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Preventing Cigarette Ignition of Mattresses Williams-Leir, G.

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TECHNICAL NOTE

PREPARED BY G. Williams-Leir CHECKED BY GWS

APPROVED BY NBH

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PREPARED FOR General Distribution

SUBJECT PREVENTING CIGARETTE IGNITION OF MATTRESSES

In some fatal fires attributed to "smoking in bed", the only material damaged is the victim's mattress. A burning mattress, therefore, can cause death even without starting a general fire.

There are methods of preventing cigarette ignition of mattresses. For example, although the cotton wadding with which most mattresses are filled can be readily ignited by a cigarette, a dropped cigarette can be separated from the cotton wadding by a layer of material incapable of ignition by a cigarette and that will not conduct sufficient heat to ignite the cotton below.

This Note describes experiments to determine whether certain available materials have the required properties.

MATERIALS

Old mattress cut into 6-in. squares.

Cotton sheeting, 3.8 oz/yd².

Polyethylene sheet 0.010 in. thick, clear.

Vinyl sheet (polyvinyl chloride) 0.008 in. thick, clear.

Wool blanket scraps, 13 oz/sq yd, used previously for experiments on laundering.

Wool blanket used in a hospital.

Mixture blanket: 75 per cent wool, 25 per cent orlon, 13.2 oz/sq yd.

Heavy cotton twill, stated to have been treated with a commercial, launderable fire retardant and then washed 12 times.

Similar cotton, untreated (control).

QDn

Cigarettes of various brands, with and without filters.

CONDITIONING

All materials were conditioned to 15 per cent RH and 73°F before use.

METHOD

The mattress section was placed on an asbestos board in a fume cupboard. Forced ventilation was turned down to the minimum setting. Various combinations of materials were put on the mattress, the cigarette lit, the cupboard window lowered to a 1-in. opening, and the result awaited.

Trials were made to examine the effect of layers of sheeting below and above the cigarette. One layer above keeps the cigarette from rolling away from where it was placed, and one layer both below and above makes little difference to the severity of the test. This arrangement was consequently adopted as standard. It was noted that three layers above and one beneath produced a deeper scorch than the reverse arrangement.

The mode of burning of a mattress ignited in this way is interesting, and different from that of the more common kinds of fire. A combustion front spreads out slowly through the material in all directions. No flame or visible glow appears and the material is not entirely consumed, but the material blackens and heat and smoke are released. Measurements made later show that the combustion front progresses at a speed of about 0.38 cm/min.

RESULTS

When bare, or covered with the standard sheeting arrangement, the mattress consistently ignited. Polyethylene softened, perforated and shrank away from the hole, permitting ignition of the mattress. Vinyl sheeting, however, and both samples of woollen blanket prevented ignition. The orlon mixture blanket also prevented ignition, but the scorch beneath it was more pronounced than that beneath a pure wool blanket. Treated cotton twill prevented ignition, unlike the untreated control.

Different brands of cigarettes had similar effects. Half a cigarette was usually sufficient for ignition; in the event that ignition did not result, the experiment was repeated with a whole cigarette.

CONCLUSIONS

If it is not feasible to discourage or prevent people from smoking in bed, an effective defence is placing a layer of protective material between the sheets and the mattress. Among effective materials are woollen blankets, certain types of plastic sheeting, cotton cloth treated with a commercial launderable fire retardant, and the materials examined by Hammack (1). These will not prevent charring damage to a mattress, but they should prevent ignition. Which is most suitable will be determined by considerations other than their fire properties.

REFERENCE

1. Hammack, J. M. Cigarette ignition of bedding. Fire J. Vol. 59, May 1965, p. 9.