National Protective Security Authority

BODY ARMOUR GUIDANCE

Factsheet 4 – Body Armour Types

There are a number of different types of body armour which may be defined partly by what they are designed to defeat (the threat) and partly by how they are worn and used. To provide a consistent way of comparing the weights of armour the term areal density is used. This is defined as the mass of armour per unit surface area and is usually stated in kg/m^2. The types of body armour are described in more detail below.

Soft Body Armour

Soft body armour refers to armour which is designed for the defeat of stab, slash or low velocity bullets. Due to the levels of threat for which it is designed, it is possible to use woven, uni-directional or laminated textiles. Each layer of these materials is flexible; hence the term 'soft' is used. As more layers are added the flexibility will be reduced but some flexibility will remain. Soft body armour falls into three main categories: overt, covert and fully concealed. Generally the soft body armour is protected in a fabric casing which in turn is placed in a robust fabric carrier.

Overt

Overt body armour is worn outside the normal outer layer of clothing. It is therefore completely visible to any observer. It is usually seen as part of a uniform, or even if not, it makes a statement that the wearer is protected by an armour system. Overt body armour has the advantage that it is very easy to put on and remove, as it will be the outer layer of clothing.

Figure 1 shows a simple overt body armour design, which incorporates only a limited amount of external pockets and attachments. Many users will require significantly more pockets and attachments for their equipment.

Figure 1: Overt body armour (Courtesy: Sioen)

Covert

Figure 2: Covert body armour (Courtesy: Sioen)

Covert body armour is designed to be worn underneath the outer layers of clothing. This does not mean that the armour is invisible, unless under very thick layers of outer clothing. A typical example can be seen in Figure 2. The need for concealment may require compromises which limit the level of protection and the area of coverage that can be provided. If greater concealment than that provided by covert armour is needed, then fully concealed body armour is required.

A specific example of a covert armour system is the anti-slash armour shown in Figure 3. This armour type consists of only two layers of textile and hence would be equivalent to wearing a sweatshirt with an under-layer. It is also a system which provides protection over the full torso and for the full length of the arms. This

armour is shown with areas upgraded with stab- resistant packs. Obviously this type of armour could be considered very covert but the achievable level of protection may be limited.

Figure 3: Two-layer anti-slash armour (Courtesy: Sioen)

Fully Concealed

Fully concealed body armour is a further stage of coverage over covert body armour. It is designed so that when worn under only a shirt an observer would not know that the wearer was using body armour. Such items are quite rare, but are just entering the body armour market.

Upgrade Plates

Soft body armour will not defeat high velocity bullets from rifles or machine guns. To defeat the threats the armour has to be fitted with upgrade plates. There are two different generic constructions for upgrade plates. These plates may have a facing layer of hard ceramic material backed by a more resilient composite material or may be constructed from a monolithic composite, such as Dyneema® or Spectra®. Three views of a typical upgrade plate can be seen in Figure 4.

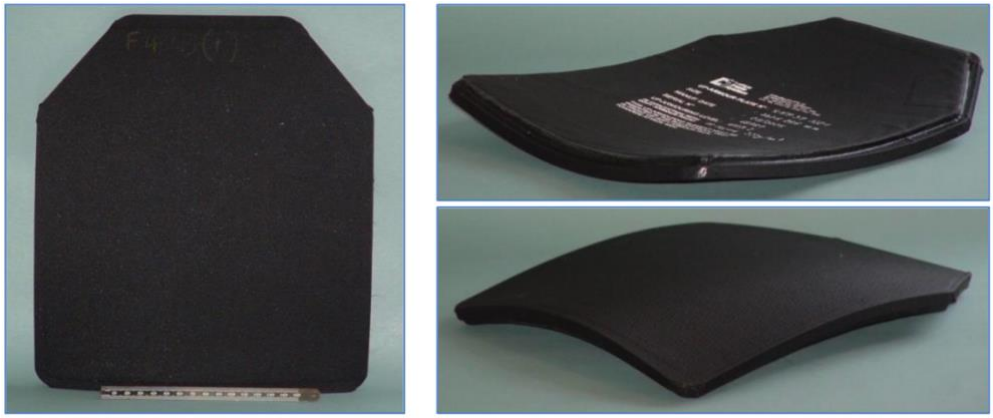

Figure 4: A typical upgrade plate

Because of their weight and rigidity, upgrade plates only cover a much smaller area of the body than soft body armour and are usually designed to protect vital organs. Plates are usually worn inserted into pockets sewn into the front and rear of the soft body armour carrier. Alternatively the plates can be used by mounting them in a plate carrier without soft body armour provided they have been tested satisfactorily for use without a backing of soft armour.

The combination of upgrade plates with other armour components in body armour is not always specified in the same way, and this may lead to confusion, especially when testing. Therefore it is necessary to define how the hard armour plate should be specified as part of a complete body armour system.

The term ‘in-conjunction’ means that the hard armour plate is designed to work in combination with the specified soft body armour that is worn under it. This means that the projectile must be stopped within the complete system and may actually pass through the hard plate and be stopped in the soft armour. This is specified in an attempt to produce lighter systems. However some manufacturers will use this requirement to allow the use of very thick ceramics (often cheap) and very thin composite backings (perhaps only one or two layers). Some experts consider this to be a dangerous approach as there is a very little safety margin when a high velocity bullet, or part thereof, has passed into the soft armour. For the ‘in-conjunction’ case, when the plate is tested, it must be done with the relevant soft armour beneath it on a clay support for measurement of back-face signature (BFS). This design theoretically allows for the lightest armour plate solutions.

Strictly ‘stand-alone’ armour is one in which the bullet is to be stopped within the plate and in which there is no soft armour in the system. Therefore this type of plate would be mounted in a plate carrier. The ratio of ceramic to composite backing is critical in this case, in order to keep the weight manageable. Therefore the choice of the optimum ceramic and polythene for the requirement is also critical. When the plate is tested it would normally be done so in direct contact with the clay used for BFS measurement. This design typically produces the heaviest armour plate construction.

There is also an in-between case. This is where the hard armour plate is used with soft armour beneath it, but with the requirement that the high velocity bullet must be completely stopped within the plate (in this case the armour plate is tested with the soft armour between it and the clay). Some people refer to this as a stand-alone requirement and some as an in-conjunction requirement. It is safest not to either term, but to describe what it really is. An accurate description would be ‘the bullet is stopped in the plate with soft body armour being part of the complete system’. This design allows for a lighter armour plate to be used than the pure stand-alone case, but heavier than an ‘in- conjunction’ solution. It also provides a solution with a greater safety margin than an ‘in- conjunction’ solution.