

TABLE 1. THERMODYNAMIC PROPERTIES OF MOIST AIR<sup>a</sup> (STANDARD ATMOSPHERIC PRESSURE, 29.921 IN. HG) (Continued)

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CHAPTER 3

1950 Guide

| FAHR.<br>TEMP.<br>(°F) | HUMIDITY<br>RATIO<br>$W \times 10$ | VOLUME<br>CU FT/LB DRY AIR |          |        | ENTHALPY<br>BTU/LB DRY AIR |          |        | ENTROPY<br>BTU PER (°F) (LB DRY AIR) |          |        | CONDENSED WATER             |                                      |                               | FAHR.<br>TEMP.<br>(°F) |
|------------------------|------------------------------------|----------------------------|----------|--------|----------------------------|----------|--------|--------------------------------------|----------|--------|-----------------------------|--------------------------------------|-------------------------------|------------------------|
|                        |                                    | $v_a$                      | $v_{as}$ | $v_g$  | $h_a$                      | $h_{as}$ | $h_g$  | $s_a$                                | $s_{as}$ | $s_g$  | Enthalpy<br>Btu/Lb<br>$h_w$ | Entropy<br>Btu/(Lb)<br>(°F)<br>$s_w$ | Vap. Press<br>In. Hg<br>$p_g$ |                        |
| 105                    | 0.5070                             | 14.232                     | 1.155    | 15.387 | 25.232                     | 56.11    | 81.34  | 0.04943                              | 0.1052   | 0.1546 | 73.04                       | 0.1385                               | 2.2439                        | 105                    |
| 106                    | 0.5234                             | 14.238                     | 1.194    | 15.452 | 25.472                     | 57.95    | 83.42  | 0.04985                              | 0.1085   | 0.1584 | 74.04                       | 0.1403                               | 2.3109                        | 106                    |
| 107                    | 0.5404                             | 14.283                     | 1.235    | 15.518 | 25.713                     | 59.85    | 85.56  | 0.05028                              | 0.1118   | 0.1621 | 75.04                       | 0.1421                               | 2.3797                        | 107                    |
| 108                    | 0.5578                             | 14.308                     | 1.278    | 15.586 | 25.953                     | 61.80    | 87.76  | 0.05070                              | 0.1153   | 0.1660 | 76.04                       | 0.1438                               | 2.4502                        | 108                    |
| 109                    | 0.5758                             | 14.333                     | 1.321    | 15.654 | 26.194                     | 63.82    | 90.03  | 0.05113                              | 0.1189   | 0.1700 | 77.04                       | 0.1456                               | 2.5225                        | 109                    |
| 110                    | 0.5944                             | 14.359                     | 1.365    | 15.724 | 26.434                     | 65.91    | 92.34  | 0.05155                              | 0.1226   | 0.1742 | 78.03                       | 0.1472                               | 2.5966                        | 110                    |
| 111                    | 0.6135                             | 14.384                     | 1.412    | 15.796 | 26.675                     | 68.05    | 94.72  | 0.05197                              | 0.1264   | 0.1784 | 79.03                       | 0.1491                               | 2.6728                        | 111                    |
| 112                    | 0.6333                             | 14.409                     | 1.460    | 15.869 | 26.915                     | 70.27    | 97.18  | 0.05239                              | 0.1302   | 0.1826 | 80.03                       | 0.1508                               | 2.7505                        | 112                    |
| 113                    | 0.6536                             | 14.435                     | 1.509    | 15.944 | 27.156                     | 72.55    | 99.71  | 0.05281                              | 0.1342   | 0.1870 | 81.03                       | 0.1525                               | 2.8304                        | 113                    |
| 114                    | 0.6746                             | 14.460                     | 1.560    | 16.020 | 27.397                     | 74.91    | 102.31 | 0.05323                              | 0.1384   | 0.1916 | 82.03                       | 0.1543                               | 2.9123                        | 114                    |
| 115                    | 0.6962                             | 14.485                     | 1.613    | 16.098 | 27.637                     | 77.34    | 104.98 | 0.05365                              | 0.1426   | 0.1963 | 83.03                       | 0.1560                               | 2.9982                        | 115                    |
| 116                    | 0.7185                             | 14.510                     | 1.668    | 16.178 | 27.878                     | 79.85    | 107.73 | 0.05407                              | 0.1470   | 0.2011 | 84.03                       | 0.1577                               | 3.0821                        | 116                    |
| 117                    | 0.7415                             | 14.536                     | 1.723    | 16.259 | 28.119                     | 82.43    | 110.55 | 0.05449                              | 0.1515   | 0.2060 | 85.02                       | 0.1595                               | 3.1701                        | 117                    |
| 118                    | 0.7652                             | 14.561                     | 1.782    | 16.343 | 28.359                     | 85.10    | 113.46 | 0.05490                              | 0.1562   | 0.2111 | 86.02                       | 0.1612                               | 3.2603                        | 118                    |
| 119                    | 0.7897                             | 14.586                     | 1.842    | 16.428 | 28.600                     | 87.86    | 116.46 | 0.05532                              | 0.1610   | 0.2163 | 87.02                       | 0.1629                               | 3.3527                        | 119                    |
| 120                    | 0.8149                             | 14.611                     | 1.905    | 16.516 | 28.841                     | 90.70    | 119.54 | 0.05573                              | 0.1659   | 0.2216 | 88.01                       | 0.1646                               | 3.4474                        | 120                    |
| 121                    | 0.8410                             | 14.637                     | 1.968    | 16.605 | 29.082                     | 93.64    | 122.72 | 0.05615                              | 0.1710   | 0.2272 | 89.01                       | 0.1664                               | 3.5443                        | 121                    |
| 122                    | 0.8678                             | 14.662                     | 2.034    | 16.696 | 29.322                     | 96.66    | 125.98 | 0.05656                              | 0.1763   | 0.2329 | 90.01                       | 0.1681                               | 3.6436                        | 122                    |
| 123                    | 0.8955                             | 14.687                     | 2.103    | 16.790 | 29.563                     | 99.79    | 129.35 | 0.05698                              | 0.1817   | 0.2387 | 91.01                       | 0.1698                               | 3.7452                        | 123                    |
| 124                    | 0.9242                             | 14.712                     | 2.174    | 16.886 | 29.804                     | 103.0    | 132.8  | 0.05739                              | 0.1872   | 0.2446 | 92.01                       | 0.1715                               | 3.8493                        | 124                    |
| 125                    | 0.9537                             | 14.738                     | 2.247    | 16.985 | 30.044                     | 106.4    | 136.4  | 0.05780                              | 0.1930   | 0.2508 | 93.01                       | 0.1732                               | 3.9558                        | 125                    |
| 126                    | 0.9841                             | 14.763                     | 2.323    | 17.086 | 30.285                     | 109.8    | 140.1  | 0.05821                              | 0.1989   | 0.2571 | 94.01                       | 0.1749                               | 4.0649                        | 126                    |
| 127                    | 1.016                              | 14.788                     | 2.401    | 17.189 | 30.526                     | 113.4    | 143.9  | 0.05862                              | 0.2050   | 0.2636 | 95.00                       | 0.1766                               | 4.1765                        | 127                    |
| 128                    | 1.048                              | 14.813                     | 2.482    | 17.295 | 30.766                     | 117.0    | 147.8  | 0.05903                              | 0.2113   | 0.2703 | 96.00                       | 0.1783                               | 4.2907                        | 128                    |
| 129                    | 1.082                              | 14.839                     | 2.565    | 17.404 | 31.007                     | 120.8    | 151.8  | 0.05944                              | 0.2178   | 0.2772 | 97.00                       | 0.1800                               | 4.4076                        | 129                    |
| 130                    | 1.116                              | 14.864                     | 2.652    | 17.516 | 31.248                     | 124.7    | 155.9  | 0.05985                              | 0.2245   | 0.2844 | 98.00                       | 0.1817                               | 4.5272                        | 130                    |
| 131                    | 1.152                              | 14.889                     | 2.742    | 17.631 | 31.489                     | 128.8    | 160.3  | 0.06026                              | 0.2314   | 0.2917 | 99.00                       | 0.1834                               | 4.6495                        | 131                    |
| 132                    | 1.189                              | 14.915                     | 2.834    | 17.749 | 31.729                     | 133.0    | 164.7  | 0.06067                              | 0.2386   | 0.2993 | 100.00                      | 0.1851                               | 4.7747                        | 132                    |
| 133                    | 1.227                              | 14.940                     | 2.930    | 17.870 | 31.970                     | 137.3    | 169.3  | 0.06108                              | 0.2459   | 0.3070 | 101.00                      | 0.1868                               | 4.9028                        | 133                    |
| 134                    | 1.267                              | 14.965                     | 3.029    | 17.994 | 32.211                     | 141.6    | 174.0  | 0.06148                              | 0.2536   | 0.3151 | 102.00                      | 0.1886                               | 5.0337                        | 134                    |
| 135                    | 1.308                              | 14.990                     | 3.132    | 18.122 | 32.452                     | 146.4    | 178.9  | 0.06189                              | 0.2614   | 0.3233 | 103.00                      | 0.1902                               | 5.1676                        | 135                    |
| 136                    | 1.350                              | 15.016                     | 3.237    | 18.253 | 32.692                     | 151.2    | 183.9  | 0.06229                              | 0.2695   | 0.3318 | 104.00                      | 0.1918                               | 5.3046                        | 136                    |
| 137                    | 1.393                              | 15.041                     | 3.348    | 18.389 | 32.933                     | 156.1    | 189.0  | 0.06270                              | 0.2778   | 0.3405 | 105.00                      | 0.1935                               | 5.4446                        | 137                    |
| 138                    | 1.439                              | 15.066                     | 3.462    | 18.528 | 33.174                     | 161.2    | 194.4  | 0.06310                              | 0.2865   | 0.3496 | 106.00                      | 0.1952                               | 5.5878                        | 138                    |
| 139                    | 1.485                              | 15.091                     | 3.580    | 18.671 | 33.414                     | 166.5    | 199.9  | 0.06350                              | 0.2954   | 0.3589 | 107.00                      | 0.1969                               | 5.7342                        | 139                    |

<sup>a</sup>Compiled by John A. Goff and S. Gratch.TABLE 1. THERMODYNAMIC PROPERTIES OF MOIST AIR<sup>a</sup> (STANDARD ATMOSPHERIC PRESSURE, 29.921 IN. HG) (Continued)

Thermodynamics

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| FAHR.<br>TEMP.<br>(°F) | HUMIDITY<br>RATIO<br>W <sub>9</sub> | VOLUME<br>CU FT/LB DRY AIR |                 |                | ENTHALPY<br>BTU/LB DRY AIR |                 |                | ENTROPY<br>BTU PER (°F) (LB DRY AIR) |                 |                | CONDENSED WATER                      |                                               |                                        | FAHR.<br>TEMP.<br>(°F) |
|------------------------|-------------------------------------|----------------------------|-----------------|----------------|----------------------------|-----------------|----------------|--------------------------------------|-----------------|----------------|--------------------------------------|-----------------------------------------------|----------------------------------------|------------------------|
|                        |                                     | v <sub>a</sub>             | v <sub>as</sub> | v <sub>g</sub> | h <sub>a</sub>             | h <sub>as</sub> | h <sub>g</sub> | s <sub>a</sub>                       | s <sub>as</sub> | s <sub>g</sub> | Enthalpy<br>Btu/Lb<br>h <sub>w</sub> | Entropy<br>Btu/(Lb)<br>(°F)<br>s <sub>w</sub> | Vap. Press<br>In. Hg<br>p <sub>s</sub> |                        |
| 140                    | 0.1534                              | 15.117                     | 3.702           | 18.819         | 33.655                     | 172.0           | 205.7          | 0.06390                              | 0.3047          | 0.3686         | 107.99                               | 0.1985                                        | 5.8338                                 | 140                    |
| 141                    | 0.1584                              | 15.142                     | 3.829           | 18.971         | 33.896                     | 177.7           | 211.0          | 0.06430                              | 0.3142          | 0.3785         | 108.99                               | 0.2002                                        | 6.0367                                 | 141                    |
| 142                    | 0.1636                              | 15.167                     | 3.961           | 19.128         | 34.136                     | 183.6           | 217.7          | 0.06470                              | 0.3241          | 0.3888         | 109.99                               | 0.2018                                        | 6.1930                                 | 142                    |
| 143                    | 0.1689                              | 15.192                     | 4.098           | 19.290         | 34.377                     | 189.7           | 224.1          | 0.06510                              | 0.3343          | 0.3994         | 110.99                               | 0.2035                                        | 6.3527                                 | 143                    |
| 144                    | 0.1745                              | 15.218                     | 4.239           | 19.457         | 34.618                     | 196.0           | 230.6          | 0.06549                              | 0.3449          | 0.4104         | 111.99                               | 0.2051                                        | 6.5160                                 | 144                    |
| 145                    | 0.1803                              | 15.243                     | 4.386           | 19.629         | 34.859                     | 202.5           | 237.4          | 0.06589                              | 0.3559          | 0.4218         | 112.99                               | 0.2068                                        | 6.6828                                 | 145                    |
| 146                    | 0.1862                              | 15.268                     | 4.539           | 19.807         | 35.099                     | 209.3           | 244.4          | 0.06629                              | 0.3672          | 0.4335         | 113.99                               | 0.2084                                        | 6.8532                                 | 146                    |
| 147                    | 0.1924                              | 15.293                     | 4.693           | 19.991         | 35.340                     | 216.4           | 251.7          | 0.06669                              | 0.3790          | 0.4457         | 114.99                               | 0.2101                                        | 7.0273                                 | 147                    |
| 148                    | 0.1989                              | 15.319                     | 4.862           | 20.181         | 35.581                     | 223.7           | 259.3          | 0.06708                              | 0.3912          | 0.4583         | 115.99                               | 0.2117                                        | 7.2051                                 | 148                    |
| 149                    | 0.2055                              | 15.344                     | 5.033           | 20.377         | 35.822                     | 231.3           | 267.1          | 0.06748                              | 0.4038          | 0.4713         | 116.99                               | 0.2134                                        | 7.3867                                 | 149                    |
| 150                    | 0.2125                              | 15.369                     | 5.211           | 20.580         | 36.063                     | 239.2           | 275.3          | 0.06787                              | 0.4169          | 0.4848         | 117.99                               | 0.2150                                        | 7.5722                                 | 150                    |
| 151                    | 0.2197                              | 15.394                     | 5.396           | 20.790         | 36.304                     | 247.3           | 283.6          | 0.06827                              | 0.4304          | 0.4987         | 118.99                               | 0.2167                                        | 7.7616                                 | 151                    |
| 152                    | 0.2271                              | 15.420                     | 5.587           | 21.007         | 36.545                     | 255.9           | 292.4          | 0.06866                              | 0.4445          | 0.5132         | 119.99                               | 0.2183                                        | 7.9550                                 | 152                    |
| 153                    | 0.2349                              | 15.445                     | 5.788           | 21.233         | 36.785                     | 264.7           | 301.5          | 0.06906                              | 0.4591          | 0.5282         | 120.99                               | 0.2200                                        | 8.1525                                 | 153                    |
| 154                    | 0.2430                              | 15.470                     | 5.996           | 21.466         | 37.026                     | 273.0           | 310.9          | 0.06945                              | 0.4743          | 0.5438         | 121.99                               | 0.2216                                        | 8.3541                                 | 154                    |
| 155                    | 0.2514                              | 15.496                     | 6.213           | 21.709         | 37.267                     | 283.5           | 320.8          | 0.06984                              | 0.4901          | 0.5599         | 122.99                               | 0.2232                                        | 8.5599                                 | 155                    |
| 156                    | 0.2602                              | 15.521                     | 6.439           | 21.960         | 37.508                     | 293.5           | 331.0          | 0.07023                              | 0.5060          | 0.5768         | 123.99                               | 0.2248                                        | 8.7701                                 | 156                    |
| 157                    | 0.2693                              | 15.546                     | 6.675           | 22.221         | 37.749                     | 303.9           | 341.7          | 0.07062                              | 0.5237          | 0.5943         | 124.99                               | 0.2265                                        | 8.9846                                 | 157                    |
| 158                    | 0.2788                              | 15.571                     | 6.922           | 22.493         | 37.990                     | 314.7           | 352.7          | 0.07101                              | 0.5415          | 0.6125         | 125.99                               | 0.2281                                        | 9.2036                                 | 158                    |
| 159                    | 0.2887                              | 15.597                     | 7.178           | 22.775         | 38.231                     | 326.0           | 364.2          | 0.07140                              | 0.5600          | 0.6314         | 127.00                               | 0.2297                                        | 9.4271                                 | 159                    |
| 160                    | 0.2990                              | 15.622                     | 7.446           | 23.068         | 38.472                     | 337.8           | 376.3          | 0.07179                              | 0.5793          | 0.6511         | 128.00                               | 0.2313                                        | 9.6556                                 | 160                    |
| 161                    | 0.3098                              | 15.647                     | 7.727           | 23.374         | 38.713                     | 350.1           | 388.8          | 0.07218                              | 0.5994          | 0.6716         | 129.00                               | 0.2329                                        | 9.8876                                 | 161                    |
| 162                    | 0.3211                              | 15.672                     | 8.020           | 23.692         | 38.954                     | 363.0           | 402.0          | 0.07257                              | 0.6204          | 0.6930         | 130.00                               | 0.2345                                        | 10.125                                 | 162                    |
| 163                    | 0.3329                              | 15.698                     | 8.326           | 24.024         | 39.195                     | 376.5           | 415.7          | 0.07296                              | 0.6423          | 0.7153         | 131.00                               | 0.2361                                        | 10.367                                 | 163                    |
| 164                    | 0.3452                              | 15.723                     | 8.648           | 24.371         | 39.436                     | 390.6           | 429.9          | 0.07334                              | 0.6652          | 0.7385         | 132.00                               | 0.2377                                        | 10.614                                 | 164                    |
| 165                    | 0.3581                              | 15.748                     | 8.985           | 24.733         | 39.677                     | 405.3           | 445.0          | 0.07373                              | 0.6892          | 0.7629         | 133.00                               | 0.2393                                        | 10.866                                 | 165                    |
| 166                    | 0.3716                              | 15.773                     | 9.339           | 25.112         | 39.918                     | 420.8           | 460.7          | 0.07411                              | 0.7142          | 0.7883         | 134.00                               | 0.2409                                        | 11.123                                 | 166                    |
| 167                    | 0.3858                              | 15.799                     | 9.708           | 25.507         | 40.159                     | 437.0           | 477.2          | 0.07450                              | 0.7405          | 0.8150         | 135.01                               | 0.2426                                        | 11.385                                 | 167                    |
| 168                    | 0.4007                              | 15.824                     | 10.098          | 25.922         | 40.400                     | 454.0           | 494.4          | 0.07488                              | 0.7680          | 0.8429         | 136.01                               | 0.2441                                        | 11.652                                 | 168                    |
| 169                    | 0.4163                              | 15.849                     | 10.508          | 26.357         | 40.641                     | 471.8           | 512.4          | 0.07527                              | 0.7969          | 0.8722         | 137.01                               | 0.2457                                        | 11.925                                 | 169                    |
| 170                    | 0.4327                              | 15.874                     | 10.938          | 26.812         | 40.882                     | 490.6           | 531.5          | 0.07565                              | 0.8273          | 0.9030         | 138.01                               | 0.2473                                        | 12.203                                 | 170                    |
| 171                    | 0.4500                              | 15.900                     | 11.391          | 27.291         | 41.123                     | 510.4           | 551.5          | 0.07603                              | 0.8592          | 0.9352         | 139.01                               | 0.2489                                        | 12.486                                 | 171                    |
| 172                    | 0.4682                              | 15.925                     | 11.870          | 27.795         | 41.364                     | 531.3           | 572.7          | 0.07641                              | 0.8927          | 0.9691         | 140.01                               | 0.2505                                        | 12.776                                 | 172                    |
| 173                    | 0.4875                              | 15.950                     | 12.376          | 28.326         | 41.605                     | 553.5           | 594.9          | 0.07680                              | 0.9281          | 1.0049         | 141.01                               | 0.2521                                        | 13.069                                 | 173                    |
| 174                    | 0.5078                              | 15.975                     | 12.911          | 28.896         | 41.846                     | 576.3           | 618.3          | 0.07718                              | 0.9684          | 1.0426         | 142.02                               | 0.2537                                        | 13.369                                 | 174                    |