



Central Fire Brigades Advisory Council
Scottish Central Fire Brigades Advisory Council
Joint Committee on Fire Research

Sprinklers for Life Safety in Shops: Survey of Shops



by Brian Hume

Research Report Number 70

1997



Central Fire Brigades Advisory Council
Scottish Central Fire Brigades Advisory Council
Joint Committee on Fire Research

Sprinklers for Life Safety in Shops: Survey of Shops

By

BRIAN HUME

Research carried out by
W J S B Piers of the Fire Protection Association

The text of this publication may not be reproduced,
nor may talks or lectures based on material contained
within the document be given, without the written
consent of the Head of the Home Office Fire Research
and Development Group.

Research Report Number 70

1997

© Crown Copyright
ISBN 1-85893-756-6



Sprinklers for Life Safety in Shops: Survey of Shops

BACKGROUND

Concerns have been growing for some time as to whether life safety measures in shops in case of fire are adequate. The nature of the goods on display has changed in recent years and may now include a high quantity of highly combustible materials supporting rapid fire growth which the current fire safety measures may not be sufficient to deal with. Of particular concern are those shops found in the High Street which may have a high fuel load and which are not at present required to have sprinklers.

To help determine if sprinklers would be desirable, it was decided that a survey of High Street shops should be undertaken to find out the range of compartment sizes and hazardous materials present and to identify the situations of greatest concern. It was decided that small shops of floor area less than 280 square metres (this is the definition of a small shop used in BS5588) would not be included as the hazard in these shops was considered to be less.

THE SURVEY

FRDG let a contract to the Fire Protection Association (FPA) at Borehamwood, Hertfordshire, to carry out the survey which was carried out between October 1995 and January 1996. Over 90 shops were visited in a number of towns in England, Scotland and Wales. A survey report form was completed for each shop recording the floor area and ceiling height of each sales floor, the types and arrangements of materials present and any other relevant information. Over 500 photographs and 5 hours of video recordings were taken showing the conditions in the shops visited.

Of particular concern was the presence of arrangements of materials which could support a

rapidly spreading fire that could put customers and staff in untenable conditions prior to a warning and safe evacuation being completed.

Towns visited were chosen at random to provide a cross-section of sizes, geographical locations and socio-economic well-being. The survey period was during the run up to Christmas which accounted for some high stock inventories, resultant high fire loadings and congested shops.

During the survey it was quickly established that some shops, freezer centres for instance, had a limited combustible loading, which was extremely well spaced. It also quickly became apparent that discount stores tended to pack a vast range and quantity of combustible goods into their shops, some more proficiently than others. This accounts for there being survey reports on only 2 freezer centres but 22 discount stores (see Table 1).

Some of the older discount stores appeared to present a severe fire loading and congestion problem. Although the problem might have been recognised by local managers, they seemed resigned to having to make do with the facilities they had.

RESULTS OF SURVEY

Once they had completed the survey, the FPA analysed the data collected to identify the points of concern.

Fire Loads. A list was drawn up of arrangements of materials likely to support rapid fire growth. This included the following:-

- blister packs in large vertical stacks e.g. containing plastic toys, on hanging arms against the wall (Photograph 1),
- tights in cartons, on hanging arms against the wall,

TABLE 1. DISTRIBUTION OF TYPES OF SHOPS SURVEYED

Books/stationary	7	Home decoration	1
Camping/outdoor	3	Kitchenware	2
Carpets	2	Ladies fashions	3
Catalogue/Warehouse store	3	Market, covered	5
Clothes, children's	4	Miscellaneous	3
Clothes, designer	4	Music	2
Clothes, discount	3	Pharmacy/drug store	8
Department store	11	Portal frame buildings	5
Discount store	22	Sports	2
Electrical/electronic	1	Supermarket	2
Food	2	Textiles/home furnishings	1
Footwear	2	Theme	3
Freezer stores	2	Toy shop	2

- children's fluffy slippers free-hanging or in wire baskets, or soft toys in wire baskets, shelves or in a large pile (Photograph 2),
- video cassettes and CD's displayed on a plastic rack (Photograph 3),
- bags of sweets on hanging arms and crisps in wire racks or plastic bins
- soccer kits and sportswear jackets on plastic hangers against the wall (Photograph 4).



Photo 1. Plastic Toys in Blister Packs



Photo 2. Soft Toys on Wire Shelves



Photo 3. Video Cassettes and CD's



Photo 4. Sportswear Jackets on Hanging Arms

Obstructed Sprinklers. Where sprinklers were installed, these were in some cases obstructed; for example, by light fittings too close to the sprinkler head; shelving arrays close up to the ceiling and totally obstructing sprinkler heads; and display systems with “tops” of one form or another that would interfere with sprinkler water reaching the goods below.

Combustible display systems. The majority of display systems appeared to be based on steel. However some racks, known as “browsers”, were of timber or plastic construction. The provision of combustible display systems when non-combustible alternatives are available would seem to be a retrograde step.

Congestion and narrow or obstructed aisles. The ability of people to locate the fire exits in an emergency and then to actually progress rapidly to and through them is of paramount importance. In a number of instances, particularly in some of the discount stores which were over-laden with stock, the escape routes were far from ideal. It was not so much the distance of travel that was of concern, but the difficulty those escaping might experience negotiating obstacles in the shop. This would particularly apply to those encumbered with children, pushchairs and shopping.

SMALL-SCALE FIRE TESTS

After the survey had been completed it was decided that the FPA would carry out a series of small-scale fire tests on samples of products to identify which products were likely to support rapid fire growth and thus present a serious fire hazard. The purpose of this work was to allow a set of “real-life” arrangements of the most hazardous materials to be

specified, should it be decided to carry out full-scale fire tests.

The FPA selected 18 items thought to be more hazardous and purchased samples of each. The items were scrutinised and the different materials from which they were made (such as cardboard, plastic or nylon) were determined.

The samples were burnt in the Loss Prevention Council’s Specialist Fire Analysis Rig. During each test the mass loss, plume temperature and radiation were recorded and from these an estimate was made of the anticipated maximum fire size from a full-size display of the product.

From the tests, the items found to be of most concern were:-

- lightweight sportswear jackets,
- soft toys,
- plastic toys in blister packs,
- video cassettes
- potato crisps and similar products

RESULTS

From the results of the FPA work, FRDG produced the following short-list of the most hazardous arrangements of materials which would be suitable candidates for full-scale fire tests:-

- toys in blister packs, on hanging arms against the wall
- tights in cartons, on hanging arms against the wall
- soft toys, arranged in a large pile
- video cassette displays, either on metal shelves or a plastic rack
- crisps, displayed on open wire mesh shelving
- lightweight sportswear jackets, on metal hanging arms against the wall.

CONCLUSIONS

The survey of shops has identified the materials and arrangements of materials most likely to support rapid fire growth and so present the greatest fire hazards. Other circumstances were also identified which presented a fire hazard: obstructed sprinklers; combustible display systems; congestion and obstructed escape routes.

FURTHER WORK

Discussions took place between the Home Office, the DOE and the Fire Research Station to consider which arrangements of materials would be selected for full-scale fire tests and it was proposed that tests on the following scenarios should be undertaken:-

- *Video/audio cassettes* displayed on shelves and racks
- *Toys* (soft toys and polystyrene toys in blister packs)
- *Clothing* (suspended anoraks on hanging arms)
- *DIY store* (flammable liquids in plastic bottles and blister packs of plastic goods)

As the issue of fire safety in shops was also of interest to the Department of the Environment (DOE) it agreed to undertake a series of full-scale fire tests as part of an on-going programme of research being carried out by the Fire Research Station.

FURTHER INFORMATION

The following report provides more details of the project:

“Sprinklers for Life Safety in Shops: Survey of Shops”, W J S B Piers, Fire Protection Association for Home Office, Fire Research and Development Group, Publication number 11/96.

Copies may be obtained from the Home Office Fire Information Desk, Telephone: 01608-651470

Produced by The Stationery Office (FM)
© Crown Copyright
ISBN 1-85893-756-6