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Content Based Chemical Engineering

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veni	SIZILIQ	FUL	Vessels

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.

Steam Condensing on Tank Surfaces

BASIS: Necessary air inflow through the vent must be sufficient to replace the volume of steam condensed within the tank

- This spreadsheet covers three cases: Case A: Cylindrical Tank, Steam Condensing on Roof and Shell Case B: Cylindrical Tank, Steam Condensing on Roof, Shell, and Bottom
 - Case C: General Case, Steam Condensing on Tank Surface
- 1.) Enter the identification at [C4].
- Use the drop-box to select the case, A, B, or C.
 Enter tank MAV at [D7].
- For Cases A and B: enter height at [D8] and diameter at [D9]. For Case C: enter total condensing area

For cases A allo b, einer height at [Do] and ularited at [Dy]. For case C, einer total concertsing area at [D14]. The required vent area is indicated at C25, add this to any other venting requirements. Note that this area is valid for 'natural' reliefs only (short nozzles). For long or complex vents, eg, with a vapor seals the required air inflow rate for this hazard is shown at F31. This rate can be used with the DARCY spreadsheets to determine appropriate piping size, etc.,

Cold Water Spray - Steam Condensing

- This spreadsheet allows for input of a varying degrees of minimum water temperatures used for rinsing tanks such as used in CIP operations. Venting considerations of a "cold summer" rain shower on exterior surfaces are also a consideration of needed air inflow.

- Enter the identification at [C4].
 Enter tank MAV at [C6].
 Enter the MINIMUM POSSIBLE water temperature at [F6] (consider winter water temperatures).
- 3.) Enter the MINIMUM PUSSIBLE water temperature at [F6] (consider winter water temperatures).
 4.) Enter water mass spary area at [F7] the equivalent volumentic rate is reflected at [F8].
 The required vent area is indicated at E18, add this to any other venting requirements. Note that this area is valid for natural reliefs (short nozzles) only. For long or complex vents, eg. with a vapor seals the required at inflow rate for this hazard is shown at F26. This rate can be used with the Darcy spreadsheet to determine appropriate piping size, etc...

Vacuum Hazard from Draindown & Pumpout

Drain valves are calculated as liquid orifices, the vent area is calculated using the an orifice coefficient of 0.60 (equivalent of a short nozzle).

1.) Enter identification at [C4].

- 2.) Enter MAV at [C6].
- Enter tank maximum liquid height at [C7]. 4.) Enter fluid at [G6].

- Enter fluid at [G6].
 Enter drain valve "Ko" at [G7].
 Enter drain valve "Ko" at [G11] if different from 0.8.
 Enter the inside diameter for each drain at [D14]...[D18] (see piping table).
 Enter pump names/reference at [C24]...[C28] and their maximum flows [G24]..[G28]. The required vent area is indicated at F38, add this to any other venting requirements. Note that this area is valid for natural" reliefs (Short nozzles) only. For long or complex vents, eg. with a vapor seals the required at inflow rate for this hazard is shown at F47. This rate can be used with the Darcy spreadsheet to determine appropriate piping size, etc...

Tank Venting for Gas & Liquid Inflows

BASIS

BASIS:

BASIS:

- The program sizes a natural relief for gas inflow, plus the gas displaced by liquid inflows; NOT for combined gas/liquid flow through the vent. An adequate overflow is assumed.
- 1.) Enter identification at [C4].
- 2.) Enter MAP at [C6].
- Steric allowable overpressure at [F6].
 Forter gass name at [C14], or " = " and schroll down to the appropriate gas in the lookup table starting at cell [E49].
 Enter the mass flow rate, at [C15]. The molecular weight (mw), specific heat ratio (k), are automatically

- added from the lookup table, if the fluid was listed. 6.) Input the temperature at [C16]. If the fluid is steam the spreadsheet will determine temperature. The specific volume will be calculated and shown at [G15]. 7.) Enter Ko at [C10], use the Comment Box info to select Ko. 8.) Enter liquid name at [C24], or " = " and schroll down to the appropriate liquid in the lookup table starting at cell [A49].
- 9.) Enter the mass flow rate at [C25] the volumetric rate is calculated and reflected at [C26]. The specific gravity is automatically added from the lookup table, if the fluid was listed. The volumetric flow is calculated and shown
- is accompared by a local unit the lockup lade; if the hold was itset. The volument how is calculated and at [F18]. The gas displaced by liquid is calculated and shown at [E30], and the total vent flow at [E35]. This total flow may be used with DARCY for complex or piped vent arrangements. The required vent area shows at [F39], and its diameter at [G41]. A recommended vent size based on NOTE: schd 40 pipe is shown at [C44].

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Print out using direct EXCEL commands.

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.

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Tank Vent Requirement - Steam Condensation on Tank Surface TANK: Hot Water Vessel, VE-8002 CASE: Steam Condensing on Roof, Shell, and Bottom Ŧ MAV =3.000 psi Height = 132.0 inches or 11.00 ft. Diameter = 96.0 8.00 ft. inches or Ab =50 ft² bottom area assumed flat Ar = ft² roof area assumed flat 50 As = 276 ft² shell surface area Acond = 377 ft² total condensing area ····· vent sizing ····· P1a = 14.7 P2a/P1a = 0.796 psia P2a = 11.7 lambda = 965 for Air psia for (P2a/P1a < .975) $d = 2.8 \cdot (Acond/lambda)^{0.5}$ d = 1.75 in. Av = 2.404799 in² required vent area

$$W := K_0 \cdot A \cdot \lambda \cdot \sqrt{\left(\frac{P1_a}{V_1}\right)} = 1463 \text{ lb/hr}$$

Tank Vent Requirement - Steam Condensation on Tank Surface TANK: Hot Water Vessel, VE-8002 **CASE:** Steam Condensing on Roof and Shell Ŧ MAV =20684 Ра Height = 3352.8 nillimeter or 3.3528 meter Diameter = 2438.4 nillimeter or 2.4384 meter Ar = 4.67 meter² roof area assumed flat As = 25.68 meter² shell surface area Acond = 30.35 meter² total condensing area ····· vent sizing ····· P1a = 101325 Pa.abs P2a/P1a = 0.796 P2a = 80641 Pa.abs lambda = 965 for Air for (P2a/P1a < .975) $d = 0.233 \cdot (Acond/lambda)^{0.5}$ d = 41.315379 millimeter Av = 1340.644 millimeter² required vent area

W := 5.88 · K
$$_{0}$$
 · A · λ · $\sqrt{\frac{P1}{v}}_{1}$ · 10⁻⁴ = 0.1593 kg/sec

Tank Vent Requirement - Cold Water Spray

TANK: Final Mix Tank - HAZARD 7

MAV = 0.87	psig	TW =	48	°F, minimum cold temp
= 13.826	psia	W =	15000	lb/hr, spray rate
Tsat = 209.2398	°F	Q =	30.00	gpm, spray rate
		$\Delta T =$	161.23984	°F, temp differential

····· vent sizing ·····

 $\begin{array}{rll} {P1a} = & 14.7 & psia \\ {P2a} = & 13.83 & psia \\ {P2a/P1a} = & 0.941 \\ \lambda = & 569 \end{array}$

$$A := \left(\frac{0.002439 \cdot \Delta T \cdot W}{\lambda}\right) = 10.371977 \text{ in}^2 \text{ required vent area}$$

this area = 3.634 in. diameter

$$W := K_0 \cdot A \cdot \lambda \cdot \sqrt{\left(\frac{P1_a}{V_1}\right)} = 3716.5419 \text{ lb/hr}$$

Tank Vent Requirement - Cold Water Spray

TANK: Final Mix Tank - HAZARD 7

MAV = 5998.4 Pa = 95326.6 Paabs Tsat = 100.5722 °C	W = Q =	6.80	°C, minimu kg/sec, spr m ³ /hr, spra °C, temp c	ay rate
vent sizing	P2a = P2a/P1a =	101325 95326.561 0.941 569		
$A := \left(\frac{0.0225 \cdot \Delta T \cdot W}{\lambda}\right) =$				ea mm diameter

····· required air inflow ·····

.

W := 5.88 ·K $_{0}$ ·A· λ · $\sqrt{\frac{P1}{v}}_{1}$ ·10⁻⁴ = 0.4798993 kg/sec

								04/25/04
	Vacuum I	Hazard - F	rom Dr	ain Dowr	n and I	Pump Out		
VESSEL :	Brine Tank;	50-D-9022	26					
MAV: Liquid Height: Liquid Head:	0.2 100 4.437	psi inches or 8 psi, liquid	3.33 feet		Fluid: Sp Gr: ensity:	BRINE, CAL 1.230 76.752	CIUM CHLOF specific grav lb/cu ft	
 for drains					Ko =	0.8		
	W := 2410·	< ₀ ·Α·√(Ρ ₁	– P ₂)·D					
	drain #1:	1.610	in.Ø		W ₁ :	72435.165	lb/hr	
	drain #2:	0.000	in.Ø		W ₂ :	0	lb/hr	
	drain #3:	0	in.Ø		W3 :	0	lb/hr	
	drain #4:	0	in.Ø		W4 :	0	lb/hr	
	drain #5:	0	in.Ø		W ₅ :	0	lb/hr	
						72435.165	total lb/hr	
 for pumps			SUB TO ⁻	TAL - DR/	AINS :	117.8	gpm, drains	
pump #1:	Brine Reger	neration Pu	mp		Q ₁ :	100	gpm	
pump #2:	binto ricego.				Q ₂ :	0	gpm	
pump #3:					Q ₃ :	0	gpm	
pump #4:					Q ₄ :	0	gpm	
pump #5:					Q ₅ :	0	gpm	
			SUB TO	DTAL - PU	MPS :	100	gpm, pump	6
			тот	AL OUTF	LOW :	217.78076	gpm	
 required vent ar	ea to relieve	e draindow	n/pumpo	ut				
					Ko =	0.6		

 $A := GPM \cdot 0.075 \cdot \frac{60}{\left[\frac{7.48}{\left[\frac{2410}{\left(\frac{K_0}{\sqrt{MAV \cdot 0.075}}\right)}\right]}\right]} = 0.740 \text{ in}^2$ or, $\emptyset = 0.971$ inch diameter

$$W := K_0 \cdot A \cdot \lambda \cdot \sqrt{\left(\frac{P1_a}{V_1}\right)} = 130.2351 \text{ lb/hr}$$

Vacuum Hazard - From Drain Down and Pump Out

VESSEL : Brine Tank; 50-D-90226

Liquid Height	: 1378.9515 Pa : 2540 mm c : 30637.936 Pa, lic	or 2.54 meter quid	Fluid: Sp Gr: Density:	BRINE, CAL 1.230 1230	CIUM CHLORIDE 25% specific gravity kg/cu meter
····· for drains ···	 W := 1.42∙K ₀ ∙A	$\cdot \sqrt{(P_1 - P_2) \cdot D}$	Ko =	0.8	
····· for pumps ···	drain #2: drain #3: drain #4: drain #5:	0 - mmØ 0 - mmØ 0 - mmØ	W ₂ : W ₃ :	9.1800743	kg/sec kg/sec kg/sec kg/sec total kg/sec m ³ /hr, drains
	Brine Regeneratio	on Pump	$\begin{array}{c} Q_1 : \\ Q_2 : \\ Q_3 : \\ Q_4 : \\ Q_5 : \end{array}$	0 0 0	m ³ /hr m ³ /hr m ³ /hr m ³ /hr m ³ /hr

SUB TOTAL - PUMPS : 22.712471 m³/hr, pumps

TOTAL OUTFLOW: 49.580981 m³/hr

····· required vent area to relieve draindown/pumpout

Ko = 0.6

$$A := \frac{m^3}{hr} \cdot 1.20 \cdot 1000 \cdot \frac{1000}{\left[\frac{3600}{\left[\frac{1.42}{\left[\frac{K_0}{\left(\sqrt{MAV \cdot 1.20}\right)}\right]}\right]}} = 476.858 \text{ mm}^2$$
or, $\emptyset = 24.641$ mm diameter

W := 5.88 ·K
$$_{0}$$
·A· λ · $\sqrt{\frac{P1}{v}}_{1}$ ·10⁻⁴ = 0.0164061 kg/sec

Tank Venting Requirements For Gas and Liquid Inflows

SERVICE: 50% CAUSTIC STORAGE TANK VENTING FROM AIR BLOW

MAP =	1.00	psig	% OP =	10.0	over pressure
P1 =	1.100	psig	P1a =	15.800	psia
P2 =	0.000	psig	P2a =	14.696	psia

Ko = 0.8

····· compressible inflow ·····

Fluid:	STEAM				
Mass Flow Rate:	14675	W, Ib/hr	ບ1 =	14.41	cu ft/lb
T1:	246.85	°F	T1a =	706.4462	°R
Ratio of Sp. Ht.:	1.32	k	PRcrit =	0.5430	
MW:	18.02	molecular wt.	$\lambda =$	612	
PR:	0.9301	pressure ratio	crit $\lambda =$	1144	

····· noncompressible inflow ·····

Fluid:	WATER				
Mass Flow Rate:	25083	W, Ib/hr	Sp. Gr.:	1.00	specific gravity
Volumetric Rate:	50.2	Q, gpm	Density:	62.40	lb/cu ft

$$W_{L} := \left(\frac{Q}{7.48}\right) \left(\frac{60}{\upsilon_{1}}\right) = 27.932848 \text{ lb/hr, gas displaced}$$

····· required area ·····

 $W_{tot} = W_g + W_L = 14703$ lb/hr, total required vent flow

$$A := \frac{W_{tot}}{K_0 \cdot \lambda \cdot \sqrt{\left(\frac{P1_a}{\upsilon_1}\right)}} = 28.65 \text{ in}^2$$

or 6.040 inch inside diameter

Use a 6 inch Schedule 40 or Equivalent Size Vent.

Tank Venting Requirements For Gas and Liquid Inflows

SERVICE: 50% CAUSTIC STORAGE TANK VENTING FROM AIR BLOW

MAP =	6894.76	Ра	% OP =	10.0	over pressure
P1 =	7584.233	Ра	P1a =	108909.23	Paabs
P2 =	0.000	Ра	P2a =	101325	Paabs

Ko = 0.8

····· compressible inflow ·····

Fluid:	STEAM				
Mass Flow Rate:	1.8490189	W, kg/sec	ບ1 =	0.90	m³/kg
T1:	119.36	Co	T1a =	392.509	°K
Ratio of Sp. Ht.:	1.32	k	PRcrit =	0.5430	
MW:	18.02	molecular wt.	$\lambda =$	612	
PR:	0.9304	pressure ratio	crit $\lambda =$	1144	

····· noncompressible inflow ·····

Fluid:	WATER					
Mass Flow Rate:	3.1604048	W, kg/sec	Sp. G	r.:	1.00	specific gravity
Volumetric Rate:	11.377457	Q, m ³ /hr	Densit	y: 10	00.00	kg/m ³

$$W_L := 1.29 \cdot \left(\frac{Q}{3600}\right) = 0.0040769 \text{ kg/sec}, \text{ gas displaced}$$

····· required area ·····

 W_{tot} = W_g + W_L = 1.8530958 kg/sec, total required vent flow

$$A := \frac{\left(W_{tot} \cdot 10^{4}\right)}{5.88 \cdot K_{0} \cdot \lambda \cdot \sqrt{\left(\frac{P1_{a}}{V_{1}}\right)}} = 18511.31 \text{ mm}^{2}$$

or 153.52 mm inside diameter

Use a 150 mm Schedule 40 or Equivalent Size Vent.

ACETIC ACID 100% 1050 ACETIC ACH3COOH 1.30 60.05 Pressu ACETOR CADD 70% 1.010 ACETVLEN C2H2 1.30 26.00 Pressu ACETONE 0.799 AIR 1.40 28.97 Temperal AMMONIA 26% 0.905 AMMONIA NH3 1.30 17.030 Temperal BENZENE 0.844 BENZENE C6H6 1.30 78.11 Water BRINE, SODUM CHLORIDE 25% 1.100 DARBON IC C.02 1.30 79.910 Ratio of Sear CAUSTIC 20% 1.523 CARBON I C.0 1.40 28.010 Her Specifi CAUSTIC 20% 1.530 CARBON I C.0 1.40 28.000 Hater Specifi CONDENSATE 0.000 C/LOROFC HCLORIC 1.30 70.910 Ratio of S ETHANOL 100% 0.995 CYANOGE (CN)2 1.30 74.12 1.14 ETHANOL 100% 0.993 ETHANE C.2H6 1.30 1.00 1.2				(Keenan &	
ACE TIC ACID 70% 1010 ACE TYLEN C2H2 130 26.00 Pres ACE TONE 0.789 AIR - 1.40 28.97 Temperal AMMONIA 100% 0.662 ARGON A 1.40 39.90 Steam BRINE, CALCIUM CHLORIDE 25% 1.200 BROMINE Br2 1.30 159.83 Evag CARBON DIDIDE 1.102 CARBON E C.22 1.30 4.010 Steam CARBON DIDIDE 1.102 CARBON E C.22 1.30 76.13 Wate CAUSTIC 50% 1.500 CARBON I C.21 1.30 70.910 Ratio of 5 CONDENSATE 0.000 CHLOROFC CHORIN E 1.30 30.00 1/2 FHANOL 40% 0.795 CYANOGEF (CN)2 1.30 74.12 1.74 FHANOL 40% 0.935 ETHANE C.2450H 1.30 46.07 3/4 ETHANOL 40% 0.935 ETHANE 10% C.2450H 1.30 1.72	ble from 0			Imperial	Metric
ACE TONE 0.789 AIR 1.40 28.97 Ten AMMONIA 26% 0.780 AMMONIA 26% 0.960 AMMONIA NH3 1.30 17.030 Temperal AMMONIA 100% 0.682 AMMONIA NH3 1.30 17.030 Temperal BRINE, CALCIUM CHLORIDE 25% 1.100 BUTANE CAHE 1.30 76.13 Wate BRINE, CALCIUM CHLORIDE 25% 1.100 BUTANE CAHEND IC C.02 1.30 44.010 Steam CAUSTIC 20% 1.233 CARBON IC C.02 1.30 76.13 Wate CAUSTIC 20% 1.233 CARBON IC C.02 1.30 76.13 Wate CAUSTIC 20% 1.233 CARBON IC C.02 1.30 70.010 Ratio of 2 CONDENSATE 1.000 CHLOROFC CH23 1.30 mon dia ETHANOL 100% 0.799 CYCLOHEX C4HC 1.30 40.07 3/4 ETHANC HUGNIDE 0.923 ETHAL C2H5CL 1.30 76.13 1.10 ETHANO	ure, gauge		-	13.83	95326.9
AMMONIA 26% 0.905 AMMONIA NH3 1.30 17.030 Temperal AMMONIA 100% 0.682 ARGON A 1.40 39.90 Steam BRINE, CALCHUM CHLORIDE 25% 1.200 BROMINE Br2 1.30 159.83 Evag BRINE, SODIUM CHLORIDE 25% 1.200 CARBON DI CO2 1.30 44.010 Stear CAUSTIC 20% 1.232 CARBON DI CO2 1.30 76.13 Wate CAUSTIC 50% 1.530 CARBON NIC CS2 1.30 70.910 Ratio of S CONDENSATE 1.000 CHLORINE CHLORINE 1.30 19.93 Pipe S DOWTHERM 0.995 CYANOCER CH03 1.30 10.0 1/2 ETHANU 1.95% 0.904 ETHYL CHCCHSOH 1.30 64.50 1 ETHANC 95% 0.904 ETHYL ENC C2H50H 1.30 137.40 2 ETHANC 95% 0.904 ETHYL ENC C2H50H 1.30 17.40 2	ssure, abs		Pa	28.52	196651.9
AMMONIA 100% O.682 ARGON A 1.40 39:00 Steam BENZENE O.644 BENZENE Colf6 1.30 78:11 Water BRINE, CALCIUM CHLORIDE 25% 1.200 BROMINE BROMINE BC2 1.30 44:010 Steam CAUSTIC 20% 1.233 CARBON IC CO2 1.30 76:13 Wate CAUSTIC 50% 1.233 CARBON I CC3 1.30 76:13 Wate CAUSTIC 50% 1.233 CARBON I C.2 1.30 76:13 Ratio of 2 CONDENSATE 1.000 CHLOROF CH23 1.30 84:16 12 ETHANOL 40% 0.995 CYANOGE (N2)2 1.30 84:07 34 ETHANOL 40% 0.995 ETHANE C2H6 1.30 84:07 34 ETHANOL 10% 0.795 ETHANE C2H5 1.30 76:03 1.12 ETHANOL 40% 0.935 ETHANE C2H5 1.30 76:03	mperature		°C	246.85	119.4
BENZENE 0.844 BENZENE Céhé 1.30 78.11 Water BRINE, SOLUM CHLORIDE 25% 1.30 BROMINE Br2 1.30 58.10 Brayedin CARBON DIOXIDE 1100 CARBON D CO2 1.30 44.010 Star CAUSTIC 20% 1.232 CARBON N CO2 1.30 76.13 Water CAUSTIC 50% 1.530 CARBON N C.22 1.30 70.10 Ratio of 2 CONDENSATE 1.000 CHLOROFC CH23 1.30 119.39 Pipe S DOWTHERM A 0.995 CYANOGE (CN2 1.30 10.00 1/2 ETHANOL 100% 0.795 CYCLOHEX CH12 1.30 46.07 3/4 ETHANOL 40% 0.995 ETHAV CZH6 1.30 1.01 1 ETHANOL 40% 0.993 ETHYL AL C2H50 1.30 46.07 3/4 ETHYL CHUCRODE 0.923 ETHYL EMUCTOSIC 1.30 70.02 1 <td< td=""><td>ture, abs</td><td></td><td></td><td>706.52</td><td>392.5</td></td<>	ture, abs			706.52	392.5
BRINE, CALCIUM CHLORIDE 25% 1.30 BROMINE Br2 1.30 159.83 Evag BRINE, SODIUM CHLORIDE 25% 1.90 BUTANE CAH10 1.30 58.01 am Specifi ARSON IOXIDE 1.102 CARBON IO C.22 1.30 74.13 Wate CAUSTIC 20% 1.233 CARBON IO CS2 1.30 76.13 Wate CAUSTIC 50% 1.530 CARBON IO CS2 1.30 76.13 Wate CAUSTIC 50% 1.530 CARBON IO CS2 1.30 70.13 Ratio of S CONDENSATE 1.000 CHLORINE CHLORINE 1.30 84.01 S DOWTHERM A 0.995 CYANOGE CH32 1.30 46.07 3/4 ETHANOL 40% 0.985 ETHANE C2H6 1.30 46.07 3/4 ETHANOL 40% 0.893 FEND 11 F.11 1.30 40.7 1/2 ETHANOL 40% 0.801 FEND 11 F.114 1.30 170.9 2.12 FENDN R11	n Enthalpy				4868.8
BRINE, SODIUM CHLORIDE 25% 1.190 BUTANE C4H10 1.30 58.10 am Specifi CARBON DIOXIDE 1.102 CARBON C CO2 1.30 44.010 Stear CAUSTIC 20% 1.53 CARBON N CO2 1.30 16.13 Wate CAUSTIC 50% 1.530 CARBON N CO 1.40 28.001 Ref Specific CAUSTIC 50% 1.467 CHLOROFC (CHCI3 1.30 119.39 Pipes 5 DOWTHERM A 0.995 CYANOGEN (CHCI3 1.30 84.16 T ETHANOL 100% 0.789 CYCLOHEX C4H2 1.30 46.07 3/4 ETHANOL 40% 0.935 ETHAYL CH C2H50L 1.30 46.07 3/4 ETHANOL 40% 0.936 FREON 11 F-114 1.30 170.90 21/2 ETHANE CHVC CH CHC CHC16 1.30 170.90 21/2 1.40 1.40 4.00 1 FREON R22 1.40 FREON 11 F-114 1.30 16.02	r Enthalpy				901.8
CARBON DIOXIDE 1.102 CARBON D CO2 1.30 44.010 Stear CAUSTIC 20% 1.520 CARBON N CO 1.40 28.010 FS.920 CAUSTIC 50% 1.530 CARBON N CO 1.40 28.010 FS.920 CONDENSATE 1.000 CHLORINE CL2 1.30 150.29 nom dia DOWTHERM A 0.995 CYANOGER CN12 1.30 84.16 nom dia ETHANOL 40% 0.935 ETHANE C2H6 1.30 46.07 3/4 ETHANOL 40% 0.923 ETHYL CHI C2H5CL 1.30 46.50 1 ETHYLEV CHUCRIDE 0.923 ETHYL CHI C2H5CL 1.30 74.12 1.1/4 FERON, R1 1.410 ETHYLEV CHI C2H5C2 1.30 70.00 1.1/2 FREON, R1 1.410 ETHYL CHI C2H5C2 1.30 70.00 1.1/2 FREON, R1 1.410 FREON 11 F-114a 1.30 70.90 1.2/2 FREON, R12	p Enthalpy				3967.0
CAUSTIC 20% 1.223 CARBON N CS2 1.30 76.13 Wate CAUSTIC 50% 1.530 CARBON N CO 1.40 28.010 Her Specifi CHLORINE LIQUID 1.467 CHLORINE CL2 1.30 70.730 Pipes CONDENSATE 1.000 CHLORINE CL2 1.30 81.06 Tom dia CONDENSATE 0.000 CHRONGE CHC13 1.30 119.39 Pipes DOWTHERM A 0.995 CYCLOHEX CH12 1.30 84.07 34.4 ETHANOL 100% 0.935 ETHAL CH C2H6 1.30 46.07 34.4 ETHYL CH CABSO THX CABSO 1.12 FREON R1 1.140 FTHYL CH C2H5120 1.30 74.12 1.147 FREON R12 1.170 FREON 114 F-114 1.30 137.40 2 1.20 FREON R12 1.70 FREON 114 F-114 1.30 16.04 3.12 GASOLINE GASOLINE <t< td=""><td>ic Volume</td><td>: 't3/lb</td><td>o m³/k</td><td>14.4060</td><td>0.8993</td></t<>	ic Volume	: 't3/lb	o m³/k	14.4060	0.8993
CAUSTIC 50% 1.530 CARBON N CO 1.40 28.010 ter Specifi CHLORINE LIQUID 1.467 CHLORINE CL2 1.30 70.910 Ratio of S CONDENSATE 0.095 CYANOGEN CHC3 1.30 119.39 Pipes S DOWTHERM A 0.995 CYCLOHEX CHC13 1.30 184.16 ETHANOL 100% 0.789 CVCLOHEX CH14 1.30 44.60 3/4 ETHANOL 40% 0.923 ETHAVL CHI C2H5CL 1.30 46.07 3/4 ETHANOL 40% 0.923 ETHYL CHI C2H5CL 1.30 46.07 3/4 ETHYLEN CLUCL 1.10 FREON 11 F.114 1.30 170.90 2/12 FREON R12 1.400 FREON 11 F.114a 1.30 170.90 2/12 FUEL OIL #6 0.993 FREON 11 F.114a 1.30 170.90 3 GASOLINE 0.751 FREON 11 F.114a 1.30 160.00 8 SOPROPVI ALCHOL	m Density	: b/ft3	¦kg/m	0.0694	1.1119
CHLORINE LIQUID 1.467 CHLORINE CL2 1.30 70.910 Ratio of S CONDENSATE 1.000 CHLOROFC CHCI3 1.30 19.39 Pipe S DOWTHERM A 0.995 CYANOGE (CN)2 1.30 52.02 nom dia ETHANOL 40% 0.935 ETHANE C2H60 1.30 46.10 1/2 ETHANOL 40% 0.935 ETHVL CHI C2H5CL 1.30 46.450 1 ETHYL CHLORIDE 0.923 ETHYL CHI C2H5CL 1.30 44.10 11/4 FREON, R11 1.110 ETHYL ETH (C2H5QC) 1.30 74.12 11/4 FREON, R12 1.170 FREON 11 F-114 1.30 137.40 2 FREON, R12 0.751 FREON 11 F-114 1.30 102.03 3 FUEL OIL #6 0.993 FREON R1 FREON 11 F-113 130 102.03 4 GLYCEROL, 100% 1.260 FREON R1 C31.30 102.03 4 GLYCEROL, 100% 1.260<	er Density	: b/ft3	kg/m	58.875	943.080
CONDENSATE 1.000 CHLOROF(CHCI3 1.30 119.39 Pipe S DOWTHERM A 0.995 CYANOGEN C(N)2 1.30 52.02 nom dia ETHANOL 100% 0.789 CYCLOHEK CH12 1.30 84.16 ETHANOL 40% 0.935 ETHVL ALC C2H6D 1.30 46.07 3/4 ETHVL CHLORIDE 0.923 ETHVL CHL C2H5DH 1.30 46.07 1 ETHVL CHL CRIDE 0.923 ETHVL CHL C2H4 1.30 46.07 1 FREON, R12 1.170 FREON 11 F-114 1.30 137.40 2 FREON, R22 1.440 FREON 12 R-12 1.30 10.02.03 4 GASOLINE 0.575 FREON 12 R-12 1.30 86.48 31/2 GASOLINE 0.571 FREON 11 F-114 1.30 100.02 12 FUEL OIL #2 1.30 86.00 8 120 120 120 121/2 13	ic Volume	: 't3/lb	m ³ /k	0.01699	0.00106
DOWTHERM A 0.995 CYANOGEP (CN)2 1.30 52.02 nom dia ETHANOL 100% 0.789 CYCLOHEX C6H12 1.30 84.16 ETHANOL 100% 0.935 ETHANE C2H6 1.30 46.07 3/4 ETHANCL 00% 0.923 ETHVL CHL C2H5CL 1.30 64.50 1 ETHYL CHLORIDE 0.923 ETHVL CHL C2H5CL 1.30 74.12 1 FREON, R11 1.110 ETHYL ENE C2H4 1.30 137.40 2 FREON, R12 1.170 FREON 11 F-114 1.30 137.40 2 FREON, R12 0.876 FREON 12 R-12 3 66.48 3 1/2 GASOLINE 0.837 FREON HF CH2L OLI (#2) 1.30 86.00 8 GASOLINE 0.751 FREON HF CH2C OL 1.30 86.00 8 ISOPROPUL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 ISOPROPUL ALCOHOL	Spec Heat	: Cp	o/Cv	1.315	1.315
ETHANOL 100% 0.789 CYCLOHEX C6H12 1.30 84.16 ETHANOL 40% 0.935 ETHANE C2H6 1.30 30.00 1/2 ETHANOL 40% 0.932 ETHANE C2H6 1.30 46.07 3/4 ETHYL CHORIDE 0.923 ETHYL CHI C2H5CL 1.30 46.150 1 ETHYLENE GLYCOL 1.110 ETHYLCHI C2H5D20 1.30 74.12 1.174 FREON, R12 1.170 FREON 11 F-114 1.30 137.40 2 FREON, R12 1.400 FREON 12 R-12 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HFI CH2FCF3 1.30 86.00 8 SOPROPYL ALCOHOL 0.785 HELU MI He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 86.07 1 UBE OLI MOBIL 634 0.884 HEXANC CH14 1.40 4.00 10 KEROSENE	ize Lookl	Jp Tak	ble		
ETHANOL 40% 0.935 ETHANE C2H6 1.30 30.00 1/2 ETHANOL 95% 0.804 ETHYL ALC (2H50H 1.30 46.07 3/4 ETHYL CHU CUDE 0.923 ETHYL CHU C2H50L 1.30 64.50 1 ETHYL ENE GLYCOL 1.110 ETHYL ENE (2H4 1.30 28.000 11/2 FREON, R11 1.100 ETHYL ENE (2H4 1.30 137.40 2 FREON, R22 1.440 FREON 11 F-114 1.30 170.90 2 FREON, R22 1.440 FREON 112 R-12 1.30 120.93 3 FUEL OIL #2 0.876 FREON 112 R-12 1.30 120.93 3 GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 86.00 8 SOPROPYL ALCOHOL 0.785 HELUM He 1.40 10 KEROSENE 0.811 HEPTANE C7H16 1.30 10.020 12 LUBE OIL MOBIL 634 0.84 HEXANE C/H14<	ID sch 4	0 nex	xt ID	1	
ETHANOL 95% 0.804 ETHYL ALL C2H5CL 1.30 46.07 3/4 ETHYL CHLORIDE 0.923 ETHYL CHL CHL C2H5CL 1.30 64.50 1 ETHYL ENE GLYCOL 1.110 ETHYL ENE (C2H5)2O 1.30 74.12 1 1/4 FREON, R11 1.410 ETHYL ENE C2H4 1.30 137.40 2 FREON, R12 1.170 FREON 11 F-114 1.30 137.40 2 FREON, R12 1.170 FREON 12 R-12 1.30 120.93 3 FUEL OIL #2 0.876 FREON 12 R-12 1.30 102.03 4 GASOLINE 0.751 FREON 14 F-114 1.30 102.03 4 GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 86.00 8 ISOPROPVA ALCOHOL 0.785 HELIUM He 1.40 40.01 KEROSENE 0.811 HEPTANE C7H16 1.30 102.02 18 METHANOL 40	0.001	3	3/4	1	
ETHYL CHLORIDE 0.923 ETHYL CHL C2H5CL 1.30 64.50 1 ETHYLENE GLYCOL 1.110 ETHYLETH C2H5D20 1.30 74.12 1 1/4 FREON, R11 1.410 ETHYLENE C2H4 1.30 78.02 1 1/2 FREON, R12 1.170 FREON 11 F-114 1.30 170.90 2 1/2 FUEL OIL #6 0.993 FREON 12 R.22 1.30 86.48 31/2 GASOLINE 0.751 FREON 12 R.22 1.30 96.00 6 HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 96.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KETHANCLORIG 31.5% 1.159 GASOLINE 1.30 86.17 14 MUBE OLI MOBIL 634 0.811 HEPTANE C7H16 1.30 86.47 122 LUBE OLI MOBIL 634 0.837 HYDROGE HC 1.40 36.47 <td>0.622</td> <td>3</td> <td>3/4</td> <td>1</td> <td></td>	0.622	3	3/4	1	
ETHYL CHLORIDE 0.923 ETHYL CHI C2H5CL 1.30 64.50 1 ETHYLENE GLYCOL 1.110 ETHYLETH (22H5)20 1.30 74.12 1.174 FREON, R11 1.410 ETHYLENE C2H4 1.30 137.40 2 FREON, R22 1.440 FREON 114 F-114a 1.30 170.90 2 1/2 FUEL OIL #6 0.993 FREON 12 R.22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON 12 R.22 1.30 96.00 6 HYDROCHLORC 31.5% 1.159 GASOLINE 1.30 96.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KETHANCINC 31.5% 1.159 GASOLINE 1.30 86.17 14 MBETHANCINC 03.5% 1.90 6.70.76 HYDROCH HCI 1.40 2.02 18 METHANOL 100% 0.937 HYDROGE H2 1.40 2.02	0.824		1	1	
FREON, R11 1.410 ETHYLENE C2H4 1.30 28.000 1 1/2 FREON, R12 1.170 FREON 11 F-11 1.30 137.40 2 FREON, R22 1.440 FREON 11 F-114a 1.30 170.90 2 1/2 FREON, R22 0.876 FREON 12 R-12 1.30 120.93 3 FUEL OIL #2 0.876 FREON 12 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF CH2FCF3 1.30 102.03 4 GLYCEROL, 100% 1.75% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KETHANOL 100% 0.937 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGE H2 1.40 2.02 18 METHANOL 100% 0.937 HYDROGE HCI 1.40 36.47 16 METHAN	1.049	1	1/4	1	
FREON, R11 1.410 ETHYLENE C2H4 1.30 28.000 1 1/2 FREON, R12 1.170 FREON 11 F-11 1.30 137.40 2 FREON, R22 1.440 FREON 11 F-114a 1.30 170.90 2 1/2 FREON, R22 0.876 FREON 12 R-12 1.30 120.93 3 FUEL OIL #2 0.876 FREON 12 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF CH2FCF3 1.30 102.03 4 GLYCEROL, 100% 1.75% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KETHANOL 100% 0.937 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGE H2 1.40 2.02 18 METHANOL 100% 0.937 HYDROGE HCI 1.40 36.47 16 METHAN	1.38		1/2	1	
FREON, R12 1.170 FREON 11 F-11 1.30 137.40 2 FREON, R22 1.440 FREON 114 F-114a 1.30 170.90 2 12 FUEL OIL #2 0.876 FREON 12 R-12 1.30 120.93 3 FUEL OIL #6 0.993 FREON 22 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF CH2FCF3 1.30 102.03 4 GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 96.00 6 SIOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 86.07 14 METHANOL 40% 0.937 HYDROCH HC1 1.40 2.02 18 METHANOL 40% 0.937 HYDROGE HC1 1.40 2.02 18 METHANOL 40% 0.937 HYDROGE HC1 1.40 2.02 13	1.61		2	1	
FREON, R22 1.440 FREON 112 F-114a 1.30 170.90 2 1/2 FUEL OIL #2 0.876 FREON 12 R-12 1.30 120.93 3 FUEL OIL #6 0.993 FREON 22 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF (H2FCF3 1.30 102.03 4 GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 96.00 6 HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 102.03 12 LUBE OIL MOBIL 634 0.884 HEXIM HEI 140 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 40% 0.937 HYDROGET H2 1.40 2.02 18 METHANOL 90% 0.875 HYDROGET HCN 1.40 27.03 24 NITRIC ACID 60%	2.067		1/2	1	
FUEL OIL #2 0.876 FREON 12 R-12 1.30 120.93 3 FUEL OIL #6 0.993 FREON 22 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF (CH2FCF3 1.30 102.03 4 GASOLINE 0.751 FREON HF (CH2FCF3 1.30 96.00 6 HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 80.77 14 METHANOL 100% 0.796 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGEF HZ 1.40 80.92 20 MULTITHERM PG-1 0.875 HYDROGEF HCI 1.40 80.47 22 MULTITHERM PG-1 0.875 HYDROGEF HI 1.40 12.710 34 OIL, VEGETABLE HARDENED	2.469		3	1	
FUEL OIL #6 0.993 FREON 22 R-22 1.30 86.48 3 1/2 GASOLINE 0.751 FREON HF (CH2FCF3 1.30 102.03 4 GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 96.00 6 GLYCEROL, 100% 1.760 FUEL OIL (#2) 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 40% 0.976 HYDROGE H2 1.40 2.02 18 METHANOL 40% 0.937 HYDROGEF HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEF HCI 1.40 30.47 22 MUTTIC ACID 60% 1.500 HYDROGEF HCI 1.40 12.7.03 24 NITRIC ACID 69% <td< td=""><td>3.068</td><td></td><td>1/2</td><td>1</td><td></td></td<>	3.068		1/2	1	
GASOLINE 0.751 FREON HF CH2FCF3 1.30 102.03 4 GLVCEROL, 100% 1.260 FUEL OIL (#2) 1.30 96.00 6 HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 100% 0.937 HYDROGE H2 1.40 36.47 20 METHANOL 90% 0.824 HYDROGE H2 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE HC 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE H2 1.30 25.384 30 OIL, VEGETABLE HARDENED 0.920 IODINE 12 1.30 72.10 34 SULPHURIC ACID 9	3.548		4	1	
GLYCEROL, 100% 1.260 FUEL OIL (#2) 1.30 96.00 6 HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOH∪ 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 86.17 14 METHANOL 100% 0.796 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGE H2 1.40 2.02 18 METHANOL 90% 0.824 HYDROGE HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE H2 1.30 34.08 28 OIL, VEGETABLE UNHARDENED 0.920 IODINE 12 1.30 72.10 34 SULPHURI CACID 96% <td>4.026</td> <td></td> <td>6</td> <td>1</td> <td></td>	4.026		6	1	
HYDROCHLORIC 31.5% 1.159 GASOLINE 1.30 86.00 8 ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 100% 0.976 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGEI H2 1.40 80.92 20 METHANOL 90% 0.824 HYDROGEI HI2 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEI HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEI H2 1.30 34.08 28 OIL, VEGETABLE HARDENED 0.890 ISOBUTAN C4H10 1.30 58.10 32 SULPHURIC ACID 60% 1.500 METCHY Hg 1.40 20.60 36 SULPHURIC ACID 60% 1.500 METHANC H1.30 16.040 32.04	6.065		8	1	
ISOPROPYL ALCOHOL 0.785 HELIUM He 1.40 4.00 10 KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 100% 0.796 HYDROGE H2 1.40 36.47 202 METHANOL 40% 0.937 HYDROGE H2 1.40 36.47 22 METHANOL 90% 0.824 HYDROGE HBr 1.40 36.47 22 MUTTITHERM PG-1 0.875 HYDROGE HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGE H2 1.30 34.08 28 OIL, VEGETABLE HANDENED 0.920 IODINE 12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 HYDROGE H1 1.40 20.60 36 SULPHURIC ACID 60% 1.500 METHANE CH12 1.30 72.10 34 </td <td>7.981</td> <td></td> <td>10</td> <td>1</td> <td></td>	7.981		10	1	
KEROSENE 0.811 HEPTANE C7H16 1.30 100.20 12 LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 100% 0.964 HYDROCH HCI 1.40 36.47 16 METHANOL 90% 0.937 HYDROGE H2 1.40 30.92 20 METHANOL 90% 0.824 HYDROGE HBr 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE HCN 1.30 27.03 24 NITRIC ACID 60% 1.500 HYDROGE HI 1.40 36.47 22 OIL, VEGETABLE HARDENED 0.902 IODINE 1.30 27.03 24 SULPHURIC ACID 60% 1.500 HYDROGE HI 1.40 36.47 22 SULPHURIC ACID 60% 1.500 IODINE 12 1.30 25.84 30 OIL, VEGETABLE HARDENED 0.880 ISOBUTAN CH410 1.30 32.04 SULPHUR	10.02		12	1	
LUBE OIL MOBIL 634 0.884 HEXANE C6H14 1.30 86.17 14 METHANOL 100% 0.766 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGEF H2 1.40 2.02 18 METHANOL 90% 0.824 HYDROGEF HBr 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEF HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGEF HI 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEF HI 1.40 127.91 26 OIL, VEGETABLE HARDENED 0.920 IODINE 12 1.30 25.84 30 OIL, VEGETABLE UNHARDENED 0.880 ISOBUTAN C4H10 1.30 58.10 32 SULPHURIC 100% 1.444 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC 106% 1.830 METHYL A CH30H 1.30 30.04 <	11.938		14	1	
METHANOL 100% 0.796 HYDROCH HCI 1.40 36.47 16 METHANOL 40% 0.937 HYDROGE H2 1.40 2.02 18 METHANOL 90% 0.824 HYDROGE HBr 1.40 80.92 20 METHANOL 90% 0.824 HYDROGE HBr 1.40 36.47 22 MUTITHERM PG-1 0.875 HYDROGE HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGE HI 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGE H2 1.30 34.08 28 OIL, VEGETABLE HARDENED 0.920 IODINE I2 1.30 34.08 28 SULPHUR IOXIDE 1.434 ISOBUTAN C4H10 1.30 72.10 34 SULPHUR IO C10% 1.840 MERCURY Hg 1.40 20.060 36 SULPHURIC ACID 60% 1.500 METHAL CH310 1.30 74.08 <td< td=""><td>13.124</td><td></td><td>16</td><td>1</td><td></td></td<>	13.124		16	1	
METHANOL 40% 0.937 HYDROGE H2 1.40 2.02 18 METHANOL 90% 0.824 HYDROGE HBr 1.40 80.92 20 METHANOL 90% 0.988 HYDROGE HBr 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGE HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGE HI 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEN H2S 1.30 34.08 28 OIL, VEGETABLE HARDENED 0.920 IODINE I2 1.30 58.10 32 SULPHURI DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 METHYL A'H3COOCH 1.30 74.08 36 SULPHURIC ACID 98% 1.830 METHYL A'H3COOCH 1.30 74.08 32 TURPENTINE 0.862 METHYL A'H3COOCH 1.30 46.07 WATER 0.864 </td <td>15</td> <td></td> <td>18</td> <td>1</td> <td></td>	15		18	1	
METHYL CHLORIDE 0.998 HYDROGEI HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEI HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGEI HL 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEI HI 1.40 127.91 26 OIL, VEGETABLE HARDENED 0.902 IODINE I2 1.30 34.08 30 OIL, VEGETABLE HARDENED 0.902 IODINE I2 1.30 72.10 34 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 METHYL A' CH10 1.30 74.08 36 SULPHURIC ACID 98% 1.830 METHYL A' H3COCH 1.30 32.04 TURPENTINE 0.862 METHYL A' CH3OH 1.30 32.04 WATER 1.000 METHYL C' CH3CI 1.30 46.07 NTROCS N2 1.40 28.020	16.867		20	1	
METHYL CHLORIDE 0.998 HYDROGEI HCI 1.40 36.47 22 MULTITHERM PG-1 0.875 HYDROGEI HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGEI HL 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEI HI 1.40 127.91 26 OIL, VEGETABLE HARDENED 0.902 IODINE I2 1.30 34.08 30 OIL, VEGETABLE HARDENED 0.902 IODINE I2 1.30 72.10 34 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 METHYL A' CH10 1.30 74.08 36 SULPHURIC ACID 98% 1.830 METHYL A' H3COCH 1.30 32.04 TURPENTINE 0.862 METHYL A' CH3OH 1.30 32.04 WATER 1.000 METHYL C' CH3CI 1.30 46.07 NTROCS N2 1.40 28.020	18.812		22	1	
MULTITHERM PG-1 0.875 HYDROGEI HCN 1.30 27.03 24 NITRIC ACID 60% 1.370 HYDROGEI HI 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEI HI 1.40 127.91 26 OIL, VEGETABLE HARDENED 0.920 IODINE 12 1.30 253.84 30 OIL, VEGETABLE UNHARDENED 0.820 ISOBUTAN C4H10 1.30 58.10 32 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 METHANE CH30 13.00 74.08 SULPHURIC ACID 60% 1.830 METHYL A CH30H 1.30 32.04 TOLUENE 0.862 METHYL A CH30H 1.30 32.04 TURPENTINE 0.864 METHYL C CH32L 1.30 46.07 WATER 1.000 METHYL A V1202 1.30 14.02 NITRICO 2 NO 1.40<	21.25		24	1	
NITRIC ACID 60% 1.370 HYDROGEI HI 1.40 127.91 26 NITRIC ACID 95% 1.500 HYDROGEN H2S 1.30 34.08 28 OIL, VEGETABLE HARDENED 0.920 IODINE I2 1.30 253.84 30 OIL, VEGETABLE UNHARDENED 0.880 ISOBUTAN C4H10 1.30 72.10 34 SULPHUR IOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHUR IC 10%, FUMING 1.434 ISOPENTAI CH4 1.30 74.08 36 SULPHURIC ACID 60% 1.500 METHYL A H3COCH 1.30 74.08 SULPHURIC ACID 98% 1.830 METHYL A CH3OH 1.30 32.04 TURPENTINE 0.864 METHYL C CH32L 1.30 46.07 WATER 1.000 NC 1.40 28.020 NITRIC O NO 1.40 28.020 NITROUS I N20 1.30 44.020 OCTANE </td <td>23.25</td> <td></td> <td>26</td> <td>1</td> <td></td>	23.25		26	1	
NITRIC ACID 95% 1.500 HYDROGEN H2S 1.30 34.08 28 OIL, VEGETABLE HARDENED 0.920 IODINE I2 1.30 253.84 30 OIL, VEGETABLE UNHARDENED 0.820 ISOBUTAN C4H10 1.30 58.10 32 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC ACID 60% 1.500 MERCURY Hg 1.40 200.60 36 SULPHURIC ACID 98% 1.830 METHYL A'H3COOCH 1.30 74.08 TURPENTINE 0.862 METHYL C CH30H 1.30 32.04 VMATER 0.864 METHYL C CH32H 1.30 46.07 WATER 1.000 METHYL C CH32H 1.30 19.50 NEON Ne 1.40 28.020 NITROUS (NCEN N2 1.30 44.020 NTROUS (N26EN N2 1.30	25.25	_	28	1	
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OIL, VEGETABLE UNHARDENED 0.880 ISOBUTAN C4H10 1.30 58.10 32 SULPHUR DIOXIDE 1.434 ISOPENTAI C5H12 1.30 72.10 34 SULPHURIC 110%, FUMING 1.840 MERCURY Hg 1.40 200.60 36 SULPHURIC ACID 60% 1.500 METHAN CH4 1.30 16.040 SULPHURIC ACID 60% 1.630 METHYL A:H3COCOCH 1.30 32.04 TOLUENE 0.862 METHYL A:CH3OH 1.30 32.04 TURPENTINE 0.864 METHYL C:CH3CI 1.30 50.49 WATER 1.000 METHYL C:CH3CI 1.30 46.07 NATURAL typical 1.30 30.010 NITRICO NO 1.40 20.20 NITROSE NE 1.40 28.020 NITRICOS NO 1.40 28.020 NITROSE N2 1.40 32.000 PENTANE C5H12 1.30 72.10 PHOSPHOF P 1.30 30.9	29.25		32	1	
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SODIUM Na 1.40 22.99					
STEAM H2O 1.32 18.020					
SULPHUR I SO2 1.32 18.020					
SOLPHOR I SO2 1.30 64.070 TOLUENE C6H5CH3 1.30 92.13					