Table 2 . . . . Winter Climatic Conditions[a]—Canada

Col. 1 Prov of Canada	Col. 2 Station[b]	Col. 3 Elevation[c] Ft	Col. 4 Period of Record[d]	Col. 5 Lowest Temp on Record[d] F	Col. 6 Average Annual Min. Temp[e] F	Col. 7 Winter Design Temp[g] —F 1%	Col. 8 2½%	Col. 9 5%	Col. 10 10%	Col. 11 Avg Wind Speed[f] Mph
Alta.	Calgary A	3540	1921–1950	−46	−31	−35	−29	−25	−16	10.1
	Edmonton A	2219	1921–1950	−55	−39	−39	−33	−29	−21	7.6
	Grande Prairie A	2190	1942–1950	−62	−47	−43	−39	−34	−27	7.9
	Lethbridge A	3018	1921–1950	−45	−32	−38	−32	−28	−19	15.0
	McMurray A	1216	1921–1950	−64	−51	−48	−42	−37	−30	
	Medicine Hat A	2365	1921–1950	−49	−34	−41	−35	−31	−22	9.0
B. C.	Estevan Point C	20	1924–1950	7	22	14	17	21	27	9.9
	Fort Nelson A	1230	1938–1950	−61	−47	−42	−38	−33	−28	3.7
	Penticton A	1121	1921–1950	−16	−1	−14	−6	−1	4	
	Prince George A	2218	1921–1950	−58	−42	−43	−32	−25	−16	7.2
	Prince Rupert C	170	1921–1950	−3	12	5	8	12	18	8.0
	Vancouver A	22	1938–1950	0	13	8	11	15	21	7.7
	Victoria C	228	1921–1950	6	20	12	15	19	25	12.3
Man.	Brandon C	1200	1921–1950	−49	−40	−36	−32	−28	−24	
	Churchill A	115	1932–1950	−50	−43	−43	−42	−40	−37	14.7
	The Pas A	894	1921–1950	−54	−42	−43	−39	−30	−26	6.4
	Winnipeg A	786	1921–1950	−44	−35	−33	−29	−25	−21	12.0
N. B.	Campbellton C	42	1938–1950	−31		−14	−11	−8	−3	
	Fredericton C	164	1923–1950	−38	−24	−9	−6	−3	2	9.2
	Moncton A	248	1921–1950	−36	−23	−11	−8	−5	0	14.9
	Saint John C	119	1921–1950	−21	−12	−6	−3	0	5	13.8
Nfld.	Corner Brook C	40	1933–1950	−25	−12	−4	−1	2	6	
	Gander A	482	1937–1950	−16	−10	−6	−3	0	4	17.2
	Goose Bay A	144	1942–1950	−35	−30	−29	−26	−24	−20	10.3
	St. John's A	463	1926–1950	−10	−2	−1	1	4	7	19.3
N.W.T.	Aklavik C	30	1927–1950	−62	−42	−50	−46	−43	−39	
	Fort Norman C	300	1925–1950	−65	−54	−46	−42	−39	−35	
	Frobisher A	68	1942–1950	−49	−44	−51	−47	−43	−39	
	Resolute C	56	1948–1950	−55	−53	−45	−42	−40	−36	9.2
	Yellowknife A	682	1942–1950	−60	−51	−49	−47	−45	−41	
N.S.	Halifax C	83	1921–1950	−21	−6	0	4	7	11	9.6
	Halifax A	136	1944–1950	−11		−3	2	5	9	12.4
	Sydney A	197	1921–1950	−23	−9	−7	1	4	8	13.1
	Yarmouth A	136	1921–1950	−11	1	4	7	10	13	13.5
Ont.	Fort William A	644	1921–1950	−41	−29	−30	−24	−20	−15	9.6
	Hamilton C	303	1939–1950	−17	−6	−4	0	5	10	
	Kapuskasing A	752	1921–1950	−53	−42	−34	−30	−27	−22	10.0
	Kingston C	340	1921–1950	−31	−17	−15	−11	−6	−1	10.8
	Kitchener C	1100	1921–1950	−29	−11	−8	−3	2	7	
	London A	912	1921–1950	−27	−11	−5	−1	3	8	11.9
	North Bay A	1210	1925–1950	−46	−33	−24	−20	−16	−11	11.3
	Ottawa A	339	1921–1950	−38	−26	−18	−15	−11	−7	11.1
	Peterborough C	648	1921–1950	−38	−21	−15	−11	−6	−1	
	Sioux Lookout A	1227	1931–1950	−50	−39	−38	−33	−29	−24	8.5
	Sudbury C	837	1921–1950	−45		−21	−17	−12	−5	
	Timmins C	1100	1921–1950	−55	−34	−30	−26	−22	−17	
	Toronto C	379	1921–1950	−22	−7	−4	0	5	10	14.1
	Toronto A	578	1938–1950	−24	−13	−9	−4	1	6	12.1
	Windsor A	637	1921–1950	−10	−2	0	3	7	11	12.3
P. E. I.	Charlottetown C	74	1921–1950	−23	−11	−6	−3	0	4	11.3
Que.	Arvida C	375	1932–1950	−42	−31	−23	−19	−16	−11	8.2
	Knob Lake A	1605	1948–1950	−59	−48	−44	−40	−34	−30	
	Mont Joli A	150	1943–1950	−28		−14	−11	−8	−3	13.3
	Montreal C	187	1921–1950	−29	−16	−12	−9	−6	−2	12.3
	Montreal A	98	1942–1950	−28	−20	−14	−11	−8	−4	13.1
	Port Harrison C	66	1942–1950	−49	−42	−43	−39	−35	−31	13.4
	Quebec City C	296	1921–1950	−32	−19	−16	−12	−9	−4	12.4
	Seven Islands A	190	1944–1950	−43		−23	−20	−17	−12	
	Sherbrooke C	620	1921–1950	−39	−24	−15	−12	−9	−5	8.2
	Three Rivers C	50	1921–1950	−43	−24	−17	−13	−10	−5	
Sask.	Prince Albert A	1414	1921–1950	−56	−46	−48	−41	−37	−30	4.9
	Regina A	1884	1921–1950	−54	−39	−39	−34	−30	−25	12.1
	Saskatoon A	1645	1921–1950	−54	−41	−45	−37	−33	−26	9.7
	Swift Current A	2677	1921–1950	−54	−34	−39	−33	−29	−24	14.6
Y. T.	Dawson C	1062	1921–1950	−73	−54	−62	−56	−50	−39	
	Whitehorse A	2289	1941–1950	−62	−51	−49	−43	−37	−26	8.7

Notes for Table 2 . . . . Winter Climatic Conditions[a]—Canada

[a] Data compiled from the *Climatological Atlas of Canada* for the years indicated.

[b] Col. 2. The stations followed by letter A are airport stations; all others are city office stations and are followed by letter C.

[c] Col. 3. The elevations listed are ground elevations of the station.

[d] Col. 4. The periods of record indicated apply only to the lowest temperature ever recorded shown in Col. 5, and generally extend from a summer month of the first year indicated through the spring months of the last year indicated.

[e] Average of readings of one lowest temperature obtained for each year for period of record. For Canada, in some cases, more than one location have been used.

[f] Most of the wind speeds are based on periods ending in 1947 which are somewhat shorter than the periods for the minimum temperatures. The three months, December, January, and February were used.

[g] The winter design temperatures shown in columns 7-10 inclusive for Canadian cities are the Fahrenheit temperature values at or below which 1, 2½, 5, and 10 percent, respectively, of the January hourly outdoor temperatures occur for the 10 years from 1941 to 1950. The tabulated values are based on hourly temperature observations for some of the cities and upon the difference between the mean monthly temperature and the design temperature for the remainder of the cities listed.

decision on outdoor design temperature, that if the indoor-outdoor design temperature difference is exceeded, the indoor temperature will fall. The question is to determine how large a drop will occur and whether it can be tolerated.

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 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 engineering judgment in problems of this type. Judgment is developed from experience and continued study.

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.[a] In using these values to calculate the heat loss of a building, the engineer is thus designing for the coldest month of the year.

Winter design temperature on a 2½ percent basis is the temperature value expressed in degrees Fahrenheit at or below which 2½ percent of the January outdoor temperatures occur. It is suggested that this 2½ percent basis value be normally used in Canada. However, the engineer has the opportunity of selecting the 5 or 10 percent basis value if it is not so important that the pre-selected indoor design temperature be maintained, or on the other hand the 1 percent basis value if cost is not as important as the maintenance of indoor temperatures.

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 not less than 3 ft from the outside walls. Indoor air temperatures usually specified, vary in accordance with the intended use of the building. Table 3 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 6. 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

Table 3 . . . . Winter Indoor Dry-Bulb Temperatures Usually Specified[a]

Type of Building	F
SCHOOLS—	
Classrooms	72–74
Assembly rooms	68–72
Gymnasiums	55–65
Toilets and baths	70
Wardrobe and locker rooms	65–68
Kitchens	66
Dining and lunch rooms	65–70
Playrooms	60–65
Natatoriums	75
HOSPITALS—	
Private rooms	72–74
Private rooms (surgical)	70–80
Operating rooms	70–95
Wards	72–74
Kitchens and laundries	66
Toilets	68
Bathrooms	70–80
THEATERS—	
Seating space	68–72
Lounge rooms	68–72
Toilets	68
HOTELS—	
Bedrooms and baths	75
Dining rooms	72
Kitchens and laundries	66
Ballrooms	65–68
Toilets and service rooms	68
HOMES	73–75
STORES	65–68
PUBLIC BUILDINGS	72–74
WARM AIR BATHS	120
STEAM BATHS	110
FACTORIES AND MACHINE SHOPS	60–65
FOUNDRIES AND BOILER SHOPS	50–60
PAINT SHOPS	80

[a] The most comfortable dry-bulb temperature to be maintained depends on the relative humidity and air motion. These three factors considered together constitute what is termed the *effective temperature*. (See Chapter 6.) When relative humidity is not controlled separately, optimum dry-bulb temperature for comfort will be slightly higher than shown in Table 3.