



King Plastic Corporation

## **King Plasti-Shield® FAQ**

### **What is King Plasti-Shield®?**

King Plasti-Shield® is a borated polyethylene neutron shielding material. It is the product of a proprietary process called K-Stran™, the most advanced manufacturing process for superior flatness and consistency of 1" thick. Custom sheets, blocks and slabs can be made as a special order in the compression mold or extrusion mold. King Plasti-Shield® has a smooth finish on both sides of the sheet. It is made with 5% boron by weight and our trademark purple color. King Plasti-Shield® is an effective shielding material to meet all applicable applications for healthcare cancer treatment centers, diagnostic and hospital facilities. Applications include linear accelerators, nuclear or radiation shielding, industrial use, security such as seaports and airport security, nuclear submarines, nuclear power plants, border protection and other applications requiring attenuation of thermal neutrons. The polymer sheet never needs painting or refinishing, works like wood and it is easy to fabricate using common woodworking tools and techniques.

### **What type of finish?**

Smooth finish on both sides of the sheet.

### **What colors are available?**

King Plasti-Shield® is made in 5% boron by weight and our trademark purple.

### **Can you custom color match?**

Yes. Please call Customer Service at 941.493.5502.

### **What is required for custom orders?**

Please call Customer Service at 941.493.5502.

### **What sizes are available?**

King Plasti-Shield® standard sheet size is 48" x 96". Standard gauge is 1". Custom sheet sizes and gauges available upon request. Please call Customer Service at 941.493.5502.



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**Is King Plasti-Shield® available with an antimicrobial?**

No.

**Is King Plasti-Shield® available with a flame retardant?**

No.

**What are the Features and Benefits of King Plasti-Shield®?**

- Effective shielding material to meet all applicable applications for healthcare cancer treatment centers, diagnostic and hospital facilities

**How does the borated polyethylene act as a shield?**

The best materials for shielding neutrons must do three things: moderate or slow down neutrons, absorb slow neutrons, and shield against any resulting radiation.

***Moderating or slowing down neutrons:*** Materials containing light atoms such as hydrogen atoms found in polyethylene accomplish slowing down neutrons. The nucleus of a hydrogen atom contains only one proton. Since a proton and a neutron have almost identical masses, a neutron travelling from a fission reaction colliding with a hydrogen nucleus gives up most, if not all, its energy to the proton after one collision. This is similar to billiards when a cue ball hits another ball of identical mass, the cue ball can stop and the other ball starts moving with the same velocity. On the other hand, if a cue ball hits a bowling ball (neutron vs. heavy nucleus), the cue ball bounces off with very little change in velocity, only a change in direction. Therefore, a material such as lead is ineffective for blocking neutron radiation. To clarify, lead is very effective at stopping gamma ( $\gamma$ ) rays and x-rays which differ from neutron radiation.

Technically, a hydrogen (H-1) atom has a moderating cross-section of 20 and a capture cross-section of 0.2.

***Absorbing slow neutrons:*** Materials with high neutron capture cross-sections like boron easily absorb slow, or thermal, neutrons. Boron's neutron capture cross-section is 2000 times more than hydrogen.



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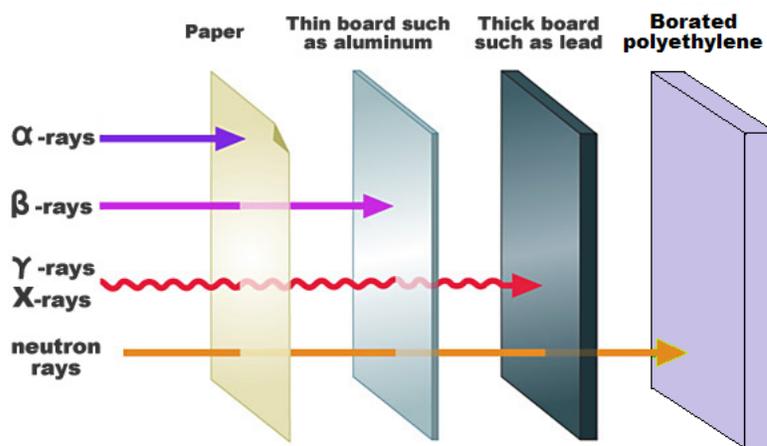
Technically, a boron (B-10) atom has a moderating cross-section of 2 and a capture cross-section of 200.

**Shielding against any resulting radiation:** In the case of certain absorber materials such as cadmium, a strong emission of gamma ( $\gamma$ ) rays accompanies the absorption of neutrons requiring additional shielding to weaken the effect of the gamma ( $\gamma$ ) rays. This phenomenon is much less important for boron as a neutron absorption material and results in a significantly reduced energy dosage of only 0.42 MeV.

## What are the radiation types and the degree of penetration?

Borated polyethylene from King Plastic, branded as King Plasti-Shield®, is lightweight and workable making it the perfect choice for neutron shielding.

### Radiation types and the degree of penetration



## How can the material be fabricated and finished?

Use standard woodworking tools: table saws, table routers, drills, blades and bits. Carbide router bits with two to four flutes are recommended. For more information, please refer to the fabrication brochures.

## How to care and store?

- Store the sheets flat on a level surface
- Keep away from teak oil and other products that can stain the finish
- Use china markers or water-based markers to draw patterns



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- Pen marks can usually be removed with household cleaners
- Keep away from heat sources that exceed 180°F
- Because there is no grain, parts can be cut from any area of the sheet
- Save the scraps for small parts, shims, spacers and plugs

## **What are common applications?**

- Airport Security and Sea Port Security
- International Border Security
- Doors for Linear Accelerators
- Medical Vaults
- Nuclear Reactors
- Nuclear-Powered Vessels
- Research Applications

## **Can I use a CNC machine?**

Yes.

## **Will the material produce dust when fabricating?**

No, only small shavings.

## **Can I use glue or paint?**

Gluing is not recommended. King Plasti-Shield® sheet products are designed to resist water and grime, therefore they cannot be painted and the use of adhesives is not recommended. It is preferable to mechanically fasten or weld. Specialized welding equipment and rods, designed for use with polymer sheets, are available.