

HEATING AND COOLING DEGREE DAY DATA



HEATING DEGREE DAYS

Early in this century, heating engineers began using the heating degree days statistic as a useful index of heating fuel requirements. They found that when the daily average temperature is lower than 65 degrees, most buildings require heating in order to maintain an inside temperature of 70 degrees.* Each degree that the average temperature is below 65 is counted as one heating degree day. For example, if the maximum temperature is 70 degrees and the minimum 52 degrees, four heating degree days would be produced ($70 + 52 = 122$; 122 divided by $2 = 61$; $65 - 61 = 4$). If the daily average temperature is 65 degrees or higher, the heating degree day total is zero. For each additional heating degree day, additional fuel is needed to maintain a comfortable 70 degrees indoors. A day with an average temperature of 35 degrees (30 heating degree days) would require twice as much fuel as a day with an average temperature of 50 (15 heating degree days) assuming, of course, similar meteorological conditions such as wind speed and cloudiness.

Heating degree day statistics have become so useful that daily, monthly and seasonal totals are computed routinely for all temperature-observing stations in the National Weather Service's network. Daily figures are used by fuel companies for evaluation of fuel use rates and for efficient scheduling of deliveries. For example, if a heating system is known to use one gallon of fuel for every five heating degree days, oil deliveries will be scheduled to meet this use rate. Gas and electric company dispatchers use the data to anticipate demand, and to implement priority procedures when demand exceeds capacity.

The amount of heat required to maintain a certain temperature level is proportional to heating degree days. A fuel bill usually will be twice as high for a month with 1,000 heating degree days as for a month with 500. For example, it has been estimated that about four times as much fuel will be required to heat a building in Chicago, where the annual average is 6,100 heating degree days, as it would to heat a similar building in New Orleans, where the average is about 1,500. All this is true only if building construction and living habits in these areas are similar. Since such factors are not constant, these ratios must be modified by actual experience. The use of heating degree days has the advantage that consumption rates are fairly constant; i.e., fuel consumed for 100 degree days is about the same whether the 100 heating degree days were accumulated on only three or four days or were spread over seven or eight days.

Accumulation of temperature data for a particular location has resulted in the establishment of "normal" values based on 30 years of record (see Note 1). Maps and tables of heating degree day normals are published by the National Oceanic and Atmospheric Administration's Environmental Data and Information Service (EDIS). The maps are useful only for broad, general comparisons, because temperatures, even in a

*All temperatures are in degrees Fahrenheit unless otherwise specified. The daily average temperature is obtained by adding together the maximum and minimum temperatures reported for the day, and dividing the total by two.

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NATIONAL CLIMATIC CENTER
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small area, vary considerably depending on differences in altitude, exposure, wind, and other circumstances. FIGURE 1, NORMAL SEASONAL HEATING DEGREE DAYS, 1941-1970, illustrates the national distribution. Tables of normal monthly and annual heating degree days (see items C and E, page 3) for U.S. cities provide a more accurate basis for comparison. Heating degree day comparisons within a single area are the most accurate. For example, March heating degree day totals in the Midwest average about 70 percent of those for January. In Chicago, the coldest six months in order of decreasing coldness are January, December, February, March, November, and April. Annual heating degree day data are published by heating season which runs from July of one year through June of the next year. This facilitates direct comparison of seasonal heating degree day data and seasonal heating fuel requirements.

COOLING DEGREE DAYS

The cooling degree day statistic - the summer analog of the familiar heating degree day - serves as an index of air-conditioning requirements during the year's warm months. After obtaining the daily average temperature, the base 65 is subtracted from the resulting figure to determine the cooling degree day total. For example, a day with a maximum temperature of 82 degrees and a minimum of 60 would produce six cooling degree days ($82 + 60 = 142$; $142 \text{ divided by } 2 = 71$; $71 - 65 = 6$). If the daily average temperature is 65 degrees or lower, the cooling degree day total is zero.

The greater the number of cooling degree days, the more energy is required to maintain indoor temperatures at a comfortable level. However, the relationship between cooling degree days and energy use is less precise than that between heating degree days and fuel consumption. There is considerable controversy among meteorologists, as well as air-conditioning engineers, as to what meteorological variables are most closely related to energy consumption by air-conditioning systems. Many experts argue that because moisture is usually removed from the air in the air-conditioning process, some measure of moisture should be included in calculating energy needs for air conditioning. The Temperature-Humidity Index has been suggested as an alternative basis for calculating cooling degree days. In addition to humidity some experts feel there are other factors, such as cloudiness and wind speed, that should be included in computation of energy needs for air conditioning. All agree, however, that there is a need for a more effective measure of the influence of weather on energy requirements for air conditioning.

Until a definitive study of the problem is conducted, EDIS/NOAA will continue to use and publish statistics based on simple cooling degree day calculations, employing air temperatures measured at National Weather Service Offices and cooperating stations throughout the country. As with heating degree days, normals of cooling degree days have been established, based on 30-years of record (see Note 1). FIGURE 2, NORMAL SEASONAL COOLING DEGREE DAYS, 1941-1970, illustrates the national distribution.

PLEASE NOTE THAT HEATING AND COOLING DEGREE DAYS DO NOT CANCEL EACH OTHER. TOTALS FOR EACH ARE ACCUMULATED SEPARATELY.

NATIONAL CLIMATIC CENTER DATA PUBLICATIONS

The sources of climatological information listed below have been found useful for many applications. Current subscription and single copy prices for these publications are available from the National Climatic Center, Federal Building, Asheville, NC 28801-2696. The telephone number is 704-258-2850, extension 683; and the Federal Telecommunications Systems number is 672-0683.

A. LOCAL CLIMATOLOGICAL DATA is issued monthly (Exhibit 1) and annually (Exhibits 2 and 3) for about 285 major locations in the United States. The monthly summary includes daily heating and cooling degree days, monthly totals, and departures from normal (if computed). The annual summary includes monthly and annual values for the current year, normal monthly values (if computed), and monthly and seasonal heating and cooling degree days for as many as 20 years. Distribution is usually 40 days after the end of the month for monthly issues, and the annual summary is usually published in April.

B. CLIMATOLOGICAL DATA is issued monthly (Exhibits 4 and 5) and annually for each state or a combination of states. Data are shown for all cities in the state, or combination of states, for which daily maximum and minimum temperatures are recorded. Data are published for approximately 8,000 stations. Distribution is usually 45 days after the end of each month for the monthly issue, and the annual issue is usually published in April. The July issue (Exhibit 6) each year lists monthly and seasonal heating degree days for the just completed heating degree day season plus the seasonal normal value (if computed). Cooling degree day summary information is included in the annual publication.

C. CLIMATOGRAPHY OF THE UNITED STATES NO. 81, Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days is published decennially (Exhibits 7 and 8) for each state or a combination of states. Data are shown for all cities in the state, or combination of states, which have sufficient temperature data available for computation of a normal. Data for the period 1941-1970 were published in August 1973 and the normals will be in effect through 1982. Corrections will be made as necessary to reflect changes in location and instrumentation of first-order stations. (See Note 1.)

D. CLIMATOGRAPHY OF THE UNITED STATES NO. 84, Daily Normals of Temperature and Heating and Cooling Degree Days is published decennially (Exhibit 9). Data for the period 1941-1970 were published for 325 stations in September 1973 and the normals will be in effect through 1982. Corrections will be made as necessary to reflect changes in station location and instrumentation. (See Note 1.)

E. COMPARATIVE CLIMATIC DATA is published annually (Exhibits 10 and 11) and all editions contain monthly and annual heating and cooling degree day normals for National Weather Service first-order stations.

F. HISTORICAL CLIMATOLOGY SERIES 5-1, State, Regional, and National Monthly and Seasonal Heating Degree Days, Weighted by Population (July 1931 - June 1981) is updated and published every two years (Exhibit 12 and Note 2).

G. HISTORICAL CLIMATOLOGY SERIES 5-2, State, Regional and National Monthly and Seasonal Cooling Degree Days, Weighted by Population (January 1931 - December 1980) is updated and published every two years (Exhibit 13 and Note 2).

H. MONTHLY STATE, REGIONAL AND NATIONAL HEATING DEGREE DAYS WEIGHTED BY POPULATION (Exhibit 14 and Note 2). Provides current population-weighted heating degree day information on a monthly basis and is usually available about 45 days after the end of the month for the monthly issues.

I. MONTHLY, STATE, REGIONAL AND NATIONAL COOLING DEGREE DAYS WEIGHTED BY POPULATION (Exhibit 15 and Note 2). Provides current population-weighted cooling degree day information on a monthly basis and is usually available about 45 days after the end of the month for the monthly issues.

J. ANNUAL DEGREE DAYS TO SELECTED BASES, 1941-70 (Exhibit 16) gives annual normal heating and cooling degree days computed for base temperatures of 45, 50, 55, 60, and 65 for the period 1941-1970, from the publication "Degree Days to Selected Bases" (Exhibit 17) which is available on microfiche only from the National Climatic Center.

K. CLIMATOGRAPHY OF THE UNITED STATES NO. 85, Divisional Normals and Standard Deviations of Heating and Cooling Degree Days 1931-1980 (1931-60, 1941-70, 1951-80) is published decennially and contains monthly and annual normals and standard deviations for heating degree days (Exhibit 18) and cooling degree days (Exhibit 19) for the period 1931-60, 1941-70, and 1951-80. For the 50-year period 1931-80, divisional averages and standard deviations are also presented. A climatic division is a geographical area in a state which represents, as nearly as possible, a homogeneous climatic regime. A U.S. map depicting the divisions is included at the end of the volume. Sequential tables of monthly and annual data from 1931-80, as well as the normals, are available on microfiche (Exhibit 20).

ADDITIONAL DATA SOURCES

WEEKLY WEATHER & CROP BULLETIN is issued each week (Exhibit 21). For those with an immediate need for heating degree day data, this is the earliest government publication available. During most of the heating season several maps are printed and depict weekly and seasonal heating degree day departure from normal (1941-1970) and seasonal heating degree day departure from the previous season. Tabulations of weekly and monthly heating degree days for about 200 stations are also published. The monthly values generally appear in the first issue of the following month. Distribution is normally made on Tuesday, summarizing weekly data through the previous Sunday.

Subscription is not obtainable from the National Climatic Center (NCC). Please direct inquiries to the NOAA/USDA Joint Agricultural Weather Facility, USDA South Building, Room 5844, Washington, DC 20250.

CLIMATE IMPACT ASSESSMENT, U.S., ENERGY SECTION is issued biweekly by the Center for Environmental Assessment Services (CEAS). This publication contains biweekly data tabulations and energy assessments based on population-weighted values of degree days and departures from normal (Exhibit 22), along with related descriptive maps (Exhibit 23):

1. "Summary of Temperature-Related Energy Consumption,"
2. "Population-Weighted State Averages of Heating Degree Days," and
3. "Population-Weighted Regional and National Heating Degree Days."

Also given are weekly estimates and outlooks (in map format) related to energy consumption, which are derived from CEAS Energy Models using observed degree day data. Included in the publication on a monthly basis are one- and three-month "Heating Degree Summary and Outlook" data, in table and map formats, which are based on forecasted values of average temperature.

Subscription to this publication are available only from the Center for Environmental Assessment Services. Please direct inquiries to:

CEAS/EDIS/NOAA, D242
3300 Whitehaven Street
Page Building 2, Room 135
Washington, DC 20235
Telephone: 202-634-1822/1996

SPECIAL PRODUCTS

Although publications may be considered a convenient method of presenting basic climatological data, special tabulations often are necessary to meet requirements not covered by published data or original observations. An important part of the NCC's mission is to help solve individual problems by furnishing data in the form and quantity needed.

Special heating or cooling degree day tabulations or other summaries can be prepared on a reimbursable basis. A copy of each resulting tabulation or summary having climatological significance is retained in our files. New requests are reviewed in light of existing summaries, and when one or more of those summaries is pertinent to a request, copies can be provided at cost of reproduction.

Original data tabulations and summaries are prepared at cost to anyone requesting them according to mutually agreed upon specifications. The NCC assists the requester in determining his climatological data requirements, but avoids infringement upon the domain of the private meteorological consultant in those areas where a private user needs assistance in interpreting climatological information and applying the information to his specific problem. All private requesters needing special assistance are referred to the American Meteorological Society for a list of qualified meteorological consultants.

Please write or call us for further information. We will be glad to answer other questions you may have on this subject. Our telephone number is 704-258-2850, extension 683.

DEGREE DAY DATA ON MAGNETIC TAPE

Heating and cooling degree day data, for the stations published in the Local Climatological Data and Climatological Data bulletins described above, are available in digital form on magnetic tape from the National Climatic Center. Data file TD-9924 contains monthly totals of heating degree days (for the period 1948 to present) and cooling degree days (from 1980 to present); monthly normals (for the period 1941-1970) are available in data file TD-9641. Division, state, regional, and national monthly data for the period 1931-1980 are available in data file TD-9640. For further information about these data sets, contact the User Services Branch of the National Climatic Center; the telephone number is 704-258-2850, extension 683.

NOTE 1

Normals. A normal of a climatological element is the arithmetic average computed for a uniform and relatively long period comprising three consecutive decades. It estimates the true average of the element at the current exposure of the instrument measuring the element. For most practical purposes the normal does not convey complete information about the climate. The highest and lowest observed values are often of special interest as they give an idea of the range through which the climatic element may vary at a given locality. (Ref. 4.)

Temperature and Precipitation Normals for National Weather Service are computed by simply averaging the values from the 1941-1970 record, if no exposure changes have occurred at the station. Since it is not possible to maintain a multiple purpose network of meteorological stations without having some exposure changes, it is first necessary to identify periods of heterogeneity. After the periods have been determined, adjustments are applied to correct the heterogeneities in the record. This is done by comparing the record at the station for which the normal is desired to the record at a supplementary station with a homogeneous record. The difference method is used to adjust the monthly average maximum and minimum temperatures. The normal is the weighted average of the various partial averages of the adjusted record.

Temperature and Precipitation Normals for Substations are computed somewhat differently than those for the major National Weather Service first-order stations. Monthly substation normals are the simple arithmetic averages of the monthly values of temperature for the period. The 1941-1970 normals were computed only for substations active during the entire period. No attempt was made to adjust for minor changes in location of the observing site, or for changes in the time of observations. Normals were not computed for substations which moved a significant distance during the 1941-1970 period (more than five miles horizontally, or 100 feet vertically). Up to 18 consecutive missing temperature values in the data series could be estimated. Annual substation heating and cooling degree day normals are the sums of the monthly values.

Monthly Degree Day Normals. The usual arithmetical procedures were not applied to obtain the heating and cooling degree day data because of numerous heterogeneities in the records at most stations due to instrument changes and relocations. The rational conversion formulae developed by Thom (Ref. 1, 2 and 3) allow the properly adjusted

mean temperature normals to be converted to degree day normals with uniform consistency. In some cases this procedure will yield degree day values that are unexpected. These cases are not statistically significant (a relatively low number of degree days) and occur when the standard deviations are computed from a mixed distribution as frequently occurs during the spring and fall months.

Daily Degree Day Normals. The daily degree day normals are not simple means of the observed daily values but are interpolated values obtained from the monthly degree day normals by use of spline functions.

ATTENTION: The current normals period is the 30-year period 1941-70. These normals will be in effect until 1982 when the 1951-80 normals will be issued.

NOTE 2

Fuel allocation and energy consumption are directly related to population (i.e., more fuel and energy are used in high population areas than in low population areas). Therefore, the majority of the applications for heating degree day and cooling degree day statistics require the data be weighted according to population distribution within a given area. Since the basic allocation of fuel, energy and/or funding is at the state level, the publications present heating degree day and cooling degree day data which have been adjusted by the percent that each state's population contributes to the national population.

REFERENCES

1. Thom, H.C.S., "Seasonal Degree-Day Statistics for the United States." Monthly Weather Review (September 1952).
2. Thom, H.C.S., "The Rational Relationship Between Heating Degree-Days and Temperature." Monthly Weather Review (January 1954).
3. Thom, H.C.S., "Normal Degree-Days Above Any Base by the Universal Truncation Coefficient." Monthly Weather Review (July 1966).
4. World Meteorological Organization, "Guide to Climatological Practices." WMO-No. 100.TP.44 (1960).

FIGURE 1.

NORMAL SEASONAL HEATING DEGREE DAYS (BASE 65°F), 1941-1970



DEC 1981 03812
ASHEVILLE, NORTH CAROLINA
ASHEVILLE REGIONAL AIRPORT

LOCAL CLIMATOLOGICAL DATA

Monthly Summary



NATIONAL WEATHER SERVICE OFC

LATITUDE 35 26 N LONGITUDE 82 33 W ELEVATION (GROUND) 2140 TIME ZONE EASTERN MBAN #03812

CAROLINA

DATE	TEMPERATURE °F				DEGREE DAYS BASE 65°F		WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS ON GROUND AT 07AM 5 HAIL 6 GLAZE 7 DUST/STORM 8 SMOKE, HAZE 9 BLOWING SNOW	SNOW ICE PELLETS OR ICE ON GROUND AT 07AM INCHES	PRECIPITATION		AVERAGE STATION PRESSURE IN INCHES	WIND (M.P.H.)			SUNSHINE		SKY COVER (TENTHS)					
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	HEATING (SEASON BEGINS WITH JUL)			COOLING (SEASON BEGINS WITH JAN)	WATER EQUIVALENT (INCHES)		SNOW, ICE PELLETS (INCHES)	RESULTANT DIR.	RESULTANT SPEED	AVERAGE SPEED	FASTEST MILE	MINUTES	PERCENT OF TOTAL POSSIBLE	SUNRISE TO SUNSET	MI. TO MIDNIGHT	DATE	
1	45	34	40	-2	37	25	0	2	0	0	27.59	19	6.5	7.3	14	18	0	0	10	10	1	2
2	58	36	47	6	37	18	0	2	0	0	27.51	34	4.4	8.8	17	35	595	100	0	2	2	
3	53	32	43	2	30	22	0	0	0	0	27.70	35	2.5	5.3	12	29	488	82	4	4	6	
4	46	35	41	-2	31	24	0	1	4	0	27.70	35	10.9	12.9	23	33	112	19	9	4	6	
5	43	30	37	-3	24	28	0	0	0	0	27.88	34	18.6	19.1	26	34	495	0	0	0	0	
6	51	26	39	-1	19	26	0	0	0	0	27.91	34	10.5	10.6	17	42	0	0	0	0	0	

EXHIBIT 2.

Meteorological Data For The Current Year

Station: ASHEVILLE, NORTH CAROLINA # 03812 ASHEVILLE REGIONAL AIRPORT Standard time used: EASTERN Latitude: 35° 26' N Longitude: 82° 33' W

Month	Temperature °F						Degree days Base 65 °F	Precipitation in inches						Relative humidity, pct.				Wind						Sunrise to sunset										
	Averages			Extremes				Water equivalent			Snow, ice pellets			Hour		Resultant		Fastest mile		Percent of possible sunshine	Average sky cover, tenths, sunrise to sunset	Clear	Partly cloudy	Cloudy										
	Daily maximum	Daily minimum	Monthly	Highest	Date	Lowest		Date	Heating	Cooling	Total	Greatest in 24 hrs.	Date	Total	Greatest in 24 hrs.	Date	Hour 01	Hour 07	Hour 13						Hour 19	Direction	Speed m.p.h.	Average speed m.p.h.	Speed m.p.h.	Direction	Date			
JAN	48.9	32.0	40.5	63	15	15	31	753	0	2.65	0.75	13-14	2.1	1.5	4-5	84	88	69	77	34	3.8	8.2	29	34	12	42	7.9	4	5	22				
FEB	47.2	22.9	35.1	74	23	9	5	861	0	0.53	0.19	9	6.3	3.6	9	78	88	52	61	34	5.7	10.4	35	34	26	69	5.6	10	7	12				
MAR	55.9	36.5	46.2	73	8	9	5	573	0	8.26	2.81	20-21	5.8	3.7	1-2	75	84	61	61	33	2.0	10.2	35	34	2	50	6.9	8	8	10				
APR	68.1	44.8	56.5	86	23	31	6	284	0	4.66	4.66	9-8	4.66	4.66	0	84	84	84	84	33	2.0	10.2	35	34	2	50	6.9	11	10	10				
MAY	75.7	53.8	64.8	88	12	37	10	100	0	3.53	7.26	19-7	0.28	19-7	3.06	19-7	1	19-7	1	19-7	90	92	58	67	7.1	40	34	19-7	10	10				
JUN	82.3	61.0	71.7	94	24	37	10	100	0	3.31	8.83	19-7	1.72	19-7	4.99	19-7	1	19-7	1	19-7	90	92	58	67	7.1	40	34	19-7	10	10				
JUL	88.1																																	
AUG																																		
SEP																																		

Normals, Means, And Extremes

Month	Temperatures °F						Normal Degree days Base 65 °F	Precipitation in inches						Relative humidity pct.				Wind						Sunrise to sunset													
	Normal			Extremes				Water equivalent			Snow, ice pellets			Hour		Resultant		Fastest mile		Percent of possible sunshine	Average sky cover, tenths, sunrise to sunset	Clear	Partly cloudy	Cloudy													
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest		Year	Heating	Cooling	Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Maximum monthly	Year						Maximum in 24 hrs.	Year	Hour 01	Hour 07	Hour 13	Hour 19	Direction	Speed m.p.h.	Average speed m.p.h.	Speed m.p.h.	Direction	Year	
(a)				16		16																															
JAN	48.4	27.3	37.9	78	1975	-7	1966	840	0	3.39	7.47	1978	1.75	1970	2.95	1978	17.6	1966	7.6	1966	82	86	61	70	9.8	40	34	1975	55	6							
FEB	50.6	28.2	39.4	77	1977	-2	1967	717	0	3.60	6.56	1966	0.44	1978	3.17	1966	25.5	1969	11.7	1969	77	83	55	62	9.9	60	34	1972	63								
MAR	58.3	33.5	45.9	82	1978	-9	1980	592	0	4.66	9.86	1978	2.59	1966	5.13	1968	13.0	1969	10.9	1969	80	85	54	61	9.5	46	35	1969	60								
APR	69.4	42.4	55.9	89	1972	24	1973	279	6	3.53	7.26	1978	0.28	1976	3.06	1973	0.2	1971	0.2	1971	78	86	50	56	8.9	44	22	1976	60								
MAY	76.8	50.6	63.7	91	1969	29	1971	100	60	3.31	8.83	1978	1.72	1970	4.99	1973	1	1979	1	1979	90	92	58	67	7.1	40	34	1971	10								
JUN	82.3	58.7	70.6	96	1969	35	1966																														
JUL	88.1																																				
AUG																																					
SEP																																					

Heating Degree Days

Year	ASHEVILLE, NC													
	Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1960-61	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961-62	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962-63	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963-64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964-65	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965-66	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966-67	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968-69	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969-70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970-71	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971-72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972-73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973-74	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974-75	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975-76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976-77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977-78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978-79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979-80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980-81	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Cooling Degree Days

Year	ASHEVILLE, NC													
	Season	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Total
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Means and extremes above are from exi locality as follows: Highest tempera precipitation T in October 1963; maxi March 1960.

(a) Length of record, years, through the current year unless otherwise noted, based on January data.
(b) 70° and above at Alaskan stations.

EXHIBIT 3.

MISSOURI

EXHIBIT 7.

MONTHLY AND ANNUAL HEATING DEGREE DAY NORMALS

STATION	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
ADVANCE	0	0	21	209	555	859	933	739	590	215	65	0	4186
ALBANY	5	9	72	286	693	1088	1234	966	791	359	141	23	5667
ANDERSON	0	0	29	227	573	865	949	750	628	250	96	8	4375
APPLETON CITY	0	0	26	210	582	924	1029	798	659	258	94	10	4590
ARCADIA	0	0	44	248	582	890	983	784	649	264	97	8	4548
BETHANY	0	7	68	288	698	1094	1237	980	800	367	157	17	5715
BOLIVAR INE	0	0	33	208	558	871	967	759	635	244	84	10	4369
BONVILLE WATERWORKS	0	6	57	265	651	1017	1147	924	766	337	132	12	5314
BROOKFIELD	0	7	43	241	639	1032	1166	913	742	312	118	15	5228
BRUNSWICK	0	0	35	231	630	1008	1141	904	735	312	121	11	5128
CANTON LOCK AND DAM 20	0	8	44	269	669	1057	1197	960	797	362	140	10	5513
CARTHAGE	0	0	22	192	531	837	933	717	593	230	72	8	4135
CARUTHERSVILLE	0	0	10	153	453	753	837	658	521	167	35	0	3587
CHILLICOTHE RADIO KCHI	0	0	48	258	666	1048	1187	935	763	338	136	13	5392
CLINTON 3 NW	0	6	38	252	633	989	1097	868	735	312	118	13	5061
COLUMBIA REGION WSO	0	0	42	247	633	998	1107	879	730	314	117	11	5078
CONCEPTION	0	6	64	281	699	1094	1249	980	809	366	144	17	5709
DONIPHAN	0	0	23	206	531	834	893	706	560	191	53	0	3997
ELDON	0	0	35	205	576	905	1001	804	665	261	83	8	4553
ELSBERRY 1 S	0	5	52	261	651	1017	1119	902	729	317	127	10	5180
FARMINGTON	0	0	44	246	588	899	983	784	649	258	100	10	
FAYETTE	0	0	38	240	630	992	1110	874	724	306	119		
FULTON 4 SW	0	7	51	264	651	1014	1132	913	760	338			
GRANT CITY	5	8	76	291	723	1116	1265	1000					
GREENVILLE 4 NNW	0	0	24	221	558	856	977						
HAMILTON 2 W	0	0	56	268									
HANNIBAL WATERWORKS	0	8	50	278									

MISSOURI

EXHIBIT 8.

MONTHLY AND ANNUAL COOLING DEGREE DAY NORMALS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
ADVANCE	0	0	10	23	139	321	425	375	162	32	0	0	1487
ALBANY	0	0	0	8	98	242	362	313	111	26	0	0	1160
ANDERSON	0	0	8	28	92	242	369	351	137	22	0	0	1249
APPLETON CITY	0	0	8	21	125	292	422	400	176	45	0	0	1489
ARCADIA	0	0	10	27	94	248	366	336	137	28	0	0	1246
BETHANY	0	0	0	7	98	224	360	313	111	25	0	0	1138
BOLIVAR INE	0	0	12	25	112	283	412	395	186	56	0	0	1481
BONVILLE WATERWORKS	0	0	0	10	108	252	384	341	141	36	0	0	1272
BROOKFIELD	0	0	7	15	121	279	409	370	151	42	0	0	1394
BRUNSWICK	0	0	7	18	124	275	406	363	146	29	0	0	1368
CANTON LOCK AND DAM 20	0	0	0	8	94	244	369	324	113	24	0	0	1176
CARTHAGE	0	0	10	35	115	296	428	420	187	48	0	0	1540
CARUTHERSVILLE	0	0	15	41	178	369	471	434	232	66	0	0	1806
CHILLICOTHE RADIO KCHI	0	0	0	14	108	247	378	330	120	25	0	0	1222
CLINTON 3 NW	0	0	9	18	109	262	398	365	143	41	0	0	1345
COLUMBIA REGION WSO	0	0	8	14	98	251	381	346	141	30	0	0	1268
CONCEPTION	0	0	0	9	97	239	375	338	130	39	0	0	1227
DONIPHAN	0	0	12	26	121	309	437	403	176	35	0	0	1519
ELDON	0	0	11	24	115	272	409	380	170	38	0	0	1411
ELSBERRY 1 S	0	0	0	11	102	259	366	325	133	25	0	0	
FARMINGTON	0	0	10	18	97	259	366	333	137	26	0		
FAYETTE	0	0	8	12	98	246	372	338	134	29	0		
FULTON 4 SW	0	0	0	15	90	248	382	341	141	28			
GRANT CITY	0	0	0	8	83	216							
GREENVILLE 4 NNW	0	0	11	21	106								
HAMILTON 2 W	0	0	0	9									
HANNIBAL WATERWORKS	0	0	0										
HARRISONVILLE	0												

CLIMATOGRAPHY OF THE UNITED STATES NO. 84

DAILY NORMALS OF TEMPERATURE AND HEATING AND COOLING DEGREE DAYS 1941-70

CINCINNATI, OHIO GREATER CINCINNATI AP BOONE COUNTY, KY

DAY	JANUARY			FEBRUARY			MARCH			APRIL			MAY			JUNE		
	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD	TEMPERATURE MAX	TEMPERATURE MIN	DEG DAY HDD
1	40	23	31	41	22	32	46	27	36	59	38	48	70	48	59	79	57	68
2	40	23	31	41	22	32	46	27	37	59	38	49	70	48	59	80	57	69
3	40	23	31	41	22	32	47	27	37	60	38	49	71	48	59	80	58	69
4	40	23	31	41	22	32	47	28	37	60	39	50	71	48	60	80	58	69
5	39	23	31	41	23	32	47	28	38	61	39	50	71	49	60	81	58	70
6	39	23	31	41	23	32	48	28	38	61	39	50	71	49	60	81	59	70
7	39	23	31	41	23	32	48	28	38	62	40	51	72	49	60	81	59	70
8	39	23	31	41	23	32	49	29	39	62	40	51	72	49	61	82	59	71
9	39	23	31	41	23	32	49	29	39	63	41	52	73	50	61	82	60	71
10	39	23	31	42	23	32	49	29	39	63	41	52	73	50	61	82	60	71
11	39	23	31	42	23	32	50	30	40	64	41	52	73	50	62	83	60	71
12	39	23	31	42	23	32	50	30	40	64	42	53	73	51	62	83	61	72
13	39	22	31	42	23	32	50	30	40	64	42	53	73	51	62	83	61	72
14	39	22	31	42	23	32	51	31	41	65	43	54	74	51	62	83	61	72
15	39	22	31	43	24	33	51	31	41	65	43	54	74	51	63	83	61	72
16	39	22	31	43	24	33	52	32	42	65	43	54	74	52	63	84	61	73
17	40	22	31	43	24	33	52	32	42	66	43	55	75	52	63	84	62	73
18	40	22	31	43	24	33	52	32	42	66	44	55	75	52	64	84	62	73
19	40	22	31	43	24	34	53	33	43	67	44	55	75	53	64	84	62	73
20	40	22	31	44	24	34	53	33	43	67	44	56	76	53	64	84	62	73
21	40	22	31	44	25	34	54	33	43	67	45	56	76	53	65	85	62	73
22	40	22	31	44	25	34	54	34	44	68	45	56	76	54	65	85	63	74
23	40	22	31	44	25	35	55	34	44	68	45	57	76	54	65	85	63	74
24	40	22	31	45	25	35	55	34	45	68	46	57	77	54	66	85	63	74
25	40	22	31	45	26	35	56	35	45	69	46	57	77	55	66	85	63	74
26	40	22	31	46	26	36	56	35	46	69	46	58	77	55	66	85	63	74
27	40	22	31	46	26	36	57	36	46	69	46	58	78	55	67	85	63	74
28	40	22	31	46	26	36	57	36	46	69	47	58	78	56	67	85	63	74
29	41	22	32	46	26	36	57	36	47	70	47	58	79	56	68	85	63	74
30	41	22	32	46	26	36	58	37	47	70	47	59	79	56	68	85	63	74
31	41	22	32	46	26	36	58	37	48	70	47	59	79	57	68	85	63	74

MONTHLY NORMALS	MONTHLY NORMALS	MONTHLY NORMALS	MONTHLY NORMALS
MAX 39.7	MAX 42.7	MAX 51.8	MAX 65.0
MIN 22.4	MIN 23.8	MIN 31.6	MIN 42.7
MEAN 31.1	MEAN 33.3	MEAN 41.7	MEAN 52.7
HEATING 1051	HEATING 888	HEATING 722	HEATING 527
COOLING 0	COOLING 0	COOLING 0	COOLING 0

NORMAL HEATING DEGREE DAYS (JULY - JUNE)

EXHIBIT 10.

NORMALS 1941-70	YRS	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
BIRMINGHAM, ALABAMA - AP	30	0	0	6	137	391	614	654	517	389	116	20	0	2844
HUNTSVILLE, ALABAMA	30	0	0	11	159	441	701	747	605	451	145	32	0	3302
MOBILE, ALABAMA	30	0	0	0	33	211	385	451	337	221	40	0	0	1684
MONTGOMERY, ALABAMA	30	0	0	0	93	306	512	556	419	299	76	8	0	2269
ANCHORAGE, ALASKA	30	220	282	507	936	1317	1612	1649	1322	1280	891	583	312	10911
ANNETTE, ALASKA	30	231	211	330	561	753	902	977	792	828	666	484	318	7053
BARROW, ALASKA	30	815	849	1041	1541	1965	2396	2471	2341	2486	1977	1423	960	20265
BARTER ISLAND, ALASKA	30	775	809	1002	1507	1944	2389	2485	2366	2471	1947	1361	937	19994
BETHEL, ALASKA	30	319	394	600	1079	1434	1879	1857	1590	1662	1215	772	467	13203
BETTLES, ALASKA	30	231	406	750	1395	1992	2393	2424	2038	1969	1335	722	202	15925
BIG DELTA, ALASKA	30	181	322	642	1234	1743	2145	2167	1725	1634	1068	580	257	13698
COLD BAY, ALASKA	30	462	425	531	787	921	1116	1141	1030	1116	957	791	588	9865
FAIRBANKS, ALASKA	30	148	304	618	1234	1866	2337	2384	1890	1720	1083	549	211	14344
GULKANA, ALASKA	30	254	366	642	1184	1767	2173	2241	1711	1565	1044	657	333	13937
HOMER, ALASKA	30	394	391	540	856	1104	1352	1352	1123	1159	900	704	489	10364
JUNEAU, ALASKA	30	288	332	474	719	975	1169	1287	1036	1026	783	564	354	
KING SALMON, ALASKA	30	326	347	531	973	1287	1652	1600	1355	1383	1005	694	42	
KODIAK, ALASKA	30	338	313	450	753	906	1088	1073	941	1020	843	676		
KOTZEBUE, ALASKA	30	375	443	717	1283	1719	2136	2130	1940	2031	1560	1060		
MC GRATH, ALASKA	30	219	357	636	1231	1800	2300	2291	1826	1739	1155			
NOME, ALASKA	30	462	490	687	1132	1482	1879	1829	1674	1786				
ST. PAUL ISLAND, ALASKA	30	598	543	518	843	954	1153	1206	1176	1277				
TALKEETNA, ALASKA	30	220	322	567	1020	1425	1736	1724	1392	13				
UNALAKLEET, ALASKA	30	341	406	645	1169	1551	1965	1910	1691					
VALDEZ, ALASKA	30	363	403	555	853	1167	1411	1463	1193					

NORMAL COOLING DEGREE DAYS (JAN - DEC)

EXHIBIT 11.

NORMALS 1941-70	YRS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
BIRMINGHAM, ALABAMA - AP	30	9	10	26	62	190	372	462	440	273	84	0	0	1928
HUNTSVILLE, ALABAMA	30	0	6	21	46	174	357	450	434	248	72	0	0	1808
MOBILE, ALABAMA	30	23	29	47	127	304	459	515	512	375	160	16	10	2577
MONTGOMERY, ALABAMA	30	14	16	35	82	237	417	496	487	330	118	6	0	2238
ANCHORAGE, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
ANNETTE, ALASKA	30	0	0	0	0	0	6	8	0	0	0	0	0	14
BARROW, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
BARTER ISLAND, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
BETHEL, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
BETTLES, ALASKA	30	0	0	0	0	0	6	11	0	0	0	0	0	17
BIG DELTA, ALASKA	30	0	0	0	0	0	20	8	6	0	0	0	0	34
COLD BAY, ALASKA	30	0	0	0	0	0	31	15	6	0	0	0	0	0
FAIRBANKS, ALASKA	30	0	0	0	0	0	9	0	6	0	0	0	0	52
GULKANA, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	9
HOMER, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
JUNEAU, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
KING SALMON, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
KODIAK, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
KOTZEBUE, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
MC GRATH, ALASKA	30	0	0	0	0	0	6	8	0	0	0	0	0	0
NOME, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
ST. PAUL ISLAND, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
TALKEETNA, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
UNALAKLEET, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0
VALDEZ, ALASKA	30	0	0	0	0	0	0	0	0	0	0	0	0	0

EXHIBIT 12.

STATE HEATING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)

STATE NORTH CAROLINA 1.3

--BASE TEMP = 65 DEG F

SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	SEASONAL
31/32	0	0	3	125	264	449	460	413	539	199	58	2	2512
32/33	0	0	14	156	482	569	522	561	192	192	454	1	2963
33/34	0	0	2	146	453	511	626	799	524	162	47	1	3271
34/35	0	0	7	175	359	700	713	585	301	218	58	4	3120
35/36	0	0	15	156	336	910	848	715	375	241	27	1	3624
36/37	0	0	6	121	463	526	442	609	510	205	45	0	3027
37/38	0	0	28	230	513	723	728	465	301	158	36	6	3188
38/39	0	0	12	177	338	685	647	450	368	193	46	0	2916
39/40	0	0	.6	118	523	668	1072	624	541	235	60	2	3849
40/41	0	0	29	182	427	570	743	752	625	127	27	2	3484
41/42	0	0	5	60	403	603	770	734	416	138	34	1	3164
42/43	0	0	12	149	370	733	671	565	500	231	26	0	3257
43/44	0	0	33	202	472	703	727	531	486	134	76	1	3365
44/45	1	0	10	181	476	823	767	526	218	101	78	2	3213
45/46	0	0	4	183	369	852	681	541	284	154	55	3	3126
46/47	0	0	18	151	284	566	578	730	692	129	44	5	3259
47/48	2	0	11	97	504	717	892	599	347	113	43	3	3328
48/49	0	0	21	252	293	587	480	431	436	213	41	2	2757
49/50	0	0	31	97	466	613	411	510	523	229	31	2	2914
50/51	0	1	22	113	511	836	692	567	464	210	59	2	3477
51/52	0	0	14	115	544	622	560	552	480	180	36	0	3103
52/53	0	0	20	270	431	711	592	517	426	189	11	1	3170
53/54	0	0	22	139	444	671	702	456	479	94	11	2	3157
54/55	0	0	6	135	525	765	777	588	370	107	29	19	3322
55/56	0	0	11	184	471	813	813	505	482	236	39	4	3558
56/57	0	0	29	138	463	427	705	472	502	115	34	2	2893
57/58	0	1	10	280	392	627	892	817	603	196	43	2	3865
58/59	0	0	20	210	338	833	775	552	516	152	66	4	3430
59/60	0	0	13	129	442	664	717	651	830	122	21	3	3646
60/61	0	0	13	150	416	664	863	514	374	327	66	2	3659
61/62	0	0	6	197	344	696	789	542	572	242	11	8	3403
62/63	0	0	28	139	495	819	859	735	376	146	66	4	3699
63/64	0	0	34	166	416	923	760	711	462	176	40	6	3719
64/65	0	0	23	285	330	624	739	634	572	184	15	1	3415
65/66	0	0	3	216	403	565	887	660	499	243	100	7	3650
66/67	0	0	25	220	437	730	673	711	404	127	81	11	3438
67/68	1	0	64	214	550	589	869	805	429	166	52	4	3792
68/69	0	0	23	161	434	804	846	680	626	146	39	1	3793
69/70	0	0	28	176	515	797	942	658	508	146	55	3	3812
70/71	0	0	3	139	446	633	803	633	577	238	84	3	3562
71/72	0	0	8	87	452	444	617	633	469	212	88	1	3046
72/73	0	0	11	229	468	561	759	634	351	227	82	19	
73/74	0	0	5	139	362	683	472	531	357	227	47	2	
74/75	0	0	30	262	447	681	638	530	519	250	31	15	
75/76	0	0	19	128	47	681	710	433	338	162	83	1	
76/77	0	0	33	312	356	806	1105	676	366	116	33	3	
77/78	0	0	8	251	365	742	953	860	544	176	46	1	
78/79	0	0	7	221	327	656	838	794	426	169	75	1	
79/80	0	0	18	209	357	673	738	773	558	169	75	1	
80/81	0	0	5	241	503	724	943	620	558	169	75	1	
MEAN	.1	.1	16.7	176.0	428.2	6P							
SD	.34	.39	11.68	56.33	76.95	1							
# YRS	50	50	50	50	50								

EXHIBIT 13.

STATE COOLING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)

STATE NORTH CAROLINA 1.3

--BASE TEMP = 65 DEG F

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1931	3	0	1	3	95	308	478	341	306	63	11	10	1619
1932	31	10	6	3	106	321	470	382	206	48	0	3	1592
1933	21	1	12	11	232	350	372	355	340	51	0	4	1759
1934	12	0	7	17	114	366	467	389	260	34	2	0	1678
1935	5	0	33	6	104	313	398	385	197	43	3	0	1499
1936	1	0	22	3	163	299	439	406	259	65	0	1	1658
1937	36	0	8	8	125	351	390	389	259	20	0	0	1498
1938	4	6	38	19	148	423	366	423	208	31	4	0	1476
1939	10	8	23	11	120	392	373	355	262	68	0	0	1632
1940	0	0	7	4	103	336	374	346	152	29	0	2	1353
1941	4	0	0	28	168	305	423	395	276	125	1	1	1726
1942	2	0	16	23	154	345	450	345	236	47	2	0	1617
1943	8	0	9	5	172	424	390	402	140	25	0	0	1580
1944	4	1	9	11	215	386	353	323	237	0	0	1571
1945	1	1	73	47	82	332	392	335	296	33	8	2	1595
1946	6	1	43	16	113	285	351	290	193	48	2	0	1356
1947	15	0	0	266	289	266	289	356	224	87	0	0	1442
1948	0	0	28	35	134	316	428	340	172	13	8	2	1476
1949	26	9	14	7	132	319	452	364	151	83	0	2	1559
1950	40	4	17	5	152	303	343	313	170	70	0	0	1407
1951	6	1	11	8	102	312	405	393	203	72	0	2	1515
1952	17	1	10	13	150	435	446	348	174	11	0	0	1605
1953	15	2	15	12	251	305	414	384	185	54	0	0	1617
1954	5	3	10	47	57	314	422	411	276	58	0	0	1603
1955	1	0	24	41	165	185	440	403	226	32	0	0	1517
1956	3	3	10	4	133	297	394	369	149	56	0	0	1517
1957	5	4	8	37	146	318	380	315	238	11	1	1	1422
1958	0	0	1	9	125	262	427	372	176	23	3	0	1476
1959	2	1	8	18	182	282	382	413	204	60	0	0	1509
1960	4	0	0	31	102	288	354	388	203	45	0	0	1407
1961	0	1	23	0	65	290	371	375	254	25	3	0	1515
1962	2	1	3	3	226	254	347	335	147	53	0	0	1605
1963	0	0	22	19	89	244	331	340	147	53	0	0	1617
1964	3	0	11	12	128	313	337	296	166	35	0	0	1603
1965	4	0	3	10	213	214	340	359	217	10	0	0	1517
1966	0	0	8	3	96	216	400	334	162	22	1	0	1422
1967	7	0	17	27	59	198	322	422	84	22	0	0	1509
1968	0	0	14	11	108	265	377	422	174	44	0	0	1407
1969	0	0	1	14	133	322	431	312	147	28	0	0	1515
1970	0	0	8	20	175	270	389	356	280	28	0	0	1605
1971	1	0	3	3	68	312	346	314	225	5	0	0	1617
1972	13	0	11	6	82	173	358	344	200	5	0	0	1603
1973	3	0	26	3	82	298	367	335	200	5	0	0	1517
1974	29	0	25	14	117	200	342	354	259	10	0	0	1422
1975	10	2	7	10	151	271	329	408	149	10	0	0	1509
1976	1	9	29	15	175	225	352	283	18P	10	0	0	1476
1977	0	0	22	34	144	256	466	391	18P	10	0	0	1509
1978	0	0	15	13	82	280	368	394	18P	10	0	0	1605
1979	2	0	15	15	101	180	326	394	18P	10	0	0	1617
1980	2	0	4	14	118	244	428	394	18P	10	0	0	1517
MEAN	7.3	1.4	14.3	15.1	127.8	290.6							
SD	9.93	2.60	13.45	12.00	45.89	5a							
# YRS	50	50	50	50	50	50							

STATE HEATING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION) EXHIBIT 14.

THRU AUGUST 1981 --BASE TEMP = 65 DEG F

STATE :	SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
31	NORTH CAROLINA												
	80/81	0	0	5	241	503	724	943	620	567	111	86	0
	80/81	0	0	5	246	749	1473	2416	3036	3603	3714	3800	3800
	80/81	.0	.0	27.3	117.5	115.9	109.5	114.0	110.1	111.2	108.6	109.4	109.2
	81/82	0	0	0	0	0	0	0	0	0	0	0	0
	81/82	0	0	0	0	0	0	0	0	0	0	0	0
	81/82	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
32	NORTH DAKOTA												
	60/81	24	102	286	682	949	1568	1521	1263	959	569	355	157
	80/81	24	126	412	1094	2043	3611	5132	6395	7354	7923	8278	8435
	80/81	60.8	130.7	111.9	112.4	97.4	97.8	92.6	91.1	88.7	87.9	88.4	89.0
	81/82	29	31	0	0	0	0	0	0	0	0	0	0
	81/82	29	60	0	0	0	0	0	0	0	0	0	0
	81/82	73.4	62.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
33	OHIO												
	80/81	3	0	66	483	770	1090	1343	944	861	359	254	24
	80/81	3	3	62	552	1322	2412	3755	4699	5560	5919	6173	6197
	80/81	62.5	19.1	66.2	118.1	114.1	109.8	110.8	106.8	106.5	104.5	105.3	105.1
	81/82	3	14	0	0	0	0	0	0	0	0	0	0
	81/82	3	17	0	0	0	0	0	0	0	0	0	0
	81/82	62.5	108.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
34	OKLAHOMA												
	80/81	0	0	5	168	452	673	807	588	417	60	64	0
	80/81	0	0	5	173	625	1298	2105	2693	3110	3170	3234	3234
	80/81	.0	.0	25.5	106.2	99.7	94.3	93.5	92.9	92.0	89.6	90.6	90.6
	81/82	0	0	0	0	0	0	0	0	0	0	0	0
	81/82	0	0	0	0	0	0	0	0	0	0	0	0
	81/82	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
35	OREGON												
	80/81	51	110	147	352	576	722	719	632	586	462	64	0
	80/81	51	161	308	660	1236	1958	2677	3309	3895	4357	3234	3234
	80/81	87.6	122.1	108.0	98.5	94.9	93.4	90.9	91.9	91.5	91.6	90.6	90.6
	81/82	71	28	0	0	0	0	0	0	0	0	0	0
	81/82	71	99	0	0	0	0	0	0	0	0	0	0
	81/82	122.0	75.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

LINE 1 = HEATING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)
 LINE 2 = ACCUMULATED HEATING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)
 LINE 3 = ACCUMULATED HEATING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION) PERCENTAGE OF 9999.9 => 10000

STATE COOLING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION) EXHIBIT 15.

--BASE TEMP = 65 DEG F

STATE :	31 NORTH CAROLINA											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	2	0	4	14	118	244	428	428	280	15	0	0
1980	2	2	6	20	138	382	810	1238	1518	1533	1533	1533
1980	45.5	37.7	35.1	61.7	90.1	91.3	101.5	107.0	112.2	110.4	110.4	110.3
1981	0	0	4	34	72	385	406	285	0	0	0	0
1981	0	0	4	38	110	495	901	1186	0	0	0	0
1981	.0	.0	23.4	117.3	71.8	118.3	112.9	102.6	.0	.0	.0	.0
STATE :	32 NORTH DAKOTA											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	0	0	0	8	64	91	202	76	16	0	0	0
1980	0	0	0	8	72	163	365	441	457	457	457	457
1980	.0	.0	.0	727.3	274.8	155.5	130.5	105.1	103.3	103.0	103.0	103.0
1981	0	0	0	2	19	43	185	168	0	0	0	0
1981	0	0	0	2	21	64	249	417	0	0	0	0
1981	.0	.0	.0	181.8	80.2	61.1	89.0	99.4	.0	.0	.0	.0
STATE :	33 OHIO											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	0	0	0	0	0	97	275	295	107	0	0	0
1980	0	0	0	0	49	146	421	716	823	823	823	823
1980	.0	.0	.0	.0	90.6	69.0	91.8	107.1	108.3	107.0	107.0	107.0
1981	0	0	0	4	21	167	243	179	0	0	0	0
1981	0	0	0	4	25	192	435	614	0	0	0	0
1981	.0	.0	.0	142.9	46.2	90.7	94.9	91.8	.0	.0	.0	.0
STATE :	34 OKLAHOMA											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	0	0	9	20	152	473	714	662	374	49	0	0
1980	0	0	9	29	181	654	1368	2030	2404	2453	2453	2453
1980	.0	.0	44.3	44.3	79.7	108.4	119.5	122.9	124.3	122.1	122.0	122.0
1981	0	0	21	116	97	415	590	434	0	0	0	0
1981	0	0	21	137	234	649	1239	1673	0	0	0	0
1981	.0	.0	103.4	209.2	103.1	107.6	108.2	101.3	.0	.0	.0	.0
STATE :	35 OREGON											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1980	0	0	0	0	0	2	75	38	24			
1980	0	0	0	0	0	2	77	115	139			
1980	.0	.0	.0	.0	.0	8.3	76.9	65.8	68.5			
1981	0	0	0	0	0	12	53	129				
1981	0	0	0	0	0	12	65	194				
1981	.0	.0	.0	.0	.0	49.6	64.9	111.0				

LINE 1 = COOLING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)
 LINE 2 = ACCUMULATED COOLING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION)
 LINE 3 = ACCUMULATED COOLING DEGREE DAYS (DIVISIONS WEIGHTED BY 1980 POPULATION) AS PERCENTAGE OF 9999.9 => 10000

ANNUAL DEGREE DAYS TO SELECTED BASES, 1941-70

STATE	HEATING					COOLING				
	BASE					BASE				
	65	60	55	50	45	65	60	55	50	45
ALABAMA										
Birmingham	2844	1995	1333	838	488	1928	2916	4073	5403	6877
Huntsville	3302	2414	1670	1103	686	1808	2747	3828	5090	6492
Mobile	1684	1062	619	330	148	2577	3780	5162	6698	8342
Montgomery	2269	1508	945	547	282	2238	3302	4568	5991	7551
ALASKA										
Anchorage AP	10911	9122	7492	6081	4896	0	36	224	647	1279
Annette AP	7053	5315	3773	2513	1543	14	98	386	940	1808
Barrow AP	20265	18440	16615	14803	13009	0	0	0	13	44
Barter Island AP	19994	18169	16344	14528	12738	0	0	0	9	44
Bethel AP	13203	11404	9695	8140	6835	0	26	142	411	938
Bettles AP	15925	14180	12548	11060	9718	17	97	289	626	1110
Big Delta AP	13698	11985	10410	8977	7735	34	145	395	787	1370
Cold Bay AP	9865	8040	6230	4532	3095	0	0	16	138	533
Fairbanks AP	14345	12661	11115	9714	8451	52	196	467	898	1468
Gulkana	13938	12162	10507	8985	7648	9	63	228	537	1027
Homer	10364	8539	6745	5133	3840	0	0	24	240	777
Juneau AP	9007	7222	5557	4107	2925	0	39	197	573	1219
King Salmon AP	11582	9773	8047	6563	5304	0	12	112	456	1023
Kodiak	8860	7049	5327	3819	2593	0	7	117	436	1032
Kotzebue AP	16039	14237	12491	10852	9337	0	23	102	288	598
McGrath AP	14487	12736	11107	9634	8348	14	88	284	642	1184
Nome AP	14325	12503	10721	9047	7528	0	0	46	197	503
St. Paul Island AP	11119	9294	7469	5667	4021	0	0	0	24	199
Shemya AP	9735	7910	6085	4298	2693	0	0	0	30	254
Summit FAA AP	14368	12556	10790	9146	7640	0	10	71	253	578
Talkeetna	11708	9934	8306	6848	5609	6	57	254	620	1207
Unalakleet	14027	12238	10515	8943	7565	0	31	138	391	842
Yakutat AP	9533	7711	5942	4420	3181	0	0	56	362	947
ARIZONA										
Flagstaff	7322	5776	4421	3267	2299	140	416	894	1562	2418
Phoenix	1552	899	431	165	45	3508	4680	6039	7596	9297
Prescott FAA AP	4456	3303	2321	1507	883	882	1560	2400	3414	4612
Tucson	1752	1050	541	229	65	2814	3937	5253	6765	8431
Winslow	4733	3623	2683	1882	1249	1203	1921	2802	3828	5018
Yuma	1005	507	211	59	8	4195	5518	7045	8719	10498
ARKANSAS										
Fort Smith	3336	2442	1687	1075	613	2022	2949	4015	5239	6595
Little Rock	3354	2442	1687	1075	624	1925	2843	3908	5128	6496
CALIFORNIA										
Bakersfield	2185	1367	760	371	147	2179	3185	4400	5835	7437
Bishop	4313	3179	2230	1437	848	1037	1728	2603	3641	4876
Blue Canyon	5704	4271	3037	2015	1206	302	698	1283	2079	3106
Daggett FAA AP	2203	1420	824	410	166	2729	3765	5004	6415	7996
Eureka	4679	2925	1494	607	194	0	55	460	1414	2816
Fresno	2650	1724	995	493	205	1671	2563	3667	4986	6525
Long Beach	1606	772	292	70	8	985	1982	3325	4928	6696
Los Angeles INTL	1819	833	295	66	7	615	1464	2755	4348	6115
Los Angeles Civic Ctr	1245	522	158	26	0	1185	2289	3747	5442	7244
Mount Shasta	5890	4458	3215	2177	1338	286	680	1263	2045	3035
Oakland	2909	1570	714	263	61	128	622	1598	2963	4587
Red Bluff	2688	1762	1018	505	208	1904	2803	3895	5196	6727
Sacramento	2843	1837	1043	493	186	1159	1971	3011	4286	5812
Sacramento City	2587	1627	893	406	148	1291	2158	3249	4584	6151
Sandberg	4427	3177	2107	1250	622	800	1374	2123	3100	4293
San Diego	1507	648	213	42	9	722	1694	3084	4746	6532
San Francisco	3042	1668	769	289	67	108	550	1496	2832	4438
San Francisco Fed Bldg	3080	1576	608	169	25	39	368	1230	2619	4298
Santa Maria	3053	1624	690	229	42	84	484	1377	2738	4380
Stockton	2806	1835	1072	537	219	1259	2100	3167	4455	5900
COLORADO										
Alamosa	8609	7029	5654	4473	3457	88	320			
Colorado Springs	6473	5131	3954	2949	2089	461				
Denver - Stapleton	6016	4723	3601	2653	1852					
Denver - City	5505	4246	3175	2271	1533					
Eagle AP	8426	6864	5505	4277						
Grand Junction	5605									
Pueblo										

DEGREE DAYS TO SELECTED BASES

EXHIBIT 17.

111549 CHICAGO O HARE WSO		ILLINOIS												DEGREE DAYS (1941-70)			
BASE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NDV	DEC	ANNUAL			
BELOW	70	1460	1229	1063	636	371	117	42	69	199	502	924	1330	7942			
	65	1305	1089	908	486	240	45	7	18	90	360	774	1175	6497			
	60	1150	949	753	343	141	11	0	0	24	230	624	1020	5245			
	55	995	809	607	212	67	0	0	0	0	134	474	865	4163			
	50	840	669	464	116	24	0	0	0	0	61	336	710	3220			
	45	685	529	335	47	8	0	0	0	0	21	212	567	2404			
	43	632	478	290	29	0	0	0	0	0	14	172	510	2125			
	40	544	399	230	14	0	0	0	0	0	7	121	427	1742			
	35	407	275	148	0	0	0	0	0	0	0	53	304	1187			
	32	332	212	105	0	0	0	0	0	0	0	28	243	920			
	30	288	175	80	0	0	0	0	0	0	0	18	207	768			
	25	195	101	38	0	0	0	0	0	0	0	6	129	469			
ABOVE	30	68	66	257	564	880	1143	1299	1274	1011	738	294	117	7711			
	32	50	46	220	504	818	1083	1237	1212	951	676	244	91	7132			
	40	14	9	97	278	570	843	989	964	711	435	97	27	5034			
	43	9	0	64	203	482	753	896	871	621	348	58	17	4322			
	45	0	0	47	161	423	693	834	809	561	294	38	12	3872			
	50	0	0	21	80	284	543	679	654	411	179	12	0	2863			
	55	0	0	9	26	173	393	524	499	265	97	0	0	1984			
	60	0	0	0	7	92	254	369	348	135	38	0	0				
	65	0	0	0	0	35	138	221	207	51	12	0	0				
	70	0	0	0	0	12	60	101	103	10	0	0	0				
	75	0	0	0	0	0	16	29	34	0	0	0	0				
	80	0	0	0	0	0	0	0	8	0	0	0	0				

MEAN TEMP.
ST. DEV.

22.9 26.1 35.7 48.8 58.4 68.1 71.9 71.1
4.89 4.09 4.81 3.09 3.50 2.75 2.10 2.5

HEATING DEGREE DAYS (BASE 65 DEG F) DIVISIONAL NORMALS AND STANDARD DEVIATIONS

NORTH CAROLINA

DIVISIONS		JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANN
SOUTHERN MOUNTAINS														
01	1931-80 AVERAGE	0	0	48	275	561	794	838	713	582	295	110	15	4231
	STD DV	1	0	27	70	82	120	162	120	119	62	43	13	295
	1931-60 NORMAL	0	0	46	259	568	789	794	685	594	297	104	11	4147
	STD DV	0	0	24	69	84	125	155	119	129	64	42	12	290
	1941-70 NORMAL	0	0	55	273	573	818	840	711	597	283	105	14	4269
	STD DV	1	0	28	73	78	112	133	127	125	72	46	13	300
	1951-80 NORMAL	0	0	50	292	567	807	881	731	586	290	114	19	
	STD DV	1	0	28	67	79	115	140	120	112	62	48		

COOLING DEGREE DAYS (BASE 65 DEG F) DIVISIONAL NORMALS AND STANDARD DEVIATIONS

NORTH CAROLINA

DIVISIONS		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
SOUTHERN MOUNTAINS														
01	1931-80 AVERAGE	3	0	4	2	49	160	239	216	101	9	0	0	783
	STD DV	7	0	6	3	28	48	44	40	38	10	0	0	115
	1931-60 NORMAL	4	0	4	2	52	177	248	222	102	11	0	0	822
	STD DV	8	0	7	4	26	47	39	40	36	11	0	0	83
	1941-70 NORMAL	3	0	3	2	52	163	235	213	91	9	0	0	771
	STD DV	7	0	7	4	30	49	41	44	35	12	0	0	100
	1951-80 NORMAL	2	0	3	2	48	146	235	217	98	6	0	0	

SAMPLE DATA ON MICROFICHE

January 1931 - December 1980

STATE: 1 ALABAMA
 DIVISION: 1 NORTHERN VALLEY

DIVISIONAL HEATING DEGREE DAYS (BASE 65 DEG F)

ST/DIV	SEASON	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
1	1 30-31							762	552	618	206	72	0	
1	1 31-32	0	0	0	99	249	447	531	377	556	131	40	0	2430
1	1 32-33	0	0	16	209	549	672	550	607	459	181	10	0	3253
1	1 33-34	0	0	0	138	397	387	597	677	471	120	21	0	2808
1	1 34-35	0	0	12	116	318	697	674	539	228	131	25	0	2740
1	1 35-36	0	0	10	121	380	864	809	711	309	196	13	0	3413
1	1 36-37	0	0	0	134	477	561	442	582	490	133	22	0	2841
1	1 37-38	0	0	14	200	471	697	654	375	228	109	18	0	2766
1	1 38-39	0	0	10	99	365	654	600	476	320	171	32	0	2727
1	1 39-40	0	0	0	96	492	613	1168	649	446	174	74	0	3712
1	1 40-41	0	0	20	129	444	529	698	716	597	87	14	0	3234
1	1 41-42	0	0	0	43	465	592	818	708	411	100	28	0	3165
1	1 42-43	0	0	24	139	334	678	674	534	516	155	15	0	3060
1	1 43-44				207	504	713	724	452	416	176	16	0	
1	1 44-45				114	414	775	762	536	216	105	71		
1	1 45-46					414	775	762	536	216	105	71		
1	1 46-47					414	775	762	536	216	105	71		
1	1 47-48					414	775	762	536	216	105	71		
1	1 48-49					414	775	762	536	216	105	71		
1	1 49-50					414	775	762	536	216	105	71		
1	1 50-51					414	775	762	536	216	105	71		
1	1 51-52					414	775	762	536	216	105	71		
1	1 52-53					414	775	762	536	216	105	71		
1	1 53-54					414	775	762	536	216	105	71		
1	1 54-55					414	775	762	536	216	105	71		
1	1 55-56					414	775	762	536	216	105	71		
1	1 56-57					414	775	762	536	216	105	71		
1	1 57-58					414	775	762	536	216	105	71		

REQUESTS FOR MICROFICHE
 COPIES OF THIS REPORT
 SHOULD BE ADDRESSED TO:

DIRECTOR
 NATIONAL CLIMATIC CENTER
 FEDERAL BUILDING
 ASHEVILLE, NC 28801

THE REQUESTED MICROFICHE
 WILL BE PROVIDED AT
 COST.

(704) 258-2850, EXT. 683

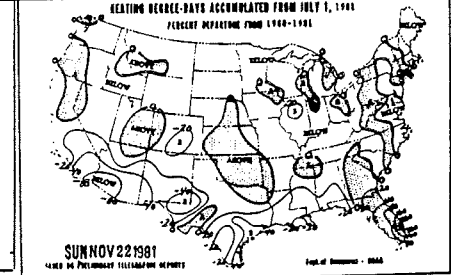
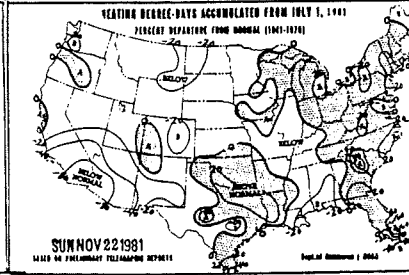
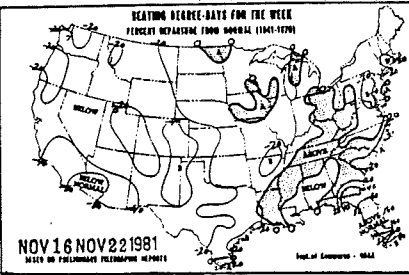
(FTS 672-0683)

STATE: 1 ALABAMA
 DIVISION: 1 NORTHERN VALLEY

HEATING DEGREE DAYS (BASE 65°) FOR WEEK ENDING NOV. 22, 1981.

BASED ON 1941-70 NORMALS. + ACCUMULATION FROM JULY 1, 1981.

Table with columns for STATES AND STATIONS, WEEKLY DEPARTURE, SEASONAL ACCUMULATION, and DEPARTURE FROM 1980-81. Rows list various cities across the United States with their corresponding heating degree day values.



POPULATION - WEIGHTED STATE AVERAGES OF HEATING DEGREE DAYS

STATE	2 WEEKS ENDING DEGREE DAYS	DEC 13 DEV FROM NOR ¹	SEASON DEGREE DAYS	JUL 1 THRU SEASON OFN	DIFF	LAST YEAR	RATIOS	
							ACC TO DATE VS NORMAL TO DATE	ACC TO DATE VS LAST YEAR TO DATE
ALABAMA	238	4	606	-73	-60	0.892	0.910	
ARIZONA	91	-86	222	-233	-122	0.488	0.645	
ARKANSAS	252	-49	755	-111	-76	0.872	0.909	
CALIFORNIA	127	-28	454	-123	-14	0.787	0.970	
COLORADO	313	-122	1240	-409	-230	0.752	0.844	
CONNECTICUT	421	-25	1598	90	-3	1.060	0.998	
DELAWARE	393	5	1340	111	9	1.090	1.007	
FLORIDA	110	42	196	40	79	1.324	1.675	
GEORGIA	281	45	706	44	95	1.066	1.155	
IDAHO	375	-77	1699	-141	-190	0.923	0.899	
ILLINOIS	442	-36	1602	-33	-45	0.980	0.973	
INDIANA	436	-15	1544	14	22	1.009	1.014	
IOWA	473	-51	1716	-107	-106	0.941	0.942	
KANSAS	353	-65	1201	-136	-81	0.898	0.942	
KENTUCKY	384	0	1233	-1	54	0.999	0.999	
LOUISIANA	443	10	349	-55	-95	0	0	
MAINE	457	-73	2128	-46	-80	0	0	
MARYLAND	362	-13	1208	50	85	0	0	
MASSACHUSETTS	415	3	1553	177	1	0	0	
MICHIGAN	462	-26	1965	158	-37	0	0	
MINNESOTA	562	-66	2179	-171	-21	0	0	
MISSISSIPPI	227	4	571	-61	0	0	0	
MISSOURI	359	-42	1176	-90	0	0	0	
MONTANA	455	-88	2107	-289	0	0	0	

SEASONAL STATE HEATING DEGREE DAYS* (°F) AND DEPARTURES FROM NORMAL

EXHIBIT 23.

July 1 - December 13, 1981

