

PRODUCT REVIEW SOFTWARE FOR ISO TANKS, CARGO TRAILERS, RAIL TANK CARS, 4BW TANKS & TOTES

PURPOSE: Review requests from package engineering for product review in various containers; Advise customer of changes required to get container in compliance with applicable regulations (US DOT, IMDG, ARD, RID)

HLA developed multiple spreadsheets to simplify the time-consuming task of reviewing a hazardous material for shipment by road, rail, or ship, to the applicable country's shipping regulations. The software has three main worksheets: 1. Calculation of the required pressure relief valve venting capacity, 2. Calculation of the maximum allowable working pressure (MAWP) of the container, and 3. The maximum fill density of the container. This software allows the engineer to perform many scenarios in an efficient manner, instead of reviewing each regulation individually.

	A	B	C	D	E	F	G	H	I	J	K	L
1	PRESSURE RELIEF VALVE VENTING CAPACITY REQUIREMENTS PER VARIOUS REGULATIONS											
2	HLA Job No.						02XXX					
3	Tank Data:											
4	Drawing Number:											
5	Manufacturer:						XXXX					
6	Applicable regulations:						IMO1/M101					
7	Nom. Capacity, (nc)						3537 US gallons					
8	Total exposed surface area of tank =						363.1 m ²					
9	Tank design pressure =						58 psig					
10	Tank design reference temperature =						149 F	65.0 C				
11	Relief Valve Data:											
12	Relief valve manufacturer and model:						Fort Vale 2-1/2" SuperMax					
13	Quantity of relief valves in parallel:											
14	Set pressure of relief valve:											
15	Vacuum setting:											
16	Rupture disc setting:											
17	Capacity / valve at 120% of set						***** User Input (Highlighted in Yellow)*****					
18	Capacity / valve at 83% of 120%						HLA Job No.					
19	Rupture disc (10% flow reduction)						Tank Data:					
20	Gauze Screen (12% flow reduction)						Drawing Number:	N.A.				
21	Total capacity for IMO1						Manufacturer:	XXXX				
22	Product Data:						Nom. Capacity, (nc)	3,537 US gallon	13,389 liters			
23	Product:						Applicable regulations:	IMO1/M101				
24	UN number						Stamped MAWP	58 psig				
25	Relief valve set pressure, (sp) =						Product		XXXX			
26	Accumulating pressure = 1.2(sp)						Boiling temperature at 14.7 psia		37 C			
27	Temp. @ accumulating pressure						Fill temperature, (ft)		15 C	519 R		
28	Gas compressibility factor at accumulation						DOT Reference temperature, (dotrt)		46 C	574.8 R		
29	Pressure at critical point =						IMDG Reference temperature, (imdrf)					
30	Temperature at critical point =						Internal pressure during filling, (P1)					
31	Specific heat ratio, (Cp/Cv) at accumulation						Vacuum pressure pulled after filling / sealing, (Pv)					
32							Inert gas pad pressure added after vacuum is pulled, (Pp)					
33							Vapor pressure @ fill temp, (vpft)					
34							Vapor pressure @ DOT ref. temp, (vprr)					
35							Vapor pressure @ 65C, (vp65)					
36							Static head height, (h)					
37							Density @ fill temp, (dft)					
38							Density @ DOT ref. temp, (ddotr)					
39							Density @ IMDG ref. temp, (dimrt)					
40							Fill density, (fd), (example: 0.95 for 95% liquid full)					
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1	FILL DENSITY REQUIREMENTS FOR LIQUIDS AND LIQUIFIED GASES PER VARIOUS REGULATIONS											
2	HLA Job No.						02XXX					
3	Tank Data:											
4	Drawing Number:											
5	Manufacturer:						XXXX					
6	Nom. Capacity, (nc)						13,389 liters					
7	Applicable regulations:						IMO1/M101					
8	Max. gross weight						30,480 kg					
9	Tare weight						3490 kg					
10	Reference Temperatures:											
11	DOT insulated tank:									41 C		
12	DOT uninsulated tank:									46 C		
13	ADR/RID tank (insulated or uninsulated):									50 C		
14	IMO5 tank (insulated or uninsulated):									55 C		
15	IMO1 tank									50 C		
16												
17												
18	Product Data:											
19	Product						XXXX			***Calculated***		
20	Density @ 15C, (d15)						1.2608 kg/l			10.52178 lb/gal		
21	Density @ 41C, (d41)						1.2103 kg/l			10.10034 lb/gal		
22	Density @ 46C, (d46)						1.2000 kg/l			10.01438 lb/gal		
23	Density @ 50C, (d50)						1.1920 kg/l			9.94762 lb/gal		
24	Density @ 55C, (d55)						1.1817 kg/l			9.861663 lb/gal		
25	Density @ 60C, (d60)						1.1712 kg/l			9.774037 lb/gal		
26												
27	***Calculated Output Data***											
28	Per DOT (173.24b(1)):											
29												
30	Insulated tank:											
31	Outage shall be at least 1% of total capacity @ ref temp of 41C											
32	Volume @ 99% full @ 41C = 0.99(nc) =									3,502 gallons		
33	Volume @ 99% full @ 41C = 0.99(nc) =									36.369 m ³		