

MRP MODULAR PROTECTION SYSTEM

TECHNICAL SPECIFICATION

Form

The MRP Modular Protection System is in the form of hollow interlocking blocks each block measuring 500 mm deep. The basic Wall and Corner blocks measure 1000 mm long by 750 mm high. Combinations of smaller blocks are available, designed to fit this same modular size. The weight of the largest block is 33 kg. The typical wall thickness is 18mm.

Each block is provided with interlocking features on all four edges, 2 male and 2 female, with lifting/ fixing holes in the main faces. A 50 mm hole is built into the top face of the block for the purposes of filling and emptying of the chosen material (water, sand, iron or lead shot or grout).

Materials of Construction

The blocks are manufactured in black polyethylene by the rotational moulding technique and are, therefore, devoid of any construction joints. The black polyethylene has less than 2% carbon black compounded into the base polymer, providing practically unlimited UV resistance and good radiation stability.

The blocks are manufactured in two stages. The first process provides a dense outer coating of polyethylene, then a second process includes a foaming agent, giving an expansion of up to 2.5 times, providing the inner coating. Both coatings cure simultaneously and so are bonded together. This results in a total wall thickness of approximately 18 mm with a good strength to weight ratio.

Accessories

There are a number of 'add-ons' that are available, if required. A variety of external polyethylene fixing plates and nylon setscrews, extract pumps, lifting grabs etc. are available. Also available are 'over the wall' structures for facilities where wind loadings and impacts must be considered. MRP provide a design advisory service to assist clients with their applications.

Test Programme

The block design has been subject to a number of tests including structural stability and shielding efficiency. The results of these tests are:

- That a single empty block can be vertically loaded to 25 tonnes (5 times design) without catastrophic failure and an ability to almost return to the original dimensions.
- An empty block can carry a load of 7 concrete filled blocks (5 tonnes) without significant distortion and will return to its former shape.
- The 8 block high wall, filled with water, can tilt to at least 5% from vertical without toppling.
- The radiation shielding tests indicated that the efficiency at the joints was just 17% less than that at the centre of the block.

- Freezing tests have shown that water inside the block will take over 100hrs to freeze in a -22C cold room atmosphere and subsequently over 200 hours to thaw in ambient conditions.
- Impact tests have shown that individual blocks can withstand impact energies of over 1.1kJ without failure.

Radiation Stability

Polythene liners are regularly used in radioactive waste containers as the material offers high stability under radiation conditions. See Ref 1. Up to 10E6 Gy before softening occurs. The black material used in the MRP systems also offers higher stability in UV radiation and is therefore suitable for outdoor use.

Decontamination

The surface finish of the blocks is polished and free from inclusions, resulting in a product which can be easily decontaminated, for re-use elsewhere. The use of strippable coatings is recommended where heavy airborne contamination is expected. The smooth surface of the block will aid the removal of the strippable coating when required. The smooth polyethylene finish can be easily wiped over to remove loose contamination and the potential for contamination traps have been minimised.

Traceability

Each block is marked with an adhesive, metallic backed, label with a discreet bar code number that is entered in the company held database. We are, therefore, able to provide a life history of every block supplied.

Recycling

The material of construction is perfectly suitable for recycling using modern techniques of shredding and pelletising. Other contaminants (metallic backed labels, thread inserts, etc) should be removed or minimised before recycling is considered.

Prepared by MRP Systems Ltd. 26th June 2003. (Tech Spec 4)

Ref (1): The Use of Organic Materials for the Immobilisation of Intermediate Level Radioactive Wastes by D.I. Johnson & D.C. Philips (Harwell Report AERE-R10639 March 1983)