

Technical assessment of BLOXR XPF material and Thyroid Shield

A BLOXR XPF Thyroid shield was received for the purpose of analysis and testing against the claims made by the manufacturer.

Manufacturers claims and technical specification

That XPF gives 0.5mm Lead equivalent (LE) protection with a 50% weight reduction over Lead based products.

FACT: BLOXR is only 0.29mm lead equivalency in the main body and only 0.08mm lead equivalency on the side of the collar only 42% and 14% of what they claim!!!

That the BLOXR XPF Thyroid Shield gives increased hygiene and extended wear.

FACT: BLOXR is covered in a porous paper that will soak up everything and cannot be properly sanitized.

FACT: BLOXR material is extremely weak and fragile, unable to even hold up it's own weight. Any full sized apron would tear and crumble, almost immediately after being worn

Physical Assessment

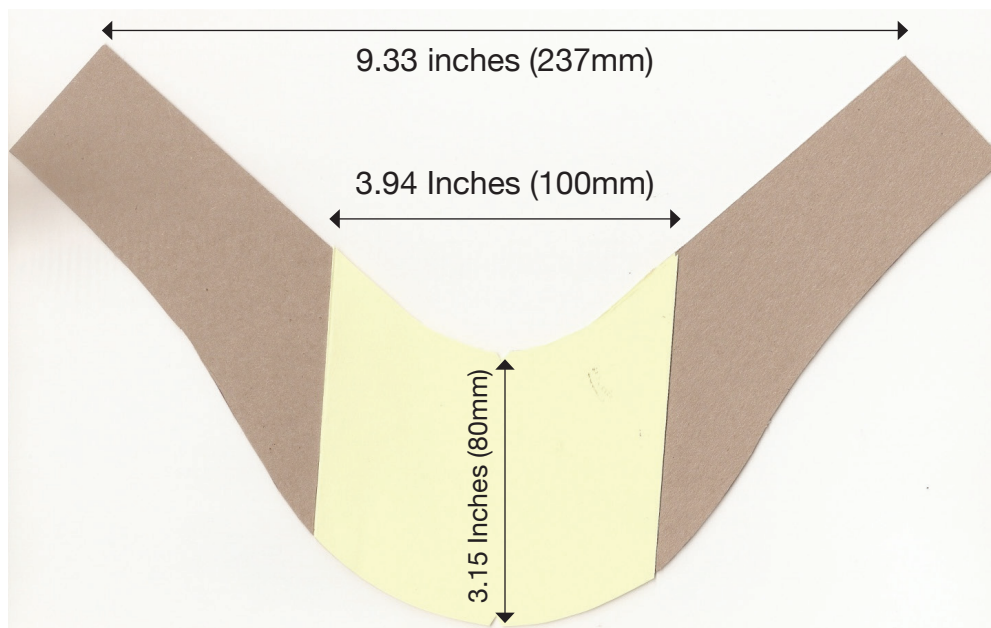
The outer cover of the thyroid shield is fabricated from a paper-like blue absorbent and porous material, which has been poorly made overall.

On removal of the outer cover the inside of the shield was found to consist of two separate layers of material one brown and one yellow in color, poorly stuck together with dots of glue.

The brown layer is based on Barium Sulphate and the yellow layer based on Bismuth Oxide.

The yellow layer is situated in the center of the shield, and only extends over 45 % of the shield area. This results in highly inadequate radiation protection

See representative illustration below:



Technical assessment

Each of the separate layers which make up the XPF material exhibited very low tensile strength, and **the material could be pulled apart with the slightest effort**. As a result of this very poor strength the XPF material is not suitable for the manufacture of x-ray protection aprons, **the material would require additional strength which could only be achieved with a significant increase in weight**.

Lead Equivalence

X-ray protection materials are tested against two main standards, these are:

ASTM test method F 2547-06. This method measures the x-ray attenuation properties of a material and is used only in the USA.

IEC 61331-1:2002 this method measures the Lead Equivalent thickness of a material and is used in Europe and the rest of the world.

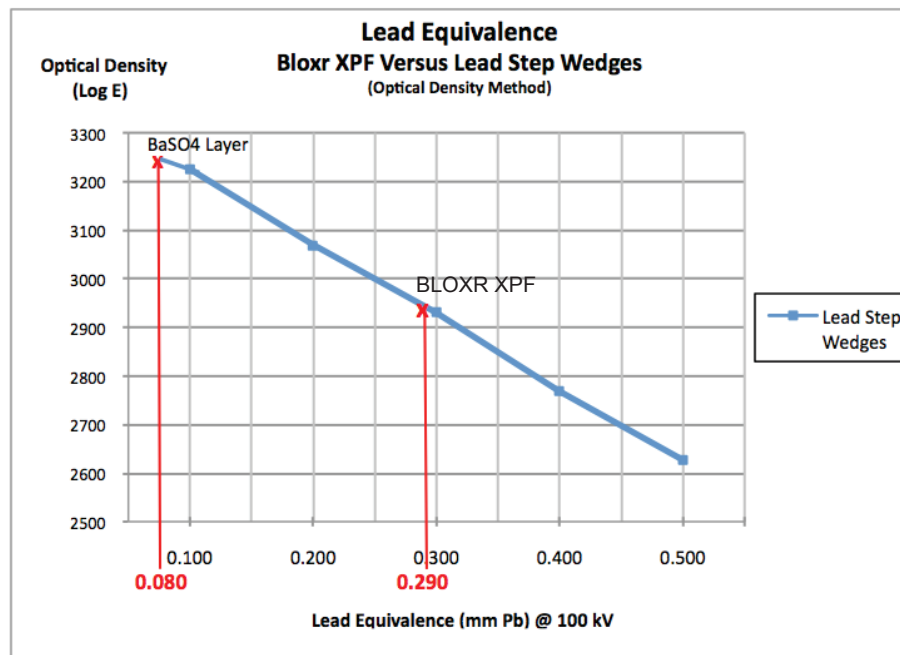
BLOXR do not indicate a test standard that the XPF material was tested to. In fact, any reputable test laboratory would have come to the same conclusions of lead equivalency FAR below that which was stated.

For simplicity X-ray analysis of the XPF material was performed using the Optical Density Method, there are no maths or other factors involved, the test samples and Lead step wedges are illuminated under the same x-ray beam for the same time side by side.

The XPF material was exposed to the x-ray beam side by side with lead step wedges at 100 kV to make a direct comparison to lead. The resultant X-ray films were measured using a Digital Optical Densitometer, and the results plotted to show LE of the XPF material.

BLOXR XPF tested to only 0.29 mm LE which is 42% lower than the manufacturers claimed figure of 0.5 mm LE. The separate brown layer which extends out to the sides of the shield tested to 0.08 mm LE.

See graph below:



Product Weight

The BLOXR XPF material was weighed and found to be 0.87 pounds per square foot (4.225 Kg per square meter).

However, this is at a tested 0.29 mm LE, if extrapolated to the claimed 0.5 mm LE the XPF material would weigh 1.50 pounds per square foot (7.340 Kg per square meter).

Lead based materials average a typical 1.40 pounds per square foot (6.90 Kg per square meter) in weight.

BLOXR claim their XPF material gives a 50% weight reduction compared to Lead based materials giving the same level of protection. This is incorrect, if the mass of the BLOXR XPF material is extrapolated in order to achieve the claimed 0.5 mm LE this would result in material weight that is 7% heavier than a typical Lead based material.

Conclusions

The BLOXR XPF Thyroid shield does not provide the wearer with the claimed 0.5 mm LE protection, it tested at 0.29 mm LE.

This is very dangerous to the wearer, the level of protection is far lower than claimed and the wearer will receive a greatly increased radiation dose.

The BLOXR XPF material does not give the claimed 50% weight reduction compared to Lead based materials at a claimed 0.5 mm LE protection. At an equivalent 0.5 mm LE the BLOXR XPF material would in fact be 7% heavier than a typical Lead based material.

As shown in the illustration the shield has the two separate layers of material present only in the central section, the wrap around side sections of the shield are comprised of a single barium sulphate based layer. This has a very much lower level of protection than the manufacturers claimed 0.5 mm LE – in fact only 0.08 mm LE. This presents a real danger to the wearer as there is very little protection from scatter radiation to the side of the thyroid gland.

The XPF material is not suitable for the manufacture of x-ray protection aprons, due to its very low strength the material is not suitable for sewing into a garment. In order for this material to be fabricated into an x-ray protection apron it would require additional strength which in turn would add additional weight to a material already 7% heavier than Lead based products.

The outer cover of the BLOXR XPF Thyroid Shield is both absorbent and porous, this means that it cannot be cleaned and sterilized with alcohol based cleaning agents that are used in hospitals world-wide. Claims of increased hygiene over Lead based products are inaccurate.