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COOLER HOMES *from* ATTIC VENTILATION

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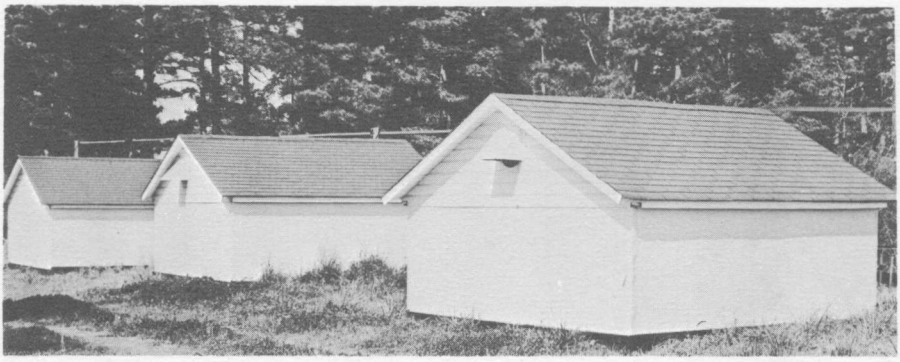
ATTIC VENTILATION and ceiling insulation can make your house cooler during the hot summer months.

Results of research at the Agricultural Experiment Station of The Alabama Polytechnic Institute[1] show that high ceiling temperatures can be lowered by insulating the ceiling and removing hot air trapped in the attic. These control measures are especially important because attic air, sometimes 30° higher than outside air, heats the ceilings of the rooms below. Thus, they become undesirable heating panels for occupants of the rooms.

[1] The study was in cooperation with the Southern Research Housing Project S-8.

TEST DESCRIPTION and RESULTS

First year. Various types of attic ventilation systems were installed in a series of identical test roofs to check their effects on ceiling surface temperatures. These systems were gable end louvers, a ridge louver, a flue, and a fan. A fifth roof was completely closed and used as a check.



Above are three of the battery of various attic types used in the Experiment Station study to determine the best system for lowering ceiling temperature.

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TABLE 1. CEILING SURFACE TEMPERATURES WITH DIFFERENT VENTILATION SYSTEMS, AUGUST 25, CLEAR DAY[1]

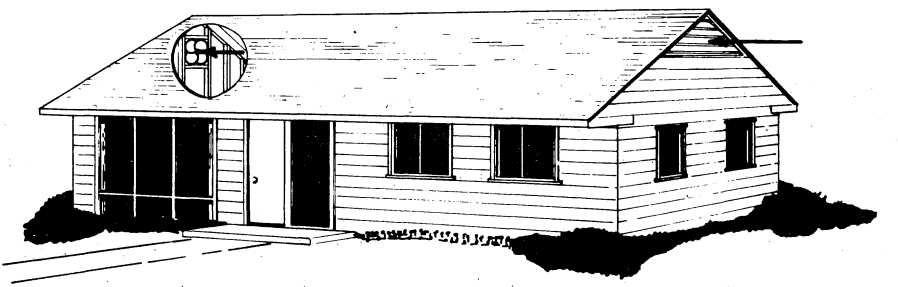
Ventilation system	Temperature at different times of day (degrees Farenheit)									
	8 a.m.	9 a.m.	10 a.m.	11 a.m.	12 m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.
Outside temperature	88	90	94	97	97	97	100	98	97	94
Closed attic	84	99	107	114	117	118	117	117	114	110
Ridge louver	82	92	98	102	104	106	106	105	103	100
Flue	81	93	97	103	103	104	107	105	103	99
Fan	85	92	96	98	98	100	101	100	98	96
Gable louvers	85	95	100	106	107	108	109	107	104	102

[1] Temperatures given are typical of others recorded during test period. There was no insulation on upper surface of ceiling.

The fan, which produced one air change per minute, was the most effective system for lowering the ceiling surface temperature, Table 1. The ridge louver was second followed by the flue and gable end louvers. The completely closed attic produced the hottest ceiling surface. When insulation was applied to the upper ceiling surface, the temperature differential between systems decreased. However, the effectiveness of the various attic space ventilation systems remained in the same order.

Second year. Following the first summer tests, the roofs were modified. Fans of different sizes were installed in four roofs. The fifth roof remained closed. The fans were rated to produce 1, 2, 3½, and 5½ attic air changes per minute. The last two rates were selected to correspond with summer room ventilation systems of ⅔ and 1 air change per minute for a one-story house with 8-foot ceilings. Expanded vermiculite insulation was applied to areas of the ceilings of each test roof at thickness of 1 and 2 inches.

Results of these studies show that the greater the rate of ventilation, the lower the ceiling surface temperature. It can be readily seen from Table 2 that the greatest difference in ceiling surface temperatures was between the unventilated attic and the attic with one air change per minute. The greater ventilation rates produced a cooler ceiling, but the reduction of temperature was not in proportion to the increased rate of air movement. The data also show that a cooler ceiling surface was obtained with the heaviest rate of insulation, Table 3. However, the greatest temperature reduction was from the no insulation to the 1-inch application.



The diagram illustrates attic ventilation system that gave good results in the tests. Arrows show movement of air pulled by fan through louvers.

TABLE 2. CEILING SURFACE TEMPERATURES WITH DIFFERENT VENTILATION RATES, AUGUST 27, CLEAR DAY[1]

Ventilation rate	Temperatures at different times of day (degrees Farenheit)										
	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	12 m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.
Outside temperature	78	82	87	89	92	93	96	98	100	96	93
Closed attic	71	76	85	90	96	102	106	107	109	109	107
1 air change	71	76	84	88	92	96	98	99	101	100	98
2 air changes	72	77	84	87	91	95	96	98	99	99	96
3½ air changes	72	76	84	87	91	95	97	97	99	98	96
5½ air changes	71	76	82	86	90	93	96	96	98	97	95

[1] Temperatures given are typical of others recorded during test period. There was no insulation on upper surface of ceiling.

TABLE 3. CEILING SURFACE TEMPERATURES WITH DIFFERENT INSULATION DEPTHS, AUGUST 27, CLEAR DAY

Insulation depth in inches	Temperatures at different times of day (degrees Farenheit)										
	7 a.m.	8 a.m.	9 a.m.	10 a.m.	11 a.m.	12 m.	1 p.m.	2 p.m.	3 p.m.	4 p.m.	5 p.m.
Outside temperature	78	82	87	89	92	93	96	98	100	96	93
Closed attic											
0	71	76	85	90	96	102	106	107	109	109	107
1	72	75	82	85	89	94	97	98	100	101	101
2	72	75	82	84	88	92	95	96	98	99	100
1 air change per minute											
0	71	76	84	88	92	96	98	99	101	100	98
1	71	75	81	84	87	91	93	95	97	97	96
2	71	75	81	84	87	90	91	92	95	95	95

CONCLUSIONS

As a result of these studies and observations, the following conclusions are drawn:

1. An attic exhaust fan will reduce ceiling surface temperature during the summer months.

2. The attic exhaust system should move air at the rate of at least one air change per minute, and should be operated continuously when attic temperature is higher than outside temperature.

3. Insulation placed on the upper surface of the ceiling will hold the ceiling at a lower temperature.

4. At least 2 inches of insulation is needed for summer and winter temperature control.