ANTI-TERMITE TESTS WITH THERMOCOUSTIC BOARD

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A sample of Thermocoustic Insulation Board was tested for termite proofness against two species of termites, *viz. Heterotermes indicola* Wasmann & *Cyclotermes obesus* Rambur. When kept in contact with the board, the termites (*H. indicola*) did not feed on it and died within 9 to 15 days. A few termites penetrated through the board, but could hardly crawl. In graveyard tests, board remained unattacked for nearly two years.

A sample of Thermocoustic Insulation Board was received from Best & Co. (Private) Ltd., Coimbatore, through a Garrison Engineer for testing its termiteproofness. The board is in wide use for insulation purposes at present. Many boards resembling Thermocoustic Insulation Board, and made from wood or cellulosic pulp get badly attacked by termites.

Williams & Kofoid[1] found all cellulosic materials to be non-resistant to termites, except those which contained cement as bonding material. McGregor[2] states that "Cellulose products, such as woodwool slabs and sawdust concrete, have been found to be resistant to termite attack, provided the cellulose is covered by the cement binder". According to the manufacturers of the Thermocoustic Board, "the board had been rendered termite and fungus-proof by the addition of magnesite and magnesium chloride". Since magnesium and its salts are not known to be proof against termites, it was of interest to investigate whether the boards were termite-proof. It was also of interest to investigate whether termites could pass through interstices of fibres and get access to susceptible materials beyond.

MATERIALS AND METHODS

Test Insects—The insects used in the tests were 'workers' of *Heterotermes indicola* Wasmann and *Cyclotermes obesus* Rambur (it is only the worker caste of termites that causes damage and digests cellulosic materials according to Misra and Ranganathan[3]). These insects were collected from the perimeter of this Laboratory.

Feeding Tests—Petri dishes (15·2cm × 3·8 cm) were filled with moist soil to a depth of 1·27 cm. Thermocoustic board pieces (10 cm × 2·5 cm × 1·27 cm) were kept on the surface of the soil. Two replicates were started with 500 workers and a few soldiers of *H. indicola* released in each dish. Pieces of *semul* (*Salmalia malabaricum*) (10 cm × 2·5 cm × 0·64 cm) served as controls. Visual observations were made daily until all the termites were dead. The tests were repeated and the results are given in Table 1.

Graveyard Tests—These tests were carried out with Thermocoustic Board pieces (30·4 cm × 5 cm × 1·27 cm) placed in the Graveyard according to a randomized plan. Both surface and burial tests were carried out. In the surface tests, test pieces were placed flat on the ground and held in position by means of a wire loop. In burial tests, the pieces were buried in soil to half the height. In each case, six replicates and six controls (*semul*

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TABLE 1

FEEDING TESTS IN THERMOCOUSTIC BOARD WITH *H. indicola*

Experiment No.	Longevity of termites in days	Experiment No.	Longevity of termites in days
1	11	4	12
2	11	5	14
3	9	6	15

All termites in control alive at the end of test period

wood) were used. The pieces in the surface test were lifted carefully for observation. Buried pieces were dug out once every month to note the extent of termite damage; after examination the pieces were placed back in their original positions. Control pieces, when destroyed, were replaced by fresh pieces. The results are summarized in Table 2.

Penetrability Tests—Workers and soldiers of *H. indicola* were released in glass petridishes (7·6 cm dia) and filled with moist soil. Thermocoustic board pieces (of 10 cm sq) were held over the petridish by means of 'hold-fast' elastic rubber bands. A *semul* wood piece (2·54 cm sq) was kept as a bait over the test piece. In one experiment, the junction between the test piece and the petridish was sealed with plasticine to prevent the escape of termites without penetrating through the board. Some termites penetrated through half the thickness of the board and escaped from the side. In the second experiment, therefore, not only the junction between the test piece and the petridish, but also the lower surface and the sides of the board were sealed so as to force the termites to pass through the whole thickness of the board. The assembly was kept in a bigger glass petridish (15·2 cm × 3·8 cm). Observations were recorded every day for the number of insects which penetrated through the board. The results are summarised in Table 3.

TABLE 2

RESULTS OF GRAVEYARD TESTS OF THERMOCOUSTIC BOARD WITH A MIXED POPULATION OF *H. indicola* AND *C. Obesus*

S. No.	Thermocoustic Board		Semul (Control)	
	Surface Test	Burial Test	Surface Test	Burial Test
1.	Sound after 22 months	Sound after 22 months	Max. survival period 9 months	Max. survival period 10 months
2.	Some pieces after 22 months were broken, but unattacked by termites	Some pieces after 22 months broken, but unattacked by termites	—do—	—do—

TABLE 3

RESULTS OF PENETRABILITY TEST OF THEMOCOUSTIC BOARD WITH *H. indicola*

S. No.	Thermocoustic Board			Semul (Control)	
	No. of termites released	No. of termites penetrating the board	Remarks	No. of termites released	No. of termites living at the close of experiment
1.	100	Nil up to 20 days	all dead	50	15
2.	40	—do—	6 alive after 20 days		
3.	68	14 after 10 days			
4.	68	9 after 16 days	all dead after 16 days	15	8 after 12 days
5.	25	Nil after 12 days	all dead after 12 days		
6.	50	4 after 9 days	none alive after 9 days	60	27 after 9 days
7.	50	10 after 9 days	none alive after 9 days		

Chemical Analysis—Chemical analysis of thermocoustic board was carried out for the presence of any inorganic salts poisonous to termites. The results of the analysis are given in Table 4.

Identification of the Wood of Thermocoustic Board—Woodwool of which the board is made was forwarded to the Timber Group of the Chief Inspectorate of General Stores, Kanpur. According to them the material was of coniferous timber, most probably chir (*Pinus roxberghii* Sargent) or blue pine (*Pinus nallichiana* A. B. Jacks) both of which are highly susceptible to termite attack. The wool was so thin that it was not possible to identify the species.

RESULTS AND DISCUSSION

The sapwood of *semul*, being one of the most susceptible timbers to termites (Ali Ausat *et al.*[4],) has been used as control in all tests. In laboratory feeding tests (Table 1) termites which were in contact with thermocoustic board survived for a period of 9 to 15 days, whereas those on *semul* did not die during the period. Ali Ausat *et al.*[4] reported that termites do not feed on resistant timbers. On Thermocoustic Board also termites did not feed. So this material could be considered to be termite-proof.

TABLE 4

CHEMICAL CONSTITUENTS OF THERMOCOUSTIC BOARD (RESULTS IN PERCENTAGE)

Total Ash	74·1
Mg. as Mgo.	34·4
Ca as CaO	0·6
Si. as SiO_2	1·6
R_2O_3	0·3

In 'Graveyard' tests (Table 2) Thermocoustic Board remained unattacked for nearly two years. In both burial as well as surface tests, no sign of termite attack was observed, while in controls, the pieces were attacked in comparatively short periods and had to be replaced.

The results of penetrability tests (Table 3) are interesting. A few termites penetrated through the thermocoustic board and those which did, either died soon after or were so weak that they could hardly crawl, and did not feed on the bait of *semul* wood which was placed over the board. No attempt was made to find out why the termites had become so weak. The possible reason is that they were injured through aberrations in their attempt to enter and pass through the material.

It will be seen that there are no chemicals in the board (Table 4) which are poisonous to termites. Magnesium salts have not been used for rendering stores insect or termite-proof.

CONCLUSION

The protection afforded against termites by magnesium compounds to Thermocoustic Board evidently appears to be a sort of mechanical blanketing of wood wool of which the board is made.

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