Table 1 ... Winter Climatic Conditions (Concluded)[a]

CANADA

Col. 1 Prov.	Col. 2 Station	Col. 3[b]	Col. 4[c] Elev., Ft.	Col. 5 Average Ann. Min., F	Col. 6 January Design Temp 99%	Col. 6 January Design Temp 97½%	Col. 7[d] Coincident Wind Velocity
Alta.	Calgary	AP	3540	−30	−29	−25	M
	Edmonton	AP	2219	−30	−29	−26	VL
	Grande Prairie	AP	2190	−44	−43	−37	VL
	Lethbridge	AP	3018	−31	−31	−24	M
	Medicine Hat	AP	2365	−33	−30	−26	M
B. C.	Fort Nelson	AP	1230	−43	−44	−41	VL
	Penticton	AP	1121	0	−1	3	L
	Prince George	AP	2218	−38	−37	−31	VL
	Prince Rupert	*	170	7	11	15	L
	Vancouver	AP	16	13	15	19	L
	Victoria	CO	228	20	20	23	M
Man.	Brandon	*	1200	−36	−29	−26	M
	Churchill	AP	115	−43	−40	−38	H
	Dauphin	AP	999	−35	−29	−26	M
	The Pas	AP	894	−41	−35	−32	M
	Winnipeg	AP	786	−31	−28	−25	M
N.B.	Campbellton	CO	25	−20	−18	−14	L
	Fredericton	AP	74	−19	−16	−10	L
	Moncton	AP	248	−16	−12	−7	H
	Saint John	AP	352	−15	−12	−7	M
Nfld.	Corner Brook	*	40	−15	−10	−5	H
	Gander	AP	482	−5	−5	−1	H
	Goose	AP	144	−28	−27	−25	M
	St. John's	AP	463	1	2	6	H
N.W.T.	Fort Smith	AP	665	−51	−49	−46	VL
	Frobisher Bay	AP	68	−45	−45	−42	H
	Norman Wells	AP	209	−53	−55	−52	VL
	Resolute	*	209	−53	−49	−47	M
	Yellowknife	AP	682	−51	−49	−47	VL
N.S.	Halifax	AP	136	−4	0	4	H
	Sydney	AP	197	−3	0	5	H
	Yarmouth	AP	136	2	5	9	H
Ont.	Fort William	AP	644	−31	−27	−23	L
	Hamilton	*	303	−6	0	3	M
	Kapuskasing	AP	752	−37	−31	−28	M
	Kingston	*	300	−16	−10	−7	M
	Kitchener	*	1125	−10	−3	1	M
	London	AP	912	−9	−1	3	M
	North Bay	AP	1210	−27	−21	−17	M
	Oshawa	*	370	−11	−5	−2	M
	Ottawa	AP	413	−21	−17	−13	M
	Peterborough	*	648	−20	−13	−9	M
	St. Catharine's	*	325	−4	2	5	M
	Sudbury	*	850	−25	−20	−15	VL
	Toronto	AP	578	−10	−3	1	M
	Windsor	AP	637	−1	4	7	M
P.E.I.	Charlottetown	AP	186	−11	−6	−3	H
Que.	Bagotville	*	536	−30	−24	−20	VL
	Knob Lake	AP	1681	−47	−40	−37	M
	Megantic	AP	1362	−27	−20	−16	M
	Mont Joli	AP	150	−16	−16	−12	H
	Montreal	AP	98	−20	−16	−10	M
	Quebec	AP	245	−25	−19	−13	M
	Seven Islands	AP	190	−29	−27	−22	L
	Sherbrooke	*	620	−24	−18	−13	L
	Three Rivers	*	200	−24	−18	−13	M
	Val d'Or	AP	1108	−37	−31	−27	L
Sask.	Prince Albert	AP	1414	−45	−41	−35	VL
	Regina	AP	1884	−38	−34	−29	M
	Saskatoon	AP	1645	−37	−34	−30	M
	Swift Current	AP	2677	−31	−29	−25	M
Y.T.	Whitehorse	AP	2289	−45	−45	−42	VL

Notes for Table 1

[a] Data compiled from official weather stations, where hourly weather observations are made by trained observers, and from other sources. Table 1 prepared by ASHRAE Technical Committee 2.2, Weather Data and Design Conditions. Percentage of design data show the percent of 3-month period, December through February. Canadian data are based on January only. Also see References 1 to 5.

[b] Most stations are located at airports, indicated by AP. Others are indicated by:

AFB = Air Force Base; CO = City Office; FD = Fire Department; FS = Forest Service; SDP = Sewage Disposal Plant; * = Based on nearby station

[c] Elevations are ground elevations for each station as of 1964. Temperature readings are generally made at an elevation of 5 ft above ground, except for locations marked r, indicating roof exposure of thermometer.

[d] Coincident wind velocities derived from approximately coldest 600 hours out of 20,000 hours of December through February data per station. Also see References 6. The four classifications are:

VL = Very Light, 70 percent or more of cold extreme hours ≤7 mph. M = Moderate, 50 to 74 percent cold extreme hours >7mph.
L = Light, 50 to 69 percent cold extreme hours ≤7 mph. H = High, 75 percent or more cold extreme hours >7 mph., and 50 percent are >12 mph.

† More detailed data on Arizona, California, and Nevada may be found in *Recommended Design Temperatures, Northern California*, published by the Golden Gate Chapter; and *Recommended Design Temperatures, Southern California, Arizona, Nevada*, published by the Southern California Chapter.

(*Continued from p. 469*)

cold. The four classes of velocity (very light, light, moderate, and high) are defined in footnote d of Table 1.

In many cases, occasional failure of a heating plant to maintain a preselected indoor design temperature during brief periods of severe weather is not critical. However, the successful completion of some industrial or commercial processes may depend upon close regulation of indoor temperatures. These are special cases and require extra study before assigning design temperatures.

Before selecting an outdoor design temperature from Table 1, a heating engineer should consider each of the following factors:

1. Is heat capacity of structure high or low?
2. Is structure insulated?
3. Is structure exposed to high wind?
4. Is the ventilation or infiltration load high?
5. Is there more glass area than normal in the structure?
6. During what part of the day will it be used?
7. What is the nature of occupancy?
8. Will there be long periods of operation at reduced indoor temperature?
9. What is the amplitude between maximum and minimum daily temperature in the locality?
10. Are there local conditions which cause significant variation from temperatures reported by Weather Bureau?
11. What auxiliary heating devices will be in the building?
12. What is the expected cost of fuel or energy?

If the structure has a low heat capacity, is not insulated, has more than normal glass area, or is occupied during the coldest part of the day, the Median of Extremes should probably be selected as the outdoor design temperature. A moderate heat capacity, some internal load, and daytime occupancy would indicate the 99 percent value as a reasonable choice. Massive, institutional buildings with little glass can usually be designed from the 97½ percent value.

The designer must keep in mind, before reaching a final decision on outdoor design temperature, that, if the outdoor design temperature difference is exceeded, the indoor temperature may fall, depending upon the thermal mass of the structure and its contents, and upon whether or not the internal load was taken into account in the calculations.

Finally, there is a factor, perhaps intangible, that should not be ignored. It is the performance expected by the owner from the system. In order to judge whether or not expected performance can be assured, the designer needs a full understanding of the basis on which the capacities of all the system components are derived or determined, the limits of accuracy of published performance data, and the accelerating capability of certain types of equipment. There is no substitute for experienced engineering judgment in problems of this type.

Canadian Winter Design Temperatures

Canadian winter design temperatures are based on temperature frequencies and show the percentage of time that the temperature might be expected to fall below certain values. Since January is normally the coldest month of the winter in most of Canada, and to simplify the analysis and understanding, these values are based on January data only.[1] In using these values to calculate the heat loss of a building, the engineer is thus designing for the coldest month.

INDOOR TEMPERATURES

The indoor air temperature that must be maintained within a building is understood to be the dry-bulb temperature at the breathing line, 5 ft above the floor, or at the seating level, 30 in. above the floor, and at a location where the temperature sensing device is not exposed to a condition of abnormal heat gain or heat loss. The indoor air temperatures usually specified vary in accordance with the intended use of the building. Table 2 presents values that conform to good practice.

The proper dry-bulb temperature to be maintained depends upon the relative humidity and air motion, as explained in Chapter 7. In other words, a person may feel warm or cool at the same dry-bulb temperature, depending on the relative humidity and air motion. The optimum winter *effective temperature* for sedentary persons, as determined at the ASHRAE Research Laboratory, is 67–68 ET.

As explained in Chapter 7 for so-called still air conditions, a relative humidity of approximately 50 percent is required to produce an effective temperature of 68 ET when the dry-bulb temperature is 72.5 F. However, even where provision is made for artificial humidification, the relative humidity is seldom maintained higher than 40 percent during extremely cold weather, and where no provision is made for humidification, the relative humidity may be 20 percent or less. Consequently, in using the values listed in Table 2, the designer should consider the actual relative humidity to be maintained, if provision is to be made for humidification. If no humidification is to be provided, the higher temperatures may not even produce comfort on cold days; if humidity is to be maintained at 50 percent, the lower temperatures will apply.

When sun is not shining in rooms having large glass areas, or in rooms with walls having a high heat transmission coefficient, the lowered surface temperature will cause a feeling of coolness even though the air temperature in the room is at or above the temperatures indicated in the table. In these rooms, it is desirable to design for even higher temperatures than those listed, unless a compensating higher temperature surface is installed to offset the low temperature surfaces.

The indoor temperatures specified in Table 2 may be used for panel heated spaces as well as for spaces heated by warm