REPORT No. 218

STANDARD ATMOSPHERE—TABLES AND DATA

By WALTER S. DIEHL

Bureau of Aeronautics, Navy Department

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SUMMARY

This report is an extension of National Advisory Committee for Aeronautics Report No. 147. Detailed tables of pressures and densities are given for altitudes up to 20,000 meters and to 65,000 feet. In addition to the tables the various data pertaining to the standard atmosphere have been compiled in convenient form for ready reference.

INTRODUCTION

A full account of the research conducted by the United States Weather Bureau in laying the foundation for a standard atmosphere is given in Mr. W. R. Gregg's paper on "Standard Atmosphere" (Reference 1). Briefly, the Weather Bureau found that the average annual conditions for latitude 40° in the United States were closely represented by Toussaint's formula for linear decrease in temperature with altitude,

$$T = T_0 - .0065Z \qquad (1)$$

where T is the temperature in °C. at the altitude Z in meters. The maximum altitude at which this formula can be applied is determined by the temperature of the isothermal atmosphere. This point will be discussed later.

Toussaint's formula not only fulfilled the requirements of simplicity and reasonable accuracy but also had the advantage of being extensively used in Europe. It was therefore adopted by the National Advisory Committee for Aeronautics as the basis of a standard atmosphere for aeronautical work in the United States.

In addition to the aerological observations which led to the recommendation and adoption of a linear decrease in temperature with altitude, Report No. 147 contained brief tables of pressures and densities in the standard atmosphere. These tables were not carried beyond an altitude of 10,000 meters or 33,000 feet although provision was made for extension when required. Subsequent general use has indicated the need of more detailed tables carried up to altitudes of 20,000 meters or 65,000 feet. It is the purpose of this report to supply such tables together with miscellaneous data on the standard atmosphere compiled in a form convenient for ready reference.

OFFICIAL ADOPTION OF BASIC PHYSICAL CONSTANTS

At a regular meeting of the executive committee of the National Advisory Committee for Aeronautics held on December 2, 1924, Dr. Joseph S. Ames, chairman of the committee on aerodynamics, submitted the following letter, dated November 26, 1924, from the committee on aerodynamics:

The Executive Committee,
National Advisory Committee for Aeronautics,
Washington, D. C.

Gentlemen: The committee on aerodynamics, by resolution adopted at its meeting held on October 11 1924, recommended that the National Advisory Committee for Aeronautics adopt the following basic physical

constants for use in connection with aeronautical calculations relating to pressure, temperature, and density relations in a normal or standard atmosphere, to be effective on and after January 1, 1925:

For conversion from meters to inches the relation fixed by the United States Statute of 1866 should govern,

$$1 \text{ m} = 39.3700 \text{ in.}$$
$$1 \text{ lb.} = 453.5924277 \text{ g,}$$

determined by International Bureau of Weights and Measures in July, 1893.

Force of gravity,

$$g = 9.80665 \text{ m/sec.}^2$$
$$= 32.1740 \text{ ft/sec.}^2$$

Weight of cubic centimeter of dry air with normal content CO_2 at temperature of 0° C. (32° F.) and pressure 76 cm. (29.921 in.).

$$W = 0.0012930 \text{ g/cm.}^3$$
$$= 0.08072 \text{ lb/ft.}^3$$

The standard temperature for working conditions for both standard density and standard atmosphere to be the same, viz. 15° C. (59° F.).

Coefficient of expansion of air,

$$a = 0.00367 \text{ per degree C.}$$
$$= 0.00204 \text{ per degree F.}$$

Where temperatures on the absolute scale are employed, the approximate scale may be defined by

$$T_{as} = 273° + t° \text{ C. } (459.4° + t° \text{ F.}).$$

RESULTING VALUES

The foregoing basic constants and assumptions result in the following working values:

Weight of standard air at 15° C. (59° F.), standard pressure,

$$W = 1.2255 \text{ kg/m}^3$$
$$= 0.07651 \text{ lb./ft.}^3$$

Standard density at 15° C. (59° F.) and standard pressure,

$$\rho = \frac{W}{g} = 0.12497 \text{ kg.-sec.}^2\text{-m.}^{-4}$$
$$= 0.002378 \text{ lb.-sec.}^2\text{-ft.}^{-4}$$

Respectfully,

COMMITTEE ON AERODYNAMICS,
JOSEPH S. AMES, *Chairman.*

After consideration by the executive committee, and on motion duly seconded and carried, it was

Resolved, That the basic physical constants for use in connection with aeronautical calculations relating to pressure, temperature, and density relations in a normal or standard atmosphere, as recommended by the committee on aerodynamics in its letter referred to, dated November 26, 1924, be, and the same are hereby approved, to be effective on and after January 1, 1925.

STANDARD VALUES

Particular attention has been given to the choice of standard values for the standard atmosphere, and so far as practicable, international standards have been followed. Instead of the density .001225 g/cm³ recommended by Toussaint, the value of .0012255 g/cm³ has been adopted as conforming to the universally accepted standard of .0012930 g/cm³ for dry air of average CO_2 content at 0° C. and 760 mm. In this connection Toussaint's value corresponds to .0012923 g/cm³ at 0° C. and 760 mm. The difference between the two values is exceedingly small and entirely negligible in comparing performance data.

The standard atmosphere has been based on approximate absolute temperatures, $T = 273 + t°$ C. or $T = 459.4 + t°$ F. The absolute temperature corresponding to zero on Fahrenheit scale has here been taken at 459.4° F., instead of the usual value 459.6° F., since (459.4° + 32° F.) corresponds to 273° C. The metric and English values are thereby made directly comparable.

Since the standard atmosphere is used almost entirely by engineers, the engineering units, kilogram-meter-second in the metric system, and pound-foot-second in the English system are used.

The following standard values have been adopted by the National Advisory Committee for Aeronautics for use in the standard atmosphere:

Standard pressure	$p_o = 760$ mm	$=29.921$ in.
Standard temperature	$t_o = 15°$C.	$=59°$F.
Standard absolute temperature	$T_o = 288°$C.	$=518.4°$F.
Standard specific weight	$g\rho = 1.2255$ kg/m³	$= 0.07651$ lb./ft.³
Standard gravity	$g = 9.80665$ m/sec.²	$=32.1740$ ft./sec.²
Standard density [1]	$\rho = 0.12497$	$= 0.002378$
Standard temperature gradient	$a = 0.0065°$C/m	$= 0.003566°$F./ft.

The standard conversion factors are:

1 meter = 39.3700 in. = 3.280833 ft.
1 kilogram = 2.204622 lb.

The values given above are those ordinarily used; more exact values may be found in Table I.

BASIC ASSUMPTIONS

In addition to the linear decrease in temperature with altitude

$$T = T_o - aZ \qquad (1)$$

certain basic assumptions are necessary to define the Standard Atmosphere. These assumptions are as follows:

That (a) the air is dry,

(b) air is a perfect gas, obeying the laws of Charles and Boyle, i. e.,

$$p = Rg\rho T \qquad (2)$$

or

$$\left(\frac{p}{p_o}\right) = \left(\frac{\rho}{\rho_o}\right)\left(\frac{T}{T_o}\right) \qquad (2a)$$

(c) gravity is constant at all altitudes with the standard value,

(d) the temperature of the isothermal atmosphere is −55°C. or −67°F.

(e) equation (1) holds true for altitudes up to the isothermal atmosphere; the gradient vanishing at the lower limit of the isothermal atmosphere.

The last assumption not only simplifies the standard atmosphere but it also appears to be a very close approximation to actual conditions at any given time. The altitude of the lower limit of the isothermal atmosphere is found from Equation (1) by substituting the isothermal temperature:

$$Z_i = \frac{288-218}{.0065} = 10769 \text{ meters}$$

$$Z_i = \frac{518.4-392.4}{.00356617} = 35332 \text{ feet.}$$

Since the air is assumed to be a perfect gas, the difference in pressure between two levels is due to the weight of a column of air of unit cross section between the two levels or

$$dp = -g\rho dZ \qquad (3)$$

This differential equation is of considerable importance, since it is the basis for the formulæ used in computing pressures at altitudes.

[1] Specific weight of mercury at 0°C=13595.1 kg/m³=848.7149 lb./ft.³

CALCULATION OF PRESSURES AND DENSITIES IN THE STANDARD ATMOSPHERE

At any altitude in the standard atmosphere the air temperature is known from equation (1) (or from the isothermal temperature). The corresponding pressure is calculated by the well-known modified form of Laplace's equation

$$Z=\frac{p_o}{\rho_o g M}\left(\frac{T_m}{T_o}\right)\log_{10}\left(\frac{p_o}{p}\right) \qquad (4)$$

where M is the modulus for the common logarithms, i. e.,

$$M=\log_{10} e=.4342945$$

Letting

$$K=\frac{p_o}{\rho_o g M}$$

and substituting the standard values

$$K=\frac{0.760\times 13595.1g}{1.2255g\times .434294}$$

$$=19413.28 \text{ m or } 63691.72 \text{ ft.}$$

A further simplification may be made by setting

$$K'=\frac{K}{T_o}$$

so that

$$K'=\frac{19413.28}{288}=67.4072 \text{ metric}$$

$$=\frac{63691.72}{518.4}=122.862 \text{ English}$$

Equation (4) may now be written

$$\log_{10}\left(\frac{p_o}{p}\right)=\frac{Z}{K'T_m} \qquad (4a)$$

from which $\frac{p_o}{p}$ is readily obtained.

The corresponding density is given by

$$\frac{\rho}{\rho_o}=\left(\frac{p}{p_o}\right)\left(\frac{T_o}{T}\right) \qquad (2a)$$

Since both $\left(\frac{p}{p_o}\right)$ and $\left(\frac{T}{T_o}\right)$ are known.

The foregoing equations are sufficient to determine any of the solutions commonly required. As an example, take the case of pressure corresponding to a given altitude. Equation (4a) may be written

$$\log_{10} p=\log_{10} p_o-\frac{Z}{K'T_m} \qquad (4b)$$

which upon substitution of the values for $\log_{10} p_o)$ and K' becomes

$$\log_{10} p=2.880814-\frac{Z}{67.4072T_m}$$

for p in mm, Z in m, and T_m in °C,

or $\log_{10} p=1.475976-\frac{Z}{122.862T_m}$

for p in in., Z in ft., and T_m in °F.

CALCULATION OF MEAN TEMPERATURE

The mean temperature T_m which appears in equation (4) is a *harmonic mean* given by

$$T_m=\frac{\int_0^Z dZ}{\int_0^Z \frac{dZ}{T}}$$

$$=\frac{aZ}{\log_e \frac{T_o}{T_o-aZ}} \qquad (5)$$

where a is the temperature gradient.

Equation (5) can not be used above the isothermal level, owing to the discontinuity in the lapse rate, a. However, it may be written in the form

$$T_m=\frac{\Sigma\,\Delta Z}{\Sigma\,\frac{\Delta T}{T_m}}=\frac{\Delta Z_1+\Delta Z_2+\cdots\cdots}{\frac{\Delta Z_1}{T_{m_1}}+\frac{\Delta Z_2}{T_{m_2}}+\cdots\cdot} \qquad (6)$$

where $T_{m_1}, T_{m_2}, \cdots$ are the average temperatures for the altitude increments $\Delta Z_1, \Delta Z_2, \cdots\cdot$ as actually used equation (6) is

$$T_m=\frac{Z}{\frac{Z_1}{T_{m_1}}+\frac{(Z-Z_1)}{T}} \qquad (6a)$$

where Z_1 is the isothermal level (10769 m or 35332 ft.), T_{m_1} the harmonic mean temperature at Z_1, and T the isothermal temperature. Substituting for Z_1, T_{m_1}, and T gives

$$T_m=\frac{Z}{\frac{10769}{251.378}+\frac{Z-10769}{218.0}} \qquad \text{Metric units} \quad Z>10769\text{m}$$

$$T_m=\frac{Z}{\frac{35332}{452.680}+\frac{Z-35332}{392.4}} \qquad \text{English units} \quad Z>35332\text{ ft.}$$

RELATIONS BETWEEN p, ρ, T AND Z

Below the isothermal level certain interesting and useful relations exist between pressure, temperature, density, and altitude. Dividing equation (3) by (2)

$$\frac{dp}{p}=-\frac{dZ}{RT}=-\frac{dZ}{R(T_o-aZ)}$$

Integrating

$$aR\log\left(\frac{p}{p_o}\right)=\log\left(\frac{T}{T_o}\right)$$

or

$$\frac{T}{T_o}=\left(\frac{p}{p_o}\right)^{aR}$$

$$\left(\frac{p}{p_o}\right)^{aR}$$

The value of the exponent aR is independent of the system of units. In the metric system

$$R=\frac{p_o}{g\rho_o T_o}=\frac{.760\times 13595.1}{1.2255\times 288}=29.2708$$

$$\therefore aR=.0065\times 29.2708=0.19026$$

$$\therefore \frac{T}{T_o}=\left(\frac{p}{p_o}\right)^{.19} \qquad (7)$$

and

$$\frac{p}{p_o}=\left(\frac{T}{T_o}\right)^{5.256} \qquad (8)$$

From equations (2a), (5) and (6) the following equations may be derived:

$$\left(\frac{\rho}{\rho_o}\right)=\left(\frac{p}{p_o}\right)^{.81} \qquad (9)$$

$$\left(\frac{p}{p_o}\right)=\left(\frac{\rho}{\rho_o}\right)^{1.235} \qquad (10)$$

$$\left(\frac{T}{T_o}\right)=\left(\frac{\rho}{\rho_o}\right)^{0.235} \qquad (11)$$

$$\left(\frac{\rho}{\rho_o}\right)=\left(\frac{T}{T_o}\right)^{4.256} \qquad (12)$$

$$\left(\frac{\rho}{\rho_o}\right)^{0.235}=\left(1-\frac{a}{T_o}Z\right) \qquad (13)$$

$$\left(\frac{\rho}{\rho_o}\right)=\left(1-\frac{a}{T_o}Z\right)^{4.256} \qquad (14)$$

$$\left(\frac{p}{p_o}\right)^{.19}=\left(1-\frac{a}{T_o}Z\right) \qquad (15)$$

$$\left(\frac{p}{p_o}\right)=\left(1-\frac{a}{T_o}Z\right)^{5.256} \qquad (16)$$

These formulae do not hold true above the lower level of the isothermal atmosphere, i. e., Z must be less than 10769 meters or 35332 feet.

ACKNOWLEDGMENT

All of the important assumptions and standard values used in this report have been officially adopted by the National Advisory Committee for Aeronautics. Certain minor assumptions and standard values not officially adopted previous to the preparation of this report, but considered necessary for a complete statement of the standard atmosphere, have been unanimously selected by Mr. W. R. Gregg of the Weather Bureau and Dr. H. N. Eaton and Dr. W. G. Brombacher of the Bureau of Standards, who have also given great assistance in checking equations, methods of calculation and constants.

A large part of the mechanical work of calculating and checking the tables has been carried out in the National Advisory Committee for Aeronautics offices.

TABLE I

STANDARD ATMOSPHERE—STANDARD VALUES

	Symbol	Metric	English
Standard temperature	t	15° C.	59° F.
Standard temperature absolute	T	288° C.	518.4° F.
Standard pressure	p	760 mm of Hg.	29.92117 in. of Hg.
Standard pressure	p	10332.276 kg/m²	2116.229 lb./ft.²
Standard gravity	g	9.80665 m/s²	32.1740 ft./sec.²
Standard specific weight	$g\rho$	1.2255 kg/m³	0.07651 lb./ft.³
Standard density	ρ	0.124966 kg/m/sec	0.002378 lb./ft./sec.
Standard temperature gradient	a	0.0065 C.	0.00356617 F.
Standard isothermal temperature	t_i	—55° C.	—67° F.
Standard gas constant for air	R	29.2708	53.33089.

REFERENCES

1. Standard Atmosphere. W. R. Gregg. N. A. C. A. Technical Report No. 147, 1922.
2. Smithsonian meteorological tables, fourth revised edition.
3. Physics of the Air. W. J. Humphreys. (J. B. Lippincott Co.)
4. Notes on the standard atmosphere. W. S. Diehl. N. A. C. A. Technical note No. 99, 1922.
5. The Determination of the Altitude of Aircraft. W. G. Brombacher, "Journal of the Optical Society of America and Review of Scientific Instruments." Vol. VII, No. 9, September, 1923.

STANDARD ATMOSPHERE
METRIC UNITS

z m	t °C.	T °C. aa	T_m °C. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p mm	ρ	$g\rho$ kg/m³	t °F.	z ft.
−1000	21.500	294.500	291.235	1.0226	1.1244	1.0996	854.58	.1374	1.3476	70.70	−3280.8
−950	21.175	294.175	291.075	1.0214	1.1179	1.0945	849.63	.1368	1.3413	70.12	−3116.8
−900	20.850	293.850	290.913	1.0203	1.1115	1.0893	844.71	.1361	1.3350	69.53	−2952.7
−850	20.525	293.525	290.752	1.0192	1.1050	1.0842	839.82	.1355	1.3287	68.95	−2788.7
−800	20.200	293.200	290.590	1.0181	1.0986	1.0791	834.94	.1349	1.3225	68.36	−2624.7
−750	19.875	292.875	290.429	1.0170	1.0922	1.0740	830.08	.1342	1.3162	67.78	−2460.6
−700	19.550	292.550	290.267	1.0158	1.0859	1.0690	825.25	.1336	1.3100	67.19	−2296.6
−650	19.225	292.225	290.106	1.0147	1.0796	1.0639	820.45	.1330	1.3038	66.61	−2132.5
−600	18.900	291.900	289.944	1.0135	1.0733	1.0589	815.67	.1323	1.2977	66.02	−1968.5
−550	18.575	291.575	289.783	1.0124	1.0670	1.0539	810.91	.1317	1.2916	65.44	−1804.5
−500	18.250	291.250	289.621	1.0113	1.0607	1.0489	806.16	.1311	1.2854	64.85	−1640.4
−450	17.925	290.925	289.459	1.0102	1.0545	1.0439	801.44	.1305	1.2793	64.27	−1476.4
−400	17.600	290.600	289.297	1.0091	1.0484	1.0390	796.75	.1298	1.2733	63.68	−1312.3
−350	17.275	290.275	289.136	1.0079	1.0422	1.0341	792.09	.1292	1.2672	63.10	−1148.3
−300	16.950	289.950	288.974	1.0068	1.0361	1.0291	787.44	.1286	1.2612	62.51	−984.2
−250	16.625	289.625	288.812	1.0056	1.0300	1.0242	782.81	.1280	1.2552	61.93	−820.2
−200	16.300	289.300	288.650	1.0045	1.0240	1.0193	778.20	.1274	1.2492	61.34	−656.2
−150	15.975	288.975	288.488	1.0034	1.0109	1.0145	773.62	.1268	1.2433	60.76	−492.1
−100	15.650	288.650	288.325	1.0023	1.0119	1.0096	769.06	.1262	1.2373	60.17	−328.1
−50	15.325	288.325	288.163	1.0011	1.0059	1.0048	764.52	.1256	1.2314	59.59	−164.0
0	15.000	288.000	288.000	1.0000	1.0000	1.0000	760.00	.12497	1.2255	59.00	0
50	14.675	287.675	287.873	.9989	.9941	.9952	755.50	.12437	1.2196	58.42	164.0
100	14.350	287.350	287.675	.9978	.9882	.9904	751.03	.12377	1.2137	57.83	328.1
150	14.025	287.025	287.513	.9966	.9823	.9856	746.57	.12317	1.2079	57.25	492.1
200	13.700	286.700	287.350	.9955	.9765	.9809	742.12	.12258	1.2021	56.66	656.2
250	13.375	286.375	287.187	.9944	.9707	.9762	737.73	.12199	1.1963	56.08	820.2
300	13.050	286.050	287.024	.9933	.9649	.9715	733.35	.12141	1.1905	55.49	984.2
350	12.725	285.725	286.861	.9921	.9592	.9668	728.97	.12082	1.1848	54.91	1148.3
400	12.400	285.400	286.697	.9910	.9534	.9621	724.62	.12023	1.1791	54.32	1312.3
450	12.075	285.075	286.534	.9899	.9478	.9575	720.30	.11965	1.1734	53.74	1476.4
500	11.750	284.750	286.371	.9887	.9421	.9528	715.99	.11907	1.1677	53.15	1640.4
550	11.425	284.425	286.208	.9876	.9364	.9482	711.71	.11849	1.1620	52.57	1804.5
600	11.100	284.100	286.044	.9865	.9308	.9436	707.45	.11792	1.1564	51.98	1968.5
650	10.775	283.775	285.881	.9854	.9253	.9390	703.21	.11735	1.1508	51.40	2132.5
700	10.450	283.450	285.717	.9842	.9197	.9345	698.98	.11678	1.1452	50.81	2296.6
750	10.125	283.125	285.554	.9831	.9142	.9299	694.78	.11621	1.1396	50.23	2460.6
800	9.800	282.800	285.390	.9820	.9087	.9254	690.60	.11564	1.1340	49.64	2624.7
850	9.475	282.475	285.227	.9808	.9031	.9208	686.43	.11507	1.1285	49.06	2788.7
900	9.150	282.150	285.063	.9797	.8977	.9163	682.30	.11451	1.1230	48.47	2952.8
950	8.825	281.825	284.900	.9786	.8923	.9119	678.18	.11395	1.1175	47.89	3116.8
1000	8.500	281.500	284.736	.9775	.8870	.9074	674.09	.11340	1.1120	47.30	3280.8
1050	8.175	281.175	284.572	.9763	.8816	.9030	670.01	.11285	1.1065	46.72	3444.9
1100	7.850	280.850	284.408	.9752	.8762	.8985	665.95	.11229	1.1011	46.13	3608.9
1150	7.525	280.525	284.245	.9741	.8709	.8941	661.91	.11174	1.0957	45.55	3773.0
1200	7.200	280.200	284.080	.9729	.8656	.8897	657.89	.11119	1.0903	44.96	3937.0
1250	6.875	279.875	283.916	.9718	.8604	.8853	653.88	.11064	1.0849	44.38	4101.0
1300	6.550	279.550	283.752	.9707	.8551	.8810	649.90	.11010	1.0796	43.79	4265.1
1350	6.225	279.225	283.589	.9696	.8499	.8766	645.94	.10955	1.0743	43.21	4429.1
1400	5.900	278.900	283.424	.9684	.8448	.8723	642.00	.10901	1.0690	42.62	4593.2
1450	5.575	278.575	283.261	.9673	.8396	.8680	638.08	.10847	1.0637	42.04	4757.2
1500	5.250	278.250	283.096	.9662	.8345	.8637	634.18	.10794	1.0584	41.45	4921.3
1550	4.925	277.925	282.932	.9650	.8293	.8594	630.30	.10740	1.0532	40.87	5085.3
1600	4.600	277.600	282.767	.9639	.8243	.8551	626.44	.10687	1.0480	40.28	5249.3
1650	4.275	277.275	282.603	.9628	.8192	.8509	622.59	.10634	1.0428	39.70	5413.4
1700	3.950	276.950	282.438	.9617	.8142	.8467	618.77	.10581	1.0376	39.11	5577.4
1750	3.625	276.625	282.274	.9605	.8092	.8424	614.97	.10528	1.0324	38.53	5741.5
1800	3.300	276.300	282.109	.9594	.8042	.8382	611.19	.10475	1.0272	37.94	5905.5
1850	2.975	275.975	281.945	.9583	.7992	.8340	607.42	.10423	1.0221	37.36	6069.5
1900	2.650	275.650	281.779	.9571	.7943	.8299	603.67	.10371	1.0170	26.77	6233.6
1950	2.325	275.325	281.615	.9560	.7894	.8257	599.94	.10319	1.0119	36.19	6397.6
2000	2.000	275.000	281.450	.9549	.7845	.8216	596.23	.10267	1.0068	35.60	6561.7
2050	1.675	274.675	281.285	.9538	.7997	.8175	592.54	.10215	1.0018	35.02	6725.7
2100	1.350	274.350	281.120	.9526	.7748	.8133	588.86	.10164	.9968	34.43	6889.8
2150	1.025	274.025	280.956	.9515	.7700	.8092	585.19	.10113	.9918	33.85	7053.8
2200	0.700	273.700	280.790	.9504	.7652	.8052	581.55	.10062	.9868	33.26	7217.8
2250	0.375	273.375	280.625	.9492	.7605	.8011	577.94	.10012	.9818	32.68	7381.9
2300	0.050	273.050	280.459	.9481	.7557	.7971	574.34	.09961	.9768	32.09	7545.9
2350	−0.275	272.725	280.295	.9470	.7510	.7931	570.74	.09910	.9719	31.51	7710.0
2400	−0.600	272.400	280.129	.9459	.7463	.7891	567.19	.09861	.9670	30.92	7874.0
2450	−0.925	272.075	279.964	.9447	.7417	.7851	563.64	.09811	.9621	30.34	8038.0

Z m	t °C.	T °C. aa	T_m °C. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p mm	ρ	$g\rho$ kg/m³	t °F	Z ft.
2500	−1.250	271.750	279.798	.9436	.7370	.7811	560.11	.09761	.9572	29.75	8202.1
2550	−1.575	271.425	279.633	.9425	.7324	.7771	556.60	.09711	.9523	29.17	8366.1
2600	−1.900	271.100	279.466	.9413	.7278	.7732	553.10	.09662	.9475	28.58	8530.2
2650	−2.225	270.775	279.301	.9402	.7231	.7691	549.62	.09614	.9427	28.00	8694.2
2700	−2.550	270.450	279.135	.9391	.7186	.7652	546.17	.09565	.9379	27.41	8858.3
2750	−2.875	270.125	278.969	.9380	.7141	.7613	542.73	.09516	.9331	26.83	9022.3
2800	−3.200	269.800	278.803	.9368	.7097	.7575	539.32	.09467	.9283	26.24	9186.3
2850	−3.525	269.475	278.638	.9357	.7052	.7536	535.91	.09419	.9236	25.66	9350.4
2900	−3.850	269.150	278.471	.9346	.7007	.7497	532.53	.09371	.9189	25.07	9514.4
2950	−4.175	268.825	278.305	.9334	.6962	.7459	529.16	.09322	.9141	24.49	9678.5
3000	−4.500	268.500	278.138	.9323	.6918	.7420	525.79	.09274	.9094	23.90	9842.5
3050	−4.825	268.175	277.972	.9312	.6874	.7382	522.46	.09227	.9047	23.32	10006.5
3100	−5.150	267.850	277.805	.9301	.6831	.7344	519.14	.09179	.9001	22.73	10170.6
3150	−5.475	267.525	277.639	.9289	.6787	.7307	515.84	.09132	.8955	22.15	10334.6
3200	−5.800	267.200	277.472	.9278	.6744	.7269	512.56	.09085	.8908	21.56	10498.7
3250	−6.125	266.875	277.306	.9267	.6701	.7231	509.28	.09038	.8862	20.98	10662.7
3300	−6.450	266.550	277.139	.9255	.6658	.7194	506.04	.08991	.8817	20.39	10826.8
3350	−6.775	266.225	276.972	.9244	.6616	.7157	502.80	.08945	.8771	19.81	10990.8
3400	−7.100	265.900	276.805	.9233	.6574	.7120	499.58	.08899	.8726	19.22	11154.8
3450	−7.425	265.575	276.638	.9222	.6532	.7083	496.37	.08851	.8679	18.64	11318.9
3500	−7.750	265.250	276.470	.9210	.6490	.7046	493.19	.08805	.8634	18.05	11482.9
3550	−8.075	264.925	276.303	.9199	.6447	.7009	490.03	.08760	.8590	17.47	11647.0
3600	−8.400	264.600	276.136	.9188	.6406	.6972	486.88	.08714	.8545	16.88	11811.0
3650	−8.725	264.275	275.969	.9176	.6365	.6936	483.75	.08669	.8501	16.30	11975.0
3700	−9.050	263.950	275.801	.9165	.6324	.6900	480.62	.08623	.8456	15.71	12139.1
3750	−9.375	263.625	275.634	.9154	.6283	.6864	477.53	.08578	.8412	15.13	12303.1
3800	−9.700	263.300	275.466	.9143	.6242	.6828	474.44	.08534	.8368	14.54	12467.2
3850	−10.025	262.975	275.299	.9131	.6202	.6792	471.37	.08488	.8324	13.96	12631.2
3900	−10.350	262.650	275.131	.9120	.6162	.6757	468.32	.08444	.8281	13.37	12795.3
3950	−10.675	262.325	274.964	.9109	.6122	.6721	465.28	.08399	.8236	12.79	12959.3
4000	−11.000	262.000	274.796	.9097	.6082	.6686	462.26	.08355	.8193	12.20	13123.3
4050	−11.325	261.675	274.628	.9086	.6043	.6651	459.25	.08311	.8150	11.62	13287.4
4100	−11.650	261.350	274.460	.9075	.6004	.6616	456.25	.08267	.8107	11.03	13451.4
4150	−11.975	261.025	274.293	.9064	.5964	.6580	453.28	.08224	.8065	10.45	13615.5
4200	−12.300	260.700	274.125	.9052	.5925	.6545	450.32	.08181	.8022	9.86	13779.5
4250	−12.625	260.375	273.957	.9041	.5886	.6511	447.38	.08136	.7980	9.28	13943.5
4300	−12.950	260.050	273.788	.9030	.5848	.6476	444.46	.08093	.7938	8.69	14107.6
4350	−13.275	259.725	273.621	.9018	.5809	.6442	441.54	.08050	.7895	8.11	14271.6
4400	−13.600	259.400	273.452	.9007	.5771	.6406	438.64	.08007	.7853	7.52	14435.7
4450	−13.925	259.075	273.284	.8996	.5734	.6374	435.77	.07965	.7811	6.94	14599.7
4500	−14.250	258.750	273.115	.8985	.5696	.6340	432.90	.07923	.7770	6.35	14763.8
4550	−14.575	258.425	272.947	.8973	.5659	.6306	430.04	.07881	.7728	5.77	14927.8
4600	−14.900	258.100	272.778	.8962	.5621	.6273	427.22	.07839	.7687	5.18	15091.8
4650	−15.225	257.775	272.610	.8951	.5584	.6238	424.40	.07796	.7646	4.60	15255.9
4700	−15.550	257.450	272.440	.8939	.5547	.6205	421.59	.07754	.7605	4.01	15419.9
4750	−15.875	257.125	272.271	.8928	.5510	.6172	418.80	.07713	.7563	3.43	15584.0
4800	−16.200	256.800	272.102	.8917	.5474	.6139	416.02	.07673	.7523	2.84	15748.0
4850	−16.525	256.475	271.934	.8906	.5437	.6106	413.27	.07631	.7483	2.26	15912.0
4900	−16.850	256.150	271.764	.8894	.5401	.6073	410.52	.07590	.7443	1.67	16076.1
4950	−17.175	255.825	271.596	.8883	.5365	.6041	407.79	.07549	.7403	1.09	16240.1
5000	−17.500	255.500	271.426	.8872	.5330	.6008	405.09	.07508	.7363	.50	16404.2
5050	−17.825	255.175	271.257	.8860	.5295	.5975	402.38	.07467	.7323	−.09	16568.2
5100	−18.150	254.850	271.089	.8849	.5259	.5943	399.69	.07427	.7283	−.67	16732.3
5150	−18.475	254.525	270.918	.8838	.5224	.5911	397.02	.07387	.7244	−1.26	16896.3
5200	−18.800	254.200	270.749	.8827	.5189	.5879	394.36	.07347	.7205	−1.84	17060.3
5250	−19.125	253.875	270.580	.8815	.5155	.5847	391.71	.07307	.7166	−2.43	17224.4
5300	−19.450	253.550	270.410	.8804	.5119	.5815	389.07	.07267	.7127	−3.01	17388.4
5350	−19.775	253.225	270.241	.8793	.5085	.5784	386.46	.07227	.7088	−3.60	17552.5
5400	−20.100	252.900	270.071	.8781	.5051	.5752	383.88	.07188	.7049	−4.18	17716.5
5450	−20.425	252.575	269.901	.8768	.5017	.5720	381.29	.07149	.7010	−4.77	17880.5
5500	−20.750	252.250	269.730	.8759	.4983	.5689	378.71	.07110	.6972	−5.35	18044.6
5550	−21.075	251.925	269.561	.8748	.4950	.5658	376.15	.07071	.6934	−5.94	18208.6
5600	−21.400	251.600	269.391	.8736	.4916	.5627	373.61	.07032	.6897	−6.52	18372.7
5650	−21.725	251.275	269.221	.8725	.4882	.5596	371.09	.06993	.6859	−7.11	18536.7
5700	−22.050	250.950	269.050	.8714	.4850	.5566	368.58	.06955	.6821	−7.69	18700.8
5750	−22.375	250.625	268.880	.8703	.4817	.5535	366.08	.06917	.6783	−8.28	18864.8
5800	−22.700	250.300	268.709	.8692	.4784	.5505	363.59	.06879	.6746	−8.86	19028.8
5850	−23.025	249.975	268.539	.8680	.4751	.5474	361.11	.06841	.6709	−9.45	19192.9
5900	−23.350	249.650	268.368	.8669	.4719	.5444	358.65	.06803	.6672	−10.03	19356.9
5950	−23.675	249.325	268.198	.8657	.4687	.5414	356.20	.06765	.6635	−10.62	19521.0

Z m	t °C.	T °C. *aa*	T_m °C. *aa*	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p mm	ρ	$g\rho$ kg/m³	t °F.	Z ft.
6000	−24.000	249.000	268.027	.8646	.4655	.5384	353.77	.06728	.6598	−11.20	19685.0
6050	−24.325	248.675	267.856	.8635	.4622	.5354	351.35	.06691	.6561	−11.79	19849.0
6100	−24.650	248.350	267.684	.8624	.4591	.5325	348.94	.06654	.6525	−12.37	20013.1
6150	−24.975	248.025	267.514	.8612	.4559	.5294	346.55	.06617	.6489	−12.96	20177.1
6200	−25.300	247.700	267.342	.8601	.4528	.5265	344.17	.06579	.6453	−13.54	20341.2
6250	−25.625	247.375	267.172	.8590	.4497	.5236	341.81	.06543	.6417	−14.13	20505.2
6300	−25.950	247.050	267.000	.8578	.4466	.5207	339.47	.06507	.6380	−14.71	20669.3
6350	−26.275	246.725	266.830	.8567	.4436	.5178	337.13	.06471	.6345	−15.30	20833.3
6400	−26.600	246.400	266.658	.8556	.4405	.5149	334.80	.06435	.6310	−15.88	20997.3
6450	−26.925	246.075	266.487	.8545	.4374	.5119	332.49	.06398	.6275	−16.47	21161.4
6500	−27.250	245.750	266.315	.8533	.4344	.5091	330.18	.06362	.6240	−17.05	21325.4
6550	−27.575	245.425	266.145	.8522	.4314	.5062	327.90	.06326	.6204	−17.64	21489.5
6600	−27.900	245.100	265.973	.8511	.4284	.5034	325.62	.06291	.6169	−18.22	21653.5
6650	−28.225	244.775	265.802	.8499	.4255	.5006	323.36	.06255	.6135	−18.81	21817.5
6700	−28.550	244.450	265.630	.8488	.4225	.4977	321.11	.06220	.6101	−19.39	21981.6
6750	−28.875	244.125	265.459	.8477	.4195	.4949	318.87	.06185	.6066	−19.98	22145.6
6800	−29.200	243.800	265.286	.8466	.4166	.4921	316.65	.06150	.6031	−20.56	22309.7
6850	−29.525	243.475	265.115	.8454	.4137	.4893	314.43	.06116	.5997	−21.15	22473.7
6900	−29.850	243.150	264.942	.8443	.4108	.4866	312.23	.06080	.5964	−21.73	22637.8
6950	−30.175	242.825	264.771	.8432	.4079	.4838	310.04	.06046	.5930	−22.32	22801.8
7000	−30.500	242.500	264.598	.8420	.4051	.4810	307.87	.06012	.5896	−22.90	22965.8
7050	−30.825	242.175	264.427	.8409	.4022	.4783	305.71	.05978	.5862	−23.49	23129.9
7100	−31.150	241.850	264.254	.8398	.3993	.4756	303.56	.05943	.5827	−24.07	23293.9
7150	−31.475	241.525	264.083	.8387	.3965	.4729	301.42	.05909	.5796	−24.66	23458.0
7200	−31.800	241.200	263.910	.8375	.3937	.4702	299.29	.05876	.5762	−25.24	23622.0
7250	−32.125	240.875	263.738	.8364	.3910	.4674	297.18	.05843	.5729	−25.83	23786.0
7300	−32.450	240.550	263.565	.8353	.3883	.4648	295.08	.05809	.5697	−26.41	23950.1
7350	−32.775	240.225	263.393	.8341	.3855	.4621	292.99	.05776	.5664	−27.00	24114.1
7400	−33.100	239.900	263.219	.8330	.3828	.4595	290.90	.05743	.5632	−27.58	24278.2
7450	−33.425	239.575	263.046	.8319	.3800	.4569	288.84	.05710	.5599	−28.17	24442.2
7500	−33.750	239.250	262.872	.8308	.3773	.4542	286.79	.05676	.5567	−28.75	24606.2
7550	−34.075	238.925	262.700	.8296	.3746	.4516	284.75	.05644	.5535	−29.34	24770.3
7600	−34.400	238.600	262.527	.8285	.3720	.4490	282.72	.05612	.5503	−29.92	24934.3
7650	−34.725	238.275	262.355	.8274	.3693	.4464	280.69	.05580	.5471	−30.51	25098.4
7700	−35.050	237.950	262.182	.8262	.3667	.4439	278.69	.05547	.5440	−31.09	25262.4
7750	−35.375	237.625	262.010	.8251	.3640	.4412	276.70	.05515	.5408	−31.68	25426.5
7800	−35.700	237.300	261.836	.8240	.3614	.4386	274.71	.05483	.5377	−32.26	25590.5
7850	−36.025	236.975	261.663	.8229	.3588	.4361	272.74	.05451	.5345	−32.85	25754.5
7900	−36.350	236.650	261.489	.8217	.3563	.4336	270.78	.05419	.5314	−33.43	25918.6
7950	−36.675	236.325	261.315	.8206	.3537	.4310	268.83	.05388	.5283	−34.02	26082.6
8000	−37.000	236.000	261.140	.8195	.3512	.4285	266.89	.05356	.5252	−34.60	26246.7
8050	−37.325	235.675	260.967	.8183	.3486	.4260	264.97	.05324	.5221	−35.19	26410.7
8100	−37.650	235.350	260.792	.8172	.3461	.4235	263.06	.05293	.5191	−35.77	26574.7
8150	−37.975	235.025	260.619	.8161	.3436	.4211	261.16	.05262	.5161	−36.36	26738.8
8200	−38.300	234.700	260.444	.8149	.3411	.4185	259.26	.05232	.5130	−36.94	26902.8
8250	−38.625	234.375	260.271	.8138	.3386	.4161	257.38	.05201	.5100	−37.53	27066.9
8300	−38.950	234.050	260.096	.8127	.3362	.4137	255.51	.05170	.5070	−38.11	27230.9
8350	−39.275	233.725	259.922	.8116	.3337	.4113	253.65	.05140	.5040	−38.70	27395.0
8400	−39.600	233.400	259.746	.8104	.3312	.4088	251.79	.05109	.5010	−39.28	27559.0
8450	−39.925	233.075	259.571	.8093	.3288	.4063	249.96	.05079	.4981	−39.87	27723.0
8500	−40.250	232.750	259.395	.8082	.3265	.4040	248.13	.05049	.4952	−40.45	27887.1
8550	−40.575	232.425	259.221	.8071	.3241	.4016	246.32	.05019	.4922	−41.04	28051.1
8600	−40.900	232.100	259.046	.8059	.3217	.3992	244.52	.04989	.4893	−41.62	28215.2
8650	−41.225	231.775	258.871	.8048	.3193	.3968	242.73	.04960	.4864	−42.20	28379.2
8700	−41.550	231.450	258.696	.8037	.3170	.3945	240.94	.04931	.4834	−42.79	28543.2
8750	−41.875	231.125	258.521	.8025	.3146	.3921	239.17	.04901	.4805	−43.37	28707.2
8800	−42.200	230.800	258.346	.8014	.3123	.3898	237.40	.04872	.4777	−43.96	28871.3
8850	−42.525	230.475	258.171	.8003	.3101	.3874	235.65	.04843	.4749	−44.55	29035.4
8900	−42.850	230.150	257.995	.7992	.3078	.3851	233.91	.04813	.4720	−45.13	29199.4
8950	−43.175	229.825	257.820	.7980	.3054	.3828	232.18	.04784	.4692	−45.72	29363.5
9000	−43.500	229.500	257.644	.7969	.3032	.3806	230.45	.04756	.4664	−46.30	29527.5
9050	−43.825	229.175	257.468	.7958	.3009	.3782	228.74	.04727	.4625	−46.89	29691.5
9100	−44.150	228.850	257.291	.7946	.2987	.3759	227.05	.04699	.4607	−47.47	29855.6
9150	−44.475	228.525	257.116	.7935	.2965	.3737	225.37	.04671	.4580	−48.06	30019.6
9200	−44.800	228.200	256.940	.7924	.2942	.3715	223.68	.04642	.4552	−48.64	30183.7
9250	−45.125	227.875	256.765	.7913	.2921	.3692	222.01	.04614	.4525	−49.23	30347.7
9300	−45.450	227.550	256.588	.7901	.2899	.3669	220.35	.04586	.4498	−49.81	30511.7
9350	−45.775	227.225	256.414	.7890	.2877	.3647	218.69	.04558	.4470	−50.40	30675.8
9400	−46.100	226.900	256.237	.7879	.2856	.3625	217.06	.04531	.4443	−50.98	30839.8
9450	−46.425	226.575	256.061	.7867	.2835	.3603	215.44	.04503	.4416	−51.57	31003.9

Z m	t °C.	T °C.* ad	T_m °C. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p mm	ρ	$g\rho$ kg/m³	t °F.	Z ft.
9500	−46.750	226.250	255.884	.7856	.2813	.3580	213.82	.04475	.4358	−52.15	31167.9
9550	−47.075	225.925	255.709	.7845	.2792	.3559	212.22	.04448	.4362	−52.74	31332.0
9600	−47.400	225.600	255.533	.7833	.2771	.3538	210.62	.04421	.4336	−53.32	31496.0
9650	−47.725	225.275	255.357	.7822	.2750	.3517	209.02	.04394	.4309	−53.91	31660.0
9700	−48.050	224.950	255.181	.7811	.2730	.3495	207.44	.04368	.4283	−54.49	31824.1
9750	−48.375	224.625	255.005	.7800	.2708	.3473	205.86	.04341	.4257	−55.08	31988.1
9800	−48.700	224.300	254.829	.7788	.2688	.3452	204.30	.04313	.4230	−55.66	32152.2
9850	−49.025	223.975	254.652	.7777	.2667	.3431	202.75	.04287	.4204	−56.25	32316.2
9900	−49.350	223.650	254.473	.7766	.2647	.3409	201.21	.04261	.4178	−56.83	32480.2
9950	−49.675	223.325	254.295	.7754	.2627	.3388	199.68	.04234	.4152	−57.42	32644.3
10000	−50.000	223.000	254.116	.7743	.2606	.3367	198.16	.04208	.4127	−58.00	32808.3
10100	−50.650	222.350	253.762	.7721	.2567	.3323	195.14	.04156	.4075	−59.17	33136.4
10200	−51.300	221.700	253.408	.7698	.2528	.3279	192.16	.04105	.4026	−60.34	33464.5
10300	−51.950	221.050	253.053	.7675	.2490	.3235	189.22	.04054	.3976	−61.51	33792.6
10400	−52.600	220.400	252.698	.7653	.2451	.3291	186.31	.04003	.3926	−62.68	34120.7
10500	−53.250	219.750	252.342	.7630	.2414	.3147	183.45	.03953	.3876	−63.85	34448.7
10600	−53.900	219.100	251.985	.7608	.2377	.3104	180.61	.03904	.3828	−65.02	34776.8
10700	−54.550	218.450	251.627	.7585	.2339	.3061	177.82	.03855	.3775	−66.19	35104.9
10769	−55.000	218.000	251.378	.7569	.2314	.3058	175.91	.03820	.3747	−67.00	35331.3
10800	−55.000	218.000	251.274	.7569	.2303	.3018	175.06	.03802	.3723	−67.00	35433.0
10900	−55.000	218.000	250.921	.7569	.2268	.2975	172.34	.03746	.3669	−67.00	35761.1
11000	−55.000	218.000	250.572	.7569	.2232	.2932	169.66	.03689	.3614	−67.00	36089.2
11100	−55.000	218.000	250.237	.7569	.2097	.2890	167.03	.03628	.3558	−67.00	36417.2
11200	−55.000	218.000	249.907	.7569	.2164	.2848	164.43	.03571	.3502	−67.00	36745.3
11300	−55.000	218.000	249.582	.7569	.2130	.2806	161.86	.03516	.3448	−67.00	37073.4
11400	−55.000	218.000	249.264	.7569	.2096	.2765	159.34	.03462	.3394	−67.00	37401.5
11500	−55.000	218.000	248.959	.7569	.2064	.2724	156.87	.03406	.3342	−67.00	37729.6
11600	−55.000	218.000	248.653	.7569	.2032	.2683	154.43	.03355	.3290	−67.00	38057.7
11700	−55.000	218.000	248.353	.7569	.2001	.2642	152.04	.03303	.3239	−67.00	38385.7
11800	−55.000	218.000	248.060	.7569	.1970	.2601	149.67	.03252	.3188	−67.00	38713.8
11900	−55.000	218.000	247.774	.7569	[illegible]	.2561	147.34	.03201	.3138	−67.00	39041.9
12000	−55.000	218.000	247.491	.7569	.1909	.2521	145.05	.03151	.3090	−67.00	39370.0
12100	−55.000	218.000	247.217	.7569	.1878	.2482	142.79	.03101	.3042	−67.00	39698.1
12200	−55.000	218.000	246.948	.7569	.1849	.2443	140.57	.03053	.2995	−67.00	40026.2
12300	−55.000	218.000	246.681	.7569	.1821	.2405	138.39	.03006	.2948	−67.00	40354.2
12400	−55.000	218.000	246.418	.7569	.1792	.2368	136.24	.02960	.2902	−67.00	40682.3
12500	−55.000	218.000	246.161	.7569	.1764	.2331	134.12	.02914	.2857	−67.00	41010.4
12600	−55.000	218.000	245.909	.7569	.1737	.2295	132.04	.02869	.2813	−67.00	41338.5
12700	−55.000	218.000	245.661	.7569	.1710	.2259	129.99	.02824	.2769	−67.00	41666.6
12800	−55.000	218.000	245.417	.7569	.1683	.2224	127.96	.02780	.2726	−67.00	41994.7
12900	−55.000	218.000	245.178	.7569	.1657	.2189	125.97	.02737	.2684	−67.00	42322.7
13000	−55.000	218.000	244.942	.7569	.1632	.2155	124.01	.02694	.2642	−67.00	42650.8
13100	−55.000	218.000	244.710	.7569	.1606	.2122	122.09	.02652	.2601	−67.00	42978.9
13200	−55.000	218.000	244.482	.7569	.1581	.2089	120.19	.02611	.2560	−67.00	43307.0
13300	−55.000	218.000	244.258	.7569	.1556	.2056	118.32	.02570	.2520	−67.00	43635.1
13400	−55.000	218.000	244.039	.7569	.1532	.2024	116.48	.02530	.2481	−67.00	43963.2
13500	−55.000	218.000	243.823	.7569	.1508	.1992	114.67	.02491	.2442	−67.00	44291.2
13600	−55.000	218.000	243.611	.7569	.1485	.1961	112.90	.02452	.2404	−67.00	44619.3
13700	−55.000	218.000	243.403	.7569	.1462	.1931	111.14	.02415	.2368	−67.00	44947.4
13800	−55.000	218.000	243.198	.7569	.1440	.1901	109.41	.02377	.2331	−67.00	45275.5
13900	−55.000	218.000	242.996	.7569	.1417	.1872	107.71	.02340	.2295	−67.00	45603.6
14000	−55.000	218.000	242.798	.7569	.1395	.1843	106.02	.02303	.2259	−67.00	45931.7
14100	−55.000	218.000	242.602	.7569	.1373	.1814	104.37	.02267	.2223	−67.00	46259.7
14200	−55.000	218.000	242.413	.7569	.1352	.1786	102.75	.02232	.2188	−67.00	46587.8
14300	−55.000	218.000	242.220	.7569	.1332	.1758	101.15	.02198	.2154	−67.00	46915.9
14400	−55.000	218.000	242.034	.7569	.1311	.1731	99.58	.02164	.2121	−67.00	47244.0
14500	−55.000	218.000	241.851	.7569	.1290	.1704	98.02	.02130	.2088	−67.00	47572.1
14600	−55.000	218.000	241.671	.7569	.1270	.1677	96.50	.02097	.2056	−67.00	47900.2
14700	−55.000	218.000	241.492	.7569	.1250	.1651	95.00	.02064	.2024	−67.00	48228.2
14800	−55.000	218.000	241.316	.7569	.1230	.1625	93.52	.02032	.1993	−67.00	48556.3
14900	−55.000	218.000	241.143	.7569	.1211	.1601	92.07	.02000	.1962	−67.00	48884.4
15000	−55.000	218.000	240.971	.7569	.1193	.1576	90.65	.01969	.1931	−67.00	49212.5
15100	−55.000	218.000	240.804	.7569	.1175	.1551	89.24	.01939	.1901	−67.00	49540.6
15200	−55.000	218.000	240.638	.7569	.1156	.1527	87.84	.01909	.1872	−67.00	49868.7
15300	−55.000	218.000	240.475	.7569	.1138	.1504	86.48	.01879	.1843	−67.00	50196.7
15400	−55.000	218.000	240.314	.7569	.1120	.1480	85.13	.01850	.1814	−67.00	50524.8
15500	−55.000	218.000	240.155	.7569	.1103	.1457	83.80	.01821	.1785	−67.00	50852.9
15600	−55.000	218.000	239.999	.7569	.1086	.1434	82.49	.01793	.1758	−67.00	51181.0
15700	−55.000	218.000	239.845	.7569	.1070	.1412	81.22	.01764	.1730	−67.00	51509.1
15800	−55.000	218.000	239.693	.7569	.1053	.1390	79.96	.01736	.1703	−67.00	51837.2
15900	−55.000	218.000	239.543	.7569	.1036	.1369	78.71	.01710	.1677	−67.00	52165.2

Z m	t °C.	T °C. *aa*	T_m °C. *aa*	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p mm	ρ	$g\rho$ kg/m³	t °F.	Z ft.
16000	−55.000	218.000	239.394	.7569	.10200	.1347	77.48	.01683	.1651	−67.00	52493.3
16100	−55.000	218.000	239.248	.7569	.10040	.1326	76.28	.01657	.1625	−67.00	52821.4
16200	−55.000	218.000	239.105	.7569	.09885	.1306	75.09	.01632	.1600	−67.00	53149.5
16300	−55.000	218.000	238.962	.7569	.09731	.1285	73.92	.01606	.1576	−67.00	53477.6
16400	−55.000	218.000	238.822	.7569	.09580	.1265	72.77	.01581	.1551	−67.00	53805.7
16500	−55.000	218.000	238.683	.7569	.09441	.1245	71.64	.01556	.1526	−67.00	54133.7
16600	−55.000	218.000	238.547	.7569	.09284	.1226	70.53	.01532	.1503	−67.00	54461.8
16700	−55.000	218.000	238.413	.7569	.09140	.1207	69.44	.01508	.1479	−67.00	54790.0
16800	−55.000	218.000	238.280	.7569	.08997	.1188	68.35	.01484	.1456	−67.00	55118.0
16900	−55.000	218.000	238.150	.7569	.08858	.1170	67.30	.01462	.1433	−67.00	55446.1
17000	−55.000	218.000	238.020	.7569	.08720	.1151	66.26	.01439	.1412	−67.00	55774.2
17100	−55.000	218.000	237.892	.7569	.08584	.1134	65.23	.01416	.1390	−67.00	56102.2
17200	−55.000	218.000	237.766	.7569	.08450	.1116	64.21	.01395	.1368	−67.00	56430.3
17300	−55.000	218.000	237.641	.7569	.08319	.1098	63.22	.01373	.1347	−67.00	56758.4
17400	−55.000	218.000	237.518	.7569	.08190	.1081	62.24	.01351	.1325	−67.00	57086.5
17500	−55.000	218.000	237.396	.7569	.08063	.1065	61.28	.01330	.1304	−67.00	57414.6
17600	−55.000	218.000	237.276	.7569	.07937	.1048	60.32	.01310	.1285	−67.00	57742.7
17700	−55.000	218.000	237.157	.7569	.07813	.1032	59.37	.01289	.1265	−67.00	58070.8
17800	−55.000	218.000	237.040	.7569	.07692	.1016	58.45	.01269	.1245	−67.00	58398.8
17900	−55.000	218.000	236.925	.7569	.07572	.1000	57.55	.01250	.1226	−67.00	58726.9
18000	−55.000	218.000	236.812	.7569	.07454	.09848	56.65	.01230	.1207	−67.00	59055.0
18100	−55.000	218.000	236.699	.7569	.07339	.09694	55.77	.01211	.1188	−67.00	59383.1
18200	−55.000	218.000	236.587	.7569	.07225	.09542	54.91	.01193	.1169	−67.00	59711.2
18300	−55.000	218.000	236.477	.7569	.07111	.09393	54.06	.01174	.1152	−67.00	60039.2
18400	−55.000	218.000	236.368	.7569	.07001	.09248	53.22	.01155	.1134	−67.00	60367.3
18500	−55.000	218.000	236.261	.7569	.06892	.09104	52.39	.01138	.1116	−67.00	60695.4
18600	−55.000	218.000	236.154	.7569	.06785	.08962	51.58	.01120	.1099	−67.00	61023.5
18700	−55.000	218.000	236.049	.7569	.06678	.08823	50.77	.01102	.1082	−67.00	61351.6
18800	−55.000	218.000	235.944	.7569	.06575	.08686	49.97	.01085	.1065	−67.00	61679.7
18900	−55.000	218.000	235.842	.7569	.06472	.08551	49.20	.01069	.1049	−67.00	62007.7
19000	−55.000	218.000	235.741	.7569	.06372	[illegible]	48.43	.01052	.1032	−67.00	62335.8
19100	−55.000	218.000	235.640	.7569	.06273	.08286	47.68	.01035	.1016	−67.00	62663.9
19200	−55.000	218.000	235.541	.7569	.06176	.08158	46.95	.01020	.1000	−67.00	62992.0
19300	−55.000	218.000	235.443	.7569	.06080	.08031	46.21	.01004	.0985	−67.00	63320.1
19400	−55.000	218.000	235.345	.7569	.05985	.07906	45.49	.00988	.0969	−67.00	63648.2
19500	−55.000	218.000	235.250	.7569	.05892	.07784	44.79	.00973	.0954	−67.00	63976.2
19600	−55.000	218.000	235.155	.7569	.05801	.07663	44.09	.00958	.0940	−67.00	64304.3
19700	−55.000	218.000	235.061	.7569	.05711	.07545	43.40	.00943	.0925	−67.00	64632.4
19800	−55.000	218.000	234.969	.7569	.05622	.07427	42.72	.00928	.0910	−67.00	64960.5
19900	−55.000	218.000	234.877	.7569	.05534	.07312	42.05	.00914	.0897	−67.00	65288.6
20000	−55.000	218.000	234.786	.7569	.05449	.07198	41.41	.00900	.0883	−67.00	65616.7

STANDARD ATMOSPHERE
ENGLISH UNITS

Z ft.	t °F.	T °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
−4000	73.265	532.665	525.500	1.0275	1.1533	1.1225	34.51	0.002669	0.08588	22.925	−1219.2
−3800	72.551	531.951	525.148	1.0261	1.1453	1.1161	34.27	.002654	.08539	22.529	−1158.2
−3600	71.838	531.238	524.795	1.0248	1.1373	1.1098	34.03	.002639	.08491	22.132	−1097.3
−3400	71.125	530.525	524.439	1.0234	1.1293	1.1035	33.79	.002624	.08442	21.736	−1036.3
−3200	70.412	529.812	524.086	1.0220	1.1213	1.0972	33.55	.002609	.08394	21.340	−975.4
−3000	69.699	529.099	523.731	1.0206	1.1134	1.0909	33.31	.002594	.08346	20.944	−914.4
−2800	68.985	528.385	523.378	1.0193	1.1055	1.0846	33.08	.002579	.08298	20.547	−853.4
−2600	68.272	520.672	523.024	1.0179	1.0977	1.0784	32.84	.002564	.08251	20.151	−792.5
−2400	67.559	526.959	522.669	1.0165	1.0899	1.0722	32.61	.002550	.08203	19.755	−731.5
−2200	66.846	526.246	522.317	1.0151	1.0822	1.0660	32.38	.002535	.08156	19.359	−670.6
−2000	66.132	525.532	521.962	1.0138	1.0745	1.0599	32.15	.002520	.08109	18.962	−609.6
−1800	65.419	524.819	521.607	1.0124	1.0668	1.0538	31.92	.002506	.08062	18.566	−548.6
−1600	64.706	524.106	521.250	1.0110	1.0592	1.0477	31.69	.002491	.08016	18.170	−487.7
−1400	63.992	523.392	520.895	1.0096	1.0516	1.0416	31.47	.002477	.07970	17.774	−426.7
−1200	63.279	522.679	520.538	1.0083	1.0442	1.0356	31.24	.002463	.07924	17.377	−365.8
−1000	62.566	521.960	520.181	1.0069	1.0367	1.0296	31.02	.002448	.07878	16.981	−304.8
−800	61.853	521.253	519.825	1.0055	1.0293	1.0237	30.80	.002434	.07832	16.585	−243.8
−600	61.140	520.540	519.469	1.0041	1.0219	1.0177	30.58	.002420	.07787	16.189	−182.9
−400	60.426	519.826	519.112	1.0027	1.0146	1.0118	30.36	.002406	.07741	15.792	−121.9
−200	59.713	519.113	518.757	1.0014	1.0073	1.0059	30.14	.002392	.07696	15.396	−61.0
0	59.000	518.400	518.400	1.0000	1.0000	1.0000	29.92	.002378	.07651	15.000	0
100	58.643	518.043	518.222	.9993	.9964	.9971	29.81	.002371	.07628	14.802	30.5
200	58.287	510.687	518.043	.9986	.9928	.9942	29.71	.002364	.07606	14.604	61.0
300	57.930	517.330	517.865	.4979	.9892	.9913	29.60	.002357	.07584	14.406	91.4
400	57.574	516.974	517.686	.9972	.9856	.9884	29.49	.002350	.07562	14.208	121.9
500	57.217	516.617	517.507	.9966	.9821	.9855	29.38	.002343	.07540	14.009	152.4
600	56.860	516.260	517.328	.9959	.9785	.9826	29.28	.002336	.07518	13.811	182.9
700	56.504	515.904	517.150	.9952	.9749	.9797	29.17	.002330	.07496	13.613	213.4
800	56.147	515.547	516.972	.9945	.9714	.9768	29.07	.002323	.07474	13.415	243.8
900	55.791	515.191	516.793	.9938	.9679	.9739	28.96	.002316	.07452	13.217	274.3
1000	55.434	514.834	516.615	.9931	.9644	.9710	28.86	.002309	.07430	13.019	304.8
1100	55.077	514.477	516.437	.9924	.9609	.9682	28.75	.002302	.07408	12.821	335.3
1200	54.721	514.121	516.258	.9917	.9574	.9653	28.65	.002295	.07386	12.623	365.8
1300	54.364	513.764	516.080	.9911	.9539	.9625	28.54	.002289	.07364	12.424	396.2
1400	54.008	513.408	515.901	.9904	.9504	.9596	28.44	.002282	.00342	12.226	426.7
1500	53.651	513.051	515.722	.9897	.9469	.9568	28.33	.002275	.07321	12.028	457.2
1600	53.294	512.694	515.544	.9890	.9434	.9540	28.23	.002269	.07299	11.830	487.7
1700	52.938	512.338	515.366	.9883	.9400	.9512	28.13	.002262	.07277	11.632	518.2
1800	52.581	511.981	515.187	.9876	.9366	.9484	28.02	.002255	.07256	11.434	548.6
1900	52.225	511.625	515.008	.9869	.9332	.9456	27.92	.002249	.07234	11.236	579.1
2000	51.868	511.268	514.830	.9862	.9298	.9428	27.82	.002242	.07213	11.038	609.6
2100	51.511	510.911	514.651	.9856	.9264	.9400	27.72	.002235	.07192	10.839	640.1
2000	51.154	510.554	514.470	.9849	.9230	.9372	27.62	.002229	.07170	10.641	670.6
2300	50.798	510.198	514.291	.9842	.9196	.9344	27.52	.002222	.07149	10.443	701.0
2400	50.441	509.841	514.112	.9835	.9162	.9316	27.41	.002215	.07128	10.245	731.5
2500	50.085	509.485	513.931	.9828	.9129	.9288	27.31	.002209	.07107	10.047	762.0
2600	49.728	509.128	513.175	.9821	.9095	.9261	27.21	.002202	.07085	9.849	792.5
2700	49.371	508.771	513.573	.9814	.9062	.9233	27.11	.002196	.07064	9.651	823.0
2800	49.015	508.415	513.392	.9807	.9028	.9206	27.01	.002189	.07043	9.453	853.4
2900	48.658	508.058	513.213	.9800	.8995	.9178	26.91	.002183	.07022	9.255	883.9
3000	48.301	507.701	513.033	.9794	.8962	.9151	26.81	.002176	.07001	9.056	914.4
3100	47.945	507.345	512.853	.9787	.8929	.9124	26.72	.002170	.06980	8.858	944.9
3200	47.588	506.988	512.674	.9780	.8896	.9096	26.62	.002163	.06959	8.660	975.4
3300	47.232	506.632	512.494	.9773	.8863	.9039	26.52	.002157	.06939	8.462	1005.8
3400	46.875	506.275	512.315	.9766	.8830	.9042	26.42	.002150	.06918	8.264	1036.3
3500	46.518	505.918	512.135	.9759	.8798	.9015	26.32	.002144	.06897	8.066	1066.8
3600	46.162	505.562	511.955	.9752	.8765	.8988	26.23	.002137	.06876	7.868	1097.3
3700	45.805	505.205	511.776	.9745	.8733	.8961	26.13	.002131	.06856	7.670	1127.8
3800	45.449	504.849	511.596	.9739	.8701	.8934	26.03	.002125	.06835	7.471	1158.2
3900	45.092	504.492	511.416	.9732	.8668	.8907	25.94	.002118	.06815	7.273	1188.7
4000	44.735	504.135	511.237	.9725	.8636	.8881	25.84	.002112	.06794	7.075	1219.2
4100	44.379	503.779	511.056	.9718	.8604	.8854	25.74	.002105	.06774	6.877	1249.7
4200	44.022	503.422	510.876	.9711	.8572	.8827	25.65	.002099	.06754	6.679	1280.2
4300	43.665	503.065	510.696	.9704	.8540	.8801	25.55	.002093	.06734	6.481	1310.6
4400	43.309	502.709	510.515	.9697	.8509	.8774	25.46	.002086	.06713	6.283	1341.1
4500	42.952	502.352	510.335	.9690	.8477	.8748	25.36	.002080	.06693	6.085	1371.6
4600	42.596	501.996	510.155	.9684	.8445	.8722	25.27	.002074	.06673	5.886	1402.1
4700	42.239	501.639	509.975	.9677	.8414	.8695	25.17	.002068	.06652	5.688	1432.6
4800	41.882	501.282	509.794	.9670	.8382	.8669	25.08	.002061	.06632	5.490	1463.0
4900	41.526	500.926	509.614	.9663	.8351	.8643	24.99	.002055	.06612	5.292	1493.5

Z ft.	t °F.	$\bar{T}$ °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
5000	41.169	500.569	509.434	.9656	.8320	.8616	24.89	.002049	.06592	5.004	1524.0
5100	40.813	500.213	509.253	.9649	.8289	.8590	24.80	.002043	.06572	4.896	1554.5
5200	40.456	499.856	509.073	.9642	.8258	.8564	24.71	.002037	.06552	4.698	1585.0
5300	40.099	499.499	508.892	.9635	.8227	.8538	24.61	.002030	.06532	4.500	1615.4
5400	39.743	499.143	508.711	.9629	.8196	.8512	24.52	.002024	.06513	4.301	1645.9
5500	39.386	498.786	508.531	.9622	.8165	.8487	24.43	.002018	.06493	4.103	1676.4
5600	39.029	498.429	508.351	.9615	.8135	.8461	24.34	.002012	.06473	3.905	1706.9
5700	38.673	498.073	508.170	.9608	.8104	.8435	24.25	.002006	.06453	3.707	1737.4
5800	38.316	497.716	507.990	.9601	.8074	.8409	24.16	.002000	.06434	3.509	1767.8
5900	37.960	497.360	507.810	.9594	.8043	.8383	24.07	.001994	.06414	3.311	1798.3
6000	37.603	497.003	507.629	.9587	.8013	.8358	23.98	.001988	.06395	3.113	1828.8
6100	37.246	496.646	507.448	.9580	.7983	.8333	23.89	.001982	.06375	2.915	1859.3
6200	36.890	496.290	507.268	.9573	.7953	.8307	23.80	.001975	.06356	2.717	1889.8
6300	36.533	495.933	507.086	.9567	.7923	.8282	23.71	.001969	.06337	2.518	1920.2
6400	36.177	495.577	506.905	.9560	.7893	.8257	23.62	.001963	.06317	2.320	1950.7
6500	35.820	495.220	506.723	.9553	.7863	.8232	23.53	.001957	.06298	2.122	1981.2
6600	35.463	494.863	506.542	.9546	.7834	.8206	23.44	.001951	.06279	1.924	2011.7
6700	35.107	494.507	506.360	.9539	.7804	.8181	23.35	.001945	.06259	1.726	2042.2
6800	34.750	494.150	506.179	.9532	.7775	.8156	23.26	.001939	.06240	1.528	2072.6
6900	34.393	493.793	505.998	.9525	.7745	.8131	23.17	.001934	.06221	1.330	2103.1
7000	34.037	493.437	505.816	.9518	.7716	.8106	23.09	.001928	.06202	1.132	2133.6
7100	33.680	493.080	505.635	.9512	.7687	.8081	23.00	.001922	.06183	.933	2164.1
7200	33.324	492.724	505.455	.9505	.7657	.8057	22.91	.001916	.06164	.735	2194.6
7300	32.967	492.367	505.272	.9498	.7628	.8032	22.82	.001910	.06145	.537	2225.0
7400	32.610	492.010	505.091	.9491	.7599	.8007	22.74	.001904	.06126	.339	2255.5
7500	32.254	491.654	504.910	.9484	.7571	.7982	22.65	.001898	.06107	.141	2286.0
7600	31.897	491.297	504.729	.9477	.7542	.7958	22.56	.001892	.06088	−.057	2316.5
7700	31.540	490.940	504.547	.9470	.7513	.7933	22.48	.001886	.06070	−.255	2347.0
7800	31.184	490.584	504.366	.9463	.7484	.7909	22.39	.001881	.06051	−.453	2377.4
7900	30.827	490.227	504.185	.9457	.7456	.7884	22.31	.001875	.06032	−.652	2407.9
8000	30.471	489.871	504.002	.9450	.7427	.7859	22.22	.001869	.06013	−0.850	2438.4
8100	30.114	489.514	503.820	.9443	.7398	.7835	22.14	.001863	.05994	−1.048	2468.9
8200	29.757	489.157	503.637	.9436	.7370	.7811	22.05	.001858	.05976	−1.246	2499.4
8300	29.401	488.801	503.455	.9429	.7342	.7786	21.97	.001852	.05957	−1.444	2529.8
8400	29.044	488.444	503.273	.9422	.7314	.7762	21.89	.001846	.05939	−1.642	2560.3
8500	28.688	488.088	503.091	.9415	.7286	.7738	21.80	.001840	.05920	−1.840	2590.8
8600	28.331	487.731	502.908	.9408	.7258	.7714	21.72	.001835	.05902	−2.038	2621.3
8700	27.974	487.374	502.727	.9402	.7230	.7690	21.64	.001829	.05884	−2.236	2651.8
8800	27.618	487.018	502.545	.9395	.7202	.7666	21.55	.001823	.05865	−2.435	2682.2
8900	27.261	486.661	502.363	.9388	.7175	.7643	21.47	.001818	.05847	−2.633	2712.7
9000	26.904	486.304	502.180	.9381	.7147	.7619	21.38	.001812	.05829	−2.831	2743.2
9100	26.548	485.948	501.998	.9374	.7119	.7595	21.30	.001806	.05811	−3.029	2773.7
9200	26.191	485.591	501.816	.9367	.7092	.7571	21.22	.001801	.05793	−3.227	2804.2
9300	25.835	485.235	501.634	.9360	.7065	.7548	21.14	.001795	.05775	−3.425	2834.6
9400	25.478	484.878	501.452	.9353	.7038	.7524	21.06	.001789	.05757	−3.624	2865.1
9500	25.121	484.521	501.270	.9346	.7011	.7501	20.98	.001784	.05739	−3.821	2895.6
9600	24.765	484.165	501.087	.9340	.6984	.7477	20.90	.001778	.05721	−4.020	2926.1
9700	24.408	483.808	500.906	.9333	.6957	.7454	20.82	.001773	.05703	−4.218	2956.6
9800	24.052	483.452	500.724	.9326	.6930	.7431	20.74	.001767	.05685	−4.416	2987.0
9900	23.695	483.095	500.541	.9319	.6903	.7407	20.66	.001762	.05667	−4.614	3017.5
10000	23.338	482.738	500.359	.9312	.6876	.7384	20.58	.001756	.05649	−4.813	3048.0
10100	22.982	482.382	500.177	.9305	.6849	.7361	20.50	.001751	.05632	−5.010	3078.5
10200	22.625	482.025	499.995	.9298	.6823	.7338	20.42	.001745	.05614	−5.208	3109.0
10300	22.268	481.668	499.812	.9291	.6796	.7315	20.34	.001740	.05596	−5.406	3139.4
10400	21.912	481.312	499.630	.9285	.6770	.7292	20.26	.001734	.05579	−5.605	3170.0
10500	21.555	480.955	499.448	.9278	.6743	.7269	20.18	.001728	.05561	−5.803	3200.4
10600	21.199	480.599	499.265	.9271	.6717	.7246	20.10	.001723	.05544	−6.001	3230.9
10700	20.842	480.242	499.083	.9264	.6691	.7223	20.02	.001718	.05526	−6.199	3261.4
10800	20.485	479.885	498.900	.9257	.6665	.7200	19.95	.001713	.05509	−6.397	3291.8
10900	20.129	479.529	498.717	.9250	.6639	.7177	19.87	.001707	.05491	−6.595	3322.3
11000	19.772	479.172	498.535	.9243	.6614	.7154	19.79	.001702	.05474	−6.793	3352.8
11100	19.416	478.816	498.353	.9236	.6588	.7132	19.71	.001696	.05457	−6.991	3383.3
11200	19.059	478.459	498.170	.9230	.6562	.7109	19.64	.001691	.05440	−7.189	3413.8
11300	18.702	478.102	497.987	.9223	.6537	.7086	19.56	.001686	.05422	−7.388	3444.2
11400	18.346	477.746	497.805	.9216	.6511	.7064	19.48	.001680	.05405	−7.586	3474.7
11500	17.989	477.389	497.623	.9209	.6486	.7042	19.40	.001675	.05388	−7.784	3505.2
11600	17.632	477.032	497.439	.9202	.6460	.7019	19.33	.001670	.05371	−7.982	3535.7
11700	17.276	476.676	497.257	.9195	.6435	.6997	19.25	.001664	.05354	−8.180	3566.2
11800	16.919	476.319	497.075	.9188	.6410	.6975	19.18	.001659	.05337	−8.378	3596.6
11900	16.563	475.963	496.892	.9181	.6384	.6953	19.10	.001654	.05320	−8.576	3627.1

Z ft.	t °F.	T °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
12000	16.206	475.606	496.710	.9175	.6359	.6931	19.03	.001648	.05303	−8.774	3657.6
12100	15.849	475.249	496.527	.9168	.6333	.6909	18.95	.001642	.05286	−8.973	3688.1
12200	15.493	474.893	496.341	.9161	.6309	.6887	18.88	.001637	.05270	−9.171	3718.6
12300	15.136	474.536	496.157	.9154	.6284	.6865	18.80	.001632	.05253	−9.369	3749.0
12400	14.779	474.179	495.973	.9147	.6259	.6843	18.73	.001627	.05236	−9.567	3779.5
12500	14.423	473.823	495.787	.9140	.6234	.6821	18.65	.001622	.05219	−9.765	3810.0
12600	14.066	473.466	495.603	.9133	.6210	.6799	18.58	.001616	.05203	−9.963	3840.5
12700	13.710	453.110	495.418	.9126	.6185	.6778	18.51	.001611	.05186	−10.161	3871.0
12800	13.353	472.753	495.234	.9119	.6161	.6756	18.43	.001606	.05170	−10.359	3901.4
12900	12.996	472.396	495.049	.9113	.6136	.6733	18.36	.001601	.05153	−10.558	3931.9
13000	12.640	472.040	494.865	.9106	.6112	.6712	18.29	.001596	.05136	−10.756	3962.4
13100	12.283	471.683	494.680	.9099	.6088	.6690	18.21	.001591	.05120	−10.954	3992.9
13200	11.927	471.327	494.495	.9092	.6064	.6669	18.14	.001586	.05104	−11.152	4023.4
13300	11.570	470.970	494.310	.9085	.6040	.6647	18.07	.001580	.05087	−11.350	4053.8
13400	11.213	470.613	494.126	.9078	.6016	.6626	18.00	.001575	.05070	−11.548	4084.3
13500	10.857	470.257	493.941	.9071	.5992	.6605	17.93	.001570	.05054	−11.746	4114.8
13600	10.500	469.900	493.757	.9064	.5968	.6583	17.85	.001565	.05037	−11.944	4145.3
13700	10.143	469.543	493.572	.9058	.5945	.6562	17.78	.001560	.05021	−12.142	4175.7
13800	9.787	469.187	493.386	.9051	.5921	.6541	17.71	.001555	.05005	−12.341	4206.2
13900	9.430	468.830	493.202	.9044	.5897	.6520	17.64	.001550	.04989	−12.539	4236.7
14000	9.074	468.474	493.017	.9037	.5873	.6499	17.57	.001545	.04973	−12.737	4267.2
14100	8.717	468.117	492.833	.9030	.5850	.6478	17.50	.001540	.04957	−12.935	4297.7
14200	8.360	467.760	492.648	.9023	.5827	.6457	17.43	.001535	.04941	−13.133	4328.2
14300	8.004	467.404	492.463	.9016	.5804	.6436	17.36	.001530	.04925	−13.331	4358.6
14400	7.647	467.047	492.278	.9009	.5781	.6416	17.29	.001525	.04909	−13.529	4389.1
14500	7.291	466.691	492.093	.9003	.5757	.6394	17.22	.001520	.04893	−13.727	4419.6
14600	6.934	466.334	491.908	.8996	.5734	.6373	17.15	.001515	.04877	−13.926	4450.1
14700	6.577	465.977	491.723	.8989	.5711	.6352	17.09	.001510	.04861	−14.124	4480.6
14800	6.221	465.621	491.537	.8982	.5688	.6332	17.02	.001506	.04846	−14.322	4511.0
14900	5.864	465.264	491.353	.8975	.5665	.6311	16.95	.001501	.04830	−14.520	4541.5
15000	5.507	464.907	491.168	.8968	.5642	.6291	16.88	.001496	.04814	−14.718	4572.0
15100	5.151	464.551	490.982	.8961	.5620	.6270	16.81	.001491	.04798	−14.916	4602.5
15200	4.794	464.194	490.797	.8954	.5597	.6250	16.75	.001486	.04783	−15.114	4633.0
15300	4.438	463.838	490.612	.8947	.5575	.6230	16.68	.001481	.04767	−15.312	4663.4
15400	4.081	463.481	490.426	.8941	.5552	.6209	16.61	.001476	.04752	−15.511	4693.9
15500	3.724	463.124	490.242	.8934	.5530	.6189	16.54	.001472	.04736	−15.709	4724.4
15600	3.368	462.768	490.057	.8927	.5507	.6169	16.48	.001467	.04720	−15.907	4754.9
15700	3.011	462.411	489.873	.8920	.5485	.6149	16.41	.001462	.04704	−16.105	4785.4
15800	2.655	462.055	489.687	.8913	.5463	.6129	16.34	.001457	.04689	−16.303	4815.8
15900	2.298	461.698	489.501	.8906	.5441	.6109	16.28	.001453	.04673	−16.501	4846.3
16000	1.941	461.341	489.317	.8899	.5418	.6088	16.21	.001448	.04658	−16.699	4876.8
16100	1.585	460.985	489.130	.8892	.5396	.6068	16.15	.001443	.04643	−16.897	4907.3
16200	1.228	460.628	488.944	.8886	.5374	.6048	16.08	.001438	.04628	−17.096	4937.8
16300	0.871	460.271	488.759	.8879	.5352	.6028	16.02	.001434	.04613	−17.294	4968.2
16400	0.515	459.915	488.573	.8872	.5331	.6008	15.95	.001429	.04598	−17.492	4998.7
16500	0.158	459.558	488.387	.8865	.5309	.5988	15.89	.001424	.04583	−17.690	5029.2
16600	−0.198	459.202	488.202	.8858	.5287	.5968	15.82	.001419	.04567	−17.888	5059.7
16700	−0.555	458.845	488.015	.8851	.5266	.5949	15.76	.001415	.04552	−18.086	5090.2
16800	−0.912	458.488	487.830	.8854	.5245	.5930	15.69	.001410	.04537	−18.284	5120.7
16900	−1.268	458.132	487.644	.8837	.5223	.5910	15.63	.001406	.04522	−18.482	5151.1
17000	−1.625	457.775	487.459	.8831	.5202	.5891	15.56	.001401	.04507	−18.680	5181.6
17100	−1.982	457.418	487.272	.8824	.5181	.5871	15.50	.001396	.04492	−18.879	5212.1
17200	−2.338	457.062	487.087	.8817	.5160	.5852	15.44	.001392	.04477	−19.077	5242.6
17300	−2.695	456.705	486.901	.8810	.5139	.5832	15.37	.001387	.04462	−19.275	5273.1
17400	−3.051	456.349	486.714	.8803	.5118	.5812	15.31	.001383	.04447	−19.473	5303.5
17500	−3.408	455.992	486.529	.8796	.5097	.5793	15.25	.001378	.04433	−19.671	5334.0
17600	−3.765	455.635	486.343	.8789	.5076	.5774	15.19	.001373	.04418	−19.869	5364.5
17700	−4.121	455.279	486.157	.8782	.5055	.5755	15.12	.001369	.04403	−20.067	5395.0
17800	−4.478	454.922	485.971	.8776	.5034	.5736	15.06	.001364	.04389	−20.265	5425.5
17900	−4.834	454.566	485.785	.8769	.5013	.5717	15.00	.001360	.04374	−20.464	5455.9
18000	−5.191	454.209	485.598	.8762	.4992	.5698	14.94	.001355	.04359	−20.662	5486.4
18100	−5.548	453.852	485.411	.8755	.4972	.5679	14.88	.001351	.04344	−20.860	5516.9
18200	−5.904	453.496	485.225	.8748	.4951	.5660	14.82	.001346	.04330	−21.058	5547.4
18300	−6.261	453.139	485.038	.8741	.4931	.5641	14.75	.001342	.04316	−21.256	5577.9
18400	−6.618	452.782	484.851	.8734	.4911	.5622	14.69	.001337	.04302	−21.454	5608.3
18500	−6.974	452.426	484.664	.8727	.4891	.5603	14.63	.001333	.04287	−21.652	5638.8
18600	−7.331	452.069	484.478	.8720	.4870	.5584	14.57	.001329	.04272	−21.850	5669.3
18700	−7.687	451.713	484.290	.8714	.4850	.5565	14.51	.001324	.04258	−22.049	5699.8
18800	−8.044	451.356	484.103	.8707	.4830	.5546	14.45	.001320	.04244	−22.247	5730.3
18900	−8.401	450.999	483.917	.8700	.4810	.5528	14.39	.001315	.04230	−22.445	5760.7

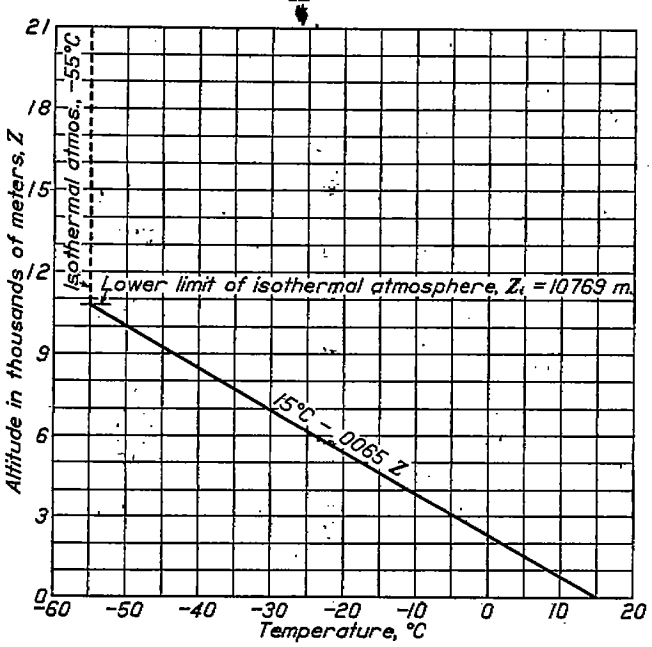
z ft.	t °F.	T °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	z m
19000	−8.757	450.643	483.729	.8693	.4790	.5509	14.33	.001311	.04216	−22.643	5791.2
19100	−9.114	450.286	483.541	.8686	.4770	.5491	14.27	.001306	.04201	−22.841	5821.7
19200	−9.470	449.930	483.355	.8679	.4750	.5473	14.21	.001302	.04187	−23.039	5852.2
19300	−9.827	449.573	483.168	.8672	.4730	.5454	14.15	.001298	.04173	−23.237	5882.7
19400	−10.184	449.216	482.981	.8665	.4711	.5436	14.09	.001293	.04159	−23.435	5913.1
19500	−10.540	448.860	482.794	.8659	.4691	.5418	14.04	.001289	.04145	−23.633	5943.6
19600	−10.897	448.503	482.608	.8652	.4672	.5400	13.98	.001285	.04131	−23.832	5974.1
19700	−11.254	448.146	482.421	.8645	.4652	.5381	13.92	.001281	.04118	−24.030	6004.6
19800	−11.610	447.790	482.234	.8638	.4633	.5363	13.86	.001276	.04103	−24.228	6035.1
19900	−11.967	447.433	482.047	.8631	.4614	.5345	13.80	.001272	.04089	−24.426	6065.5
20000	−12.323	447.077	481.859	.8624	.4594	.5327	13.75	.001267	.04075	−24.624	6096.0
20100	−12.680	446.720	481.672	.8617	.4575	.5308	13.69	.001263	.04061	−24.822	6126.5
20200	−13.037	446.363	481.484	.8610	.4557	.5290	13.63	.001259	.04048	−25.020	6157.0
20300	−13.393	446.007	481.296	.8604	.4537	.5272	13.57	.001255	.04034	−25.218	6187.5
20400	−13.750	445.650	481.108	.8597	.4517	.5255	13.52	.001250	.04020	−25.417	6218.0
20500	−14.106	445.294	480.921	.8590	.4498	.5237	13.46	.001246	.04007	−25.615	6248.4
20600	−14.463	444.937	480.732	.8583	.4480	.5219	13.40	.001242	.03993	−25.813	6278.9
20700	−14.820	444.580	480.545	.8576	.4461	.5201	13.35	.001238	.03980	−26.011	6309.4
20800	−15.176	444.224	480.357	.8569	.4442	.5183	13.29	.001234	.03966	−26.209	6339.9
20900	−15.533	443.867	480.169	.8562	.4423	.5165	13.24	.001229	.03952	−26.407	6370.3
21000	−15.890	444.510	479.980	.8555	.4405	.5148	13.18	.001225	.03938	−26.605	6400.8
21100	−16.246	443.154	479.793	.8549	.4386	.5130	13.13	.001220	.03925	−26.803	6431.3
21200	−16.603	442.797	479.605	.8542	.4368	.5113	13.07	.001216	.03912	−27.002	6461.8
21300	−16.959	442.441	479.417	.8535	.4350	.5095	13.01	.001212	.03898	−27.200	6492.3
21400	−17.316	442.084	479.229	.8528	.4331	.5078	12.96	.001208	.03885	−27.398	6522.7
21500	−17.673	441.727	479.042	.8521	.4313	.5061	12.90	.001204	.03872	−27.596	6553.2
21600	−18.029	441.370	478.853	.8514	.4294	.5043	12.85	.001199	.03859	−27.794	6583.7
21700	−18.386	441.014	478.666	.8507	.4276	.5026	12.80	.001195	.03846	−27.992	6614.2
21800	−18.743	440.657	478.478	.8500	.4258	.5008	12.74	.001191	.03832	−27.190	6644.7
21900	−19.099	440.301	478.289	.8493	.4240	.4991	12.69	.001187	.03819	−28.388	6675.1
22000	−19.456	439.944	478.100	.8487	.4222	.4974	12.63	.001183	.03806	−28.586	6705.6
22100	−19.812	439.588	477.912	.8480	.4204	.4957	12.58	.001179	.03792	−28.785	6736.1
22200	−20.169	439.231	477.723	.8473	.4186	.4940	12.52	.001175	.03779	−28.983	6766.6
22300	−20.526	438.874	477.534	.8466	.4169	.4923	12.47	.001171	.03766	−29.181	6797.1
22400	−20.882	438.518	477.345	.8459	.4151	.4906	12.42	.001167	.03753	−29.379	6827.5
22500	−21.239	438.161	477.156	.8452	.4133	.4889	12.36	.001163	.03740	−29.577	6858.0
22600	−21.595	437.805	476.966	.8445	.4115	.4872	12.31	.001159	.03727	−29.775	6888.5
22700	−21.952	437.448	476.777	.8438	.4097	.4855	12.26	.001155	.03715	−29.973	6919.0
22800	−22.309	437.091	476.589	.8432	.4080	.4838	12.20	.001151	.03702	−30.171	6949.5
22900	−22.665	436.735	476.399	.8425	.4062	.4821	12.15	.001147	.03689	−30.370	6980.0
23000	−23.022	436.378	476.210	.8418	.4045	.4805	12.10	.001143	.03676	−30.568	7010.4
23100	−23.379	436.021	476.021	.8411	.4028	.4788	12.05	.001139	.03663	−30.766	7040.9
23200	−23.735	435.665	475.831	.8404	.4010	.4772	12.00	.001135	.03650	−30.964	7071.4
23300	−24.092	435.308	475.642	.8397	.3993	.4755	11.95	.001131	.03638	−31.162	7101.9
23400	−24.448	434.952	475.453	.8390	.3976	.4739	11.90	.001127	.03625	−31.360	7132.3
23500	−24.805	434.595	475.265	.8383	.3959	.4721	11.84	.001123	.03612	−31.558	7162.8
23600	−25.162	434.238	475.075	.8377	.3942	.4705	11.79	.001119	.03600	−31.756	7193.3
23700	−25.518	433.882	474.887	.8370	.3925	.4689	11.74	.001115	.03587	−31.955	7223.8
23800	−25.875	433.525	474.698	.8363	.3907	.4672	11.69	.001111	.03574	−32.153	7254.3
23900	−26.231	433.169	474.508	.8356	.3891	.4656	11.64	.001107	.03562	−32.351	7284.7
24000	−26.588	432.812	474.320	.8349	.3874	.4640	11.59	.001103	.03550	−32.549	7315.2
24100	−26.945	432.455	474.131	.8342	.3857	.4624	11.54	.001099	.03538	−32.747	7345.7
24200	−27.301	432.099	473.941	.8335	.3841	.4608	11.49	.001096	.03526	−32.945	7376.2
24300	−27.658	431.742	473.751	.8328	.3824	.4591	11.44	.001092	.03513	−33.143	7406.7
24400	−28.015	431.385	473.561	.8321	.3808	.4576	11.39	.001088	.03500	−33.341	7437.1
24500	−28.371	431.029	473.370	.8315	.3791	.4559	11.34	.001085	.03488	−33.539	7467.6
24600	−28.728	430.672	473.181	.8308	.3775	.4543	11.29	.001081	.03476	−33.738	7498.1
24700	−29.084	430.316	472.991	.8301	.3758	.4527	11.24	.001077	.03464	−33.936	7528.6
24800	−29.441	429.959	472.801	.8294	.3741	.4511	11.20	.001073	.03451	−34.134	7559.1
24900	−29.798	429.602	472.609	.8287	.3725	.4496	11.15	.001069	.03439	−34.332	7589.5
25000	−30.154	429.246	472.420	.8280	.3709	.4480	11.10	.001065	.03427	−34.530	7620.0
25100	−30.511	428.889	472.230	.8273	.3693	.4463	11.05	.001061	.03415	−34.728	7650.5
25200	−30.867	428.533	472.039	.8266	.3677	.4447	11.00	.001057	.03403	−34.926	7681.0
25300	−31.224	428.176	471.850	.8260	.3661	.4432	10.96	.001053	.03391	−35.124	7711.5
25400	−31.581	427.819	471.660	.8254	.3645	.4416	10.91	.001049	.03379	−35.323	7741.9
25500	−31.937	427.463	471.469	.8246	.3629	.4401	10.86	.001046	.03367	−35.521	7772.4
25600	−32.294	427.106	471.279	.8239	.3613	.4385	10.81	.001042	.03355	−35.719	7802.9
25700	−32.651	426.749	471.090	.8232	.3597	.4370	10.77	.001039	.03343	−35.917	7833.4
25800	−33.007	426.393	470.899	.8225	.3581	.4355	10.72	.001035	.03331	−36.115	7863.9
25900	−33.364	426.036	470.709	.8218	.3566	.4339	10.67	.001031	.03320	−36.313	7894.3

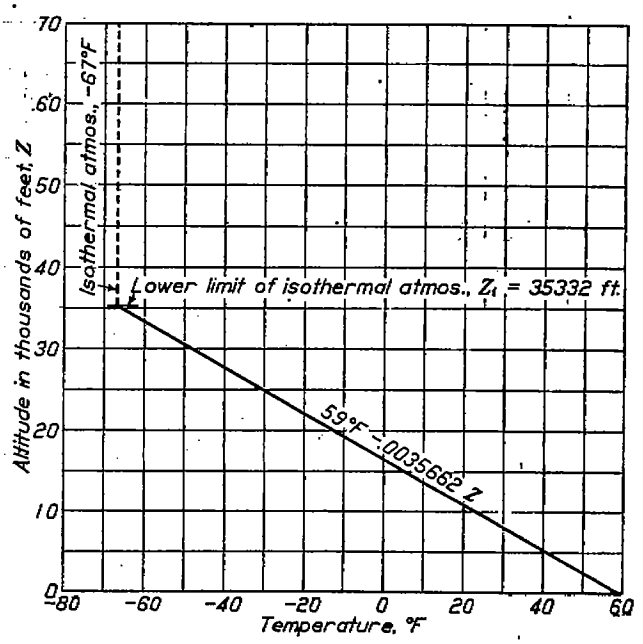
Z ft.	°F.	T °F. αz	T_m °F. αz	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
26000	−33.720	425.680	470.518	.8211	.3550	.4323	10.62	.001028	.03308	−36.511	7924.8
26100	−34.077	425.323	470.327	.8205	.3535	.4308	10.58	.001024	.03296	−36.709	7955.3
26200	−34.434	424.966	470.136	.8198	.3519	.4292	10.53	.001020	.03284	−36.908	7985.8
26300	−34.790	424.610	469.946	.8191	.3504	.4277	10.48	.001017	.03282	−37.106	8016.3
26400	−35.147	424.253	469.755	.8184	.3488	.4262	10.44	.001013	.03260	−37.304	8046.7
26500	−35.504	423.896	469.563	.8177	.3473	.4247	10.39	.001010	.03249	−37.502	8077.2
26600	−35.860	423.540	469.372	.8170	.3458	.4232	10.34	.001006	.03237	−37.700	8107.7
26700	−36.217	423.183	469.181	.8163	.3442	.4216	10.30	.001002	.03226	−37.898	8138.2
26800	−36.573	422.827	468.989	.8156	.3427	.4201	10.25	.000999	.03214	−38.096	8168.7
26900	−36.930	422.470	468.798	.8150	.3412	.4186	10.21	.000995	.03203	−38.294	8199.1
27000	−37.287	422.113	468.607	.8143	.3397	.4171	10.16	.000992	.03192	−38.493	8229.6
27100	−37.643	421.757	468.415	.8136	.3382	.4156	10.12	.000988	.03180	−38.691	8260.1
27200	−38.000	421.400	468.224	.8129	.3367	.4142	10.07	.000985	.03168	−38.889	8290.6
27300	−38.356	421.044	468.033	.8122	.3352	.4127	10.03	.000981	.03157	−39.087	8321.1
27400	−38.713	420.687	467.841	.8115	.3337	.4111	9.980	.000978	.03145	−39.285	8351.5
27500	−39.070	420.330	467.651	.8108	.3322	.4097	9.939	.000974	.03134	−39.483	8382.0
27600	−39.426	419.974	467.460	.8101	.3307	.4082	9.895	.000971	.03123	−39.681	8412.5
27700	−39.783	419.617	467.269	.8094	.3292	.4067	9.852	.000967	.03112	−39.879	8443.0
27800	−40.140	419.260	467.078	.8088	.3277	.4053	9.808	.000964	.03101	−40.077	8473.5
27900	−40.496	418.904	466.887	.8081	.3263	.4038	9.764	.000960	.03090	−40.276	8503.9
28000	−40.853	418.547	466.695	.8074	.3248	.4023	9.720	.000957	.03078	−40.474	8534.4
28100	−41.209	418.191	466.503	.8067	.3234	.4008	9.676	.000953	.03067	−40.672	8564.9
28200	−41.566	417.834	466.311	.8060	.3219	.3994	9.633	.000950	.03056	−40.870	8595.4
28300	−41.923	417.477	466.119	.8053	.3205	.3979	9.590	.000946	.03045	−41.068	8625.9
28400	−42.279	417.121	465.926	.8046	.3190	.3965	9.547	.000943	.03034	−41.266	8656.3
28500	−42.636	416.764	465.734	.8039	.3176	.3951	9.504	.000940	.03023	−41.464	8686.8
28600	−42.992	416.408	465.542	.8033	.3162	.3937	9.462	.000936	.03012	−41.662	8717.3
28700	−43.349	416.051	465.349	.8026	.3148	.3923	9.420	.000933	.03001	−41.861	8747.8
28800	−43.706	415.694	465.157	.8019	.3134	.3908	9.377	.000930	.02990	−42.059	8778.2
28900	−44.062	415.338	464.966	.8012	.3120	.3893	9.335	.000926	.02979	−42.257	8808.7
29000	−44.419	414.981	464.773	.8005	.3106	.3879	9.293	.000922	.02968	−42.455	8839.2
29100	−44.776	414.624	464.580	.7998	.3092	.3865	9.251	.000919	.02957	−42.653	8869.7
29200	−45.132	414.268	464.388	.7991	.3078	.3851	9.209	.000915	.02946	−42.851	8900.2
29300	−45.489	413.911	464.196	.7985	.3063	.3837	9.168	.000912	.02935	−43.049	8930.7
29400	−45.845	413.555	464.003	.7978	.3049	.3823	9.127	.000909	.02925	−43.247	8961.1
29500	−46.202	413.198	463.811	.7971	.3035	.3809	9.085	.000906	.02914	−43.446	8991.6
29600	−46.559	412.841	463.619	.7964	.3022	.3794	9.044	.000902	.02903	−43.644	9022.1
29700	−46.915	412.485	463.427	.7957	.3008	.3780	9.003	.000899	.02892	−43.842	9052.6
29800	−47.272	412.128	463.235	.7950	.2995	.3767	8.962	.000896	.02881	−44.040	9083.1
29900	−47.628	411.772	463.043	.7943	.2981	.3754	8.921	.000892	.02871	−44.238	9113.5
30000	−47.985	411.415	462.849	.7936	.2968	.3740	8.880	.000889	.02861	−44.436	9144.0
30100	−48.342	411.058	462.656	.7929	.2954	.3725	8.840	.000886	.02850	−44.634	9174.5
30200	−48.698	410.702	462.463	.7923	.2940	.3712	8.800	.000883	.02840	−44.832	9205.0
30300	−49.055	410.345	462.270	.7916	.2927	.3698	8.760	.000879	.02829	−45.030	9235.5
30400	−49.412	409.988	462.075	.7909	.2914	.3685	8.720	.000876	.02819	−45.229	9265.9
30500	−49.768	409.632	461.882	.7902	.2900	.3671	8.680	.000873	.02809	−45.427	9296.4
30600	−50.125	409.275	461.689	.7895	.2887	.3658	8.641	.000870	.02799	−45.625	9326.9
30700	−50.481	408.919	461.495	.7888	.2874	.3644	8.601	.000867	.02788	−45.823	9357.4
30800	−50.838	408.562	461.302	.7881	.2861	.3630	8.562	.000863	.02778	−46.021	9387.9
30900	−51.195	408.205	461.108	.7874	.2848	.3617	8.522	.000860	.02767	−46.219	9418.3
31000	−51.551	407.849	460.914	.7867	.2834	.3603	8.483	.000857	.02757	−46.417	9448.8
31100	−51.908	407.492	460.721	.7861	.2821	.3590	8.444	.000854	.02747	−46.615	9479.3
31200	−52.265	407.135	460.528	.7854	.2808	.3577	8.406	.000851	.02737	−46.814	9509.8
31300	−52.620	406.779	460.334	.7847	.2795	.3564	8.367	.000848	.02726	−47.012	9540.3
31400	−52.978	406.422	460.140	.7840	.2783	.3551	8.329	.000845	.02716	−47.210	9570.7
31500	−53.334	406.066	459.947	.7833	.2770	.3537	8.290	.000842	.02706	−47.408	9601.2
31600	−53.691	405.709	459.754	.7826	.2758	.3524	8.252	.000838	.02696	−47.606	9631.7
31700	−54.048	405.352	459.560	.7819	.2745	.3511	8.214	.000835	.02685	−47.804	9662.2
31800	−54.404	404.996	459.367	.7812	.2732	.3498	8.176	.000832	.02675	−48.002	9692.7
31900	−54.761	404.639	459.174	.7806	.2719	.3485	8.138	.000829	.02666	−48.200	9723.1
32000	−55.117	404.283	458.980	.7799	.2707	.3472	8.101	.000826	.02656	−48.399	9753.6
32200	−55.831	403.569	458.591	.7785	.2682	.3445	8.026	.000820	.02636	−48.795	9814.6
32400	−56.544	402.856	458.201	.7771	.2657	.3419	7.952	.000814	.02616	−49.191	9875.5
32600	−57.257	402.143	457.812	.7757	.2632	.3394	7.878	.000807	.02596	−49.587	9936.5
32800	−57.970	401.430	457.423	.7744	.2607	.3368	7.805	.000801	.02577	−49.983	9997.5
33000	−58.684	400.716	457.034	.7730	.2583	.3343	7.732	.000795	.02558	−50.379	10058.4
33200	−59.397	400.003	456.645	.7716	.2560	.3318	7.660	.000789	.02539	−50.776	10119.4
33400	−60.110	399.290	456.255	.7702	.2536	.3293	7.589	.000783	.02520	−51.172	10180.3
33600	−60.823	398.577	455.867	.7689	.2512	.3268	7.518	.000776	.02501	−51.568	10241.3
33800	−61.537	397.863	455.477	.7675	.2489	.3243	7.447	.000770	.02482	−51.965	10302.3

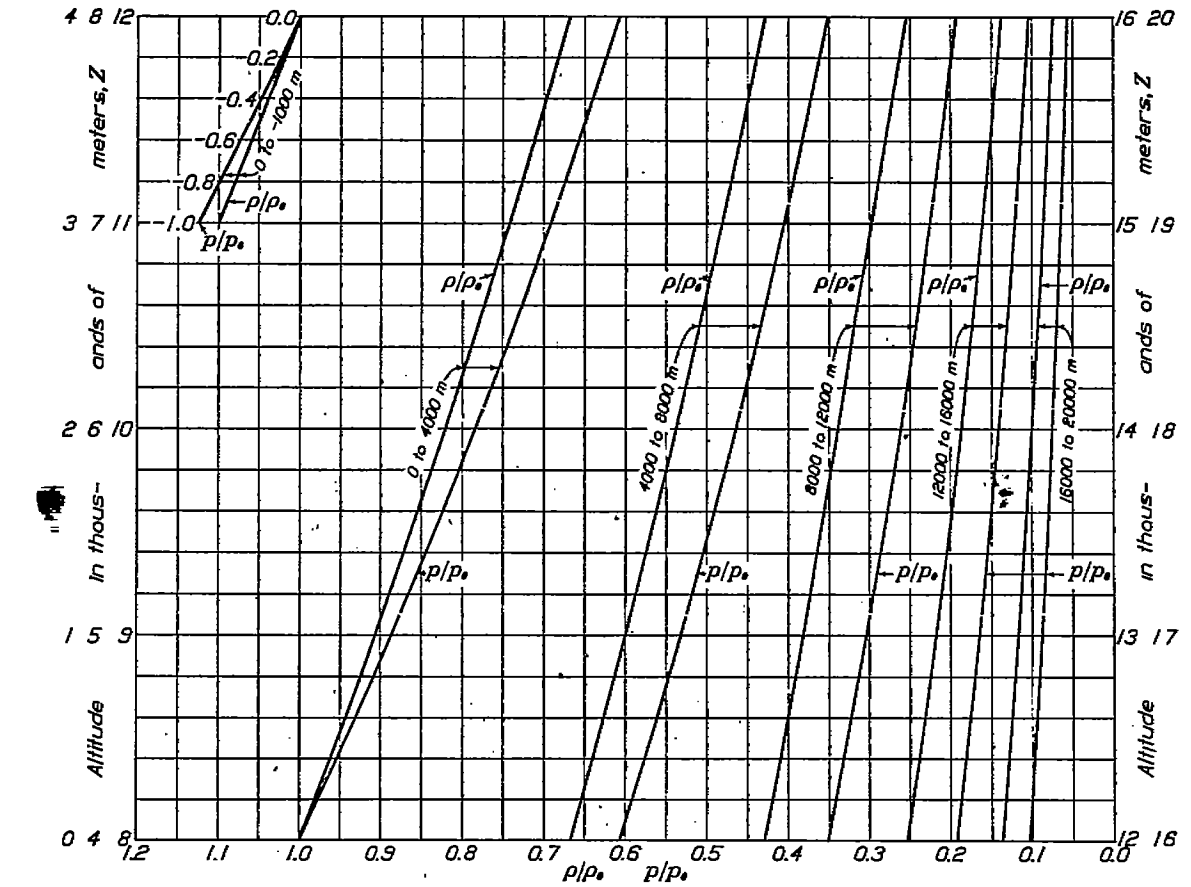
Z ft.	°F.	T °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
34000	−62.250	397.150	455.087	.7661	.2465	.3218	7.377	.000765	.02463	−52.361	10363.2
34200	−62.963	396.437	454.696	.7647	.2442	.3194	7.308	.000759	.02444	−52.757	10424.2
34400	−63.676	395.724	454.305	.7634	.2419	.3170	7.239	.000753	.02425	−53.153	10485.1
34600	−64.389	395.011	453.914	.7620	.2397	.3145	7.171	.000748	.02406	−53.550	10546.1
34800	−65.103	394.297	453.523	.7606	.2374	.3121	7.103	.000742	.02387	−53.946	10607.1
35000	−65.816	393.584	453.132	.7592	.2352	.3098	7.036	.000736	.02369	−54.342	10668.0
35200	−66.529	392.871	452.740	.7579	.2330	.3074	6.970	.000731	.02351	−54.738	10729.0
35332	−67.000	392.400	452.680	.7569	.2314	.3058	6.925	.000727	.02339	−55.000	10769.5
35400	−67.000	392.400	452.351	.7569	.2307	.3048	6.904	.000725	.02332	−55.000	10789.9
35600	−67.000	392.400	451.962	.7569	.2285	.3019	6.838	.000718	.02310	−55.000	10850.9
35800	−67.000	392.400	451.578	.7569	.2264	.2991	6.773	.000711	.02287	−55.000	10911.9
36000	−67.000	392.400	451.198	.7569	.2242	.2962	6.708	.000704	.02265	−55.000	10972.8
36200	−67.000	392.400	450.824	.7569	.2221	.2934	6.644	.000698	.02244	−55.000	11033.8
36400	−67.000	392.400	450.454	.7569	.2199	.2906	6.581	.000691	.02223	−55.000	11094.7
36600	−67.000	392.400	450.087	.7569	.2178	.2878	6.518	.000685	.02201	−55.000	11155.7
36800	−67.000	392.400	449.727	.7569	.2158	.2851	6.456	.000678	.02180	−55.000	11216.7
37000	−67.000	392.400	449.369	.7569	.2137	.2824	6.395	.000671	.02160	−55.000	11277.6
37200	−67.000	392.400	449.016	.7569	.2117	.2797	6.334	.000664	.02139	−55.000	11338.6
37400	−67.000	392.400	448.667	.7569	.2097	.2770	6.274	.000658	.02119	−55.000	11399.5
37600	−67.000	392.400	448.322	.7569	.2078	.2744	6.214	.000652	.02099	−55.000	11460.5
37800	−67.000	392.400	447.981	.7569	.2058	.2718	6.155	.000646	.02078	−55.000	11521.5
38000	−67.000	392.400	447.643	.7569	.2037	.2692	6.096	.000640	.02059	−55.000	11582.4
38200	−67.000	392.400	447.320	.7569	.2018	.2667	6.038	.000634	.02039	−55.000	11643.4
38400	−67.000	392.400	446.997	.7569	.1999	.2642	5.981	.000628	.02020	−55.000	11704.3
38600	−67.000	392.400	446.676	.7569	.1980	.2616	5.924	.000622	.02001	−55.000	11765.3
38800	−67.000	392.400	446.361	.7569	.1961	.2591	5.868	.000616	.01982	−55.000	11826.3
39000	−67.000	392.400	446.049	.7569	.1943	.2566	5.812	.000610	.01963	−55.000	11887.2
39200	−67.000	392.400	445.741	.7569	.1925	.2542	5.757	.000604	.01944	−55.000	11948.2
39400	−67.000	392.400	445.435	.7569	.1906	.2518	5.702	.000598	.01926	−55.000	12009.1
39600	−67.000	392.400	445.133	.7569	.1887	.2494	5.648	.000593	.01908	−55.000	12070.1
39800	−67.000	392.400	444.836	.7569	.1869	.2471	5.595	.000587	.01890	−55.000	12131.1
40000	−67.000	392.400	444.537	.7569	.1852	.2447	5.541	.000582	.01872	−55.000	12192.0
40200	−67.000	392.400	444.244	.7569	.1834	.2424	5.488	.000576	.01854	−55.000	12253.0
40400	−67.000	392.400	443.954	.7569	.1817	.2401	5.436	.000571	.01836	−55.000	12313.9
40600	−67.000	392.400	443.669	.7569	.1799	.2377	5.384	.000565	.01819	−55.000	12374.9
40800	−67.000	392.400	443.384	.7569	.1782	.2355	5.333	.000560	.01802	−55.000	12435.9
41000	−67.000	392.400	443.104	.7569	.1765	.2332	5.283	.000554	.01785	−55.000	12496.8
41200	−67.000	392.400	442.825	.7569	.1749	.2310	5.233	.000549	.01768	−55.000	12557.8
41400	−67.000	392.400	442.551	.7569	.1732	.2288	5.183	.000544	.01751	−55.000	12618.7
41600	−67.000	392.400	442.280	.7569	.1716	.2266	5.134	.000539	.01734	−55.000	12679.7
41800	−67.000	392.400	442.010	.7569	.1699	.2245	5.085	.000534	.01718	−55.000	12740.7
42000	−67.000	392.400	441.742	.7569	.1683	.2224	5.036	.000529	.01701	−55.000	12801.6
42200	−67.000	392.400	441.479	.7569	.1667	.2202	4.988	.000523	.01685	−55.000	12862.6
42400	−67.000	392.400	441.219	.7569	.1651	.2181	4.941	.000518	.01669	−55.000	12923.5
42600	−67.000	392.400	440.963	.7569	.1636	.2160	4.894	.000513	.01653	−55.000	12984.5
42800	−67.000	392.400	440.707	.7569	.1620	.2140	4.848	.000509	.01638	−55.000	13045.5
43000	−67.000	392.400	440.455	.7569	.1605	.2120	4.802	.000504	.01622	−55.000	13106.4
43200	−67.000	392.400	440.206	.7569	.1589	.2100	4.757	.000500	.01606	−55.000	13167.4
43400	−67.000	392.400	439.959	.7569	.1574	.2080	4.712	.000495	.01591	−55.000	13228.3
43600	−67.000	392.400	439.715	.7569	.1559	.2060	4.667	.000491	.01576	−55.000	13289.3
43800	−67.000	392.400	439.472	.7569	.1544	.2040	4.622	.000486	.01561	−55.000	13350.3
44000	−67.000	392.400	439.232	.7569	.1530	.2021	4.578	.000481	.01546	−55.000	13411.2
44200	−67.000	392.400	438.995	.7569	.1515	.2001	4.534	.000477	.01531	−55.000	13472.2
44400	−67.000	392.400	438.760	.7569	.1501	.1982	4.491	.000472	.01517	−55.000	13533.1
44600	−67.000	392.400	438.528	.7569	.1486	.1963	4.448	.000468	.01502	−55.000	13594.1
44800	−67.000	392.400	438.299	.7569	.1472	.1945	4.406	.000463	.01488	−55.000	13655.1
45000	−67.000	392.400	438.071	.7569	.1458	.1926	4.364	.000459	.01474	−55.000	13716.0
45200	−67.000	392.400	437.844	.7569	.1444	.1908	4.323	.000455	.01460	−55.000	13777.0
45400	−67.000	392.400	437.622	.7569	.1431	.1890	4.282	.000450	.01446	−55.000	13837.9
45600	−67.000	392.400	437.401	.7569	.1418	.1872	4.241	.000446	.01432	−55.000	13898.9
45800	−67.000	392.400	437.182	.7569	.1404	.1854	4.200	.000441	.01418	−55.000	13959.9
46000	−67.000	392.400	436.964	.7569	.1391	.1837	4.160	.000437	.01405	−55.000	14020.8
46200	−67.000	392.400	436.750	.7569	.1377	.1819	4.121	.000433	.01391	−55.000	14081.8
46400	−67.000	392.400	436.537	.7569	.1364	.1802	4.082	.000429	.01378	−55.000	14142.7
46600	−67.000	392.400	436.326	.7569	.1351	.1785	4.043	.000425	.01365	−55.000	14203.7
46800	−67.000	392.400	436.118	.7569	.1338	.1768	4.004	.000421	.01352	−55.000	14264.7
47000	−67.000	392.400	435.912	.7569	.1325	.1751	3.966	.000417	.01339	−55.000	14325.6
47200	−67.000	392.400	435.707	.7569	.1314	.1734	3.928	.000413	.01326	−55.000	14386.6
47400	−67.000	392.400	435.504	.7569	.1301	.1718	3.891	.000409	.01313	−55.000	14447.5
47600	−67.000	392.400	435.303	.7569	.1289	.1702	3.854	.000405	.01301	−55.000	14508.5
47800	−67.000	392.400	435.104	.7569	.1276	.1686	3.817	.000401	.01289	−55.000	14569.5

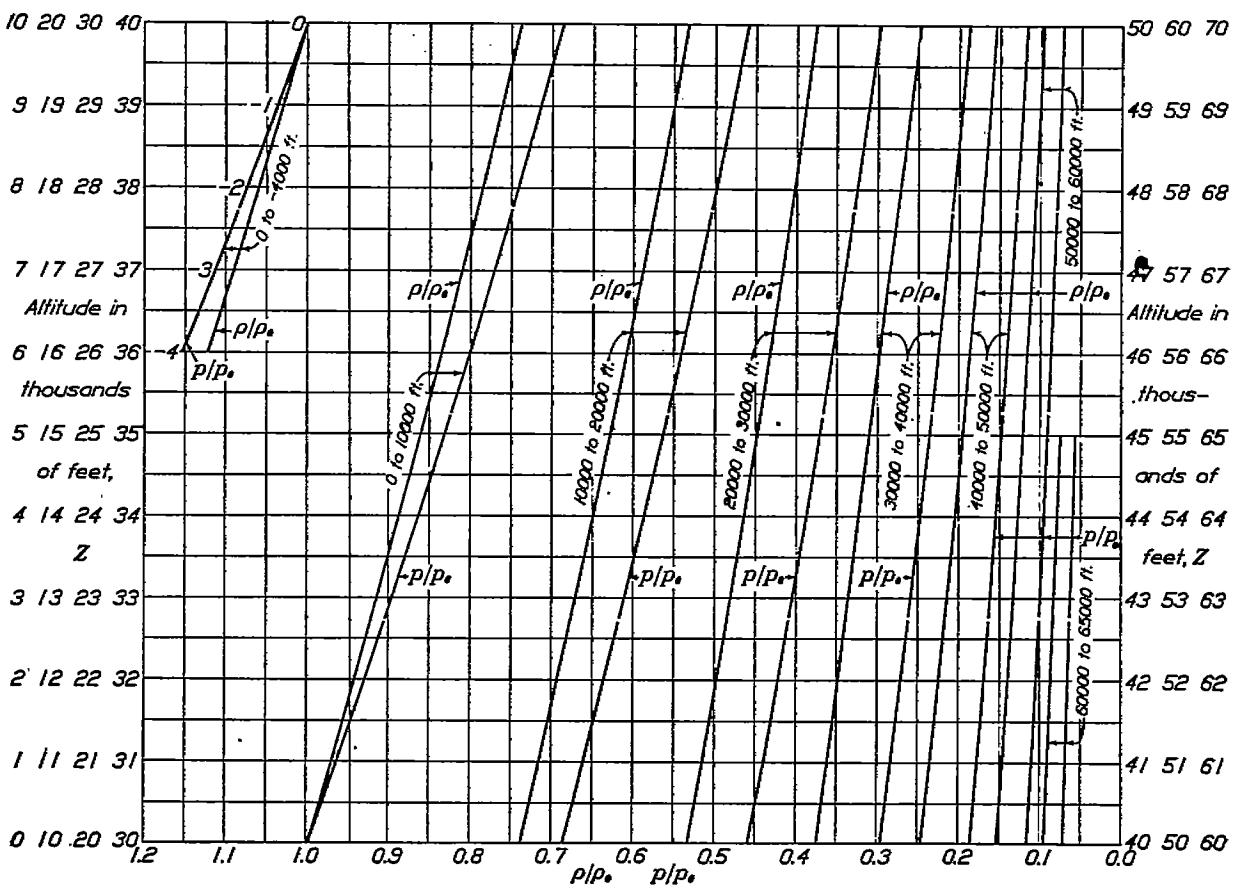
Z ft.	t °F.	T °F. as	T_m °F. as	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	g_ρ lb./ft.³	t °C.	Z m
48000	−67.000	392.400	434.906	.7569	.1264	.1669	3.781	.000397	.01277	−55.000	14630.4
48200	−67.000	392.400	434.712	.7569	.1252	.1653	3.745	.000393	.01265	−55.000	14691.4
48400	−67.000	392.400	434.518	.7569	.1240	.1638	3.709	.000390	.01253	−55.000	14752.3
48600	−67.000	392.400	434.326	.7569	.1228	.1622	3.674	.000386	.01241	−55.000	14813.3
48800	−67.000	392.400	434.136	.7569	.1276	.1606	3.639	.000382	.01229	−55.000	14874.3
49000	−67.000	392.400	433.948	.7569	.1205	.1591	3.604	.000379	.01217	−55.000	14935.2
49200	−67.000	392.400	433.760	.7569	.1194	.1577	3.570	.000375	.01206	−55.000	14996.2
49400	−67.000	392.400	433.575	.7569	.1183	.1562	3.536	.000372	.01194	−55.000	15057.2
49600	−67.000	392.400	433.391	.7569	.1171	.1547	3.502	.000368	.01182	−55.000	15118.1
49800	−67.000	392.400	433.210	.7569	.1160	.1532	3.469	.000364	.01171	−55.000	15179.1
50000	−67.000	392.400	433.030	.7569	.1149	.1517	3.436	.000361	.01161	−55.000	15240.0
50200	−67.000	392.400	432.851	.7569	.1138	.1503	3.403	.000358	.01149	−55.000	15301.0
50400	−67.000	392.400	432.673	.7569	.1127	.1488	3.371	.000354	.01138	−55.000	15362.0
50600	−67.000	392.400	432.497	.7569	.1116	.1475	3.339	.000351	.01127	−55.000	15422.9
50800	−67.000	392.400	432.324	.7569	.1106	.1461	3.308	.000347	.01117	−55.000	15483.9
51000	−67.000	392.400	432.151	.7569	.1095	.1447	3.276	.000344	.01106	−55.000	15544.8
51200	−67.000	392.400	431.981	.7569	.1085	.1433	3.245	.000341	.01095	−55.000	15605.8
51400	−67.000	392.400	431.812	.7569	.1075	.1419	3.214	.000337	.01085	−55.000	15666.8
51600	−67.000	392.400	431.644	.7569	.1065	.1405	3.183	.000334	.01075	−55.000	15727.7
51800	−67.000	392.400	431.476	.7569	.1055	.1392	3.153	.000331	.01065	−55.000	15788.7
52000	−67.000	392.400	431.312	.7569	.1044	.1380	3.123	.000328	.010550	−55.000	15849.6
52200	−67.000	392.400	431.148	.7569	.1034	.1366	3.093	.000324	.010450	−55.000	15910.6
52400	−67.000	392.400	430.985	.7569	.1024	.1353	3.064	.000321	.010350	−55.000	15971.6
52600	−67.000	392.400	430.824	.7569	.1015	.1340	3.035	.000318	.010250	−55.000	16032.5
52800	−67.000	392.400	430.665	.7569	.1005	.1327	3.007	.000315	.010154	−55.000	16093.5
53000	−67.000	392.400	430.507	.7569	.09955	.1314	2.978	.000312	.010057	−55.000	16154.4
53200	−67.000	392.400	430.349	.7569	.09866	.1303	2.950	.000310	.009961	−55.000	16215.4
53400	−67.000	392.400	430.193	.7569	.09767	.1290	2.922	.000307	.009857	−55.000	16276.4
53600	−67.000	392.400	430.037	.7569	.09674	.1278	2.894	.000304	.009775	−55.000	16337.3
53800	−67.000	392.400	429.885	.7569	.09582	.1266	2.867	.000301	.009682	−55.000	16398.3
54000	−67.000	392.400	429.734	.7569	.09491	.1253	2.839	.000298	.009591	−55.000	16459.2
54200	−67.000	392.400	429.583	.7569	.09401	.1241	2.812	.000296	.009500	−55.000	16520.2
54400	−67.000	392.400	429.433	.7569	.09312	.1230	2.785	.000293	.009410	−55.000	16581.2
54600	−67.000	392.400	429.285	.7569	.09224	.1218	2.759	.000290	.009320	−55.000	16642.1
54800	−67.000	392.400	429.137	.7569	.09136	.1207	2.733	.000287	.009231	−55.000	16703.1
55000	−67.000	392.400	428.991	.7569	.09049	.1196	2.707	.000284	.009143	−55.000	16764.0
55200	−67.000	392.400	428.847	.7569	.08962	.1184	2.682	.000282	.009056	−55.000	16825.0
55400	−67.000	392.400	428.703	.7569	.08877	.1172	2.656	.000279	.008970	−55.000	16886.0
55600	−67.000	392.400	428.560	.7569	.08793	.1162	2.631	.000276	.008885	−55.000	16946.9
55800	−67.000	392.400	428.419	.7569	.08709	.1151	2.606	.000274	.008801	−55.000	17000.9
56000	−67.000	392.400	428.279	.7569	.08626	.1140	2.581	.000271	.008718	−55.000	17068.8
56200	−67.000	392.400	428.139	.7569	.08544	.1129	2.556	.000268	.008634	−55.000	17129.8
56400	−67.000	392.400	428.001	.7569	.08463	.1118	2.532	.000266	.008551	−55.000	17190.8
56600	−67.000	392.400	427.863	.7569	.08382	.1107	2.508	.000263	.008470	−55.000	17251.7
56800	−67.000	392.400	427.727	.7569	.08302	.1097	2.484	.000261	.008390	−55.000	17312.7
57000	−67.000	392.400	427.592	.7569	.08223	.1087	2.460	.000258	.008310	−55.000	17373.6
57200	−67.000	392.400	427.459	.7569	.08145	.1076	2.437	.000256	.008228	−55.000	17434.6
57400	−67.000	392.400	427.326	.7569	.08067	.1066	2.414	.000253	.008152	−55.000	17495.6
57600	−67.000	392.400	427.193	.7569	.07990	.1056	2.391	.000251	.008074	−55.000	17556.5
57800	−67.000	392.400	427.063	.7569	.07914	.1046	2.369	.000248	.007998	−55.000	17617.5
58000	−67.000	392.400	426.933	.7569	.07839	.1035	2.346	.000246	.007922	−55.000	17678.4
58200	−67.000	392.400	426.804	.7569	.07764	.1025	2.324	.000243	.007847	−55.000	17739.4
58400	−67.000	392.400	426.676	.7569	.07690	.1017	2.302	.000241	.007773	−55.000	17800.4
58600	−67.000	392.400	426.549	.7569	.07617	.1007	2.280	.000239	.007699	−55.000	17861.3
58800	−67.000	392.400	426.423	.7569	.07545	.09969	2.258	.000237	.007626	−55.000	17922.3
59000	−67.000	392.400	426.297	.7569	.07473	.09870	2.237	.000234	.007553	−55.000	17983.2
59200	−67.000	392.400	426.173	.7569	.07402	.09782	2.215	.000233	.007481	−55.000	18044.2
59400	−67.000	392.400	426.049	.7569	.07331	.09687	2.194	.000231	.007410	−55.000	18105.2
59600	−67.000	392.400	425.927	.7569	.07262	.09594	2.173	.000229	.007339	−55.000	18166.1
59800	−67.000	392.400	425.806	.7569	.07193	.09504	2.152	.000226	.007269	−55.000	18227.1
60000	−67.000	392.400	425.685	.7569	.07125	.09413	2.132	.000224	.007201	−55.000	18288.0
60200	−67.000	392.400	425.565	.7569	.07057	.09323	2.112	.000222	.007132	−55.000	18349.0
60400	−67.000	392.400	425.446	.7569	.06990	.09235	2.092	.000220	.007064	−55.000	18410.0
60600	−67.000	392.400	425.328	.7569	.06923	.09147	2.072	.000218	.006997	−55.000	18470.9
60800	−67.000	392.400	425.210	.7569	.06857	.09060	2.053	.000216	.006931	−55.000	18531.9
61000	−67.000	392.400	425.093	.7569	.06792	.08974	2.033	.000214	.006865	−55.000	18592.8
61200	−67.000	392.400	424.978	.7569	.06728	.08888	2.013	.000211	.006800	−55.000	18653.8
61400	−67.000	392.400	424.863	.7569	.06664	.08804	1.994	.000209	.006735	−55.000	18714.8
61600	−67.000	392.400	424.749	.7569	.06601	.08720	1.975	.000207	.006671	−55.000	18775.7
61800	−67.000	392.400	424.635	.7569	.06539	.08638	1.956	.000205	.006609	−55.000	18836.7

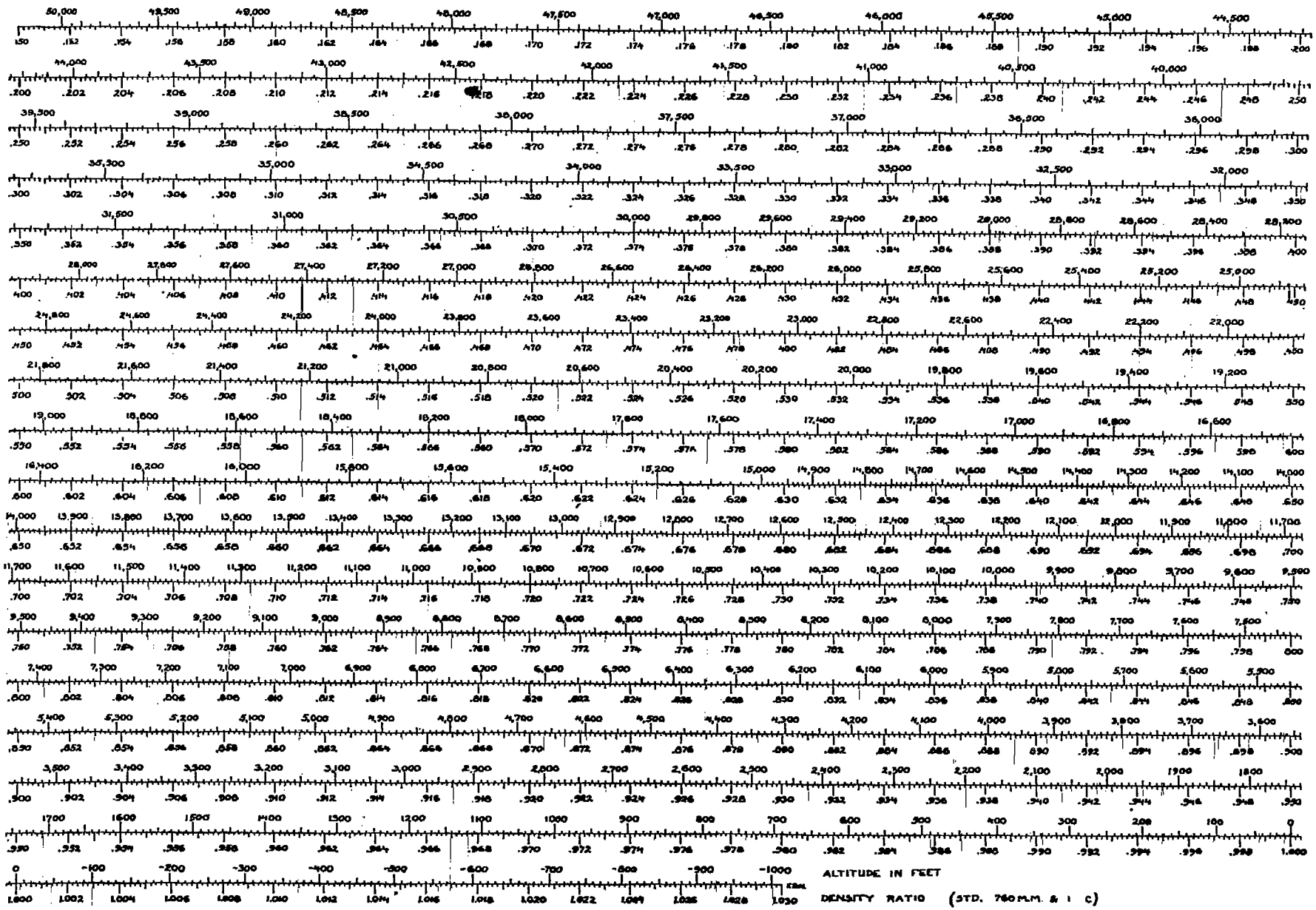
Z ft.	t °F.	T °F. aa	T_m °F. aa	$\frac{T}{T_0}$	$\frac{p}{p_0}$	$\frac{\rho}{\rho_0}$	p in.	ρ	$g\rho$ lb./ft.³	t °C.	Z m
62000	−67.000	392.400	424.522	.7569	.06476	.08555	1.938	.000203	.006546	−55.000	18897.6
62200	−67.000	392.400	424.410	.7569	.06414	.08473	1.920	.000201	.006483	−55.000	18958.6
62400	−67.000	392.400	424.299	.7569	.06353	.08392	1.901	.000199	.006421	−55.000	19019.6
62600	−67.000	392.400	424.189	.7569	.06293	.08313	1.883	.000198	.006360	−55.000	19080.5
62800	−67.000	392.400	424.080	.7569	.06233	.08235	1.865	.000196	.006299	−55.000	19141.5
63000	−67.000	392.400	423.972	.7569	.06173	.08156	1.847	.000194	.006239	−55.000	19202.4
63200	−67.000	392.400	423.864	.7569	.06114	.08078	1.830	.000192	.006180	−55.000	19263.4
63400	−67.000	392.400	423.756	.7569	.06056	.08001	1.813	.000190	.006121	−55.000	19324.4
63600	−67.000	392.400	423.649	.7569	.05999	.07925	1.796	.000188	.006063	−55.000	19385.3
63800	−67.000	392.400	423.543	.7569	.05942	.07850	1.779	.000186	.006006	−55.000	19446.3
64000	−67.000	392.400	423.439	.7569	.05886	.07775	1.761	.000185	.005949	−55.000	19507.2
64200	−67.000	392.400	423.334	.7569	.05830	.07702	1.745	.000183	.005892	−55.000	19568.2
64400	−67.000	392.400	423.229	.7569	.05774	.07628	1.729	.000181	.005836	−55.000	19629.2
64600	−67.000	392.400	423.126	.7569	.05719	.07555	1.712	.000179	.005780	−55.000	19690.1
64800	−67.000	392.400	423.024	.7569	.05665	.07483	1.696	.000177	.005725	−55.000	19751.1
65000	−67.000	392.400	422.922	.7569	.05611	.07412	1.680	.000176	.005671	−55.000	19812.0






Altitude in thousands of meters, Z
0 to 1000 m
0 to 4000 m
4000 to 8000 m
8000 to 12000 m
12000 to 16000 m
16000 to 20000 m
ρ/ρ₀
p/p₀


Altitude in thousands of feet, Z
0 to 1000 ft.
0 to 10000 ft.
10000 to 20000 ft.
20000 to 30000 ft.
30000 to 40000 ft.
40000 to 50000 ft.
50000 to 60000 ft.
60000 to 65000 ft.
ρ/ρ₀
p/p₀



Density-Altitude chart prepared by F. B Newell, Engineering Division of the Air Service, McCook Field, from Tables and data of this report