

## Reference Data

### Properties of Air

#### Specific Heat, Viscosity & Density (Weight) of Air at Various Pressures & Temperatures

Air Temp (°F)	Specific Heat (Btu/Lbs/°F)	Absolute Viscosity (Lbs/Ft/Hr)	Gauge Pressure in Lbs/In <sup>2</sup> (based on atmospheric pressure of 14.7 Lbs/In <sup>2</sup> absolute at sea level)														
			0	10	20	30	40	50	60	70	80	100	120	150	200	250	300
			Density (Weight) in Lbs/Ft <sup>3</sup>														
-20	0.239	0.039	0.0900	0.152	0.213	0.274	0.336	0.397	0.458	0.519	0.580	0.702	0.825	1.010	1.318	1.625	1.934
-10	0.239	0.039	0.0882	0.149	0.209	0.268	0.328	0.388	0.448	0.508	0.567	0.687	0.807	0.989	1.288	1.588	1.890
0	0.239	0.040	0.0864	0.146	0.204	0.263	0.322	0.380	0.438	0.497	0.556	0.672	0.790	0.968	1.260	1.553	1.850
10	0.239	0.040	0.0846	0.143	0.199	0.257	0.315	0.372	0.429	0.486	0.543	0.658	0.774	0.947	1.233	1.520	1.810
20	0.239	0.041	0.0828	0.140	0.196	0.252	0.307	0.365	0.421	0.477	0.533	0.645	0.757	0.927	1.208	1.489	1.770
30	0.240	0.041	0.0811	0.137	0.192	0.247	0.302	0.357	0.412	0.467	0.522	0.632	0.742	0.908	1.184	1.460	1.730
40	0.240	0.042	0.0795	0.134	0.188	0.242	0.295	0.350	0.404	0.458	0.511	0.619	0.727	0.890	1.161	1.431	1.705
50	0.240	0.042	0.0780	0.131	0.184	0.237	0.291	0.343	0.396	0.449	0.501	0.607	0.713	0.873	1.139	1.403	1.661
60	0.240	0.043	0.0764	0.128	0.180	0.232	0.284	0.336	0.388	0.440	0.493	0.596	0.700	0.856	1.116	1.376	1.638
70	0.240	0.044	0.0750	0.126	0.177	0.228	0.279	0.330	0.381	0.432	0.482	0.584	0.686	0.839	1.095	1.350	1.604
80	0.240	0.045	0.0736	0.124	0.174	0.224	0.274	0.324	0.374	0.423	0.473	0.572	0.673	0.824	1.074	1.325	1.573
90	0.240	0.045	0.0723	0.122	0.171	0.220	0.269	0.318	0.367	0.415	0.464	0.561	0.660	0.809	1.054	1.300	1.546
100	0.240	0.046	0.0710	0.120	0.168	0.215	0.264	0.312	0.360	0.408	0.455	0.551	0.648	0.794	1.035	1.276	1.517
120	0.240	0.047	0.0686	0.116	0.162	0.208	0.255	0.302	0.348	0.394	0.440	0.533	0.626	0.767	1.001	1.234	1.465
150	0.241	0.049	0.0652	0.110	0.154	0.199	0.243	0.287	0.331	0.375	0.419	0.508	0.596	0.730	0.953	1.175	1.392
175	0.241	0.051	0.0626	0.105	0.148	0.191	0.234	0.275	0.318	0.361	0.403	0.488	0.573	0.701	0.914	1.128	1.337
200	0.241	0.052	0.0603	0.101	0.143	0.184	0.225	0.266	0.305	0.347	0.388	0.470	0.552	0.674	0.879	1.084	1.287
250	0.242	0.055	0.0560	0.094	0.132	0.171	0.208	0.247	0.285	0.322	0.360	0.436	0.513	0.627	0.817	1.007	1.197
300	0.243	0.058	0.0523	0.088	0.124	0.159	0.195	0.230	0.265	0.301	0.336	0.407	0.478	0.585	0.762	0.940	1.118
350	0.244	0.060	0.0491	0.083	0.116	0.150	0.184	0.216	0.249	0.282	0.316	0.382	0.449	0.549	0.715	0.883	1.048
400	0.245	0.063	0.0463	0.078	0.109	0.140	0.172	0.203	0.235	0.266	0.298	0.360	0.423	0.517	0.674	0.831	0.987
500	0.248	0.067	0.0414	0.067	0.098	0.126	0.154	0.182	0.210	0.238	0.266	0.322	0.379	0.463	0.604	0.746	0.885
600	0.25	0.072	0.0376	0.063	0.089	0.114	0.140	0.165	0.190	0.216	0.241	0.292	0.343	0.419	0.547	0.675	0.801
700	0.254	0.076	0.0341	0.058	0.081	0.104	0.127	0.151	0.174	0.198	0.221	0.267	0.328	0.383	0.500	0.616	0.733
800	0.257	0.080	0.0314	0.053	0.071	0.096	0.117	0.139	0.160	0.181	0.203	0.246	0.314	0.353	0.460	0.568	0.675
900	0.259	0.085	0.0295	0.049	0.069	0.089	0.109	0.129	0.148	0.168	0.188	0.228	0.289	0.327	0.427	0.526	0.625
1000	0.262	0.089	0.0275	0.046	0.064	0.083	0.101	0.120	0.138	0.157	0.175	0.212	0.268	0.304	0.397	0.490	0.582

#### Calculation of Density at Other Temperatures & Pressures

Density at a specific pressure and temperature can be converted to density at another pressure and temperature using the following equation:

$$D_2 = D_1 \frac{T_1}{T_2} \times \frac{P_2}{P_1}$$

Where:

T<sub>1</sub> = (°F + 460°) initial condition

T<sub>2</sub> = (°F + 460°) new condition

D<sub>1</sub> = density lbs/ft<sup>3</sup> initial condition

D<sub>2</sub> = density lbs/ft<sup>3</sup> new condition

P<sub>1</sub> = absolute pressure (psia) initial condition

P<sub>2</sub> = absolute pressure (psia) new condition

#### Calculation of Flow or Volume

The same formula can be used to convert air flow or volume at gauge pressure (psig) to standard conditions (atmospheric pressure at 70°F) by substituting cubic feet (ft<sup>3</sup>) or cubic feet per minute (CFM) for density (D):

$$\text{Std. CFM} = \text{Actual CFM} \frac{(70 + 460)}{(T_2 + 460)} \times \frac{(\text{psig} + 14.7)}{14.7 \text{ psia}}$$

#### Water Vapor Content of Air in Pounds of Water/100 Ft<sup>3</sup> at Various Temperatures & Relative Humidity

Air (°F)	Lbs/100 Ft <sup>3</sup> at Specified Relative Humidity																
	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
-20	.001	.001	.001	.001	.001	.002	.002	.002	.002	.002	.002	.002	.003	.003	.003	.003	.003
-10	.001	.001	.001	.001	.002	.002	.002	.002	.003	.003	.003	.003	.003	.003	.004	.004	.004
0	.001	.002	.002	.002	.003	.003	.004	.004	.004	.005	.005	.005	.006	.006	.006	.007	.007
10	.002	.003	.003	.004	.004	.005	.006	.006	.007	.007	.008	.008	.009	.009	.010	.010	.011
20	.004	.005	.005	.006	.007	.008	.009	.010	.011	.012	.013	.014	.014	.015	.016	.017	.018
30	.006	.007	.008	.010	.011	.013	.014	.015	.017	.018	.020	.021	.022	.024	.025	.027	.028
40	.008	.010	.012	.014	.016	.018	.021	.023	.025	.027	.029	.031	.033	.035	.037	.039	.041
50	.012	.015	.018	.021	.024	.027	.030	.032	.035	.038	.041	.044	.047	.050	.053	.056	.059
60	.017	.021	.025	.029	.033	.037	.042	.046	.050	.054	.058	.062	.066	.071	.075	.079	.083
65	.020	.025	.029	.034	.039	.044	.049	.054	.059	.064	.069	.074	.078	.083	.088	.093	.098
68	.022	.027	.032	.038	.043	.049	.054	.059	.065	.070	.076	.081	.086	.092	.097	.103	.108
70	.023	.029	.035	.040	.046	.052	.058	.063	.069	.075	.081	.086	.092	.098	.104	.109	.115
71	.024	.030	.036	.042	.048	.054	.060	.065	.071	.077	.083	.089	.095	.101	.107	.113	.119
72	.025	.031	.037	.043	.049	.055	.062	.068	.074	.080	.086	.092	.098	.105	.111	.117	.123
73	.025	.032	.038	.044	.051	.057	.064	.070	.076	.083	.089	.095	.102	.108	.114	.121	.127
74	.026	.033	.039	.046	.052	.059	.066	.072	.079	.085	.092	.098	.105	.111	.118	.124	.131
75	.027	.034	.041	.047	.054	.061	.068	.074	.081	.088	.094	.101	.108	.115	.122	.128	.135
78	.030	.037	.044	.052	.059	.067	.074	.081	.089	.096	.104	.111	.118	.126	.133	.141	.148
80	.032	.040	.047	.055	.063	.071	.079	.087	.095	.103	.111	.119	.126	.134	.142	.150	.158
85	.037	.046	.055	.064	.074	.083	.092	.101	.110	.120	.129	.138	.147	.156	.166	.175	.184
90	.043	.053	.064	.075	.085	.096	.107	.117	.128	.138	.149	.160	.170	.181	.192	.202	.213
95	.049	.062	.074	.086	.099	.111	.124	.136	.148	.161	.173	.185	.198	.210	.222	.225	.247
100	.057	.071	.086	.100	.114	.128	.143	.157	.171	.185	.200	.214	.228	.242	.257	.271	.285

**Note** — To convert "grains of moisture" to pounds, multiply grains by 0.0001428.