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# Building Research Note

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ANALYZED

TEMPERATURE, RELATIVE HUMIDITY, AND  
HEAT REQUIREMENTS IN AN ELECTRICALLY  
HEATED HOME, SUSSEX, N.B. - 1963

by

D.R. Robson

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TEMPERATURE, RELATIVE HUMIDITY, AND HEAT  
REQUIREMENTS IN AN ELECTRICALLY HEATED HOME,  
SUSSEX, N.B. - 1963

by

D. R. Robson

In conjunction with a study of electrically heated homes in Sydney, N.S., and Dartmouth, N.S., a house in Sussex, N.B. was instrumented in January 1963. The Commercial Department of the New Brunswick Power Commission expressed interest in obtaining records of indoor temperature and relative humidity and undertook to make arrangements for chart changes, meter readings, and weather records.

The house in Sussex is a one-storey frame dwelling built on a basement (Figure 1). The insulation used over the ceiling was 6 in. in thickness with 3 in. thick insulation in the walls and 2 in. under the floor; the basement was unheated. The living space of the house was heated with electric baseboard units controlled by individual room thermostats.

Continuous records of indoor temperature and relative humidity were taken using a hygrothermograph (Figure 2). This instrument was calibrated on a monthly basis, and the charts were changed weekly by the homeowner.

Records of electrical energy consumption were obtained by separate metering of the space heating, water heating, and electric range. Readings were made weekly.

The house was occupied by two adults and two children.

Outdoor weather records were obtained from the Sussex substation of the Department of Transport.

The inside air temperature, inside-outside air temperature difference, relative humidity and humidity ratio based on average weekly values are shown graphically in Figure 3.

From records of electrical energy used, it has also been possible to show in graph form the electricity used for space heating on a weekly basis (Figure 4).

A summary of data in Table I details some of the more significant calculated and recorded data for this house. Table II details the monthly distribution of electrical energy used, except for the October readings which include totals for June, July, August and September.

The graph shown in Figure 5 records the average weekly basement temperatures and the average weekly outdoor temperatures. The record for the basement temperatures was not started until mid-March so a complete twelve-month record is not available.

### OBSERVATIONS

(1) It is not possible to use one house as a typical example because of variations due to occupancy, orientation, and building details. It is worth while, however, to record the data collected for possible future comparison with other houses.

(2) The record of temperature and humidity (Figure 3) indicates a fairly good control of temperature and a rather high relative humidity. This increase in indoor relative humidity is to be expected with no combustion air requirement for the heating system and, therefore, possibly a lower infiltration rate than is common to houses heated by other means.

(3) The records shown in Figure 5 indicate that the average weekly basement temperature did not go below 42°F with an average outside temperature for the same week of +5°F. The basement temperature records for January and February 1963 were not obtained, but because the low outdoor mean in December 1963 was not exceeded in January or February of 1963, it would seem reasonable that the temperature of this unheated basement would not go below 40°F.

(4) The estimated electrical energy used for space heating based on the calculated heat loss when using a C factor of 18.5 in the National Electrical Manufacturers Association (NEMA) formula shown below, is within 12 per cent of the amount actually used.

$$KW = \frac{HL \times DD \times C}{Td}$$

where

KW = Annual kwh

DD = Degree days for Sussex

HL = Calculated heat loss, kw  
Td = Temperature difference, F deg.  
C = Factor

The writer appreciates the opportunity to supplement existing information with records from this house in Sussex. The co-operation of the contractor-homeowner and the Commercial Department of the New Brunswick Electric Power Commission is very much appreciated. He is particularly grateful to Mr. Rinehart of the NBEPC who made all the arrangements, and collected and processed the data for the Sussex house. It is hoped that the summary of this information as contained in this report will be of interest and assistance with regard to the use of electricity for domestic heating.

TABLE I  
SUMMARY OF DATA FOR SUSSEX HOUSE

No.	Item	Data Summary
		Sussex
1	Calculated heat loss - Btu/hr	25,700
2	Floor area - sq ft	840
3	Degree days for period	9,145
4	Total electricity used, kwh	21,263
5	Electrical use - space heating, kwh	13,970
6	Electrical use - cooking, kwh	1,240
7	Electrical use - water heating, kwh	4,409
8	Electrical use - misc., kwh	1,644
9	Total electricity used - exclusive of heating, kwh	7,293
10	Kwh/°day (heating only)	1.52
11	Kwh/°day/sq ft floor area (heating only)	$1.81 \times 10^{-3}$

TABLE II

## SUSSEX - MONTHLY SUMMARY

Period	Electrical Energy Used (kwh)				Degree Days	Heating Kwh/°day
	Heating	Range	Water Heater	Misc.	Total	
1963						
Jan. 4 - Jan. 31	2,050	80	416	164	2,710	1.73
Jan. 31 - Mar. 4	2,500	101	453	178	3,232	1.47
Mar. 4 - Apr. 3	1,980	131	510	18	2,639	1.75
Apr. 3 - May 3	1,370	111	334	263	2,078	1.66
May 3 - June 7	630	136	442	127	1,335	1.49
June 7 -	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
- Oct. 1	520	340	1131	341	2,332	0.72
Oct. 1 - Nov. 4	640	103	313	122	1,178	1.11
Nov. 4 - Dec. 3	1,460	113	373	178	2,124	1.84
Dec. 3 - Jan. 5	2,820	125	437	253	3,635	1.66
Totals	13,970	1240	4409	1644	21,263	1.52 Ave.

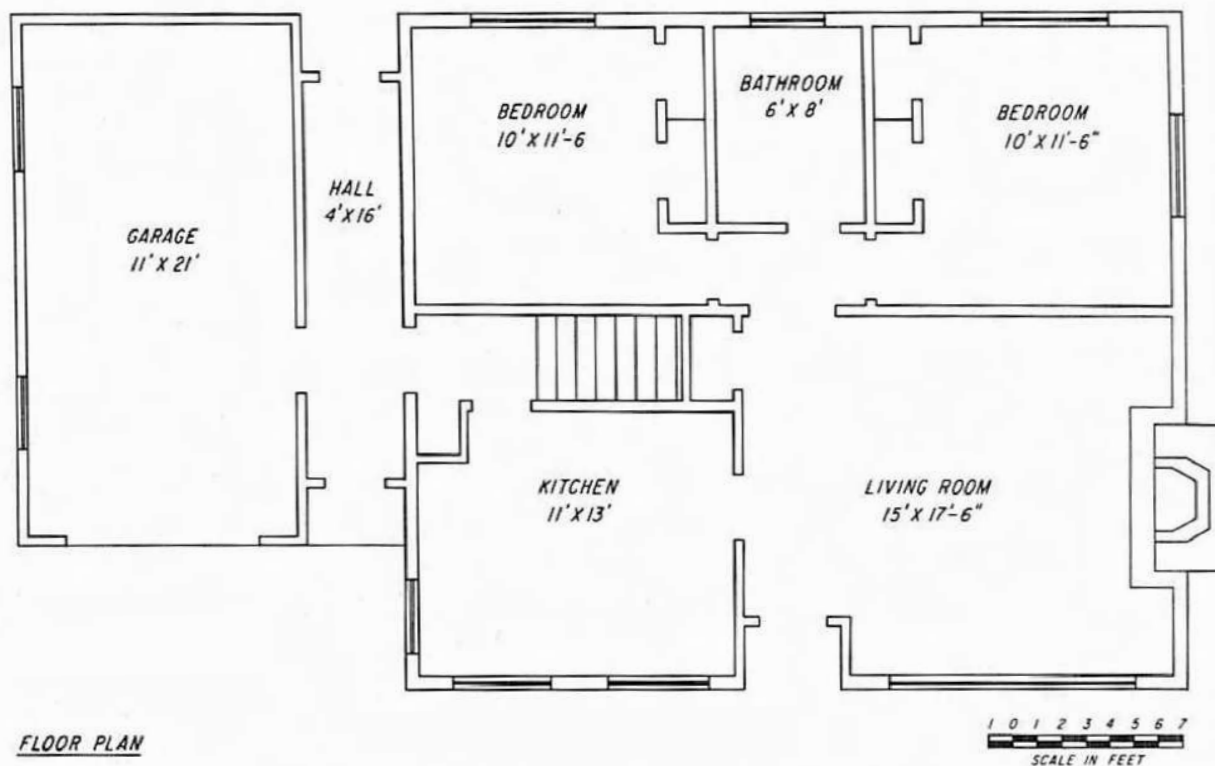


Figure 1 House in Sussex, N.B.



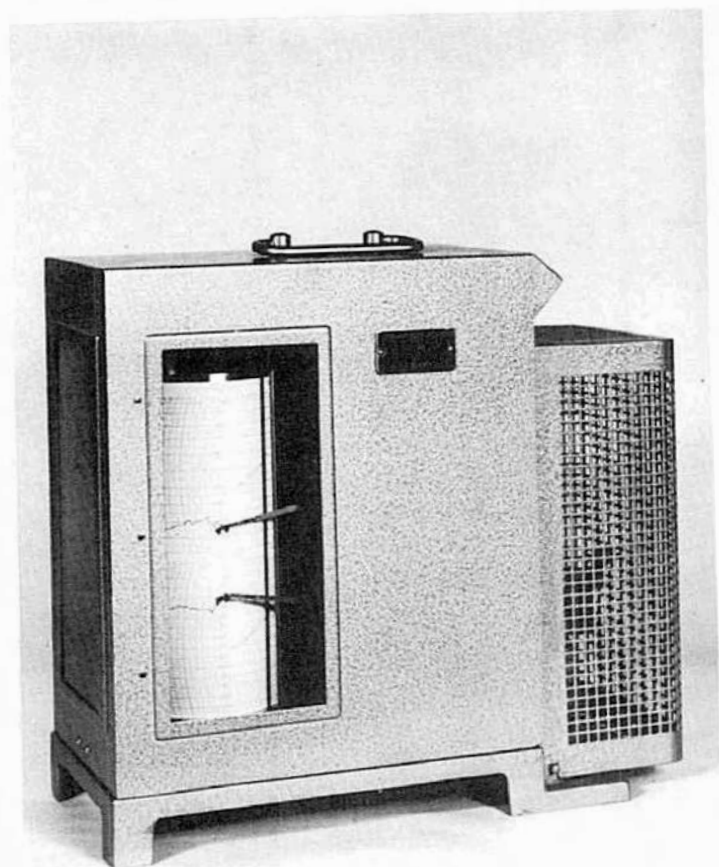
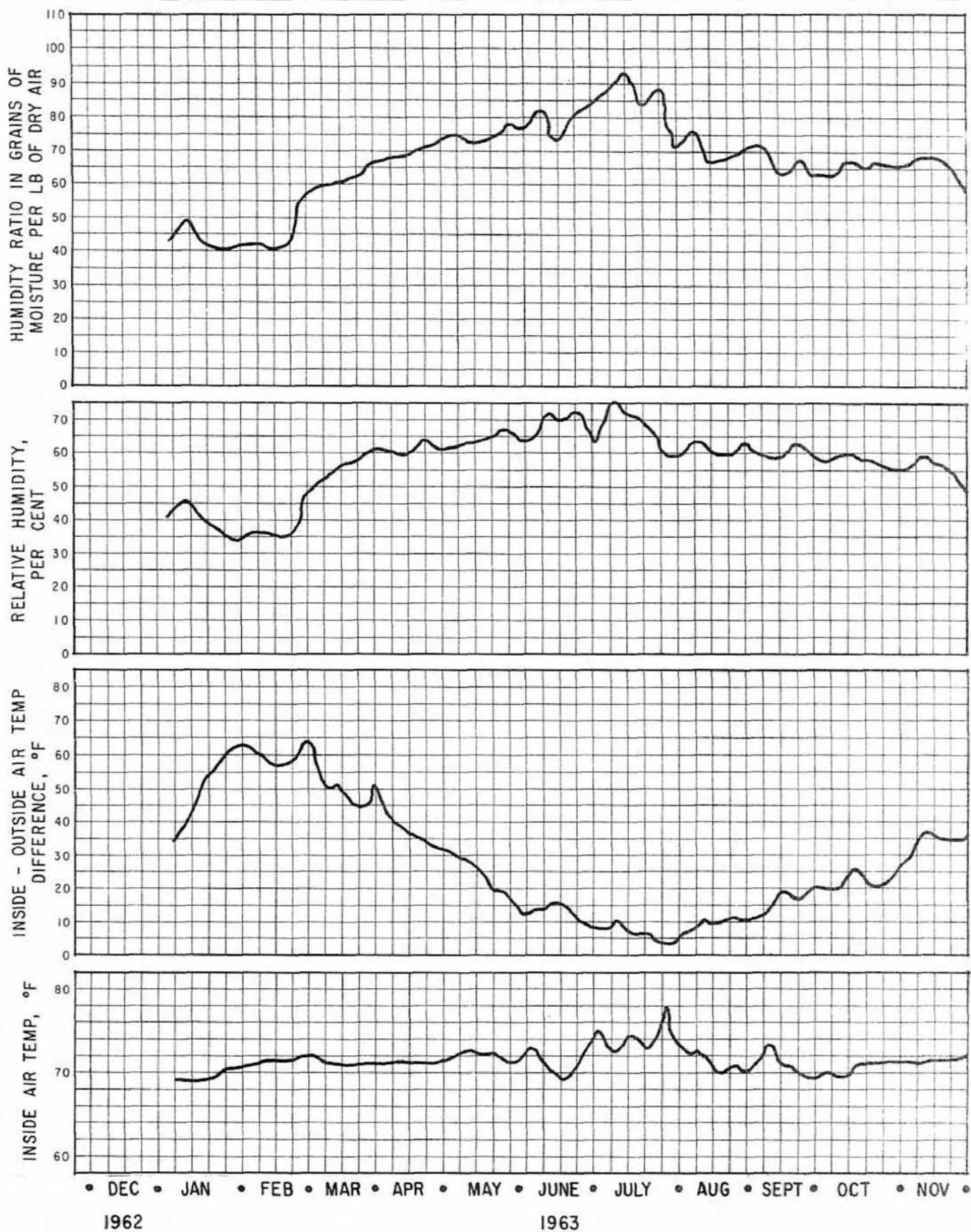


Figure 2 Hygrothermograph

D.B.R.

## INDOOR CLIMATE OF BUILDINGS

N.R.C.

LOCATION SUSSEX N.B. BUILDING HOUSE

D.B.R.

## INDOOR CLIMATE OF BUILDINGS

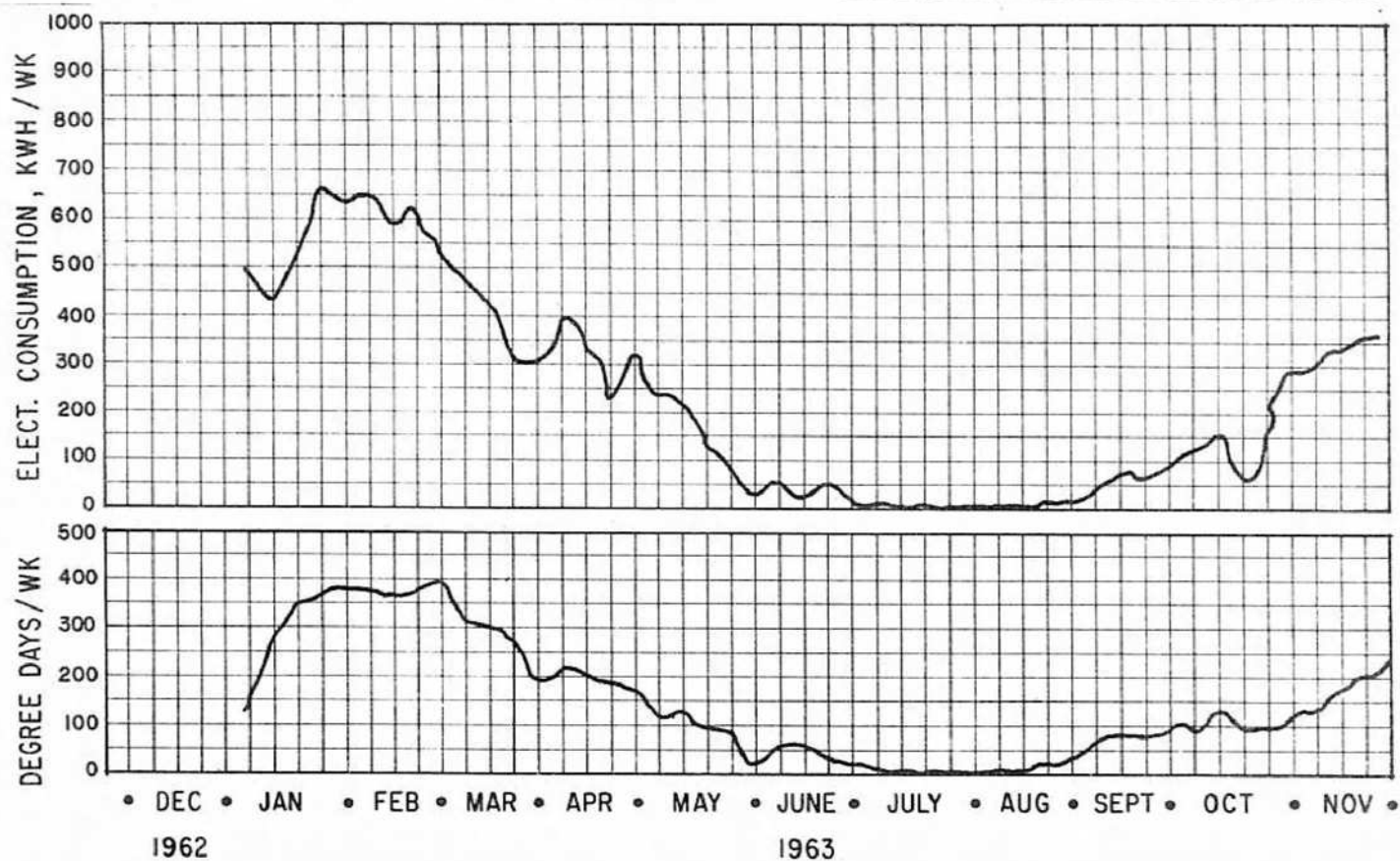
N.R.C.

LOCATION

SUSSEX N.B.

BUILDING

HOUSE



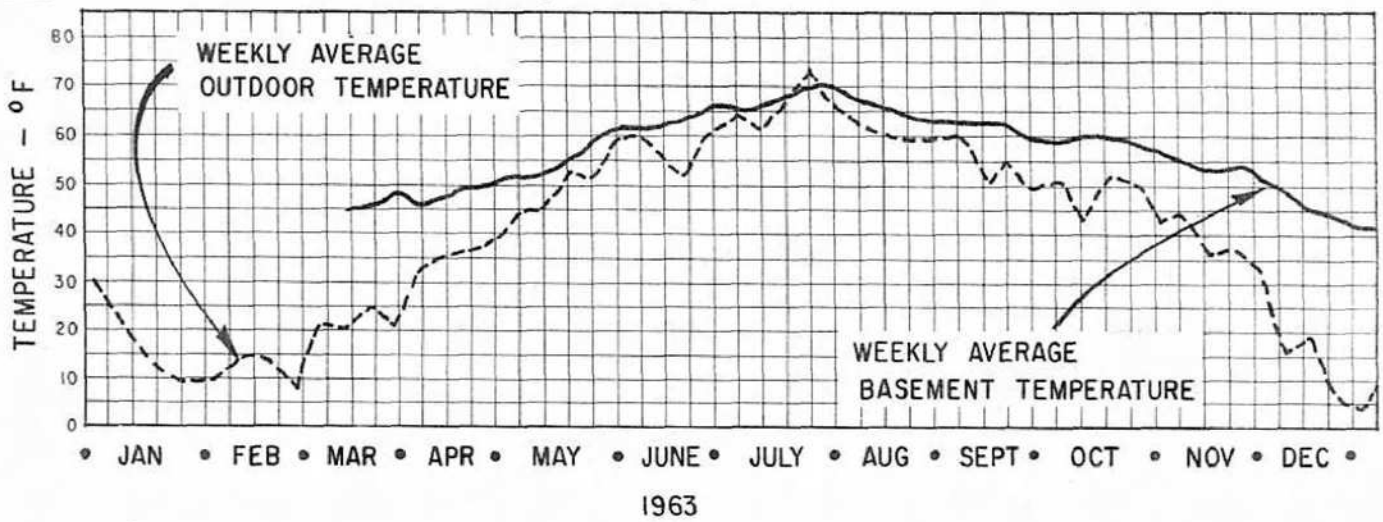
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FIGURE 4

D.B.R.

## INDOOR CLIMATE OF BUILDINGS

N.R.C.

LOCATION SUSSEX N.B.BUILDING HOUSE

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FIGURE 5