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.

1422 Goswick Ridge Road
Midlothian VA 23114

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

Content Based
Chemical Engineering

VENTING of DEFLAGRATIONS of GAS MIXTURES and MISTS
Sizing based on NFPA 68, 2007 Edition

BASIS: NFPA 68 Guide for Venting of Deflagrations 2007 Edition

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.

LIMITATIONS: Low Strength Enclosures

- Pred (pressure-reduced) Not to exceed 1.5 psi, or 0.1 bar.
- Low Strength Enclosures cannot have a vent duct.
- Pred (pressure-reduced) should exceed Pstat by 0.35-psi (0.02-bar).
- When the fundamental burning velocity of the gas exceeds 1.3 times that of propane alternate methods of protection should be used.
- When the vent area is restricted to one end of an elongated enclosure the ratio of the length to diameter should be limited to three. Use the effective diameter for cross-sections other than circular or square.

High Strength Enclosures

- Pred (pressure-reduced) > 0.1 bar (1.5-psi)
- Pred (pressure-reduced) ≤ 2 bar (29-psi) and at least 0.05 bar > Pstat
- Kg ≤ 550 bar-m/sec
- Pstat ≤ 0.5 bar (7.5-psi)
- Enclosure Volume ≤ 1000 cubic meter (35314.7 cubic feet)

Explanatory and Warning notes are provided via Excel Comment Boxes and Data Validation (utilizing the "Office Assistar

nt out using direct Excel commands. This application is provided by Chemical Engine Resource Website, visit @ cheresources.com for additional selections.

Print out using direct EXCEL commands.

dmcoffman@aol.com

Venting of Gas or Mist Deflagration in Low-Strength Enclosures

SERVICE: Escaped Methanol in Mix Room
GAS/VAPOR: METHYL ALCOHOL

			Kg:	75	bar-m/sec
Enclosure Pred :	0.1	bar	Maximum Pstat :	0.076	bar
or :	1.450	psi	or :	1.100	psi
Enclosure Surface Area :	600	m^2	Burning Velocity :	56	cm/sec
or :	6458.346	ft^2	Vent Parameter, C :	0.0689272	$bar^{0.5}$

$$A_v = C \cdot \frac{A_s}{P_{red}^{0.5}} = 130.78\ m^2 \text{ - or - } 1407.7059\ ft^2$$

7.2.2.5 - Effects of Panel Inertia, if panel mass ≤ 40-kg/m^2 & $K_G \leq 130$

Enclosure Volume :	14	m^3	Number of Panels :	1	n
or :	494.4	ft^3	Vent Panel Mass :	18	kg/m^2
			Threshold Mass, M_T :	24.58373	kg/m^2

$$\Delta A_i = A_v \cdot (0.0075) \cdot M^{0.6} \cdot K_G^{0.5} / n^{0.3} \cdot V \cdot P_{red}^{0.2}$$
$$= 0.00\ m^2 \text{ - or - } 0\ ft^2$$

$$\text{Final Vent Area} = A_V + \Delta A_i = 130.78\ m^2 \text{ - or - } 1407.7059\ ft^2$$

08/01/09

Venting of Gas or Mist Deflagration in High-Strength Enclosures

SERVICE: ETHANOL TANK - EXPLOSION VENTING REQUIREMENTS
GAS: ETHYL ALCOHOL

			Deflag. Index-Kg:	78	bar-m/sec
P_{red}:	0.17	-bar, or 2.47 -psi	Enclosure Volume :	1000	m^3
P_{stat}:	0.11	-bar, or 1.60 -psi	or :	35310.7	ft^3
P_{max}:	7	-bar, or 102 -psi	Enclosure L/D Ratio:	3.00	height/diameter

$$A_v = [(0.127 \cdot \log_{10}(K_g) - 0.0567) \cdot P_{red}^{-0.582} + 0.175 \cdot P_{red}^{-0.572} \cdot (P_{stat}-0.1)] \cdot V^{2/3}$$

A_v = 51.97 $meter^2$ or 559.45 ft^2 ..... for Cubic Vessels

7.3.3.3 - L/D Values from 2 to 5 $A_L = A_v + \Delta A_H$

ΔA_H = $[A_V \cdot Kg \cdot (L/(D-2))^2] / 750$: 5.4053559 $meter^2$ or 58.18 ft^2

A_L = 51.97 + 5.41 = 57.38 $meter^2$ or 617.64 ft^2 ..... for Elongated Vessels

7.3.3.6 - Effects of Panel Inertia, if panel mass ≤ 40-kg/m^2 & $K_G \leq 130$

Number of Panels : 1 n

Vent Panel Mass : 18 kg/m^2

Threshold Mass, M_T : 35429.179 kg/m^2

$\Delta A_i = A_v \cdot (0.0075) \cdot M^{0.6} \cdot K_G^{0.5} / n^{0.3} \cdot V \cdot P_{red}^{0.2}$: 0.00 sq meter - or - 0.00 sq ft

Final Vent Area = $A_V + \Delta A_i$ = 51.97 m^2 - or - 559.44966 ft^2

· · **Reaction Force resulting from deflagration equals :**

$F_r = \alpha \cdot A_v \cdot P_{red}$

F_r = 1526.805 force, lbf or 1060.2813 kN

EFFECTS OF VENT DUCTS - GAS MIXTURES & MISTS

Service : Mix Tank Vent Duct

Duct Length :	4.26	meters	Duct Length :	13.9728	feet
Pred w/o duct :	0.21	bar	Pred w/o duct :	3.045	psi
Duct Length :	4.65	hydraulic diameters, meters			

- For Ducts with Lengths < 3-m (10-ft) and < 4 Duct Hydraulic Diameters

$$P'_{red} = 0.779 \cdot (P_{red})^{1.161}$$

=

- For Ducts with Lengths 3-m to 6-m (10-ft to 20-ft) or ≥ 4 Duct Hydraulic Diameters

$$P'_{red} = 0.172 \cdot (P_{red})^{1.936}$$

= 0.008 -bar, or 0.122 -psi

MATERIAL	Burning velocity, cm/sec	Reference
1,2-BUTADIENE	68	NFPA-68
1,2-PENTADIENE	61	NFPA-68
1,3-BUTADIENE	64	NFPA-68
1,4-PENTADIENE	55	NFPA-68
1-BUTENE	51	NFPA-68
1-BUTYNE	68	NFPA-68
1-DECENE	44	NFPA-68
1-PENTANE	50	NFPA-68
1-PROPYNE	82	NFPA-68
2,3-PENTADIENE	60	NFPA-68
2-BUTEN-1-YNE (VINYLACETYLENE)	89	NFPA-68
2-BUTYNE	61	NFPA-68
ACETONE	54	NFPA-68
ACETYLENE	166	NFPA-68
ACROLEIN	66	NFPA-68
ACRYLONITRILE	50	NFPA-68
ALLENE (PROPADIENE)	87	NFPA-68
BENZENE	48	NFPA-68
BUTANONE	42	NFPA-68
CARBON DISULFIDE	58	NFPA-68
CARBON MONOXIDE	46	NFPA-68
CYCLOBUTANE	67	NFPA-68
CYCLOHEXANE	46	NFPA-68
CYCLOPENTADIENE	46	NFPA-68
CYCLOPENTANE	44	NFPA-68
CYCLOPENTENE	48	NFPA-68
CYCLOPROPANE	56	NFPA-68
DIETHYL ETHER	47	NFPA-68
DIMETHYL ETHER	54	NFPA-68
ETHANE	47	NFPA-68
ETHENE (ETHYLENE)	80	NFPA-68
ETHYL ACETATE	38	NFPA-68
ETHYLENE OXIDE	108	NFPA-68
ETHYLENIMINE	46	NFPA-68
GASOLINE	40	NFPA-68
HEXADECANE	44	NFPA-68
HYDROGEN	312	NFPA-68
ISOPROPYL ALCOHOL	41	NFPA-68
ISOPROPYLAMINE	31	NFPA-68
JET FUEL, JP-1	40	NFPA-68
JET FUEL, JP-1	41	NFPA-68
METHANE	40	NFPA-68
METHYL ALCOHOL	56	NFPA-68
n-BUTANE	45	NFPA-68
n-DECANE	43	NFPA-68
n-HEPTANE	46	NFPA-68
n-HEXANE	46	NFPA-68
n-PENTANE	46	NFPA-68
PROPANE	46	NFPA-68
PROPENE	52	NFPA-68
PROPIONALDEHYDE	58	NFPA-68
PROPYLENE OXIDE	82	NFPA-68
SPIROPENTANE	71	NFPA-68
TETRAHYDROPYRAN	48	NFPA-68
TETRALIN	39	NFPA-68
TOLUENE	41	NFPA-68