

BALLISTIC TESTING AND SELECTION OF BODY ARMOUR

1 General

Body Armour is designed to provide increased protection to the body against fragments, knives and bullets. It is not possible to totally cover the whole body and to provide 100% protection from all threats. The choice between different types of body armour is mostly a balance between protection level, area covered, comfort and cost. These factors will differ for most users and the choice will therefore be different.

Body armour mostly consists of 3 x different components namely:-

a) Outer cover

This is mostly made out of a textile material of any colour and is the carrier of the armour protection components. The weight and cost of the cover is mostly only a small portion of the body armour's weight and cost.

b) Soft armour panels

These panels mostly consist of multiple layers of woven or uni-directional fibre materials and are flexible for comfort. They are inserted into the outer cover and, depending on the protection level, provide protection against knives, fragments and/or handgun bullets. These panels account for most of the cost of the body armour and a reasonable proportion of the weight.

c) Hard armour plates

These plates are inserted into pockets provided into the outer cover and increase the protection level of that portion to include protection against rifle fire and special handgun bullets. In most cases each body armour garment contain two such plates, one in front and one on the back. These plates are mostly quite heavy and can be removed from the garment. These plates used to be steel, but in recent years ceramic composite plates have become the standard material.

2 Testing

If testing of body armour needs to be performed, it is recommended to refer to testing standards such as NIJ 0101, the PSDP standard and the German "Schutzvesten" standard. It should be kept in mind that the body armour has been designed to be worn on a body, and any testing should therefore mimic this situation. All of the above standards recommend that testing should be performed on Plasticine material of a certain hardness. The method for testing and calibrating this plasticine is described in the above standards.

After the body armour has been attached on the plasticine panel, the relevant bullets or fragments can be shot at the body armour panels, while care is taken to monitor that the correct bullet types are used and that the velocities are within the specified limits. After each shot the performance of the armour is investigated by inspecting the plasticine for penetration of bullet particles and measuring the depth of the indentation made into the plasticine relevant to the original plasticine face (Back face trauma). Multiple shots can be tested, providing that the shots are spaced at least 50mm apart and 75mm from the edge of the armour panels. On the hard armour plates the shots should be spaced at least 75mm apart and 50mm from the edge of the plates.

The body armour has failed the test if any part of the bullet has penetrated through the total armour system and into the plasticine panel, or if the back face trauma (BFC) exceeds the maximum allowable value, which is normally 44mm.

If a plasticine panel is not available for testing, it is advisable to use another semi-rigid material such as a large bag of dry sand or a hard packed grass bag. None of these options are the correct options and results could be negatively affected by such testing. It will also be impossible to accurately ascertain whether the body armour had been penetrated or not and trauma cannot be measured.

3 Selection of body armour

When selecting a type of body armour which is best suited for the specific application. The following factors should be considered:-

a. Outer cover

This is the part of the jacket which will be visible and should therefore be made from a material which looks similar to the uniform. It could be a plain colour or camouflage pattern and printing such as "POLICE" could be printed on the cover.

It should also contain the pockets and attachments required by the user, including large pockets for hard armour plates.

b. Soft armour panels

The soft armour panels are the heart of the jacket. It is the highest cost component and dictated which part of the body is covered against bullets and to what level. As the materials used here are very expensive, many jacket manufacturers save money by making the soft armour panels smaller than that of the competition or by putting in less layers of material. Some even supply samples for testing and then supply less or smaller layers for the jackets that are delivered.

In order to provide maximum protection, it is advisable to make the soft armour panels as large as possible, taking into the consideration that the wearer of the jacket should still be able to perform his/her task while wearing the jacket.

Most users of body armour outside of the USA use level II or IIIA soft armour. Level II will provide protection against most handgun and revolver threats, while level IIIA will also provide protection against sub-machine gun threat.

The soft armour panels should be quite flexible and lightweight. A very large outer cover plus level IIIA soft armour panels should weigh less than 4kg.

c. Hard armour plates

Hard armour plates come in many different sizes, shapes, protection levels and prices.

ii. Size:-

The most common size is 250 x 300mm (10 inch x 12 inch), with the top corners cut away by 60 x 45mm to allow the wearer to use a rifle.

ii Shape:-

In the past single curve plates were commonly used, but the most commonly used shape is now Multi-curve plates. A well designed multi-curve plate will fit well both in the front and in the back.

iii. Protection level

When the protection level is specified it is important to consider the total threat scenario and to specify protection against all the types of bullets that could be encountered.

The NIJ specification has a major drawback in that it only specifies 7,62 x 51mm Ball ammunition as level III threat, and only 7,62 x 63mm AP as level IV threat. Some level III plates can even be penetrated by normal AK-47 bullets, while some AK-47 plates can be penetrated by 7,62 x 51mm Ball bullets. It all depends on the materials used to make the plates.

The best way to ensure protection is to list all the bullet types against which protection is required and to ensure that all of these bullets can be stopped. If protection is also required against armour piercing bullets, it is better to specify the type of bullet rather than to simply specify level III or level IV. It might be possible to save a lot of weight and cost by doing it this way.

It is important to give as many details as possible during the first enquiry, as this will ensure that the products offered conform closely to the requirements.