Abstracts of the papers printed or to be printed

ON THE HEATING SYSTEM OF THE OBSERVATION HUTS*

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暖房設備について*

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The heating system was designed by *the Antarctic Building Committee* of the Architectural Institute of Japan with the co-operation of the Special Committee on Engineering for the Japanese Antarctic Research Expedition of the Japan Society of Mechanical Eegineers.

1) Heating System A central heating system with warm air furnace was adopted in due consideration of the several compartments in each observation hut. The warm air furnaces were an oil-burning and fan-packaged type specially manufactured for the Antarctic region.

As for the conditions for heat loss calculations, outside temperature was assumed as -50°C on the basis of the observation data by Maudheim, and 15°C and 50% were selected as temperature and relative humidity in the room, respectively. And the transmission coefficient for walls of each observation hut was taken as $K=0.354$ Kcal/m^2, hr, °C and ventilation air per person as 30 m^3/hr. The estimated results with the above figures are given in the Table 1.

Table 1.

	Transmission Load (Kcal/hr)	Ventilation Load (Kcal/hr)	Sum (Kcal/hr)
Living Hut	3,700	5,050	8,750
Main Hut	3,700	1,450	5,150
Wireless Hut	3,700	2,160	5,860
Work Hut	2,810	720	3,530

The above results proved that each warm air furnace in each hut should be of same capacity 10,000 Kcal/hr and besides, heating would be done with the electric heater of 3 KW inside to be worked with surplus electricity.

The efficiency of the warm air furnace was assured as 80% through the durability test by continuous operation for 500 hours.

The air ducts for the distribution of warm air were constructed in loop penetrating through the beam as illustrated in Fig. 1 and the nozzle-type diffusers were provided at the required positions on them. The warm air ducts were so designed as to be fabricated as the combination of several unit ducts, the length of which to be 54 cm and diameter 16.5 cm, with the specially prepared sheet metal fittings. The outlets were attached to the ducts of same type as the straight pipes so that the positions of diffusers might be easily interchangeable. In reality it took only 2 man-hours to fabricate all the ducts for each hut.

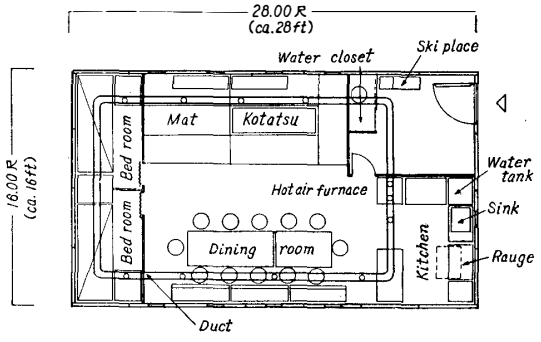

Fig. 1. Duct system in mess hut.

* 衛生工業協会誌 32 巻 2 号 (1958). 南極建築の設備計画.

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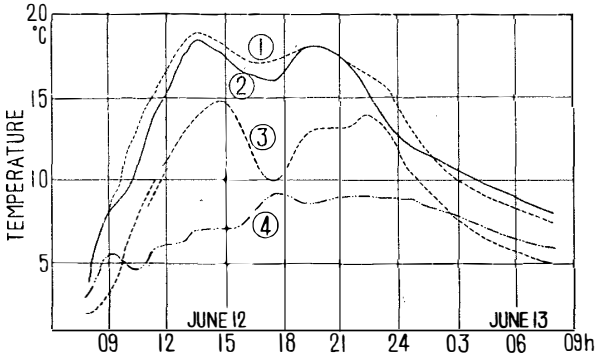

Fig. 2. Temperature variations in Mess Hut.
1. Temp. at 0.30 m below ceiling
2. Temp. at 1.00 m above floor
3. Temp. at floor level
4. Temp. in entrance hall

2) **Ventilation** The fresh air was taken into the room through the air gap around the chimney and the exhaust air was drawn off through an exhaust stack by multi-blade fan of capacity of 135 m^3/hr attached to the ceiling. Besides, the canopy hood was installed above the kitchen range to carry out exhaustion with a multi-blade fan of capacity of 500 m^3/hr.

3) **Performance of Heating** The results of measuring the room temperature in the main observation hut are shown in Fig. 2 (These data were observed from June 12 to 13, 1957 by Dr. TATSUMI, a member of the Antarctic Winter Party).

On that day of the observation the outside temperatures were relatively high −10～−12°C at night and −7～−9°C in the daytime, and the temperature difference between inside and outside was about 25°C or so during heating hours (9:00 A.M.—9:00 P.M.), when the warm air furnace worked at nearly 2/3 of its full capacity and in fact the heat loss greatly exceeded the calculated value. This is to be regarded as the effect of infiltration through the crevices between panels.

The heating system of the Antarctic Observation Huts was designed without any effective experience nor any reliable information. Though the real heat loss surpassed our estimation, the temperature could be maintained at 15～20°C in the room, because of the milder conditions outside than we expected.

According to the reports of the Antarctic Winter Party, the following points still remain to be improved, which will offer us the subjects of our future research.

a) Flowing backward of smoke at the blizzard.

b) Room air pollution by tobacco smoke owing to insufficiency of exhaust.

c) Considerable temperature difference between the upper and lower parts in the room.