outdoor air supply equals or exceeds the amount of natural infiltration which would occur without ventilation, the natural infiltration may be neglected.

9. The sum of the heat losses by transmissions (Item 6) through the outside walls and glass, as well as through any cold floors, ceilings or roof plus the heat equivalent (Item 7) of the cold air entering by infiltration, or required to replace mechanical exhaust, represents the total heat loss equivalent for any building.

10. In buildings which have a reasonably steady internal heat release of appreciable magnitude from sources other than the heating system, a computation of this heat release under design conditions should be made for deduction from the total of the heat losses computed in items 1–9. This is especially important for heating systems of high initial cost or those for which a demand charge is based on installed capacity.

DESIGN OUTDOOR WEATHER CONDITIONS

There are no hard and fast rules for selecting the design outdoor weather conditions to be used for a given locality or type of building or heating system, and the selection is to some extent a matter of judgment and experience. The appropriate design temperature in a given locality may vary with heat capacity and degree of insulation of a particular structure, the amount of protection from the wind, the length of time that nightly minimum temperatures persist, whether the particular building is being used day and night, and perhaps other factors. For heating systems that depend primarily on electrical energy as a source of heat it will often be desirable, for economic reasons, to make a more careful analysis of the factors that affect design weather conditions than would otherwise be justified.

The outside design temperature seldom is taken as the lowest temperature, or even the lowest daily mean temperature ever recorded in a given locality. Such temperatures rarely recur in successive years. Likewise the wind direction and velocity occurring at the time of design outside temperature may be different from the average velocity and prevailing direction during the winter.

The A.S.H.A.E. Technical Advisory Committee on Weather Design Conditions has recommended the adoption for heating load calculations of an *outside design temperature which is equalled or exceeded during 97½ percent of the hours in December, January, February and March.* Complete design temperature data based on this formula are not available, but Column 8, Table 1, lists this recommended design temperature based on airport station readings for the period indicated, generally the five years, 1935–1939. In most cases these stations are outside of the city and these data apply primarily to rural areas. In general the use of the airport data for buildings within an adjacent city will not make an appreciable difference in design load.

Because of the limited data available in Column 8 of Table 1, design temperatures in common use are listed in Column 10 for the United States. Many of those values were furnished by A.S.H.A.E. members, the remainder were taken from an *ACRMA* Bulletin,[1] manufacturers' publications, and other sources,[2] and a few were estimated.

The map in Fig. 1 shows isotherms of outdoor winter design temperature which are based on the values in Column 10 of Table 1 with some modifications where other data indicated that Column 8 furnishes a more reasonable design temperature. These isotherms have also been modified slightly in accordance with the elevations of the various cities. The isotherms are drawn on 10 deg temperature intervals, in most cases, and are so placed that interpolation between isotherms will provide the proper design temperature for cities between the isotherms. Thus, a city located half-way be-

TABLE 1. WINTER CLIMATIC CONDITIONS[a]

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
State	Station[b]	Elevation[c] ft	Period of Record[d]	Lowest Temp. on Record[d] °F	Average Annual Min. Temp.[e] °F	Avg. Winter Temp.[f] °F	Design Dry-Bulb Temp. on TAC 97½% Basis[g] °F	Wind Vel. at Design Temp.[h] Mph	Design Dry-Bulb Temp. in Common Use[i] °F	Avg. Wind Vel. Dec. Jan. Feb.[j] Mph
Ala.	Anniston C	733	1893–1947	−10		52.3			5	
	Birmingham C	711	1893–1945	−10	12	53.8			10	8.0
	Birmingham A	615	1939–1947	−10		51.8	21	7.4		
	Mobile C	143	1872–1947	−1	22	58.9			15	9.9
	Mobile A	219	1940–1947	13			30	8.5		
	Montgomery C	293	1872–1947	−5	18	56.4			10	7.5
	Montgomery A	226	1938–1944	9	19					
Ariz.	Flagstaff C	6957	1899–1947	−25	−15	35.9			−10	7.7
	Kingman A	3473	1935–1939*	8			22	8.6		
	Phoenix C	1122	1895–1947	16	26	59.5			25	5.4
	Phoenix A	1112	1937–1947	21		57.7	31	5.6		
	Tucson C		Up to 1946	6		57.2			25	5.2
	Tucson A	2561	1935–1939[d]	19		57.2	30	6.3		
	Winslow C	4853	Up to 1946	−19	−1	43.6		*	−10	
	Winslow A	4899	1932–1947	−18		43.5	6	7.5		
	Yuma C	146	1876–1946*	22	27	62.5			30	6.7
Ark.	Fort Smith C	545	1882–1945	−15	6	50.4			10	8.3
	Fort Smith A	463	1945–1947	7						
	Little Rock C	451	1879–1942	−12	10	51.6			5	8.3
	Little Rock A	282	1942–1947	7			21	6.6		
Cal.	Bakersfield A	499	1937–1946*	19	25	55.5	33	5.6	25	
	Burbank A	740	1931–1947	21		57.5	35	4.9		
	Daggett A	1925	1935–1939*				27	8.5		
	Eureka C	115	1886–1947	20	29	49.3			30	7.3
	Fresno C	387	1887–1939	17	26	53.8			25	5.4
	Fresno A	281	1939–1947	23			32	4.5		
	Los Angeles C	534	1877–1947	28	37	59.3			35	6.4
	Oakland A	21	1929–1947	23		51.9	36	7.5	30	
	Red Bluff C	341[c]	1877–1934	17		53.9				6.1
	Red Bluff A	346	1944–1947	25		52.9				
	Redding A	579	1935–1939*	17			32	7.1		
	Sacramento C	116	1877–1947	17	28	53.0			30	7.2
	Sacramento A	22	1938–1947	22						
	San Diego C	90	1871–1940	25	37	58.2			35	6.3
	San Diego A	34	1939–1947	34			43	5.8		
	San Francisco C	164	1875–1947	27	37	54.2			35	7.5
	San Jose C	100[c]	Up to 1946	22		53.5			25	
	Williams A	124	1935–1939*				29	8.3		
Col.	Denver C	5398	1871–1947	−29	−11	39.0			−10	7.5
	Denver A	5379	1934–1947	−30		37.0	0	8.8		
	Grand Junction C	4587[c]	1889–1945*	−21	−2	39.9			−15	4.4
	Pueblo C	4770	1889–1938*	−27		41.1			−20	7.9
	Pueblo A	4810	1939–1947	−26			2	6.4		
Conn.	Hartford C	229	1905–1940	−18		36.4			0	8.7
	Hartford A	20	1940–1947	−24			4	8.3		
	New Haven C	180	1872–1946*	−15	−1	38.4			0	9.4
	New Haven A	17	1943–1947	−4			11	8.1		
D.C.	Washington C	128	1871–1947	−15	−1	43.4			0	7.8
	Washington A	20	1935–1939*				14	7.4		
Fla.	Apalachicola C	23	1922–1947	18		60.9			25	8.4
	Jacksonville C	104	1871–1947	10	29	62.0			25	9.0
	Jacksonville A	29	1938–1947	16		60.6	31	7.0		
	Key West C	23	1871–1947	41		73.1			45	10.6
	Key West A	48	1939–1947	42		72.5				
	Miami C	253	1896–1947	27	38	71.4			35	10.1
	Miami A	13	1940–1947	28	35		45	7.3		
	Pensacola C	67	1879–1947	7	23	59.7			20	10.9
	Pensacola A	113	1943–1947	20						
	Tampa C	111	1890–1940*	19	32	66.0			30	8.6
	Tampa A	12	1941–1946	31						
	Titusville A	52	1935–1939*				38	6.5		
Ga.	Atlanta A	1020	1878–1945*	−8	12	51.3	22	10.2	10	11.7
	Augusta C	195	1871–1946*	3		54.2			10	6.5
	Augusta A	424	1939–1947	19						
	Macon C	408	1899–1947	7		54.7			15	6.7
	Macon A	432	1939–1947	8						
	Savannah C	115	1871–1945	8	22	58.5			20	9.5
	Savannah A	56	1939–1947	16		56.7	29	7.7		
Idaho	Boise C	2818	1864–1939*	−28		40.3			−10	9.1
	Boise A	2849	1939–1947	−13	−1	39.8	5	4.5		
	Burley A	4150	1935–1939*	−35		36.9	2	8.8		
	Idaho Falls A	4744	1935–1939*	−18			−7	7.6		
	Lewiston C	762	1900–1944	−23	1	42.7			5	4.1
	Pocatello C	4522	1899–1947	−28	−12	37.1			−5	8.9
	Pocatello A	4467	1938–1947	−23		35.0	6	7.2		
Ill.	Cairo C	319	1872–1947	−16		46.4			0	9.8
	Chicago C	601[c]	Up to 1946	−23	−8	37.6			−10	12.0

Blank spaces indicate data not yet completed.