Nuclear Site Security in the Event of Terrorist Activity - 8082

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ABSTRACT

This paper, presented as a poster, identifies why ballistic protection should now be considered at nuclear sites to counter terrorist threats. A proven and flexible form of multi purpose protection is described in detail with identification of trial results that show its suitability for this role.

INTRODUCTION

With the recent increase in terrorist activity around the world there is an urgent need to improve security countermeasures at nuclear material sites including commercial reactors, decommissioning and waste storage sites to defeat such a threat. This paper describes a candidate for this extra security, and the extensive testing undertaken on the product by MRP Systems, the UK Ministry of Defence and the US Department of Defense, using a wide range of live ammunition and bombs. The ballistic protection described can be simply filled with water – a readily available material or sand, to provide a readily deployable and reusable barrier system

DESCRIPTION

A brief review of the physical precautions adopted by nuclear sites in the event that there is a threatened terrorist attack have indicated that they are extremely basic. In general the precautions consist of police equipped with body armour and armed with machine pistols patrolling the site gate. In one case it has been observed that revetments to protect the police, constructed from sand bags have been positioned just outside the site main entrance. It is well known that sand bags deteriorate over time and are easily subjected to damage from general use and weather, and the simple sandbag structure collapses making the revetment useless, in the event of an attack. The authors consider that the personnel and buildings involved demand better protection in today's disturbed world.

This paper discusses a flexible, multipurpose and efficient method for combating terrorist activities in the form of moulded, hollow polyethylene blocks which when filled with water or sand provide proven protection from explosive devices and direct small arms fire. As these blocks interlock on all four edges they are structurally stable (The MRP modular reusable protection system was originally designed as a modular radiation protection system and has found widespread use in the UK nuclear industry). See Figure 1 below.

Figure 1 – Selection of blocks available

Because these blocks are manufactured using the rotational moulding technique, they are seamless and as a result, are free from leaks. The material of construction, polyethylene, is classed as a soft material compared with concrete or steel, thus any secondary fragmentation after a local explosion etc, is less damaging than alternative solutions, which contain steel or other hard materials. To maintain this 'soft' material approach, all fixing plates and screws are also manufactured from polyethylene and nylon. See Figure 2 below.

Figure 2 – 3 block high wall with fixing plates indicated

All blocks measure 500 mm in overall thickness and are obtainable in 1000mm or 500 mm lengths. Corner units, both right and left hand are available to permit enclosures to be constructed. The heaviest unit weighs just 33 kgs empty and can, therefore, be lifted into position by two persons. All units are able to be easily filled with water, and emptied by using a drum pump and moved to another location or configuration for re-use. Using water as filler provides adequate ballistic protection from one off munitions detonations. Adding sand as filler provides additional longer term protection from sustained small arms fire.

A wide range of tests has been undertaken on the barriers, from structural stability in compression and tilt conditions, low and high temperature long-term exposure, impact from trucks, etc. The UK Ministry of Defence and the United States Air Force have also undertaken an extensive and successful series of test on the blocks [1,2], employing a wide assortment of missiles, from penetration by small calibre bullets up to fragments arising from a 2000 kg bomb explosion just 1 metre from the block wall. The basis of these bomb tests was to demonstrate that the product, filled with water, would prevent sympathetic ignition of the bombs and missiles situated on the other side of the protective walls. All the tests have shown dramatically successful results where all the fragments from the exploded weapons are captured in the water or the plastic walls of the barriers.
(See Figure 3)

Figure 3 – Typical bomb explosion test set-up. [2]

Numerous blocks have been supplied to the RAF and USAF in Afghanistan (See Figure 4 below), for the segregation of armed aircraft, to the Royal Navy for munitions transfer operations at a dockyard, for the isolation of stored munitions at various bases. Although the protective walls in Afghanistan are just 3 units high, if required the block walls can be constructed 8 units high, that is 6 metres.

Figure 4 – Protection of R.A.F Harriers in Afghanistan

Recent trials in the UK [3] have demonstrated that the barriers filled with dry sand can withstand multiple shots from direct small arms fire from 7.62 and 14.5mm calibre bullets. In addition the barriers remain usable and have the potential for protection against even larger calibre attack.
The authors have reviewed other potential applications for the water barriers, for example, vehicle checking stations, personnel protection at customs points, enclosures for suspect packages, flood control and crushable road barriers, etc. The opportunities for other multiple uses are being investigated and developed on a continual basis.

CONCLUSIONS

The MRP modular reusable protection system, originally designed for radiation protection, would appear to make the sand bag, with its propensity to collapse after a short duration of exposure to the weather, totally obsolete. Because of the material of manufacture, these ballistic protection units are resistant to both ultra violet light and radiation and are therefore, very stable, both for exposure to adverse weather conditions and in structural applications, potentially providing a 20 year life and reusable in a variety of configurations.

When filled with water and exposed to close proximity explosions, they have proved to reduce the fragmentation risk to personnel and valuable assets positioned behind the barriers. When filled with dry sand they can provide excellent, long term protection, from direct small arms fire.
The MRP Barrier, which has been extensively tested, can provide nuclear facilities with a multiple use asset, a terrorist barrier to explosions and direct fire, as well as a radiation barrier. The use can be changed as the threat level changes. The barrier can be easily installed and easily relocated.

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