

**DuPont™ Suva®**  
refrigerants

**Thermodynamic  
Properties  
of**

**DuPont™  
Suva® MP39**

**Refrigerant**

**(R-401A)**

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# Thermodynamic Properties of Suva® MP39 Refrigerant

## Engineering (I/P) Units

New tables of the thermodynamic properties of Suva® MP39 refrigerant [ASHRAE designation: R-401A (53/13/34)], a near azeotropic blend of HCFC-22/HFC-152a/HCFC-124, have been developed and are presented here. These tables are based on extensive experimental measurements. Equations have been developed, based on the Peng-Robinson-Stryjek-Vera (PRSV) equation of state, which represent the data with accuracy and consistency throughout the entire range of temperature, pressure, and density presented in these tables.

### Physical Properties

Chemical Formula	CHClF <sub>2</sub> /CH <sub>3</sub> CHF <sub>2</sub> /CHClFCF <sub>3</sub> (53/13/34% by weight)	
Molecular Weight	94.44	
Boiling Point at One Atmosphere	-27.34°F	(-32.97°C)
Critical Temperature, T <sub>c</sub>	226.42°F	(108.01°C)
	686.09°R	(381.16 K)
Critical Pressure, P <sub>c</sub>	667.7 psia	(4603.8 kPa [abs])
Critical Density, D <sub>c</sub>	31.88 lb/ft <sup>3</sup>	(510.6 kg/m <sup>3</sup> )
Critical Volume, V <sub>c</sub>	0.0314 ft <sup>3</sup> /lb	(0.00196 m <sup>3</sup> /kg)

### Units and Factors

t	= temperature in °F
T	= temperature in °R = °F + 459.67
p <sub>f</sub>	= pressure of saturated liquid (bubble point) in psia
p <sub>g</sub>	= pressure of saturated vapor (dew point) in psia
v <sub>f</sub>	= volume of saturated liquid in ft <sup>3</sup> /lb
v <sub>g</sub>	= volume of saturated vapor in ft <sup>3</sup> /lb
V	= volume of superheated vapor in ft <sup>3</sup> /lb
d <sub>f</sub>	= 1/v <sub>f</sub> = density of saturated liquid in lb/ft <sup>3</sup>
d <sub>g</sub>	= 1/v <sub>g</sub> = density of saturated vapor in lb/ft <sup>3</sup>
h <sub>f</sub>	= enthalpy of saturated liquid in Btu/lb
h <sub>fg</sub>	= enthalpy of vaporization in Btu/lb
h <sub>g</sub>	= enthalpy of saturated vapor in Btu/lb
H	= enthalpy of superheated vapor in Btu/lb
s <sub>f</sub>	= entropy of saturated liquid in Btu/(lb) (°R)
s <sub>g</sub>	= entropy of saturated vapor in Btu/(lb) (°R)
S	= entropy of superheated vapor in Btu/(lb) (°R)
C <sub>p</sub>	= heat capacity at constant pressure in Btu/(lb) (°F)
C <sub>v</sub>	= heat capacity at constant volume in Btu/(lb) (°F)
The gas constant, R	= 10.732 (psia) (ft <sup>3</sup> )/(lb-mole) (°R)
for Suva® MP39, R	= 0.1136 (psia) (ft <sup>3</sup> )/(lb) (°R)
Conversion factor from Work Units to Heat Units:	
J	= 0.185053
Btu/lb	= [(psia) (ft <sup>3</sup> )/lb] ∞ J
One atmosphere	= 14.696 psia

Reference point for enthalpy and entropy:

$$h_f = 0.0 \text{ Btu/lb at } -40^\circ\text{F}$$

$$s_f = 0.0 \text{ Btu/(lb) (}^\circ\text{R) at } -40^\circ\text{F}$$

### Equations

The Peng-Robinson-Stryjek-Vera (PRSV) equation of state was used to calculate the tables of thermodynamic properties. It was chosen as the preferred equation of state because it provided an accurate fit of the thermodynamic data over the entire range of temperatures and pressures presented in these tables.

The constants for the PRSV equation of state were calculated in SI units. For conversion of thermodynamic properties to Engineering (I/P) units, conversion factors are provided for each property derived from the PRSV equation of state.

#### 1. Equation of State (PRSV)

$$P = RT/(V-b) - a/(V^2 + 2bV - b^2)$$

where P is in kPa, T is in K, V is in m<sup>3</sup>/mole, and R = 0.008314 kJ/(mole) (K). The constants a and b are calculated as follows:

$$a = \sum_{i=1}^3 \sum_{j=1}^3 x_i x_j a_{ij} \quad b = \sum_{i=1}^3 x_i b_i$$

where

$$a_{ij} = (a_i a_j)^{0.5} (1 - k_{ij}) \quad b_i = 0.077796 RT_{ci}/P_{ci}$$

x<sub>i</sub> = mole fraction of component i

x<sub>j</sub> = mole fraction of component j

$$a_i = (0.457235 R^2 T_{ci}^2/P_{ci}) \alpha_i$$

$$a_j = (0.457235 R^2 T_{cj}^2/P_{cj}) \alpha_j$$

k<sub>ij</sub> = binary interaction parameter for components i and j

$$\alpha_i = [1 + \kappa_i (1 - T_{ri}^{0.5})]^2$$

$$\kappa_i = \kappa_{0i} + \kappa_{1i} [(1 + T_{ri}^{0.5}) (0.7 - T_{ri})]$$

(Note:  $\kappa_i = \kappa_{0i}$  for  $T_r > 0.7$ )

$$\kappa_{0i} = 0.378893 + 1.4897153\omega_i - 0.17131848\omega_i^2 + 0.0196554\omega_i^3$$

$\kappa_{1i}$  = adjustable parameter for component i

$$T_{ri} = T_i/T_{ci} \text{ for component } i$$

Values for  $R$ ,  $T_{ci}$ ,  $P_{ci}$ ,  $\omega_i$ ,  $\kappa_{1i}$ ,  $x_i$ , and  $k_{ij}$  are needed to calculate constants  $a$  and  $b$ .  $R = 0.008314$  kJ/(mole) (K). The remaining constants for Suva<sup>®</sup> MP39 are summarized below:

Component	$T_{ci}$	$P_{ci}$	$\omega_i$	$\kappa_{1i}$	$x_i$
HCFC-22 (i = 1)	369.16	4977.0	0.2214	0.0360	0.57885
HFC-152a (i = 2)	386.44	4519.8	0.2752	-0.0400	0.18587
HCFC-124 (i = 3)	395.39	3616.0	0.2859	0.0490	0.23528

The binary interaction parameters,  $k_{ij}$ , for Suva<sup>®</sup> MP39 are:

$$\begin{aligned}
 k_{11} &= 0.00000 & k_{12} &= -0.02652 & k_{13} &= 0.00052 \\
 k_{21} &= -0.02652 & k_{22} &= 0.0000 & k_{23} &= -0.01314 \\
 k_{31} &= 0.00052 & k_{32} &= -0.01314 & k_{33} &= 0.0000
 \end{aligned}$$

### Ideal Gas Heat Capacity Equation (at constant pressure):

$$\begin{aligned}
 C_p^{\circ}(\text{mixture}) &= \sum_{i=1}^3 x_i C_{pi}^{\circ} \\
 C_{pi}^{\circ} &= 4.184 (A_i + B_i T + C_i T^2 + D_i T^3 \\
 &\quad + E_i T^4 + F_i T^5)
 \end{aligned}$$

where  $C_p^{\circ}$  and  $C_{pi}^{\circ}$  are in J/(mole) (K) and  $T$  is in K.  $x_i$  is the mole fraction of component  $i$  in the mixture (use same values listed in PRSV constants for Suva<sup>®</sup> MP39).

$A_i$ ,  $B_i$ ,  $C_i$ ,  $D_i$ ,  $E_i$ , and  $F_i$  are constants:

$A_1 = 6.164370$ E+00	$B_1 = 0.173407$ E-01
$A_2 = 2.072000$ E+00	$B_2 = 0.572200$ E-01
$A_3 = -4.130590$ E+01	$B_3 = 0.587312$ E+00
$C_1 = 0.557618$ E-04	$D_1 = -0.140596$ E-06
$C_2 = -0.348000$ E-04	$D_2 = 0.810700$ E-08
$C_3 = -0.233021$ E-02	$D_3 = 0.517788$ E-05
$E_1 = 0.120557$ E-09	$F_1 = -0.368814$ E-13
$E_2 = 0.000000$ E+00	$F_2 = 0.000000$ E+00
$E_3 = -0.599647$ E-08	$F_3 = 0.287937$ E-11

Properties calculated in SI units from the equations and constants listed above can be converted to I/P units using the conversion factors shown below. Please note that in converting enthalpy and entropy from SI to I/P units, a change in reference states must be included (from  $H = 200$  and  $S = 1$  at  $0^{\circ}\text{C}$  for SI units to  $H = 0$  and  $S = 0$  at  $-40^{\circ}\text{F}$  for I/P units). In the conversion equations below,  $H(\text{ref})$  and  $S(\text{ref})$  are the saturated liquid enthalpy and entropy at  $-40^{\circ}\text{C}$ . For Suva<sup>®</sup> MP39:  $H(\text{ref}) = 154.0$  kJ/kg and  $S(\text{ref}) = 0.8188$  kJ/kg  $\cdot$  K.

### Conversion Factors (SI units to I/P units):

$P$ (psia)	$= P$ (kPa) $\cdot$ 0.14504
$T$ ( $^{\circ}\text{F}$ )	$= (T[^{\circ}\text{C}] \cdot 1.8) + 32$
$D$ (lb/ft <sup>3</sup> )	$= D$ (kg/m <sup>3</sup> ) $\cdot$ 0.062428
$V$ (ft <sup>3</sup> /lb)	$= V$ (m <sup>3</sup> /kg) $\cdot$ 16.018
$H$ (Btu/lb)	$= [H$ (kJ/kg) $- H(\text{ref})] \cdot 0.43021$
$S$ (Btu/lb $\cdot$ $^{\circ}\text{R}$ )	$= [S$ (kJ/kg $\cdot$ K) $- S(\text{ref})] \cdot 0.23901$
$C_p$ (Btu/lb $\cdot$ $^{\circ}\text{F}$ )	$= C_p$ (kJ/kg $\cdot$ K) $\cdot$ 0.23901
$C_v$ (Btu/lb $\cdot$ $^{\circ}\text{F}$ )	$= C_v$ (kJ/kg $\cdot$ K) $\cdot$ 0.23901

## 2. Vapor Pressure

$$\log_n P = A + B/T + C \log_n T + D T^2$$

### For SI units

$T$  is in K and  $P$  is in kPa (abs)

$A$ ,  $B$ ,  $C$  and  $D$  are constants.

Constants for vapor pressure of saturated liquid (bubble point),  $p_f$ :

$$\begin{aligned}
 A &= 5.62796 \text{ E}+01 & C &= -6.60554 \text{ E}+00 \\
 B &= -3.86068 \text{ E}+03 & D &= 1.07509 \text{ E}-05
 \end{aligned}$$

Constants for vapor pressure of saturated vapor (dew point),  $p_g$ :

$$\begin{aligned}
 A &= 7.52641 \text{ E}+01 & C &= -9.58694 \text{ E}+00 \\
 B &= -4.63581 \text{ E}+03 & D &= 1.58459 \text{ E}-05
 \end{aligned}$$

### For I/P units

$T$  is in  $^{\circ}\text{R}$  and  $P$  is in psia

$A$ ,  $B$ ,  $C$  and  $D$  are constants.

Constants for vapor pressure of saturated liquid (bubble point),  $p_f$ :

$$\begin{aligned}
 A &= 5.82318 \text{ E}+01 & C &= -6.60554 \text{ E}+00 \\
 B &= -6.94931 \text{ E}+03 & D &= 0.33177 \text{ E}-05
 \end{aligned}$$

Constants for vapor pressure of saturated vapor (dew point),  $p_g$ :

$$\begin{aligned}
 A &= 7.89685 \text{ E}+01 & C &= -9.58694 \text{ E}+00 \\
 B &= -8.34448 \text{ E}+03 & D &= 0.48906 \text{ E}-05
 \end{aligned}$$

### 3. Density of the Saturated Liquid

$$d_f/D_c = a_0 + a_1 z + a_2 z^2 + a_3 z^3 + a_4 z^4$$

$$\text{where } z = (1 - T/T_c)^{1/3} - t_0$$

Because both density and temperature appear in the reduced form in the equation, the same constants can be used for either SI or I/P units.

$d_f$  and  $D_c$  are in  $\text{kg/m}^3$  in SI units and  $\text{lb/ft}^3$  in I/P units;  $T$  and  $T_c$  are in K in SI units and  $^\circ\text{R}$  in I/P units;  $a_0, a_1, a_2, a_3, a_4,$  and  $t_0$  are constants:

$$a_0 = 2.301857$$

$$a_3 = -1.362305$$

$$a_1 = 2.833603$$

$$a_4 = -4.522461$$

$$a_2 = 1.826214$$

$$t_0 = 0.5891813$$

**Table 1**  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID V <sub>f</sub>	VAPOR V <sub>g</sub>	LIQUID 1/V <sub>f</sub>	VAPOR 1/V <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID S <sub>f</sub>	VAPOR S <sub>g</sub>	
-150	0.17	0.08	0.0102	416.6667	97.94	0.0024	-26.2	111.6	85.4	-0.0721	0.2968	-150
-149	0.18	0.09	0.0102	400.0000	97.86	0.0025	-26.0	111.5	85.5	-0.0714	0.2959	-149
-148	0.19	0.09	0.0102	384.6154	97.77	0.0026	-25.8	111.4	85.6	-0.0706	0.2951	-148
-147	0.20	0.10	0.0102	357.1429	97.69	0.0028	-25.5	111.3	85.7	-0.0699	0.2942	-147
-146	0.21	0.10	0.0102	344.8276	97.60	0.0029	-25.3	111.2	85.8	-0.0692	0.2934	-146
-145	0.22	0.11	0.0103	322.5806	97.51	0.0031	-25.1	111.1	86.0	-0.0685	0.2926	-145
-144	0.23	0.12	0.0103	303.0303	97.43	0.0033	-24.9	111.0	86.1	-0.0678	0.2917	-144
-143	0.24	0.12	0.0103	294.1176	97.34	0.0034	-24.7	110.8	86.2	-0.0671	0.2909	-143
-142	0.26	0.13	0.0103	277.7778	97.26	0.0036	-24.4	110.7	86.3	-0.0664	0.2901	-142
-141	0.27	0.14	0.0103	263.1579	97.17	0.0038	-24.2	110.6	86.4	-0.0657	0.2893	-141
-140	0.28	0.15	0.0103	250.0000	97.08	0.0040	-24.0	110.5	86.5	-0.0650	0.2885	-140
-139	0.30	0.15	0.0103	238.0952	97.00	0.0042	-23.8	110.4	86.7	-0.0643	0.2878	-139
-138	0.31	0.16	0.0103	222.2222	96.91	0.0045	-23.5	110.3	86.8	-0.0636	0.2870	-138
-137	0.33	0.17	0.0103	212.7660	96.82	0.0047	-23.3	110.2	86.9	-0.0630	0.2862	-137
-136	0.34	0.18	0.0103	204.0816	96.73	0.0049	-23.1	110.1	87.0	-0.0623	0.2855	-136
-135	0.36	0.19	0.0103	192.3077	96.65	0.0052	-22.9	110.0	87.1	-0.0616	0.2847	-135
-134	0.38	0.20	0.0104	181.8182	96.56	0.0055	-22.6	109.9	87.2	-0.0609	0.2840	-134
-133	0.40	0.21	0.0104	175.4386	96.47	0.0057	-22.4	109.8	87.4	-0.0602	0.2833	-133
-132	0.42	0.22	0.0104	166.6667	96.38	0.0060	-22.2	109.7	87.5	-0.0595	0.2825	-132
-131	0.44	0.24	0.0104	158.7302	96.29	0.0063	-22.0	109.6	87.6	-0.0588	0.2818	-131
-130	0.46	0.25	0.0104	151.5152	96.21	0.0066	-21.7	109.5	87.7	-0.0581	0.2811	-130
-129	0.48	0.26	0.0104	142.8571	96.12	0.0070	-21.5	109.4	87.8	-0.0574	0.2804	-129
-128	0.50	0.27	0.0104	136.9863	96.03	0.0073	-21.3	109.3	88.0	-0.0568	0.2797	-128
-127	0.52	0.29	0.0104	131.5789	95.94	0.0076	-21.1	109.2	88.1	-0.0561	0.2790	-127
-126	0.55	0.30	0.0104	125.0000	95.85	0.0080	-20.8	109.0	88.2	-0.0554	0.2784	-126
-125	0.57	0.32	0.0104	119.0476	95.76	0.0084	-20.6	108.9	88.3	-0.0547	0.2777	-125
-124	0.60	0.33	0.0105	113.6364	95.67	0.0088	-20.4	108.8	88.5	-0.0540	0.2770	-124
-123	0.63	0.35	0.0105	108.6957	95.59	0.0092	-20.2	108.7	88.6	-0.0534	0.2764	-123
-122	0.65	0.37	0.0105	104.1667	95.50	0.0096	-19.9	108.6	88.7	-0.0527	0.2757	-122
-121	0.68	0.39	0.0105	99.0099	95.41	0.0101	-19.7	108.5	88.8	-0.0520	0.2751	-121
-120	0.71	0.41	0.0105	95.2381	95.32	0.0105	-19.5	108.4	88.9	-0.0513	0.2744	-120
-119	0.74	0.42	0.0105	90.9091	95.23	0.0110	-19.2	108.3	89.1	-0.0506	0.2738	-119
-118	0.78	0.44	0.0105	86.9565	95.14	0.0115	-19.0	108.2	89.2	-0.0500	0.2732	-118
-117	0.81	0.47	0.0105	83.3333	95.05	0.0120	-18.8	108.1	89.3	-0.0493	0.2726	-117
-116	0.84	0.49	0.0105	80.0000	94.96	0.0125	-18.5	108.0	89.4	-0.0486	0.2720	-116
-115	0.88	0.51	0.0105	76.3359	94.87	0.0131	-18.3	107.9	89.6	-0.0480	0.2713	-115
-114	0.92	0.53	0.0106	73.5294	94.78	0.0136	-18.1	107.8	89.7	-0.0473	0.2707	-114
-113	0.96	0.56	0.0106	70.4225	94.69	0.0142	-17.9	107.7	89.8	-0.0466	0.2702	-113
-112	0.99	0.59	0.0106	67.1141	94.59	0.0149	-17.6	107.6	89.9	-0.0460	0.2696	-112
-111	1.04	0.61	0.0106	64.5161	94.50	0.0155	-17.4	107.4	90.1	-0.0453	0.2690	-111
-110	1.08	0.64	0.0106	62.1118	94.41	0.0161	-17.2	107.3	90.2	-0.0446	0.2684	-110
-109	1.12	0.67	0.0106	59.5238	94.32	0.0168	-16.9	107.2	90.3	-0.0440	0.2679	-109
-108	1.17	0.70	0.0106	57.1429	94.23	0.0175	-16.7	107.1	90.4	-0.0433	0.2673	-108
-107	1.22	0.73	0.0106	54.6448	94.14	0.0183	-16.5	107.0	90.6	-0.0426	0.2667	-107
-106	1.26	0.76	0.0106	52.6316	94.05	0.0190	-16.2	106.9	90.7	-0.0420	0.2662	-106
-105	1.31	0.80	0.0106	50.5051	93.96	0.0198	-16.0	106.8	90.8	-0.0413	0.2656	-105
-104	1.37	0.83	0.0107	48.5437	93.86	0.0206	-15.8	106.7	90.9	-0.0406	0.2651	-104
-103	1.42	0.87	0.0107	46.7290	93.77	0.0214	-15.5	106.6	91.1	-0.0400	0.2646	-103
-102	1.48	0.90	0.0107	44.8430	93.68	0.0223	-15.3	106.5	91.2	-0.0393	0.2641	-102
-101	1.53	0.94	0.0107	43.1034	93.59	0.0232	-15.0	106.4	91.3	-0.0387	0.2635	-101
-100	1.59	0.98	0.0107	41.4938	93.49	0.0241	-14.8	106.3	91.4	-0.0380	0.2630	-100
-99	1.65	1.02	0.0107	40.0000	93.40	0.0250	-14.6	106.2	91.6	-0.0374	0.2625	-99
-98	1.72	1.07	0.0107	38.4615	93.31	0.0260	-14.3	106.0	91.7	-0.0367	0.2620	-98
-97	1.78	1.11	0.0107	37.0370	93.22	0.0270	-14.1	105.9	91.8	-0.0360	0.2615	-97
-96	1.85	1.16	0.0107	35.5872	93.12	0.0281	-13.9	105.8	92.0	-0.0354	0.2610	-96
-95	1.92	1.20	0.0107	34.3643	93.03	0.0291	-13.6	105.7	92.1	-0.0347	0.2605	-95
-94	1.99	1.25	0.0108	33.1126	92.94	0.0302	-13.4	105.6	92.2	-0.0341	0.2600	-94
-93	2.06	1.30	0.0108	31.8471	92.84	0.0314	-13.2	105.5	92.3	-0.0334	0.2596	-93
-92	2.14	1.35	0.0108	30.6748	92.75	0.0326	-12.9	105.4	92.5	-0.0328	0.2591	-92
-91	2.21	1.41	0.0108	29.5858	92.66	0.0338	-12.7	105.3	92.6	-0.0321	0.2586	-91

**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID v <sub>f</sub>	VAPOR v <sub>g</sub>	LIQUID 1/v <sub>f</sub>	VAPOR 1/v <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID s <sub>f</sub>	VAPOR s <sub>g</sub>	
-90	2.29	1.46	0.0108	28.5714	92.56	0.0350	-12.4	105.2	92.7	-0.0315	0.2582	-90
-89	2.38	1.52	0.0108	27.5482	92.47	0.0363	-12.2	105.1	92.9	-0.0308	0.2577	-89
-88	2.46	1.58	0.0108	26.5957	92.37	0.0376	-12.0	104.9	93.0	-0.0302	0.2572	-88
-87	2.55	1.64	0.0108	25.6410	92.28	0.0390	-11.7	104.8	93.1	-0.0295	0.2568	-87
-86	2.64	1.71	0.0108	24.7525	92.18	0.0404	-11.5	104.7	93.3	-0.0289	0.2564	-86
-85	2.73	1.77	0.0109	23.9234	92.09	0.0418	-11.2	104.6	93.4	-0.0283	0.2559	-85
-84	2.83	1.84	0.0109	23.0947	91.99	0.0433	-11.0	104.5	93.5	-0.0276	0.2555	-84
-83	2.92	1.91	0.0109	22.3214	91.90	0.0448	-10.7	104.4	93.6	-0.0270	0.2551	-83
-82	3.03	1.98	0.0109	21.5517	91.80	0.0464	-10.5	104.3	93.8	-0.0263	0.2546	-82
-81	3.13	2.05	0.0109	20.8333	91.71	0.0480	-10.3	104.2	93.9	-0.0257	0.2542	-81
-80	3.23	2.13	0.0109	20.1207	91.61	0.0497	-10.0	104.1	94.0	-0.0250	0.2538	-80
-79	3.34	2.21	0.0109	19.4553	91.52	0.0514	-9.8	103.9	94.2	-0.0244	0.2534	-79
-78	3.46	2.29	0.0109	18.8324	91.42	0.0531	-9.5	103.8	94.3	-0.0238	0.2530	-78
-77	3.57	2.37	0.0109	18.2149	91.33	0.0549	-9.3	103.7	94.4	-0.0231	0.2526	-77
-76	3.69	2.46	0.0110	17.6056	91.23	0.0568	-9.0	103.6	94.6	-0.0225	0.2522	-76
-75	3.81	2.55	0.0110	17.0358	91.13	0.0587	-8.8	103.5	94.7	-0.0219	0.2518	-75
-74	3.94	2.64	0.0110	16.5017	91.04	0.0606	-8.6	103.4	94.8	-0.0212	0.2514	-74
-73	4.07	2.73	0.0110	15.9744	90.94	0.0626	-8.3	103.3	95.0	-0.0206	0.2510	-73
-72	4.20	2.83	0.0110	15.4560	90.84	0.0647	-8.1	103.2	95.1	-0.0200	0.2506	-72
-71	4.33	2.93	0.0110	14.9701	90.75	0.0668	-7.8	103.0	95.2	-0.0193	0.2502	-71
-70	4.47	3.03	0.0110	14.4928	90.65	0.0690	-7.6	102.9	95.4	-0.0187	0.2499	-70
-69	4.61	3.13	0.0110	14.0449	90.55	0.0712	-7.3	102.8	95.5	-0.0181	0.2495	-69
-68	4.76	3.24	0.0111	13.6054	90.46	0.0735	-7.1	102.7	95.6	-0.0174	0.2491	-68
-67	4.91	3.35	0.0111	13.1926	90.36	0.0758	-6.8	102.6	95.8	-0.0168	0.2488	-67
-66	5.06	3.47	0.0111	12.7877	90.26	0.0782	-6.6	102.5	95.9	-0.0162	0.2484	-66
-65	5.22	3.58	0.0111	12.3916	90.16	0.0807	-6.3	102.3	96.0	-0.0155	0.2481	-65
-64	5.38	3.70	0.0111	12.0192	90.07	0.0832	-6.1	102.2	96.2	-0.0149	0.2477	-64
-63	5.54	3.83	0.0111	11.6550	89.97	0.0858	-5.8	102.1	96.3	-0.0143	0.2474	-63
-62	5.71	3.95	0.0111	11.3122	89.87	0.0884	-5.6	102.0	96.4	-0.0136	0.2470	-62
-61	5.89	4.08	0.0111	10.9769	89.77	0.0911	-5.3	101.9	96.6	-0.0130	0.2467	-61
-60	6.06	4.22	0.0112	10.6496	89.67	0.0939	-5.1	101.8	96.7	-0.0124	0.2463	-60
-59	6.25	4.36	0.0112	10.3306	89.57	0.0968	-4.8	101.7	96.8	-0.0118	0.2460	-59
-58	6.43	4.50	0.0112	10.0301	89.47	0.0997	-4.6	101.5	97.0	-0.0111	0.2457	-58
-57	6.62	4.64	0.0112	9.7371	89.38	0.1027	-4.3	101.4	97.1	-0.0105	0.2454	-57
-56	6.82	4.79	0.0112	9.4607	89.28	0.1057	-4.1	101.3	97.2	-0.0099	0.2450	-56
-55	7.02	4.94	0.0112	9.1912	89.18	0.1088	-3.8	101.2	97.4	-0.0093	0.2447	-55
-54	7.22	5.10	0.0112	8.9286	89.08	0.1120	-3.6	101.1	97.5	-0.0087	0.2444	-54
-53	7.43	5.26	0.0112	8.6730	88.98	0.1153	-3.3	100.9	97.6	-0.0080	0.2441	-53
-52	7.65	5.42	0.0113	8.4246	88.88	0.1187	-3.1	100.8	97.8	-0.0074	0.2438	-52
-51	7.87	5.59	0.0113	8.1900	88.78	0.1221	-2.8	100.7	97.9	-0.0068	0.2435	-51
-50	8.09	5.76	0.0113	7.9618	88.68	0.1256	-2.6	100.6	98.0	-0.0062	0.2432	-50
-49	8.32	5.94	0.0113	7.7399	88.58	0.1292	-2.3	100.5	98.2	-0.0056	0.2429	-49
-48	8.55	6.12	0.0113	7.5245	88.48	0.1329	-2.1	100.3	98.3	-0.0049	0.2426	-48
-47	8.79	6.31	0.0113	7.3206	88.38	0.1366	-1.8	100.2	98.4	-0.0043	0.2423	-47
-46	9.04	6.50	0.0113	7.1225	88.28	0.1404	-1.5	100.1	98.6	-0.0037	0.2420	-46
-45	9.29	6.69	0.0113	6.9252	88.18	0.1444	-1.3	100.0	98.7	-0.0031	0.2417	-45
-44	9.54	6.89	0.0114	6.7385	88.07	0.1484	-1.0	99.9	98.8	-0.0025	0.2414	-44
-43	9.81	7.10	0.0114	6.5617	87.97	0.1524	-0.8	99.7	99.0	-0.0019	0.2412	-43
-42	10.07	7.30	0.0114	6.3857	87.87	0.1566	-0.5	99.6	99.1	-0.0012	0.2409	-42
-41	10.35	7.52	0.0114	6.2150	87.77	0.1609	-0.3	99.5	99.2	-0.0006	0.2406	-41
-40	10.62	7.74	0.0114	6.0496	87.67	0.1653	0.0	99.4	99.4	0.0000	0.2403	-40
-39	10.91	7.96	0.0114	5.8928	87.57	0.1697	0.3	99.3	99.5	0.0006	0.2401	-39
-38	11.20	8.19	0.0114	5.7372	87.46	0.1743	0.5	99.1	99.6	0.0012	0.2398	-38
-37	11.50	8.43	0.0114	5.5897	87.36	0.1789	0.8	99.0	99.8	0.0018	0.2395	-37
-36	11.80	8.67	0.0115	5.4466	87.26	0.1836	1.0	98.9	99.9	0.0024	0.2393	-36
-35	12.11	8.91	0.0115	5.3050	87.16	0.1885	1.3	98.8	100.1	0.0031	0.2390	-35
-34	12.42	9.16	0.0115	5.1706	87.05	0.1934	1.6	98.6	100.2	0.0037	0.2388	-34
-33	12.75	9.42	0.0115	5.0378	86.95	0.1985	1.8	98.5	100.3	0.0043	0.2385	-33
-32	13.08	9.68	0.0115	4.9116	86.85	0.2036	2.1	98.4	100.5	0.0049	0.2383	-32
-31	13.41	9.95	0.0115	4.7870	86.75	0.2089	2.3	98.3	100.6	0.0055	0.2380	-31

**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID V <sub>f</sub>	VAPOR V <sub>g</sub>	LIQUID 1/V <sub>f</sub>	VAPOR 1/V <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID S <sub>f</sub>	VAPOR S <sub>g</sub>	
-30	13.75	10.22	0.0115	4.6685	86.64	0.2142	2.6	98.1	100.7	0.0061	0.2378	-30
-29	14.10	10.50	0.0116	4.5517	86.54	0.2197	2.9	98.0	100.9	0.0067	0.2375	-29
-28	14.46	10.79	0.0116	4.4385	86.44	0.2253	3.1	97.9	101.0	0.0073	0.2373	-28
-27	14.82	11.08	0.0116	4.3290	86.33	0.2310	3.4	97.7	101.1	0.0079	0.2371	-27
-26	15.19	11.38	0.0116	4.2230	86.23	0.2368	3.7	97.6	101.3	0.0085	0.2368	-26
-25	15.57	11.68	0.0116	4.1203	86.12	0.2427	3.9	97.5	101.4	0.0091	0.2366	-25
-24	15.96	12.00	0.0116	4.0209	86.02	0.2487	4.2	97.4	101.5	0.0097	0.2364	-24
-23	16.35	12.31	0.0116	3.9246	85.91	0.2548	4.4	97.2	101.7	0.0104	0.2361	-23
-22	16.75	12.64	0.0117	3.8300	85.81	0.2611	4.7	97.1	101.8	0.0110	0.2359	-22
-21	17.16	12.97	0.0117	3.7383	85.70	0.2675	5.0	97.0	101.9	0.0116	0.2357	-21
-20	17.57	13.31	0.0117	3.6496	85.60	0.2740	5.2	96.8	102.1	0.0122	0.2355	-20
-19	17.99	13.65	0.0117	3.5638	85.49	0.2806	5.5	96.7	102.2	0.0128	0.2353	-19
-18	18.43	14.01	0.0117	3.4795	85.39	0.2874	5.8	96.6	102.4	0.0134	0.2350	-18
-17	18.87	14.37	0.0117	3.3979	85.28	0.2943	6.0	96.4	102.5	0.0140	0.2348	-17
-16	19.31	14.73	0.0117	3.3190	85.18	0.3013	6.3	96.3	102.6	0.0146	0.2346	-16
-15	19.77	15.11	0.0118	3.2425	85.07	0.3084	6.6	96.2	102.8	0.0152	0.2344	-15
-14	20.23	15.49	0.0118	3.1676	84.97	0.3157	6.8	96.0	102.9	0.0158	0.2342	-14
-13	20.71	15.88	0.0118	3.0950	84.86	0.3231	7.1	95.9	103.0	0.0164	0.2340	-13
-12	21.19	16.27	0.0118	3.0239	84.75	0.3307	7.4	95.8	103.2	0.0170	0.2338	-12
-11	21.68	16.68	0.0118	2.9560	84.65	0.3383	7.7	95.6	103.3	0.0176	0.2336	-11
-10	22.18	17.09	0.0118	2.8885	84.54	0.3462	7.9	95.5	103.4	0.0182	0.2334	-10
-9	22.68	17.51	0.0118	2.8241	84.43	0.3541	8.2	95.4	103.6	0.0188	0.2332	-9
-8	23.20	17.94	0.0119	2.7609	84.33	0.3622	8.5	95.2	103.7	0.0194	0.2330	-8
-7	23.72	18.38	0.0119	2.6991	84.22	0.3705	8.7	95.1	103.8	0.0200	0.2328	-7
-6	24.26	18.82	0.0119	2.6392	84.11	0.3789	9.0	95.0	104.0	0.0206	0.2326	-6
-5	24.80	19.27	0.0119	2.5813	84.00	0.3874	9.3	94.8	104.1	0.0212	0.2325	-5
-4	25.36	19.74	0.0119	2.5246	83.89	0.3961	9.6	94.7	104.2	0.0218	0.2323	-4
-3	25.92	20.21	0.0119	2.4691	83.79	0.4050	9.8	94.5	104.4	0.0224	0.2321	-3
-2	26.49	20.69	0.0120	2.4155	83.68	0.4140	10.1	94.4	104.5	0.0230	0.2319	-2
-1	27.08	21.18	0.0120	2.3629	83.57	0.4232	10.4	94.3	104.6	0.0235	0.2317	-1
0	27.67	21.67	0.0120	2.3121	83.46	0.4325	10.6	94.1	104.8	0.0241	0.2315	0
1	28.27	22.18	0.0120	2.2624	83.35	0.4420	10.9	94.0	104.9	0.0247	0.2314	1
2	28.89	22.69	0.0120	2.2143	83.24	0.4516	11.2	93.8	105.0	0.0253	0.2312	2
3	29.51	23.22	0.0120	2.1673	83.14	0.4614	11.5	93.7	105.2	0.0259	0.2310	3
4	30.14	23.75	0.0120	2.1213	83.03	0.4714	11.8	93.6	105.3	0.0265	0.2309	4
5	30.79	24.30	0.0121	2.0768	82.92	0.4815	12.0	93.4	105.4	0.0271	0.2307	5
6	31.44	24.85	0.0121	2.0333	82.81	0.4918	12.7	92.9	105.6	0.0285	0.2305	6
7	32.10	25.41	0.0121	1.9908	82.70	0.5023	13.0	92.7	105.7	0.0291	0.2304	7
8	32.77	25.99	0.0121	1.9497	82.59	0.5129	13.2	92.6	105.8	0.0297	0.2302	8
9	33.45	26.57	0.0121	1.9095	82.48	0.5237	13.5	92.5	106.0	0.0303	0.2300	9
10	34.15	27.16	0.0121	1.8702	82.37	0.5347	13.8	92.3	106.1	0.0309	0.2299	10
11	34.85	27.76	0.0122	1.8318	82.26	0.5459	14.1	92.2	106.2	0.0314	0.2297	11
12	35.57	28.37	0.0122	1.7947	82.15	0.5572	14.3	92.0	106.4	0.0320	0.2296	12
13	36.30	29.00	0.0122	1.7581	82.03	0.5688	14.6	91.9	106.5	0.0326	0.2294	13
14	37.03	29.63	0.0122	1.7227	81.92	0.5805	14.9	91.7	106.6	0.0332	0.2293	14
15	37.78	30.28	0.0122	1.6880	81.81	0.5924	15.2	91.6	106.8	0.0338	0.2291	15
16	38.55	30.93	0.0122	1.6543	81.70	0.6045	15.4	91.5	106.9	0.0343	0.2290	16
17	39.32	31.60	0.0123	1.6213	81.59	0.6168	15.7	91.3	107.0	0.0349	0.2288	17
18	40.11	32.28	0.0123	1.5891	81.48	0.6293	16.0	91.2	107.2	0.0355	0.2287	18
19	40.90	32.96	0.0123	1.5576	81.36	0.6420	16.3	91.0	107.3	0.0361	0.2285	19
20	41.71	33.66	0.0123	1.5270	81.25	0.6549	16.6	90.9	107.4	0.0367	0.2284	20
21	42.53	34.38	0.0123	1.4970	81.14	0.6680	16.8	90.7	107.6	0.0372	0.2282	21
22	43.37	35.10	0.0123	1.4678	81.03	0.6813	17.1	90.6	107.7	0.0378	0.2281	22
23	44.22	35.83	0.0124	1.4393	80.91	0.6948	17.4	90.4	107.8	0.0384	0.2280	23
24	45.08	36.58	0.0124	1.4114	80.80	0.7085	17.7	90.3	107.9	0.0390	0.2278	24
25	45.95	37.34	0.0124	1.3841	80.69	0.7225	18.0	90.1	108.1	0.0395	0.2277	25
26	46.83	38.11	0.0124	1.3576	80.58	0.7366	18.2	90.0	108.2	0.0401	0.2275	26
27	47.73	38.89	0.0124	1.3316	80.46	0.7510	18.5	89.8	108.3	0.0407	0.2274	27
28	48.64	39.69	0.0124	1.3062	80.35	0.7656	18.7	89.8	108.5	0.0410	0.2273	28
29	49.57	40.50	0.0125	1.2814	80.23	0.7804	18.9	89.7	108.6	0.0416	0.2271	29



**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID v <sub>f</sub>	VAPOR v <sub>g</sub>	LIQUID 1/v <sub>f</sub>	VAPOR 1/v <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID s <sub>f</sub>	VAPOR s <sub>g</sub>	
30	50.51	41.32	0.0125	1.2571	80.12	0.7955	19.2	89.5	108.7	0.0421	0.2270	30
31	51.46	42.16	0.0125	1.2333	80.01	0.8108	19.5	89.3	108.8	0.0427	0.2269	31
32	52.43	43.00	0.0125	1.2101	79.89	0.8264	19.8	89.2	109.0	0.0433	0.2267	32
33	53.41	43.86	0.0125	1.1875	79.78	0.8421	20.1	89.0	109.1	0.0439	0.2266	33
34	54.40	44.74	0.0126	1.1654	79.66	0.8581	20.4	88.9	109.2	0.0445	0.2265	34
35	55.41	45.63	0.0126	1.1436	79.55	0.8744	20.7	88.7	109.4	0.0450	0.2264	35
36	56.43	46.53	0.0126	1.1225	79.43	0.8909	21.0	88.5	109.5	0.0456	0.2262	36
37	57.47	47.44	0.0126	1.1018	79.32	0.9076	21.2	88.4	109.6	0.0462	0.2261	37
38	58.52	48.37	0.0126	1.0815	79.20	0.9246	21.5	88.2	109.7	0.0468	0.2260	38
39	59.58	49.31	0.0126	1.0618	79.08	0.9418	22.1	87.8	109.9	0.0479	0.2259	39
40	60.66	50.26	0.0127	1.0425	78.97	0.9592	22.4	87.6	110.0	0.0484	0.2258	40
41	61.75	51.23	0.0127	1.0236	78.85	0.9769	22.7	87.5	110.1	0.0490	0.2256	41
42	62.86	52.21	0.0127	1.0052	78.74	0.9948	22.9	87.3	110.2	0.0496	0.2255	42
43	63.99	53.20	0.0127	0.9872	78.62	1.0130	23.2	87.1	110.4	0.0501	0.2254	43
44	65.12	54.21	0.0127	0.9696	78.50	1.0314	23.5	87.0	110.5	0.0507	0.2253	44
45	66.28	55.23	0.0128	0.9523	78.38	1.0501	23.8	86.8	110.6	0.0513	0.2252	45
46	67.45	56.27	0.0128	0.9354	78.27	1.0691	24.1	86.6	110.7	0.0519	0.2251	46
47	68.63	57.33	0.0128	0.9188	78.15	1.0884	24.4	86.5	110.9	0.0524	0.2250	47
48	69.83	58.39	0.0128	0.9026	78.03	1.1079	24.7	86.3	111.0	0.0530	0.2248	48
49	71.05	59.48	0.0128	0.8867	77.91	1.1278	25.0	86.1	111.1	0.0536	0.2247	49
50	72.28	60.58	0.0129	0.8712	77.80	1.1479	25.3	86.0	111.2	0.0541	0.2246	50
51	73.53	61.69	0.0129	0.8559	77.68	1.1683	25.6	85.8	111.4	0.0547	0.2245	51
52	74.79	62.82	0.0129	0.8410	77.56	1.1890	25.9	85.6	111.5	0.0553	0.2244	52
53	76.07	63.97	0.0129	0.8264	77.44	1.2100	26.2	85.4	111.6	0.0559	0.2243	53
54	77.37	65.13	0.0129	0.8122	77.32	1.2312	26.5	85.3	111.7	0.0564	0.2242	54
55	78.69	66.31	0.0130	0.7982	77.20	1.2528	26.8	85.1	111.9	0.0570	0.2241	55
56	80.02	67.50	0.0130	0.7845	77.08	1.2747	27.1	84.9	112.0	0.0576	0.2240	56
57	81.37	68.71	0.0130	0.7711	76.96	1.2969	27.4	84.7	112.1	0.0581	0.2239	57
58	82.73	69.94	0.0130	0.7579	76.84	1.3194	27.7	84.6	112.2	0.0587	0.2238	58
59	84.11	71.18	0.0130	0.7450	76.72	1.3423	28.0	84.4	112.3	0.0593	0.2237	59
60	85.51	72.44	0.0131	0.7324	76.60	1.3654	28.3	84.2	112.5	0.0599	0.2236	60
61	86.93	73.72	0.0131	0.7200	76.48	1.3889	28.6	84.0	112.6	0.0604	0.2235	61
62	88.36	75.02	0.0131	0.7079	76.36	1.4127	28.9	83.8	112.7	0.0610	0.2234	62
63	89.82	76.33	0.0131	0.6959	76.24	1.4369	29.2	83.7	112.8	0.0616	0.2233	63
64	91.29	77.66	0.0131	0.6843	76.12	1.4613	29.5	83.5	112.9	0.0621	0.2232	64
65	92.78	79.00	0.0132	0.6729	76.00	1.4862	29.8	83.3	113.0	0.0627	0.2231	65
66	94.28	80.37	0.0132	0.6617	75.88	1.5113	30.1	83.1	113.2	0.0633	0.2230	66
67	95.81	81.75	0.0132	0.6507	75.75	1.5369	30.4	82.9	113.3	0.0639	0.2229	67
68	97.35	83.15	0.0132	0.6399	75.63	1.5627	30.7	82.7	113.4	0.0644	0.2228	68
69	98.91	84.57	0.0132	0.6293	75.51	1.5890	31.0	82.5	113.5	0.0650	0.2227	69
70	100.49	86.01	0.0133	0.6190	75.39	1.6155	31.3	82.3	113.6	0.0656	0.2226	70
71	102.09	87.46	0.0133	0.6088	75.26	1.6425	31.6	82.1	113.7	0.0662	0.2225	71
72	103.71	88.94	0.0133	0.5989	75.14	1.6698	31.9	82.0	113.9	0.0667	0.2224	72
73	105.35	90.43	0.0133	0.5891	75.02	1.6975	32.2	81.8	114.0	0.0673	0.2223	73
74	107.01	91.94	0.0134	0.5795	74.90	1.7256	32.5	81.6	114.1	0.0679	0.2222	74
75	108.68	93.47	0.0134	0.5701	74.77	1.7541	32.8	81.4	114.2	0.0684	0.2221	75
76	110.38	95.02	0.0134	0.5609	74.65	1.7830	33.1	81.2	114.3	0.0690	0.2220	76
77	112.10	96.59	0.0134	0.5518	74.52	1.8122	33.5	81.0	114.4	0.0696	0.2219	77
78	113.83	98.18	0.0134	0.5429	74.40	1.8419	33.8	80.8	114.5	0.0702	0.2218	78
79	115.59	99.79	0.0135	0.5342	74.27	1.8720	34.1	80.6	114.6	0.0707	0.2217	79
80	117.36	101.42	0.0135	0.5257	74.15	1.9024	34.4	80.4	114.8	0.0713	0.2216	80
81	119.16	103.07	0.0135	0.5173	74.02	1.9333	34.7	80.2	114.9	0.0719	0.2216	81
82	120.98	104.74	0.0135	0.5090	73.90	1.9647	35.0	79.9	115.0	0.0725	0.2215	82
83	122.82	106.43	0.0136	0.5009	73.77	1.9964	35.3	79.7	115.1	0.0730	0.2214	83
84	124.67	108.15	0.0136	0.4930	73.65	2.0286	35.7	79.5	115.2	0.0736	0.2213	84
85	126.55	109.88	0.0136	0.4852	73.52	2.0612	36.0	79.3	115.3	0.0742	0.2212	85
86	128.45	111.63	0.0136	0.4775	73.40	2.0943	36.3	79.1	115.4	0.0748	0.2211	86
87	130.38	113.40	0.0136	0.4700	73.27	2.1278	36.6	78.9	115.5	0.0753	0.2210	87
88	132.32	115.20	0.0137	0.4626	73.14	2.1617	36.9	78.7	115.6	0.0759	0.2209	88
89	134.28	117.02	0.0137	0.4553	73.02	2.1962	37.3	78.5	115.7	0.0765	0.2208	89

**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID v <sub>f</sub>	VAPOR v <sub>g</sub>	LIQUID 1/v <sub>f</sub>	VAPOR 1/v <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID s <sub>f</sub>	VAPOR s <sub>g</sub>	
90	136.27	118.86	0.0137	0.4482	72.89	2.2311	37.6	78.3	115.8	0.0771	0.2207	90
91	138.28	120.72	0.0137	0.4412	72.76	2.2664	37.9	78.0	115.9	0.0776	0.2207	91
92	140.31	122.60	0.0138	0.4343	72.63	2.3023	38.2	77.8	116.0	0.0782	0.2206	92
93	142.36	124.50	0.0138	0.4276	72.50	2.3386	38.5	77.6	116.1	0.0788	0.2205	93
94	144.43	126.43	0.0138	0.4210	72.38	2.3755	38.9	77.4	116.2	0.0794	0.2204	94
95	146.53	128.38	0.0138	0.4145	72.25	2.4128	39.2	77.1	116.3	0.0799	0.2203	95
96	148.65	130.35	0.0139	0.4081	72.12	2.4506	39.5	76.9	116.4	0.0805	0.2202	96
97	150.79	132.35	0.0139	0.4018	71.99	2.4890	39.9	76.7	116.5	0.0811	0.2201	97
98	152.96	134.36	0.0139	0.3956	71.86	2.5279	40.2	76.5	116.6	0.0817	0.2200	98
99	155.14	136.40	0.0139	0.3895	71.73	2.5673	40.5	76.2	116.7	0.0823	0.2199	99
100	157.35	138.47	0.0140	0.3836	71.60	2.6072	40.8	76.0	116.8	0.0828	0.2199	100
101	159.59	140.56	0.0140	0.3777	71.47	2.6477	41.2	75.8	116.9	0.0834	0.2198	101
102	161.85	142.67	0.0140	0.3719	71.34	2.6887	41.5	75.5	117.0	0.0840	0.2197	102
103	164.13	144.80	0.0140	0.3663	71.21	2.7303	41.8	75.3	117.1	0.0846	0.2196	103
104	166.43	146.96	0.0141	0.3607	71.08	2.7725	42.2	75.1	117.2	0.0852	0.2195	104
105	168.76	149.15	0.0141	0.3552	70.95	2.8153	42.5	74.8	117.3	0.0858	0.2194	105
106	171.11	151.36	0.0141	0.3498	70.82	2.8586	42.8	74.6	117.4	0.0863	0.2193	106
107	173.49	153.59	0.0141	0.3445	70.68	2.9025	43.2	74.3	117.5	0.0869	0.2192	107
108	175.89	155.85	0.0142	0.3393	70.55	2.9470	43.5	74.1	117.6	0.0875	0.2191	108
109	178.32	158.13	0.0142	0.3342	70.42	2.9922	43.9	73.8	117.7	0.0881	0.2191	109
110	180.77	160.44	0.0142	0.3292	70.29	3.0379	44.2	73.6	117.8	0.0887	0.2190	110
111	183.25	162.77	0.0143	0.3242	70.15	3.0843	44.5	73.3	117.9	0.0893	0.2189	111
112	185.75	165.13	0.0143	0.3194	70.02	3.1313	44.9	73.1	118.0	0.0898	0.2188	112
113	188.27	167.52	0.0143	0.3146	69.89	3.1790	45.2	72.8	118.0	0.0904	0.2187	113
114	190.82	169.93	0.0143	0.3099	69.75	3.2273	45.6	72.6	118.1	0.0910	0.2186	114
115	193.40	172.37	0.0144	0.3052	69.62	3.2763	45.9	72.3	118.2	0.0916	0.2185	115
116	196.00	174.83	0.0144	0.3007	69.49	3.3260	46.2	72.1	118.3	0.0922	0.2184	116
117	198.63	177.32	0.0144	0.2962	69.35	3.3763	46.6	71.8	118.4	0.0928	0.2183	117
118	201.28	179.84	0.0144	0.2918	69.22	3.4274	46.9	71.5	118.5	0.0934	0.2182	118
119	203.96	182.38	0.0145	0.2874	69.08	3.4791	47.3	71.3	118.6	0.0940	0.2181	119
120	206.67	184.95	0.0145	0.2832	68.94	3.5316	47.6	71.0	118.6	0.0946	0.2180	120
121	209.40	187.55	0.0145	0.2789	68.81	3.5849	48.0	70.7	118.7	0.0951	0.2180	121
122	212.16	190.17	0.0146	0.2748	68.67	3.6388	48.3	70.5	118.8	0.0957	0.2179	122
123	214.95	192.83	0.0146	0.2707	68.54	3.6935	48.7	70.2	118.9	0.0963	0.2178	123
124	217.76	195.51	0.0146	0.2667	68.40	3.7490	49.1	69.9	119.0	0.0969	0.2177	124
125	220.60	198.22	0.0146	0.2628	68.26	3.8053	49.4	69.6	119.0	0.0975	0.2176	125
126	223.47	200.96	0.0147	0.2589	68.12	3.8624	49.8	69.3	119.1	0.0981	0.2175	126
127	226.36	203.72	0.0147	0.2551	67.99	3.9203	50.1	69.1	119.2	0.0987	0.2174	127
128	229.28	206.52	0.0147	0.2513	67.85	3.9790	50.5	68.8	119.3	0.0993	0.2173	128
129	232.23	209.34	0.0148	0.2476	67.71	4.0385	50.8	68.5	119.3	0.0999	0.2172	129
130	235.21	212.19	0.0148	0.2440	67.57	4.0989	51.2	68.2	119.4	0.1005	0.2171	130
131	238.22	215.08	0.0148	0.2404	67.43	4.1602	51.6	67.9	119.5	0.1011	0.2170	131
132	241.25	217.99	0.0149	0.2368	67.29	4.2223	51.9	67.6	119.5	0.1017	0.2169	132
133	244.31	220.93	0.0149	0.2334	67.15	4.2853	52.3	67.3	119.6	0.1023	0.2168	133
134	247.40	223.90	0.0149	0.2299	67.01	4.3493	52.7	67.0	119.7	0.1029	0.2167	134
135	250.52	226.90	0.0150	0.2265	66.87	4.4142	53.0	66.7	119.7	0.1035	0.2166	135
136	253.67	229.94	0.0150	0.2232	66.73	4.4800	53.4	66.4	119.8	0.1041	0.2165	136
137	256.84	233.00	0.0150	0.2199	66.59	4.5468	53.8	66.1	119.9	0.1047	0.2164	137
138	260.05	236.09	0.0150	0.2167	66.45	4.6146	54.2	65.8	119.9	0.1054	0.2163	138
139	263.28	239.22	0.0151	0.2135	66.30	4.6833	54.5	65.5	120.0	0.1060	0.2162	139
140	266.55	242.37	0.0151	0.2104	66.16	4.7531	54.9	65.1	120.0	0.1066	0.2160	140
141	269.84	245.56	0.0151	0.2073	66.02	4.8239	55.3	64.8	120.1	0.1072	0.2159	141
142	273.16	248.78	0.0152	0.2043	65.87	4.8958	55.7	64.5	120.2	0.1078	0.2158	142
143	276.52	252.03	0.0152	0.2013	65.73	4.9688	56.0	64.2	120.2	0.1084	0.2157	143
144	279.90	255.31	0.0152	0.1983	65.59	5.0428	56.4	63.9	120.3	0.1090	0.2156	144
145	283.31	258.63	0.0153	0.1954	65.44	5.1180	56.8	63.5	120.3	0.1096	0.2155	145
146	286.76	261.98	0.0153	0.1925	65.30	5.1944	57.2	63.2	120.4	0.1103	0.2154	146
147	290.23	265.36	0.0153	0.1897	65.15	5.2719	57.6	62.9	120.4	0.1109	0.2153	147
148	293.73	268.77	0.0154	0.1869	65.01	5.3505	58.0	62.5	120.5	0.1115	0.2151	148
149	297.27	272.22	0.0154	0.1841	64.86	5.4304	58.3	62.2	120.5	0.1121	0.2150	149

**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID V <sub>f</sub>	VAPOR V <sub>g</sub>	LIQUID 1/V <sub>f</sub>	VAPOR 1/V <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID S <sub>f</sub>	VAPOR S <sub>g</sub>	
150	300.84	275.70	0.0155	0.1814	64.71	5.5116	58.7	61.8	120.6	0.1128	0.2149	150
151	304.43	279.21	0.0155	0.1788	64.57	5.5940	59.1	61.5	120.6	0.1134	0.2148	151
152	308.06	282.76	0.0155	0.1761	64.42	5.6777	59.5	61.1	120.7	0.1140	0.2147	152
153	311.72	286.35	0.0156	0.1735	64.27	5.7627	59.9	60.8	120.7	0.1146	0.2145	153
154	315.41	289.96	0.0156	0.1710	64.12	5.8491	60.3	60.4	120.7	0.1153	0.2144	154
155	319.14	293.61	0.0156	0.1684	63.97	5.9369	60.7	60.0	120.8	0.1159	0.2143	155
156	322.89	297.30	0.0157	0.1659	63.82	6.0261	61.1	59.7	120.8	0.1165	0.2142	156
157	326.68	301.02	0.0157	0.1635	63.67	6.1167	61.5	59.3	120.8	0.1172	0.2140	157
158	330.50	304.78	0.0157	0.1611	63.52	6.2088	61.9	58.9	120.9	0.1178	0.2139	158
159	334.35	308.57	0.0158	0.1587	63.37	6.3024	62.3	58.5	120.9	0.1185	0.2138	159
160	338.24	312.40	0.0158	0.1563	63.22	6.3976	62.8	58.2	120.9	0.1191	0.2136	160
161	342.15	316.27	0.0159	0.1540	63.07	6.4944	63.2	57.8	120.9	0.1197	0.2135	161
162	346.10	320.17	0.0159	0.1517	62.91	6.5928	63.6	57.4	121.0	0.1204	0.2133	162
163	350.09	324.11	0.0159	0.1494	62.76	6.6928	64.0	57.0	121.0	0.1210	0.2132	163
164	354.10	328.08	0.0160	0.1472	62.61	6.7946	64.4	56.6	121.0	0.1217	0.2131	164
165	358.15	332.10	0.0160	0.1450	62.45	6.8981	64.8	56.2	121.0	0.1223	0.2129	165
166	362.23	336.15	0.0161	0.1428	62.30	7.0034	65.3	55.8	121.0	0.1230	0.2128	166
167	366.35	340.24	0.0161	0.1406	62.14	7.1106	65.7	55.4	121.1	0.1237	0.2126	167
168	370.50	344.36	0.0161	0.1385	61.99	7.2197	66.1	54.9	121.1	0.1243	0.2125	168
169	374.68	348.53	0.0162	0.1364	61.83	7.3307	66.6	54.5	121.1	0.1250	0.2123	169
170	378.90	352.73	0.0162	0.1343	61.67	7.4437	67.0	54.1	121.1	0.1257	0.2121	170
171	383.15	356.97	0.0163	0.1323	61.51	7.5587	67.4	53.7	121.1	0.1263	0.2120	171
172	387.43	361.25	0.0163	0.1303	61.35	7.6759	67.9	53.2	121.1	0.1270	0.2118	172
173	391.75	365.57	0.0163	0.1283	61.19	7.7953	68.3	52.8	121.1	0.1277	0.2116	173
174	396.11	369.93	0.0164	0.1263	61.03	7.9169	68.7	52.3	121.1	0.1284	0.2115	174
175	400.50	374.34	0.0164	0.1244	60.87	8.0408	69.2	51.9	121.1	0.1290	0.2113	175
176	404.92	378.78	0.0165	0.1224	60.71	8.1670	69.6	51.4	121.1	0.1297	0.2111	176
177	409.38	383.26	0.0165	0.1205	60.55	8.2958	70.1	50.9	121.0	0.1304	0.2109	177
178	413.87	387.78	0.0166	0.1187	60.38	8.4270	70.6	50.5	121.0	0.1311	0.2108	178
179	418.40	392.35	0.0166	0.1168	60.22	8.5609	71.0	50.0	121.0	0.1318	0.2106	179
180	422.96	396.95	0.0167	0.1150	60.06	8.6975	71.5	49.5	121.0	0.1325	0.2104	180
181	427.56	401.60	0.0167	0.1132	59.89	8.8369	71.9	49.0	121.0	0.1332	0.2102	181
182	432.20	406.29	0.0167	0.1114	59.72	8.9791	72.4	48.5	120.9	0.1339	0.2100	182
183	436.87	411.02	0.0168	0.1096	59.55	9.1244	72.9	48.0	120.9	0.1346	0.2098	183
184	441.57	415.80	0.0168	0.1078	59.38	9.2727	73.4	47.5	120.8	0.1353	0.2096	184
185	446.31	420.62	0.0169	0.1061	59.21	9.4242	73.9	47.0	120.8	0.1361	0.2094	185
186	451.09	425.48	0.0169	0.1044	59.04	9.5791	74.3	46.4	120.8	0.1368	0.2091	186
187	455.90	430.39	0.0170	0.1027	58.87	9.7374	74.8	45.9	120.7	0.1375	0.2089	187
188	460.75	435.34	0.0170	0.1010	58.70	9.8994	75.3	45.3	120.7	0.1383	0.2087	188
189	465.64	440.34	0.0171	0.0994	58.52	10.0650	75.8	44.8	120.6	0.1390	0.2085	189
190	470.56	445.38	0.0171	0.0977	58.34	10.2346	76.3	44.2	120.5	0.1398	0.2082	190
191	475.51	450.47	0.0172	0.0961	58.17	10.4082	76.8	43.6	120.5	0.1405	0.2080	191
192	480.51	455.60	0.0172	0.0945	57.99	10.5861	77.3	43.0	120.4	0.1413	0.2077	192
193	485.54	460.78	0.0173	0.0929	57.81	10.7684	77.9	42.5	120.3	0.1420	0.2075	193
194	490.60	466.01	0.0174	0.0913	57.63	10.9553	78.4	41.8	120.2	0.1428	0.2072	194
195	495.70	471.29	0.0174	0.0897	57.44	11.1471	78.9	41.2	120.1	0.1436	0.2069	195
196	500.84	476.61	0.0175	0.0882	57.26	11.3440	79.5	40.6	120.1	0.1444	0.2067	196
197	506.01	481.98	0.0175	0.0866	57.07	11.5462	80.0	39.9	119.9	0.1452	0.2064	197
198	511.22	487.40	0.0176	0.0851	56.88	11.7541	80.6	39.3	119.8	0.1460	0.2061	198
199	516.47	492.87	0.0176	0.0836	56.69	11.9679	81.1	38.6	119.7	0.1468	0.2058	199
200	521.75	498.39	0.0177	0.0820	56.49	12.1880	81.7	37.9	119.6	0.1476	0.2055	200
201	527.06	503.97	0.0178	0.0805	56.30	12.4148	82.2	37.2	119.5	0.1485	0.2051	201
202	532.41	509.59	0.0178	0.0791	56.10	12.6486	82.8	36.5	119.3	0.1493	0.2048	202
203	537.80	515.27	0.0179	0.0776	55.89	12.8900	83.4	35.8	119.2	0.1502	0.2045	203
204	543.22	520.99	0.0180	0.0761	55.69	13.1393	84.0	35.0	119.0	0.1510	0.2041	204

**Table 1** (continued)  
**Suva® MP39 Saturation Properties—Temperature Table**

TEMP. °F	PRESSURE psia		VOLUME ft <sup>3</sup> /lb		DENSITY lb/ft <sup>3</sup>		ENTHALPY Btu/lb			ENTROPY Btu/(lb)(°R)		TEMP. °F
	LIQUID P <sub>f</sub>	VAPOR P <sub>g</sub>	LIQUID v <sub>f</sub>	VAPOR v <sub>g</sub>	LIQUID 1/v <sub>f</sub>	VAPOR 1/v <sub>g</sub>	LIQUID h <sub>f</sub>	LATENT h <sub>fg</sub>	VAPOR h <sub>g</sub>	LIQUID s <sub>f</sub>	VAPOR s <sub>g</sub>	
205	548.68	526.78	0.0180	0.0746	55.48	13.3972	84.6	34.2	118.9	0.1519	0.2037	205
206	554.17	532.61	0.0181	0.0732	55.27	13.6642	85.2	33.5	118.7	0.1528	0.2033	206
207	559.70	538.51	0.0182	0.0717	55.05	13.9412	85.9	32.6	118.5	0.1537	0.2029	207
208	565.25	544.46	0.0182	0.0703	54.83	14.2288	86.5	31.8	118.3	0.1546	0.2025	208
209	570.84	550.46	0.0183	0.0688	54.61	14.5279	87.2	30.9	118.1	0.1556	0.2021	209
210	576.47	556.53	0.0184	0.0674	54.38	14.8397	87.8	30.0	117.9	0.1565	0.2016	210
211	582.12	562.66	0.0185	0.0659	54.14	15.1653	88.5	29.1	117.6	0.1575	0.2012	211























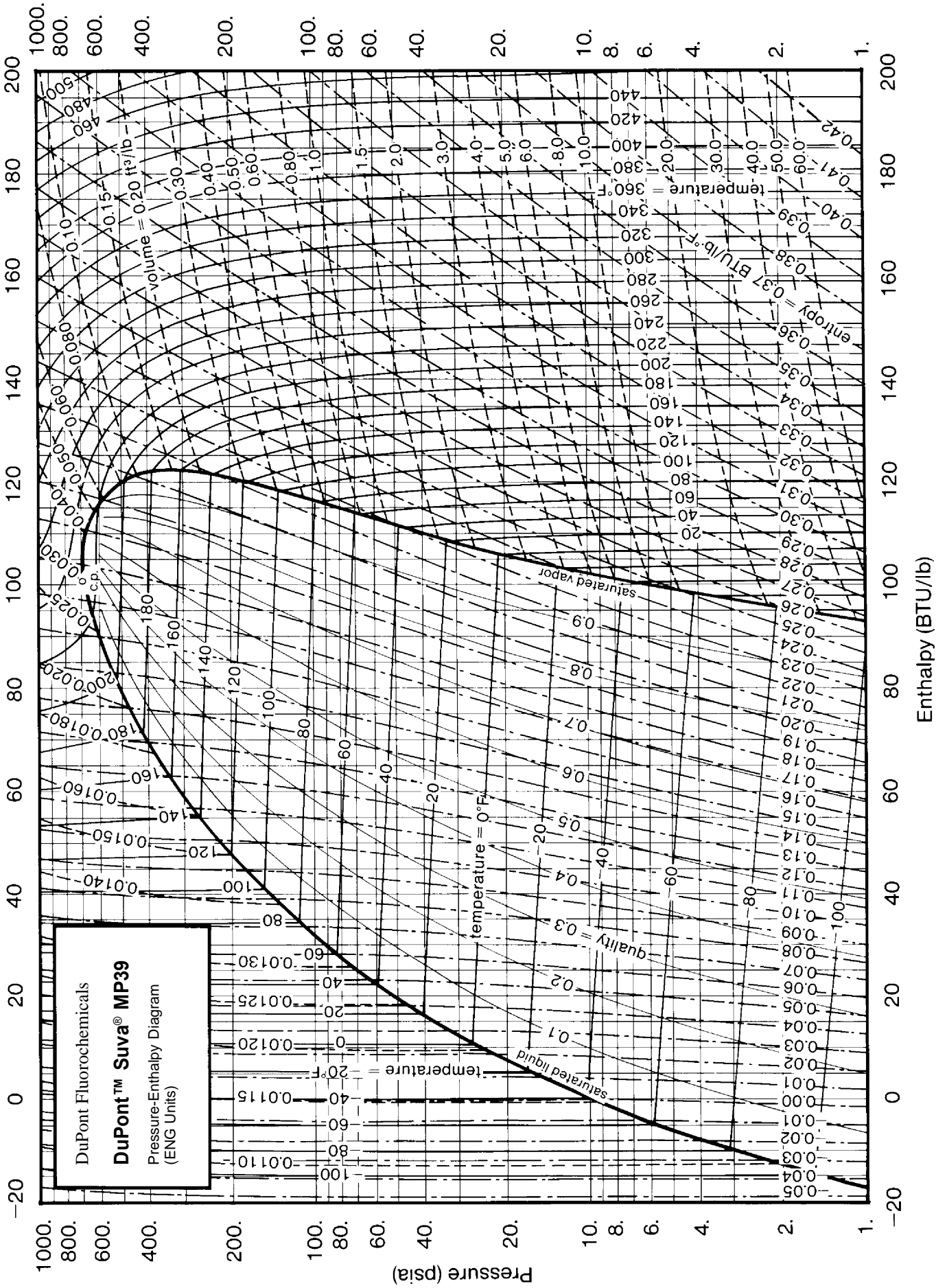
**Table 2** (continued)  
**Suva® MP39 Superheated Vapor—Constant Pressure Tables**

V = Volume in ft<sup>3</sup>/lb    H = Enthalpy in Btu/lb    S = Entropy in Btu/(lb) (°R)    (Saturation Properties in parentheses)

ABSOLUTE PRESSURE, psia													
TEMP. °F	400.00			450.00			500.00			550.00			TEMP. °F
	(180.66°F)			(190.91°F)			(200.29°F)			(208.92°F)			
	V	H	S	V	H	S	V	H	S	V	H	S	
	(0.1138)	(121.0)	(0.2103)	(0.0962)	(120.5)	(0.2080)	(0.0816)	(119.6)	(0.2054)	(0.0689)	(118.1)	(0.2021)	
190	0.1207	123.7	0.2146	—	—	—	—	—	—	—	—	—	190
200	0.1274	126.6	0.2189	0.1032	123.5	0.2127	—	—	—	—	—	—	200
210	0.1335	129.3	0.2229	0.1099	126.6	0.2173	0.0896	123.3	0.2110	0.0702	118.7	0.2030	210
220	0.1393	131.9	0.2268	0.1160	129.5	0.2216	0.0964	126.7	0.2160	0.0790	123.2	0.2097	220
230	0.1447	134.4	0.2306	0.1215	132.3	0.2256	0.1023	129.8	0.2206	0.0858	126.9	0.2151	230
240	0.1500	137.0	0.2342	0.1267	135.0	0.2295	0.1077	132.7	0.2248	0.0916	130.2	0.2199	240
250	0.1550	139.5	0.2378	0.1317	137.6	0.2333	0.1127	135.6	0.2288	0.0968	133.3	0.2243	250
260	0.1598	142.0	0.2412	0.1364	140.2	0.2369	0.1174	138.3	0.2326	0.1016	136.3	0.2284	260
270	0.1645	144.4	0.2446	0.1409	142.8	0.2404	0.1218	141.0	0.2363	0.1061	139.1	0.2323	270
280	0.1691	146.9	0.2479	0.1453	145.3	0.2439	0.1261	143.6	0.2399	0.1103	141.9	0.2361	280
290	0.1736	149.3	0.2512	0.1495	147.8	0.2472	0.1302	146.2	0.2434	0.1143	144.6	0.2397	290
300	0.1779	151.7	0.2544	0.1537	150.3	0.2506	0.1342	148.8	0.2469	0.1182	147.3	0.2433	300
310	0.1822	154.2	0.2576	0.1577	152.8	0.2538	0.1381	151.4	0.2502	0.1219	149.9	0.2468	310
320	0.1864	156.6	0.2608	0.1617	155.3	0.2570	0.1418	153.9	0.2535	0.1255	152.6	0.2501	320
330	0.1906	159.0	0.2639	0.1655	157.8	0.2602	0.1455	156.5	0.2567	0.1291	155.2	0.2535	330
340	0.1946	161.4	0.2669	0.1693	160.2	0.2633	0.1491	159.0	0.2599	0.1325	157.8	0.2567	340
350	0.1986	163.9	0.2699	0.1730	162.7	0.2664	0.1526	161.5	0.2631	0.1358	160.3	0.2599	350
360	0.2026	166.3	0.2729	0.1767	165.2	0.2694	0.1560	164.1	0.2662	0.1391	162.9	0.2631	360
370	0.2065	168.8	0.2759	0.1803	167.7	0.2724	0.1594	166.6	0.2692	0.1423	165.5	0.2662	370
380	0.2104	171.2	0.2788	0.1839	170.2	0.2754	0.1627	169.1	0.2722	0.1455	168.0	0.2693	380
390	0.2142	173.7	0.2817	0.1874	172.6	0.2783	0.1660	171.6	0.2752	0.1486	170.6	0.2723	390
400	0.2180	176.1	0.2846	0.1909	175.1	0.2813	0.1693	174.1	0.2782	0.1516	173.1	0.2753	400
410	0.2217	178.6	0.2874	0.1943	177.6	0.2841	0.1725	176.7	0.2811	0.1546	175.7	0.2782	410
420	0.2254	181.0	0.2903	0.1977	180.1	0.2870	0.1756	179.2	0.2840	0.1576	178.3	0.2812	420
430	0.2291	183.5	0.2931	0.2011	182.6	0.2898	0.1787	181.7	0.2869	0.1605	180.8	0.2841	430
440	0.2327	186.0	0.2959	0.2044	185.1	0.2926	0.1818	184.3	0.2897	0.1634	183.4	0.2869	440
450	0.2363	188.5	0.2986	0.2077	187.7	0.2954	0.1849	186.8	0.2925	0.1662	186.0	0.2898	450
460	0.2399	191.0	0.3014	0.2110	190.2	0.2982	0.1879	189.4	0.2953	0.1691	188.5	0.2926	460
470	0.2435	193.5	0.3041	0.2143	192.7	0.3009	0.1909	191.9	0.2981	0.1719	191.1	0.2954	470
480	0.2470	196.1	0.3068	0.2175	195.3	0.3037	0.1939	194.5	0.3008	0.1746	193.7	0.2982	480
490	0.2505	198.6	0.3095	0.2207	197.8	0.3064	0.1968	197.1	0.3035	0.1774	196.3	0.3009	490
500	—	—	—	0.2239	200.4	0.3091	0.1998	199.7	0.3062	0.1801	198.9	0.3036	500
510	—	—	—	—	—	—	0.2027	202.3	0.3089	0.1828	201.5	0.3064	510







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## For Further Information:

DuPont Fluorochemicals  
Wilmington, DE 19880-0711  
(800) 235-Suva  
[www.suva.dupont.com](http://www.suva.dupont.com)

---

### Europe

DuPont de Nemours  
International S.A.  
2 Chemin du Pavillon  
P.O. Box 50  
CH-1218 Le Grand-Saconnex  
Geneva, Switzerland  
41-22-717-5111

### Canada

DuPont Canada, Inc.  
P.O. Box 2200, Streetsville  
Mississauga, Ontario  
Canada  
L5M 2H3  
(905) 821-3300

### Mexico

DuPont, S.A. de C.V.  
Homero 206  
Col. Chapultepec Morales  
C.P. 11570 Mexico, D.F.  
52-5-722-1100

### South America

DuPont do Brasil S.A.  
Alameda Itapecuru, 506  
Alphaville 06454-080 Barueri  
São Paulo, Brazil  
55-11-7266-8263

DuPont Argentina S.A.  
Casilla Correo 1888  
Correo Central  
1000 Buenos Aires, Argentina  
54-1-311-8167

### Pacific

DuPont Australia  
P.O. Box 930  
North Sydney, NSW 2060  
Australia  
61-2-99236111

### Japan

Mitsui DuPont Fluorochemicals  
Co., Ltd.  
Chiyoda Honsha Bldg.  
5-18, 1-Chome Sarugakucho  
Chiyoda-Ku, Tokyo 101-0064 Japan  
81-3-5281-5805

### Asia

DuPont Taiwan  
P.O. Box 81-777  
Taipei, Taiwan  
886-2-514-4400

DuPont China Limited  
P.O. Box TST 98851  
1122 New World Office Bldg.  
(East Wing)  
Tsim Sha Tsui  
Kowloon, Hong Kong  
Phone: 852-734-5398  
Fax: 852-236-83516

DuPont Thailand Ltd.  
9-11 Floor, Yada Bldg.  
56 Silom Road  
Suriyawongse, Bankrak  
Bangkok 10500  
Phone: 66-2-238-0026  
Fax: 66-2-238-4396

DuPont China Ltd.  
Rm. 1704, Union Bldg.  
100 Yenan Rd. East  
Shanghai, PR China 200 002  
Phone: 86-21-328-3738  
Telex: 33448 DCLSH CN  
Fax: 86-21-320-2304

DuPont Far East Inc.  
6th Floor Bangunan Samudra  
No. 1 JLN. Kontraktor U1/14, SEK U1  
Hicom-Glenmarie Industrial Park  
40150 Shah Alam, Selangor Malaysia  
Phone 60-3-517-2534

DuPont Korea Inc.  
4/5th Floor, Asia Tower  
#726, Yeoksam-dong, Kangnam-ku  
Seoul, 135-082, Korea  
82-2-721-5114

DuPont Singapore Pte. Ltd.  
1 Maritime Square #07 01  
World Trade Centre  
Singapore 0409  
65-273-2244

DuPont Far East, Philippines  
8th Floor, Solid Bank Bldg.  
777 Paseo de Roxas  
Makati, Metro Manila  
Philippines  
Phone: 63-2-818-9911  
Fax: 63-2-818-9659

DuPont Far East Inc.  
7A Murray's Gate Road  
Alwarpet  
Madras, 600 018, India  
91-44-454-029

DuPont Far East Inc.—Pakistan  
9 Khayaban-E-Shaheen  
Defence Phase 5  
Karachi, Pakistan  
92-21-533-350

DuPont Far East Inc.  
P.O. Box 2553/Jkt  
Jakarta 10001, Indonesia  
62-21-517-800

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