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THE FIRE HAZARD OF A RAYBURN COOKER IN AN AIREY HOUSE

by

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Summary

The fire hazard of the smoke box of a Rayburn cooker near the wall lining of an Airey House has been examined. A metal shield may be arranged to give adequate protection to the wall.

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Introduction

Several fire incidents have occurred during the last six years in Airey Houses equipped with Rayburn cookers (1). The cooker is adjacent to a cavity wall faced with plasterboard-clad fibre insulation board and the fires have been caused by radiated heat igniting the fibre insulation board. This report examines the fire hazard of the smoke box which is the hottest part of the cooker and which is placed within 2 inches of the plasterboard. The effect of a metal shield between the two in reducing the fire hazard is dealt with as this is probably the simplest remedial measure which could be carried out.

Experimental detail and results

The back face of the smoke box is approximately 8 inches square and may reach a temperature of nearly 450°C (2). This means that the intensity of radiation falling on the plasterboard 2 inches away is about 1.4 watts cm⁻². In the experiments described in this report the radiation was obtained from a 12 inches square gas-fired radiant panel.

A specimen of wall lining tested fig. 1, was made up of the following materials:

12 in. x 12 in. x $\frac{1}{2}$ in.	plasterboard
12 in. x 12 in. x $\frac{1}{2}$ in.	fibreboard
12 in. x 2 in. x $\frac{1}{2}$ in.	timber batten
12 in. x 2 in. x $\frac{1}{2}$ in.	timber dado

Two types of metal shield were used in front of the above structure:

Shield A measured 24 in. x 18 in. and was steel coated with vitreous enamel.

Shield B measured 36 in. x 27 in. and was plain 16 gauge steel.

The shields were placed $\frac{1}{2}$ in. away from the dado as little advantage would be gained by increasing this gap (3).

On exposing the panels to radiation the results in Table 1 were obtained.

Table 1
Effect of radiation of 1.4 watts cm⁻² on unshielded and shielded specimens.

Experiment	Time of exposure min.	Observations
Unshielded specimen.	15	Paper facing on plasterboard charring, dado charring.
	47	Paper facing glowing
	53	Back face of fibreboard browning in upper corner
	56	Glowing paper ignites dado (back face of dado 450°C)
	59	Back face of fibreboard ignites in upper corner.
Specimen with Shield A	40	Paper facing and dado browning
	60	Back face of dado 180°C
Specimen with Shield B	60	No charring or browning. Back face of dado 40°C.

With all three specimens the temperature rise of the timber batten on the unexposed face was small. In fig. 2 the temperature rise of the back face of the dado is compared for shielded and unshielded specimens.

Discussion of results

Shield B prevented the temperature of the specimen rising by more than 20°C. Coating this shield with vitreous enamel would probably not reduce the protection given.

The radiant panel used in the experiment measured 12 in x 12 in. while the smoke box measures 8 in. x 8 in. The area of the shield needed for the smoke box is therefore 24 in. x 18 in. or about 430 square inches.

It is important that the air should be free to circulate between the wall lining and the shield and that no material should fall between the gap. Possibly the shield could be perforated at the edges and bent over to ensure this.

The conditions of the test are probably worse than would be found in practice as several refuellings of the stove with the damper fully open would be required to maintain the temperature of 450°C for an hour.

Conclusions

Plasterboard-clad fibre insulation board wall linings 2 inches away from the smoke box of a Rayburn cooker can be protected from radiation by a 16 gauge steel plate which is at least 430 square inches in area and is spaced half an inch from the wall board. Provision should be made to ensure that air can circulate freely between the wall and the shield and that no material can be placed between the gap.

References

1. MILLAR, D. W. and FRY, J. F. "Fires in Post-war dwellings" XXXVII F.R. 70/1953.
2. B.R.S. Drawing 2062.
3. LAWSON, D.I., FOX, L. L., WEBSTER, C. T., "The Heating of Panels by Flue Pipes" H.M.S.O. 1952 p.30.

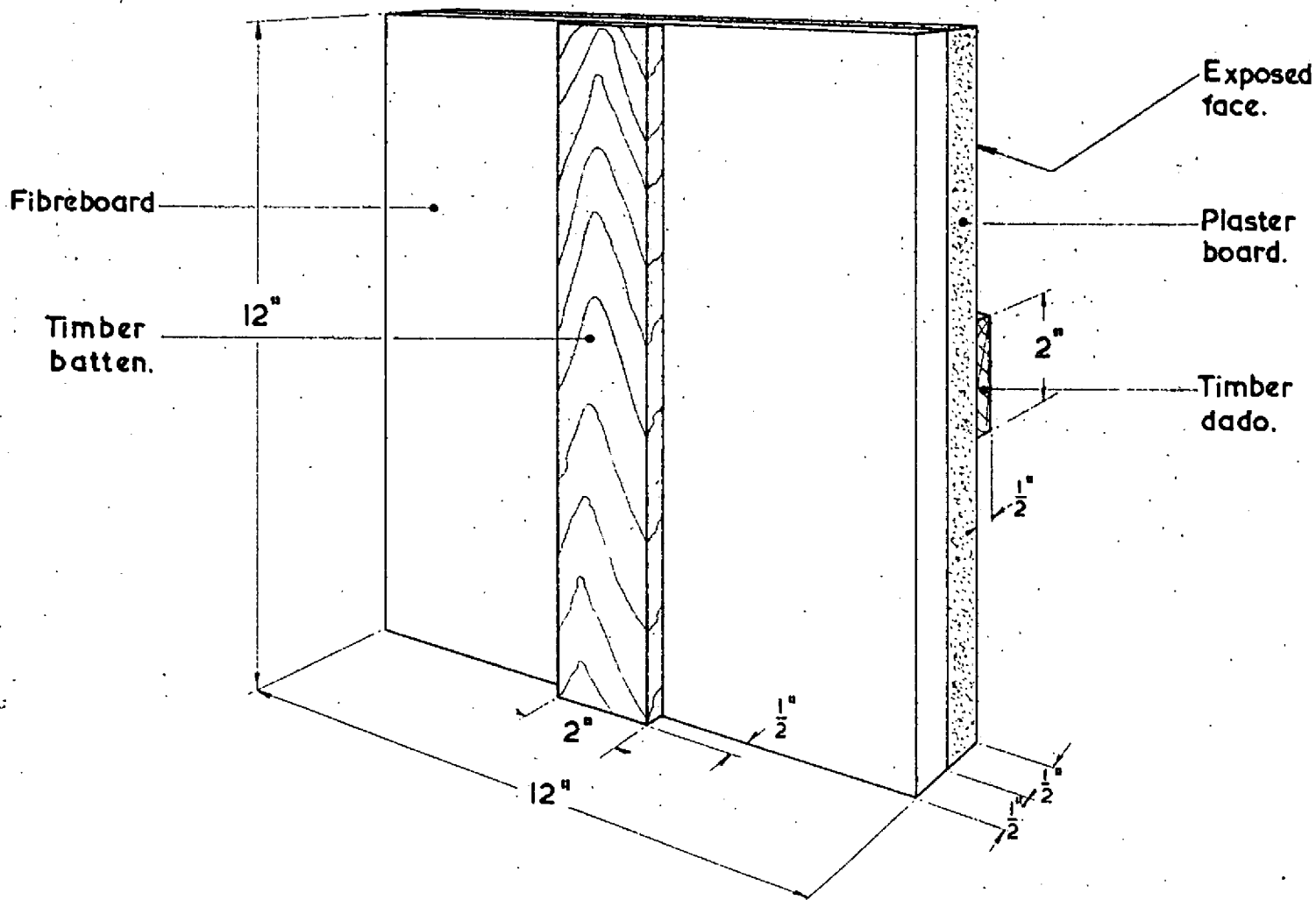


FIG. I. SPECIMEN OF WALL LINING.

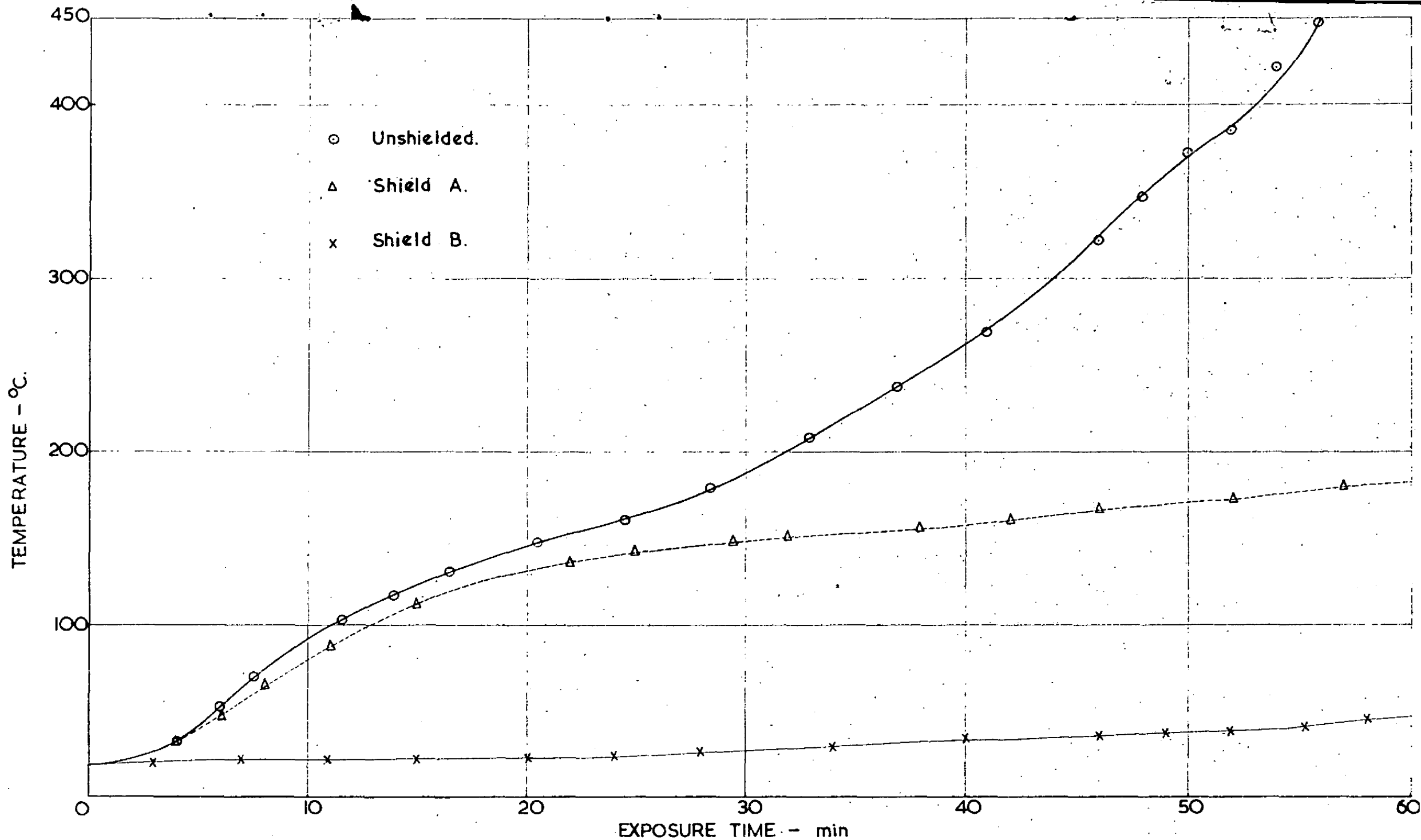


FIG. 2. TEMPERATURE OF BACK SURFACE OF DADO FOR UNSHIELDED AND SHIELDED SPECIMENS.