TABLE 1. AVERAGE MONTHLY AND YEARLY DEGREE-DAYS FOR CITIES IN THE UNITED STATES, CANADA AND NEWFOUNDLAND [a] (CONCLUDED)

State	Station	Years	No. of Seasons	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Yearly Total
Pa.	Erie	98/99-45/46	48	8	17	101	367	692	1049	1159	1105	922	591	284	68	6363
	Harrisburg A	98/99-45/46	48	1	6	67	314	637	990	1073	973	757	425	146	23	5412
	Philadelphia	98/99-45/46	48	0	2	36	235	544	884	962	881	685	378	115	17	4739
	Pittsburgh	98/99-45/46	48	3	7	69	322	651	982	1042	964	751	444	166	29	5430
	Reading	12/13-45/46	34	1	5	69	301	606	957	1038	929	736	423	144	23	5232
	Scranton	00/01-45/46	46	6	22	117	400	717	1074	1162	1071	862	523	213	51	6218
R. I.	Block Island	98/99-45/46	48	10	11	79	313	596	919	1030	984	875	618	354	108	5597
	Narragansett Pier	98/99-17/18	20	1	26	121	366	691	1012	1113	1074	916	622	342	113	6397
	Providence	04/05-45/46	42	6	16	101	358	668	1020	1106	1027	847	538	237	60	5984
S. C.	Charleston	98/99-45/46	48	0	0	1	47	225	428	452	384	239	83	7	0	1866
	Columbia	98/99-45/46	48	0	0	6	95	327	560	568	482	305	126	18	1	2488
	Due West	21/22-31/32	11	0	0	9	142	393	594	651	491	411	158	39	2	2890
	Greenville A	17/18-45/46	29	0	1	13	127	410	650	684	551	403	179	40	1	3059
S. D.	Huron	98/99-45/46	48	10	20	159	502	962	1409	1572	1353	1039	573	271	70	7940
	Pierre	98/99-40/41														
		42/43-45/46	47	4	11	136	438	887	1317	1460	1253	971	516	238	52	7283
	Rapid City	98/99-45/46	48	15	28	192	495	842	1178	1280	1140	981	598	339	109	7197
Tenn.	Chattanooga	98/99-45/46	48	0	0	13	150	432	691	711	604	412	185	39	1	3238
	Knoxville A	98/99-45/46	48	0	0	20	189	498	756	774	666	470	226	56	3	3658
	Memphis A	98/99-45/46	48	0	0	14	126	387	670	716	600	386	157	33	1	3090
	Nashville	98/99-45/46	48	0	0	20	170	469	748	788	675	467	218	55	3	3613
Texas	Abilene A	98/99-45/46	48	0	0	10	96	332	603	619	483	296	110	23	1	2573
	Amarillo A	98/99-45/46	48	1	2	42	221	548	854	861	719	546	284	107	11	4196
	Austin A	26/27-45/46	20	0	0	2	31	227	410	458	315	185	46	5	0	1679
	Brownsville A	08/09-45/46	38	0	0	0	8	65	176	191	111	65	11	1	0	628
	Corpus Christi	98/99-45/46	48	0	0	0	11	102	255	282	204	93	17	1	0	965
	Dallas A	13/14-45/46	33	0	0	6	70	293	574	600	437	281	91	15	0	2367
	Del Rio	05/06-45/46	41	0	0	2	35	203	413	413	262	139	31	3	0	1501
	El Paso A	98/99-45/46	48	0	0	6	88	366	615	615	432	291	104	14	1	2532
	Fort Worth A	98/99-45/46	48	0	0	5	79	285	553	586	463	270	97	16	1	2355
	Galveston	98/99-45/46	48	0	0	0	14	123	290	334	255	130	27	1	0	1174
	Houston	09/10-45/46	37	0	0	1	21	160	331	361	247	150	36	2	0	1315
	Palestine	98/99-45/46	48	0	0	4	67	261	496	512	401	236	80	11	0	2068
	Point Arthur	17/18-45/46	29	0	0	1	27	177	328	375	254	151	37	2	0	1352
	San Antonio A	98/99-45/46	48	0	0	1	31	171	366	390	287	148	37	4	0	1435
	Taylor	01/02-40/41	40	0	0	2	56	234	462	494	375	214	64	8	0	1909
Utah	Modena	00/01-45/46	46	6	11	136	499	832	1142	1190	944	816	567	338	97	6598
	Salt Lake City	98/99-45/46	48	3	5	98	371	712	1033	1093	871	716	446	236	66	5650
Vt.	Burlington	06/07-45/46	40	23	51	209	530	870	1313	1467	1338	1111	694	339	106	8051
	Northfield	98/99-42/43	45	62	112	283	602	947	1389	1524	1384	1176	754	405	166	8804
Va.	Cape Henry	98/99-45/46	48	0	0	7	125	398	676	731	682	526	301	86	6	3538
	Lynchburg A	98/99-45/46	48	1	2	37	230	521	799	829	737	537	287	81	12	4068
	Norfolk	98/99-45/46	48	0	0	9	129	392	668	712	650	483	254	62	5	3364
	Richmond	98/99-45/46	48	0	1	27	196	486	780	814	722	538	278	72	8	3922
	Wytheville	02/03-40/41	39	7	13	82	352	662	916	945	836	677	410	168	35	5103
Wash.	North Head	02/03-45/46	44	251	229	255	350	491	642	697	597	610	505	428	312	5367
	Seattle	98/99-45/46	48	67	69	170	365	554	704	759	637	595	436	299	160	4815
	Spokane A	98/99-45/46	48	20	37	184	480	817	1061	1139	931	756	490	285	118	6318
	Tacoma	98/99-45/46	48	71	75	190	390	581	737	786	658	612	455	313	171	5039
	Tatoosh Island	98/99-45/46	48	301	295	325	421	534	654	716	627	643	537	454	350	5857
	Walla Walla	98/99-45/46	48	5	10	90	315	662	910	981	770	571	354	186	56	4910
	Yakima	09/10-45/46	37	8	17	124	395	778	1050	1125	837	624	374	193	60	5585
W. Va.	Elkins A	98/99-45/46	48	15	23	115	403	722	1003	1033	947	763	489	229	58	5800
	Parkersburg	98/99-45/46	48	1	3	56	286	617	930	977	882	660	369	129	18	4928
Wis.	Green Bay	98/99-40/41	48	17	58	179	494	889	1329	1493	1329	1087	658	327	91	7931
	La Crosse	98/99-45/46	48	7	22	157	454	864	1339	1492	1281	990	531	232	52	7421
	Madison	04/05-45/46	42	8	20	145	452	857	1296	1451	1246	1002	588	274	66	7405
	Milwaukee	98/99-45/46	48	13	17	124	411	786	1203	1329	1177	959	617	341	102	7079
	Wausau	15/16-40/41	26	26	58	216	568	982	1427	1594	1381	1147	680	315	100	8494
Wyo.	Cheyenne A	98/99-45/46	48	40	46	251	587	876	1144	1187	1064	996	720	460	165	7536
	Lander	98/99-45/46	48	27	43	265	623	1021	1400	1427	1197	1006	669	410	155	8243
	Yellowstone Park	04/05-40/41	37	125	173	424	759	1079	1386	1464	1252	1165	841	603	334	9605
Alta.	Calgary			108	167	432	722	1122	1426	1609	1355	1215	750	480	264	9,650
	Edmonton			70	167	441	750	1224	1593	1810	1504	1299	777	428	222	10,285
B. C.	Vancouver			43	65	234	459	657	818	893	736	682	498	326	162	5,573
	Victoria			155	158	264	446	462	738	815	689	651	504	366	237	5,485
	Prince Rupert			282	229	342	546	702	893	933	804	809	645	521	357	7,063
Man.	Churchill			350	391	696	1187	1773	2356	2604	2288	2204	1530	1097	672	17,148
	Winnipeg			27°	34	330	744	1302	1829	2111	1775	1531	822	397	78	10,980
N. B.	Moncton			8°	56	282	595	936	1373	1528	1392	1190	798	474	180	8,812
	Saint John			12°	112	270	558	870	1271	1417	1266	1132	792	505	261	8,578
N. S.	Halifax			12	12	189	493	783	1141	1280	1168	1065	768	493	210	7,614
Ont.	Fort William			62	155	354	722	1143	1596	1807	1582	1386	888	567	234	10,496
	Hamilton			3°	9°	108	471	816	1178	1305	1187	1063	651	322	6	7,119
	London			3°+	11°	126	508	843	1200	1336	1240	1073	642	307	105	7,425
	Ottawa			29°	22°	204	595	984	1494	1646	1459	1256	726	310	91	8,816
	Toronto			16	35	168	504	817	1155	1304	1206	1072	669	341	87	7,374
	Windsor			19°	5°	54	425	795	1172	1283	1148	903	582	251	73	6,802
P.E.I.	Charlottetown			5°	57°	222	539	858	1246	1463	1338	1203	858	536	213	8,538
P. Q.	Montreal			7°	20°	180	561	948	1407	1587	1392	1209	702	298	88	8,399
	Quebec			17°	43	276	651	1050	1534	1696	1481	1311	849	428	102	9,438
Sask.	Saskatoon			16°	68	396	781	1305	1767	2027	1635	1445	725	397	138	10,700
Y. T.	Dawson			167	322	687	1209	1908	2440	2666	2159	1879	1092	580	246	15,355

Values of N depend on the particular building for which the estimate is being prepared and must be found by surveying plans, by observation, or by measurement of the building. Values of U for use in this equation are the unit fuel consumptions per degree-day and are obtained as a result of the collection of operating information. Certain of this information is presented later, but before referring to these data attention is directed to the nature of the unit.

Unit Fuel Consumptions per Degree-Day

The quantity of fuel used per degree-day in a given heating plant can be reduced to a unit basis in terms of quantity of fuel or steam per degree-day per square foot of radiation, cubic foot of heated building space, or thousand Btu hourly heat loss at design conditions. A less frequently used basis is quantity of fuel per (degree-day) (square foot of floor area). In fact any convenient unit can be used to relate the consumption to the degree-day and to the building.

The choice of these units requires explanation, and some discrimination and judgment. If the volume basis is used, the net heated space is preferable to the gross building cubage since gross cubage includes outer walls and certain portions of attic and basement space which are usually unheated. In the absence of data on net heated volume a figure of 80 per cent of the gross volume may be used to obtain the estimated net heated volume. The volume basis has been rather widely used primarily because of its facility in application. In industrial buildings it is usually easier to obtain the correct volume of a given building than to measure and evaluate the heating capacity of its heating system or calculate its maximum hourly Btu loss. The comparison of buildings on a straight volume basis does not allow for variation in exposure, type of construction, ratio of exposed area to cubical contents, and type of occupancy. It is considered inaccurate for purposes of estimating fuel consumption unless the buildings are of very similar nature.

The calculated heat loss or its equivalent square feet of calculated radiator surface may be used as the unit. The use of the unit equivalent direct radiation is of questionable value when referring to heat transfer surfaces used in warm air furnace or central air conditioning systems. Where steam or hot water radiation is already installed, care should be exercised in using the unit equivalent direct radiation basis for estimating, since actual installed radiation may differ considerably from the exact radiation requirements. In view of all these considerations it is believed that the unit based on *thousands of Btu of hourly calculated heat loss for the design hour* is probably the most desirable, although the one most widely used seems to be *units of fuel per degree-day per square foot of equivalent direct radiator surface.* The equivalent heating load for the hot water supply is not included in the latter unit, but it generally includes the piping load.

Since this unit is the one most widely used at present the unit fuel consumptions given in succeeding paragraphs of this chapter make use of this unit to a considerable extent, although it should be understood that most of these units of consumption can be transposed as desired.

Estimating Gas Consumption

Values of the Unit Fuel Consumption Constant (U) for gas are given in Table 2 for various gas heating values, and different types and sizes of heating plants. They are based on an inside design temperature of 70 F and an outside design temperature of 0 F, and apply only to these condi-