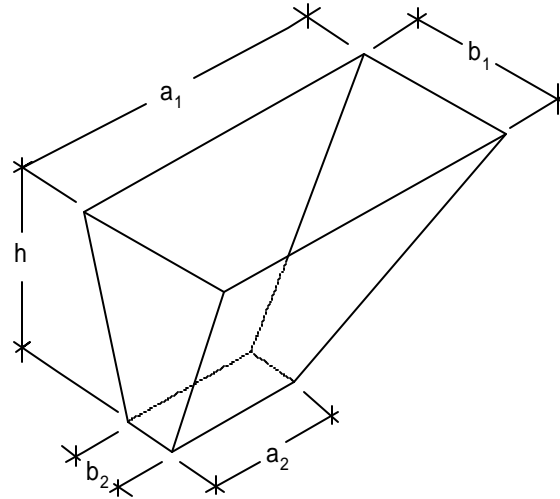
Tank & Bin Volume - Truncated Pyramid

Tank : **EXAMPLE**

Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : **1.2**
 density : 1200 kg/m³

$a_1 = 1219.2$ millimeter
 $a_2 = 584.2$ millimeter
 $b_1 = 863.6$ millimeter
 $b_2 = 304.8$ millimeter
 $h = 914.4$ millimeter



..... volume

$$A_1 = a_1 \cdot b_1 = 1.0529011 \text{ meter}^2$$

$$A_2 = a_2 \cdot b_2 = 0.1780642 \text{ meter}^2$$

$$V = \left(\frac{h}{3}\right) \cdot (A_1 + A_2 + \sqrt{A_1 \cdot A_2}) = 0.5071748 \text{ meter}^3$$

$$= 608.60981 \text{ kgs}$$

..... surface area

$$\text{Area}_{\text{SHELL}} = [(a_1 + a_2) \cdot h] + [(b_1 + b_2) \cdot h] / 1E+6 = 2.72 \text{ sq. meter, shell}$$

$$\text{Area}_{\text{ENDS}} = [(a_1 \cdot b_1) + (a_2 \cdot b_2)] / 1E+6 = 1.23 \text{ sq. meter, ends (both)}$$

$$= 3.95 \text{ sq. meter, combined area}$$

Tank & Bin Volume - Truncated Cone

Tank : EXAMPLE

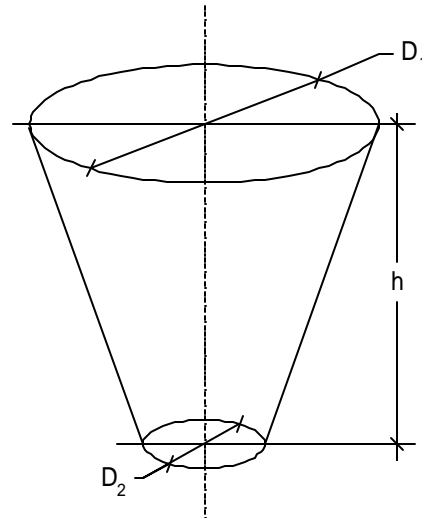
Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : 1.115
density : 69.576 lb/cu ft

$D_1 = 48.0$ inches

$h = 36.0$ inches

$D_2 = 12.0$ inches



..... volume

$$A_1 := \pi \cdot \frac{D_1^2}{4} = 1809.6$$

$$A_2 := \pi \cdot \frac{D_2^2}{4} = 113.1$$

$$V := \left(\frac{h}{3} \right) \cdot A_1 + A_2 + \sqrt{A_1 \cdot A_2} = 16.5 \text{ cu ft}$$

$$= 123.4 \text{ gal}$$

$$= 1,147.5 \text{ lbs}$$

..... surface area

$$\text{Area}_{\text{shell}} = 1.5708 \cdot (D_1 + D_2) \cdot [(D_1 - D_2)^2 + h^2]^{0.5} / 144 = 33.32 \text{ sq. ft., shell}$$

$$= 13.35 \text{ sq. ft., ends (both)}$$

$$= 46.67 \text{ sq. ft., combined area}$$

Tank & Bin Volume - Truncated Cone

Tank : EXAMPLE

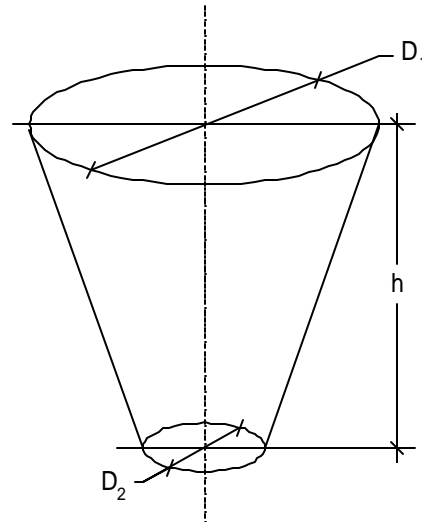
Description: **Middle Section Olestra Reactor Vessel**

material sp.gr. : 1.1
density : 1100 kg/m³

D₁ = 1219.2 millimeter

h = 914.4 millimeter

D₂ = 304.8 millimeter



..... volume

$$A_1 := \pi \cdot \frac{D_1^2}{4} = 1.167454 \text{ meter}^2$$

$$A_2 := \pi \cdot \frac{D_2^2}{4} = 0.0729659 \text{ meter}^2$$

$$V := \left(\frac{h}{3} \right) \cdot (A_1 + A_2 + \sqrt{A_1 \cdot A_2}) = 0.46704 \text{ meter}^3$$

$$= 513.74398 \text{ kgs}$$

..... surface area

$$\text{Area}_{\text{shell}} = 1.5708 \cdot (D_1 + D_2) \cdot [(D_1 - D_2)^2 + h^2]^{0.5} / 1E+6 = 3.10 \text{ sq. meter, shell}$$

$$= 1.24 \text{ sq. meter, ends (both)}$$

$$= 4.34 \text{ sq. meter, combined area}$$