

## Case Study: Radioactive Materials Tabletop Shields

**Client:** Developer of nuclear medical storage and shielding devices for radioactive materials

**Client Problem:** Needed to redesign a line of laboratory tabletop shields for protection from low energy beta and gamma radioactive materials. The new tabletop shields needed to provide an updated contemporary styling at a lower cost while maintaining identical form, function, and shielding properties and had to reuse the existing leaded glass and acrylic windows of the current line of tabletop shields.

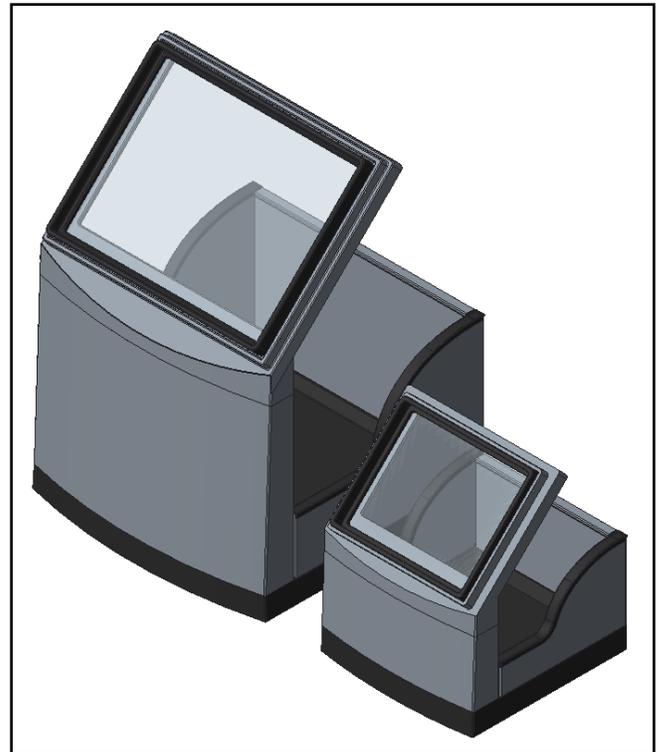
**GEOMETRIXDESIGN Solution:** Implement a tabletop shield design that combines brushed stainless steel sheet metal, aluminum sheet metal, and anodized die cast aluminum components that support the leaded windows and conceal lead plates for shielding. The design was completed in close association with an industrial design group to develop contemporary styling and aesthetics for the new line of tabletop shields.

**Design Details:** The existing line of tabletop shields consisted of two sizes—standard and mini—for various laboratory usages. Each tabletop shield utilized vertically mounted  $\frac{1}{2}$ " thick lead plates for torso protection and high-density leaded glass windows for head protection that were supported with left and right side-mounted cast aluminum frames. Optional  $\frac{1}{4}$ " thick lead side shields and  $\frac{1}{8}$ " thick lead bottom shields provided additional shielding protection. The front lead plates were colored to match the powder coated cast aluminum side frames.

The new design for the tabletop shields utilized an aluminum die cast lower base as the work surface/tray and an aluminum die cast upper frame to support the leaded and acrylic windows. A 0.063" thick stainless steel sheet metal front cover was designed to

fill between the lower and upper die cast components and to conceal a  $\frac{1}{2}$ " thick lead plate. Three rods were used as structural members to attach and support the upper frame to the lower base. The back of the central section was enclosed with a 0.063" thick aluminum sheet metal cover.

A slightly canted horizontal curved surface was designed across the entire front of the tabletop shield to soften the vertical flat surface of the existing tabletop shields. This curved surface was formed into the stainless steel front cover and continued into the front of the lower base and upper frame resulting in a smooth, unified curved front surface.



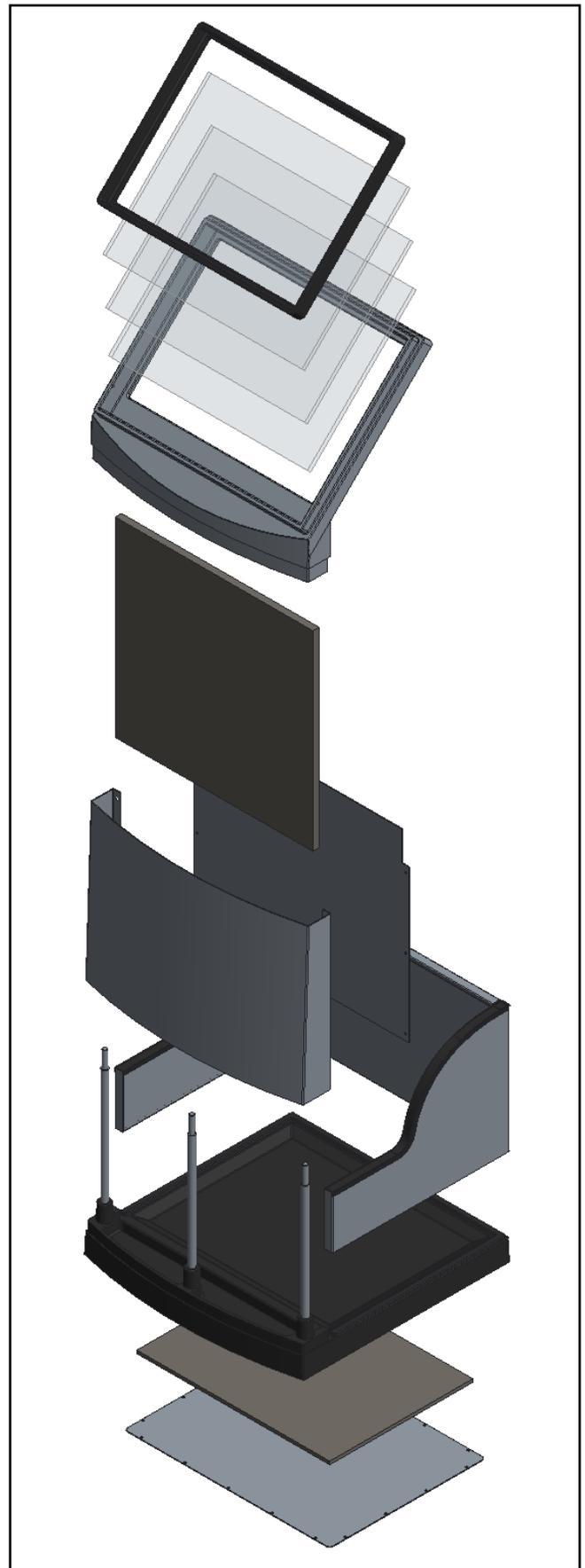
**Assembly model of line of tabletop shields with side and back shields**

The design flexibility of aluminum die-casting allowed for the integration of many features into the lower base, eliminating the need for separate components, and requiring no additional machining. These included:

- A top tray used as a work surface and to contain any spills.
- A ridge around the perimeter of the tray used to interlock optional side shields.
- Support feet on the bottom to provide stability on a tabletop.
- An underside pocket with a 0.063" thick aluminum sheet metal cover used to secure a ¼" thick lead plate for bottom shielding.
- Bosses and mounting holes used to support the three rods to attach the upper frame.
- A detent used to locate and align the front sheet metal cover.

The same aluminum die cast design flexibility was used for the upper frame to provide a thin, rigid frame for mounting the windows, bosses and mounting holes to attach the upper frame to the support, and a detent for alignment of the front cover. The client corporate nameplate and logo were even cast into the front of the upper frame.

Side and back radiation shields for the line of tabletop shield were designed as a three-layer system consisting of stainless steel sheet metal outer surface, ½" lead plate, and aluminum sheet metal inner surface. This layered structure was adhesively bonded together to eliminate any visible screws or fasteners. The two sides and back shields were connected using back facing screws through sheet metal flanges. An indent along the bottom of the side/back shield unit provided interlocking to the tabletop shield.



**Exploded assembly model of large tabletop shield showing use of aluminum die cast and sheet metal components**

## GEOMETRIXDESIGN, INC.

8 Eliot Court, Ledgewood, NJ 07852 Tel: 973.927.0422

[www.geometrixdesign.com](http://www.geometrixdesign.com) Email: [info@geometrixdesign.com](mailto:info@geometrixdesign.com)