

## **STORAGE OF FIREWORKS IN RETAIL PREMISES**

Introduction .....	3
General points.....	3
The tests .....	3
Advice .....	4
Further work.....	6

## Introduction

1. This note provides information on the findings of recent tests carried out by the Health and Safety Laboratory on the effects of a fire involving consumer fireworks stored in roller cages, metal and wooden cupboards. The note provides advice to retailers and enforcing authorities to assist them in taking these results into account when considering what storage arrangements are appropriate.
2. The results of these tests are yet to be fully evaluated and there will need to be fuller discussion with the fireworks industry, with retailers, and will local authorities and fire services on recommended storage methods for the 2007 firework season and beyond. However it seems appropriate at this stage to issue the following *interim* advice to retailers intending to store fireworks in 50mm mesh wire roller cages.

## General points

3. Fireworks are an emotive issue; it is important to ensure that control measures are proportionate. Fireworks are very stable commodities that have travelled 11,000 miles from the place of manufacture to the point of sale to the public. They are not liable to spontaneous ignition and they do not give-off flammable vapours. Fires involving fireworks in storage are rare.
4. It is important that both retailers and enforcement authorities consider the premises' fire precautions as a whole, to ensure that the risk of fire is kept to a practicable minimum, that any fire is detected at an early stage, and that means of escape are available to so that people can be evacuated quickly from wherever they may be located within the building.

## The tests

5. At the request of HSE, HSL carried out four sets of tests. These involved:
  - fireworks stored in roller cages using a 50mm mesh (3mm gauge). These were chosen as the standard roller cage typically found in supermarkets. It is important to note that the clasp fitting (allowing the unit to be locked or sealed with tamper proof tags) and hinges were all constructed of metal (rather than plastic);
  - fireworks stored in a roller cage where the 50mm mesh had been removed and replaced with 25mm mesh (3mm gauge);
  - wooden cupboards. These were purchased from a national chain of office equipment shops and constructed of 19 mm chipboard, melamine coated (all surfaces including the back);
  - metal cupboards. Again these were purchased from a national chain of office equipment suppliers and were constructed of 2mm thick steel panels pop-riveted/welded at 30mm intervals .
6. The tests involved lighting a fire next to the cage/cupboard and then recording the effects. It is important to stress that the tests were designed to assess the effects of a fire and not the likelihood of a fire occurring. It is also important to recall that in premises where there is an effective fire detection and alarm system, the premises would have been evacuated before the fireworks caught fire. An effective fire suppression system would extinguish the fire before it spread to the fireworks.

7. The fireworks were seven transport packs of selection boxes supplemented by 5 packs of rockets. The results were as follows:

- 50mm mesh cages: there was significant fragment throw, including complete rockets, over a wide area;
- 25mm mesh cages: the 25mm mesh cages largely prevented large fragments from being ejected. There was some fragment throw involving stars over a more limited area;
- the wooden cupboard offered significant (15 minutes) fire resistance. However, it did eventually catch fire and collapsed. Once it had burnt away and the fire had spread to the fireworks it did little to contain fragment throw;
- the metal cupboard offered much less fire resistance (less than a minute) than the wooden cupboard, but it retained its structural integrity and was successful in very largely preventing fragment throw. However the cupboard became extremely hot and the contents continued to smoulder for some 20 hours.

## Advice

8. In deciding if the prevention and mitigation control measures are suitable for purpose, it is important to bear in mind that the primary objective is to protect employees and other people from being harmed by fire. This objective will be to evacuate before the fireworks (or any other dangerous substances) become involved in any outbreak of fire.

9. The HSL tests reflect a scenario where a fire has already become established, in such situations the priority is to ensure that there is sufficient time for people to escape and that a fire involving the fireworks does not threaten escape routes and people trying to escape. Fireworks, if uncontained, can significantly increase the speed at which a fire can spread; suitable storage arrangements can prevent or slow the spread of a fire.

10. The following paragraphs apply to the use of cages for the longer-term storage of fireworks rather than the use of cages to move the fireworks or to provide short-term interim storage. Paragraphs 288-290 of the Approved Code of Practice (ACoP) to MSER give guidance on this topic.

11. A key element of the safe storage of fireworks is the prevention of spread of a fire involving the fireworks. Paragraphs 268 to 277 of the ACoP set out the principles relating to the prevention of spread of fire. The use of a wire mesh screen or cage is identified as an option in paragraph 268(d) but significantly paragraph 269 states "It is important to stress that the safety measures must be seen as a whole". This includes not only the physical arrangements, fire detection equipment but also staff training, and management arrangements to ensure that fire precautions are observed – eg to prevent smoking in the vicinity; or to ensure that cages are not positioned by fire exits, or in proximity to readily combustible material; and to ensure a high standard of housekeeping.

12. The ACoP envisaged the use of fixed cages or screens, and paragraph 274 of the ACoP did not envisage the use of roller cages, however, the use of such storage is not unacceptable in principle.

13. The choice of storage arrangements will depend on the context. This will include in particular the size of the storage room, what else is stored there, the location of exits, the fire detection/alarm system and any fire suppression system as well as other arrangements for the prevention of fires and for preventing or slowing down their spread. These issues need to be considered as part of the risk assessment for that site and must take into account any

other dangerous substances that may be kept in stock; for example aerosols marked as extremely flammable. The following paragraphs are intended to assist retailers by indicating the issues they will need to consider in determining what safety measures they need to take and in making the selection of storage arrangements.

#### *50mm mesh cages*

14. As noted earlier, the results of the HSL tests will need to be fully evaluated and HSE intends to discuss the findings with industry and local authorities with a view to finding an agreed way forward. The following advice is intended to assist enforcing authorities and dutyholders in managing this issue during the 2006 firework season.

15. This advice is supplementary to the advice given in the ACoP. For example, the guidance in paragraph 276 on not storing fireworks anywhere where a fire would endanger the safety of people attempting to escape would continue to apply.

16. It is the view of HSE that where fireworks are stored in 50mm mesh roller cages additional physical and management measures will be required in order to: a) detect fire before it spreads to the fireworks; b) prevent or slow down the spread of fire to the fireworks; c) prevent or slow down the spread of fire from the fireworks, so that people can be safely evacuated.

17. This combination of measures could take the form of storing the fireworks either exclusively in a room, or enclosure, separated from the rest of the premises by a fire resisting partition, or the provision of an effective automatic fire detection and suppression system. The use of cages would be acceptable where either of these conditions is met.

18. The use of these cages may also be acceptable where there is a fire detection system. However, additional physical and/or management measures will need to be taken: the fireworks must only be stored adjacent to articles or materials that are incombustible or that would not readily catch fire (this would include a wall or walls). Alternatively, sufficient empty space must be left between the fireworks and other combustible items.

1. 19. The corollary of this advice is that where there is no fire detection system, 50mm cages should not normally be regarded as meeting the requirements of ACoP paragraph 268 on the preventing the spread of fire by fragment throw.

#### *25mm mesh cages*

20. The test results indicate that 25 mm mesh cages give a higher level of protection against fragment throw.

21. 25mm cages will not contain burning stars. Although burning stars have a limited life there is still a risk of fire spread. It will therefore still be important to take additional measures, such as not storing in proximity to readily combustible materials, and storing adjacent to incombustible materials etc, in order to further reduce fire risk. The use of these cages should be avoided in situations where there are no smoke detectors or fire alarm system.

22. Where retailers are considering purchasing or adapting cages for this purpose, they may also wish to bear in mind, that the British Aerosol Manufacturers Association recommends the use of 25mm mesh cages with a minimum gauge of 2mm for the storage of aerosols in warehouses when these cannot be stored separately from other goods.

## Points applying to all mesh cages

23. Whichever type of cage is used, the following measures should be taken:
- the cage must fully enclose the contents;
  - the cage must be in good condition with no breaches in the integrity of the mesh;
  - any plastic hinges and securing mechanisms should be properly reinforced with wire to prevent the premature failure of the gate;
  - the fireworks must be kept in their closed transport cartons;
  - the cage gate must be kept securely closed except when the fireworks are being handled;
  - the top of the cage must not be used to store other commodities or used packaging materials etc.
24. Where cages are used in an area where other goods are stored the fireworks need to be kept under regular supervision and limited in quantity -the maximum number of cages should be appropriate to the available storage area and the nature and quantity of the other goods stored in that area.
25. In the absence of other measures such as a smoke detector or fire alarm system, or if there is only one escape route from the premises, then wooden or metal cupboards (in sound condition) should be used. However, it is important to bear in mind that the fireworks used in the HSL tests were low power fireworks. If more powerful fireworks (especially those containing flash powder compositions) are to be stored there is a potentially significant hazard from the rapid build up of gases in the cupboard leading to the rupture of the cupboard and flying metal shrapnel. In such cases, a wooden cupboard should be the first preference.

## Further work

26. HSL plans to carry out two further tests to test the effectiveness fire-resistant covers for roller cages. The results of these tests will be made available as soon as possible and again will be a further option for discussion in considering recommendations for the 2007 firework season and beyond.