

GUIDANCE NOTE: THE SELECTION, POSITIONING AND TESTING OF BLAST-RESISTANT LITTER BINS

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1.0	Initial issue	Sep 2016
2.0	Revised plastic sack information to account for test results	October 2019

Introduction

This Guidance Note has been developed by the Home Office Centre for Applied Science and Technology (CAST) as part of a programme of research and development funded and directed by the Centre for the Protection of National Infrastructure (CPNI). It has been issued in order to provide guidance on the hazards, selection, positioning and testing of blast-resistant litter bins.

A more detailed report¹ has also been prepared by CAST on behalf of CPNI.

Blast hazards

The main hazards to the public and to structures from explosions in litter bins come in three forms: the blast wave, fragmentation and burns. Primary fragments may be formed from bomb components whilst the bin may provide secondary fragments. These three factors account for the majority of structural damage and human casualties following a terrorist attack.

Selection of litter bins

These guidelines apply to all types of litter bin. For ease of selection these have been broken down into the following three categories.

Plastic sacks

The simplest form of litter bin is a plastic sack supported by a metal or plastic hoop, fastened to a masonry or concrete wall or to a post. The bin will provide no mitigation of the effects of an explosion, and damage from blast and primary fragmentation will not be mitigated.

Clear plastic sacks are ideal litter containers as they provide no additional fragmentation to any explosive placed in the bin and the contents of the bin can be viewed from the outside. Opaque or translucent plastic sacks provide similar benefits to clear sacks but the contents cannot be observed as readily.

Metal hoops are preferable to plastic hoops as they are less likely to produce hazardous secondary fragments.

Free-standing sack holders are available but are generally made of metal which can contribute a secondary fragment hazard.

¹ Home Office Publication 102/16 Selection, Positioning and Testing of Blast Resistant Litter Bins, September 2016.

Conventional bins

These are the normal bins that are used widely in the UK. They usually consist of an outer decorative cover and an inner refuse container made of steel or plastic. The cover is usually made of plastic but may be made of metal. These bins shield objects contained within them from view, yet provide little mitigation for blast and primary fragments. In most cases they will break up under modest blast loads producing a secondary fragment hazard. The secondary fragments may be highly hazardous when the cover or inner container is metal.

Blast-enhanced bins

These are bins that have been specifically designed to mitigate the effects of an explosive device detonated inside. There are four broad groups of blast enhanced bin; some bins will fall into more than one of these categories.

- Self-fragmenting bins. These are litter bins that are designed to break up into non-hazardous secondary fragments if a bomb detonates inside. They may provide some mitigation for blast and primary fragmentation.
- Blast-resistant bins. These are designed to contain the blast from a bomb and will generally channel it upwards. The bin is designed to remain whole during a blast event and not break up into secondary fragments. Any primary fragments should slow down as they perforate the wall.
- Fragment-resisting bins. These stop any primary fragments from a bomb placed inside the bin from leaving the bin with enough energy to injure a person standing nearby. It is likely that a bin that is fragment resistant will also be blast resistant.
- Overpressure-reducing bins. These are bins that partially suppress the blast overpressure vented from the bin. The blast hazard for people standing near the bin and nearby structures will be reduced.

Siting of litter bins

The siting of litter bins is of primary importance. Ideally bins should be placed where the public can see and use them and where they can be emptied readily. It is vital that bins are positioned so that, if a bomb explodes, excessive injury to people or damage to other assets is reduced. Thus, bins should not be placed near:

- control rooms;
- entrances, exits, evacuation routes and bomb shelter areas;
- sources of possible fragmentation (e.g. areas of glazing including overhead glazing);
- fire hydrants;

- electrical equipment;
- key structural elements (e.g. columns, load-bearing brick walls);
- areas where large numbers of people congregate (e.g. meeting places in stations);
- areas where people may be immediately above the bin (e.g. under balconies, mezzanine floors, etc.);
- on suspended floors, where people may pass underneath, unless these have been specifically designed to resist the effects of an explosion;
- beneath lightweight canopies that may easily fragment;
- street furniture that might contribute to the hazard, e.g. iron railings;
- locations which would be hard to deal with by the emergency services, (e.g. in areas that would cause difficulty in imposing a security perimeter in the event of a bomb threat or would be difficult to access in the event of an emergency);
- near air intakes for building ventilation systems; or
- areas of storage of flammable materials, hazardous chemicals, etc.

It is highly desirable that litter bins are covered by CCTV cameras that would obtain a good image of the face of any person putting a device in the bin. The CCTV footage should be recorded and, if possible, monitored at all times. It is also desirable that all bins be emptied at regular intervals to maintain the best possible safety standards.

It is important that litter bins are not placed in confined spaces as this enhances the blast effect. Large open areas, such as open platforms are preferable to covered alcoves or waiting rooms.

Litter bins should be secured to the ground in accordance with the manufacturer's instructions as they are likely to jump during the detonation of a bomb inside them. Securing the bin will also avoid them being moved without authority.

Testing of litter bins

Determination of the Explosion Resistance of Litter and Recycling Bins – Test Method² provides procedures for testing of litter bins against blast and fragmentation loading. Each bin is assessed against increasing charges until its ultimate performance is known.

² Home Office Publication No. 23/13 Determination of the Explosion Resistance of Litter and Recycling Bins – Test Method, Version 2.0, July 2014.



Figure 1: The developing fireball from a detonation within a blast-resistant litter bin

The bin is subjected to four different tests to determine the consequences of the position of the explosive within the bin and the effect of primary fragments on the bin.

The performance of a bin is assessed in terms of the quantity of explosive used and the energy of primary or secondary fragments escaping the bin. Fragment penetration into strawboards is measured as a means of assessing the likelihood of personal injury. Bin ratings range from 1 to 10 stars; the greater the number of stars, the better the threat mitigation.

Currently the Test Standard does not cover overpressure-reducing bins.

Further details can be obtained from CAST on 01727 865051.

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