

**npo**<sup>®</sup>

*Radiation Shielding*



**T-Flex<sup>®</sup> Shielding**

# T-Flex<sup>®</sup> Shielding

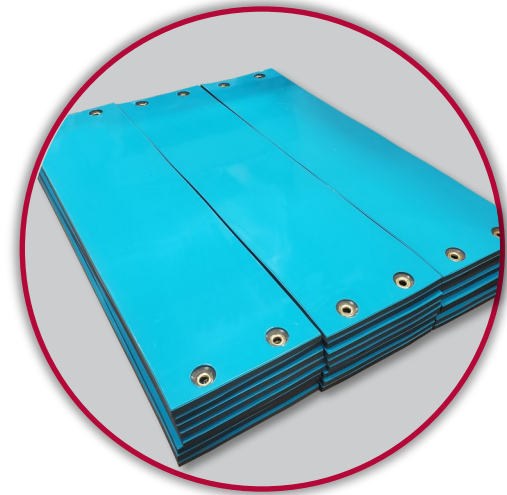
T-Flex shielding suspends high Z materials such as tungsten and bismuth in a polymer matrix to create radiation shielding that is non-toxic, flexible, and infinitely customizable. T-Flex was created to address some of the limitations and challenges of traditional lead shielding. The mixture of high Z material powder and polymer matrix provides both gamma and neutron attenuation. Since T-Flex is a liquid poured at room temperature, and subsequently solidified by curing, it can be made to virtually any shape allowing for embedding of magnets, handles, or other specialty hardware. Its flexibility, non-toxic (no lead) composition, and surface finish allow it to be easily trimmed for field fitting and easily cleaned for decontamination. T-Flex can withstand higher temperatures than lead wool blankets. It is the best option for most industrial shielding applications.

NPO invented T-Flex over 20 years ago and manufactures it inhouse at its facility located in Lisle, IL. It has since been deployed by dozens of Nuclear Power Plants, DOE facilities, and Naval Shipyards around the world.

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# T-Flex® Blankets



- Non-lead alternative to lead wool blankets
- T-Flex Bismuth or Tungsten
- Extremely flexible
- Easy to install
- 350°F operating temp
- ATSM E-84 Class A (fire rating)
- +200 lb grommet strength

Standard T-Flex® Blankets	
NPO 1' X 3' T-Flex® Bismuth Blanket 10 lb per square foot density, Corner Grommets Only, 6 Inch Grommet Spacing. Approximate Weight: 30 lb	T83BLKT12X36X42
NPO 1' X 3' T-Flex® Bismuth Blanket 15 lb per square foot density, Corner Grommets Only, 6 Inch Grommet Spacing. Approximate Weight: 45 lb	T83BLKT12X36X63
NPO 1' X 4' T-Flex® Bismuth Blanket 10 lb per square foot density, Corner Grommets Only, 6 Inch Grommet Spacing. Approximate Weight: 40 lb	T83BLKT12X48X42
NPO 1' X 4' T-Flex® Bismuth Blanket 15 lb per square foot density, Corner Grommets Only, 6 Inch Grommet Spacing. Approximate Weight: 60 lb	T83BLKT12X48X63

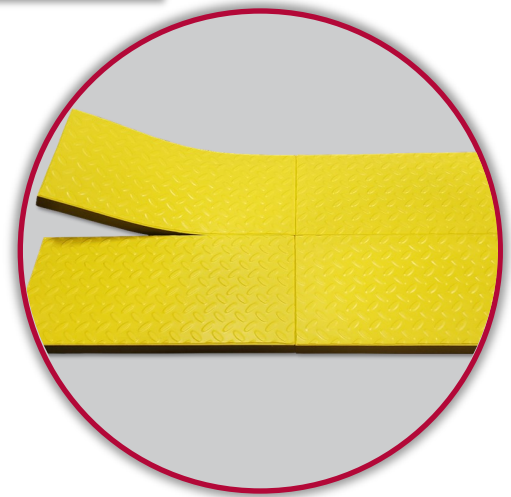
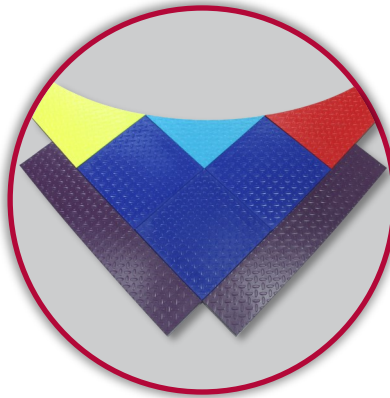
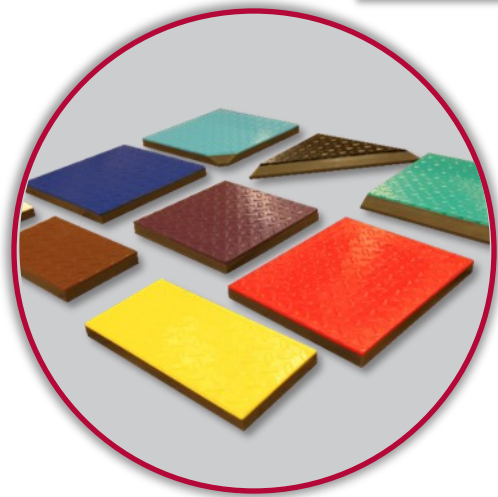
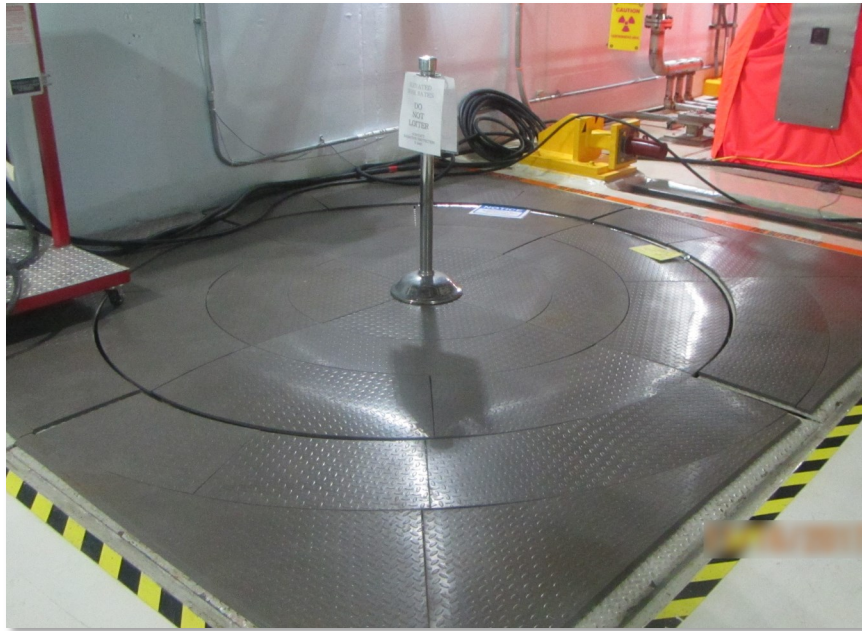
# T-Flex® Pipe Shielding



- Small bore to large diameter pipes
- Flexible but holds shape
- Tight fitting to pipe geometry
- Designed around weight limits
- Custom fit around elbows, tees, valves, and other interferences



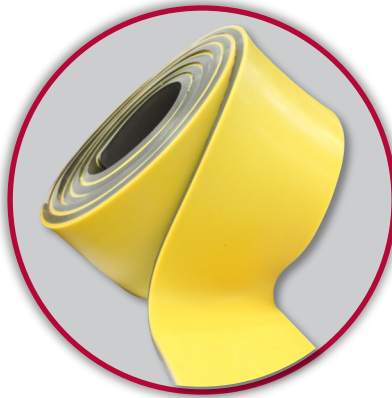
# T-Flex® Floor Tiles



- T-Flex Bismuth, Tungsten, or Iron
- Comfortable to walk on
- Slip-resistant tread
- Durable
- Fully customizable
- Variety of colors

Standard T-Flex® Floor Tiles	
T-Flex® Bismuth Floor Tile, 10psf, 12" x 24" x 0.42" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X24X42
T-Flex® Bismuth Floor Tile, 15psf, 12" x 24" x 0.63" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X24X63
T-Flex® Bismuth Floor Tile, 20psf, 12" x 24" x 0.83" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X24X83
T-Flex® Bismuth Floor Tile, 10psf, 12" x 12" x 0.42" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X12X42
T-Flex® Bismuth Floor Tile, 15psf, 12" x 12" x 0.63" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X12X63
T-Flex® Bismuth Floor Tile, 20psf, 12" x 12" x 0.83" Thick, 1/8" Yellow Tread Layer	T83SLBYT12X12X83

# T-Flex® Ribbons

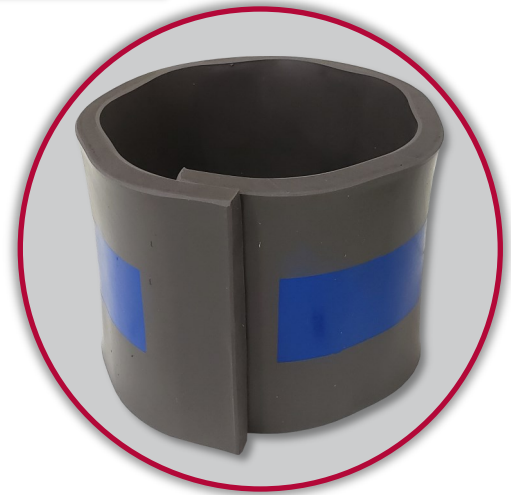
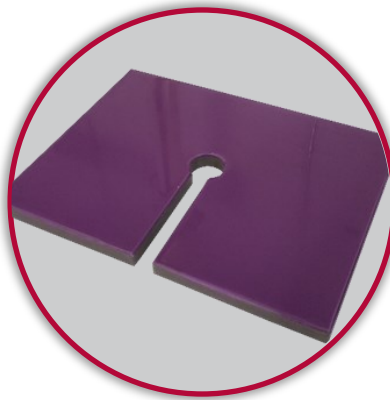
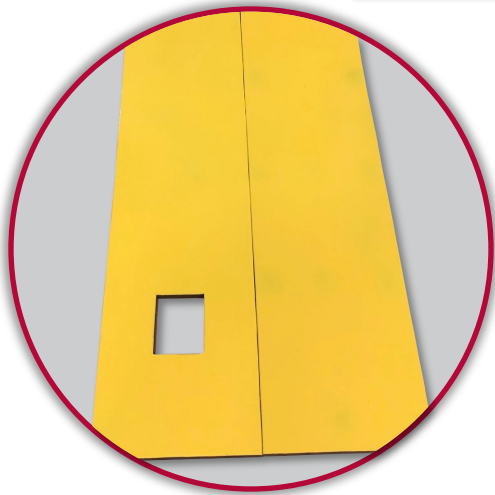


- 2", 3", or 4" wide by 96" long
- T-Flex® Tungsten— Densest, thinnest shielding material and highly flexible
- Wraps around complex geometries
- Quick to install
- Optional yellow color layer for visibility

## Standard Ribbon Wrap

T-Flex® Tungsten Ribbon Wrap, 96" L x 2" W x 0.250" Shielding Thickness. Includes Yellow Layer Approximate Total Weight: 12 lb	T62RWY96X2X250
T-Flex® Tungsten Ribbon Wrap, 96" L x 3" W x 0.250" Shielding Thickness. Includes Yellow Layer Approximate Total Weight: 18 lb	T62RWY96X3X250
T-Flex® Tungsten Ribbon Wrap, 96" L x 4" W x 0.250" Shielding Thickness. Includes Yellow Layer Approximate Total Weight: 24 lb	T62RWY96X4X250
T-Flex® Tungsten Ribbon Wrap, 96" L x 6" W x 0.250" Shielding Thickness. Includes Yellow Layer Approximate Total Weight: 36 lb	T62RWY96X6X250

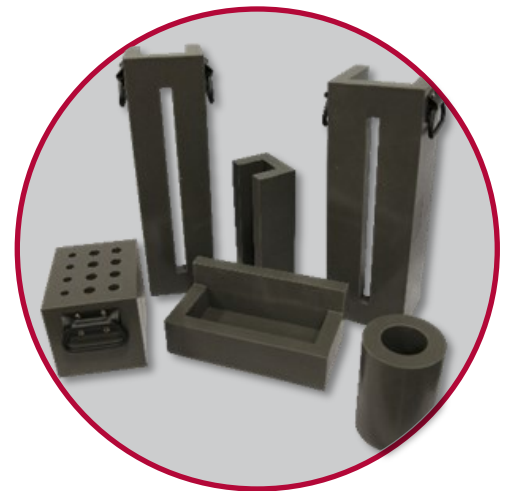
# Magnetic T-Flex®



- High-strength magnets embedded and reinforced to prevent pull out
- Stackable up to two layers
- Extra magnets for overhead applications
- Quick to install
- Available in standard sizes or can be made for custom applications



# Laboratory Applications

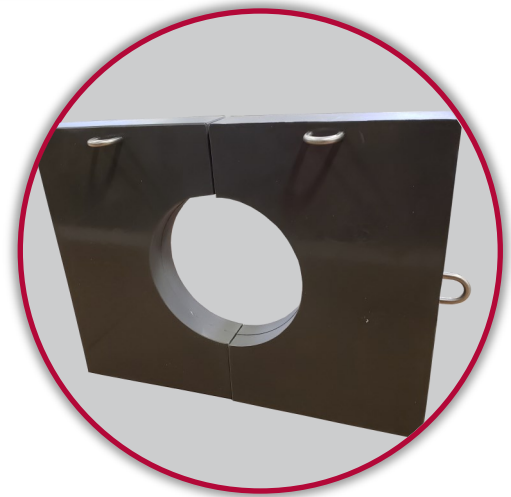
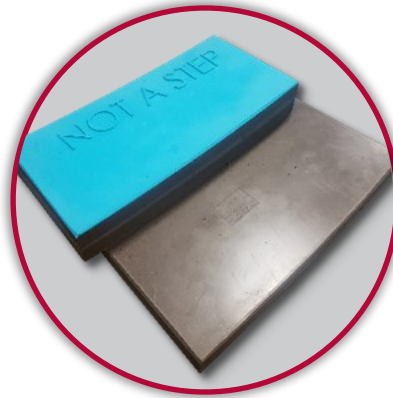
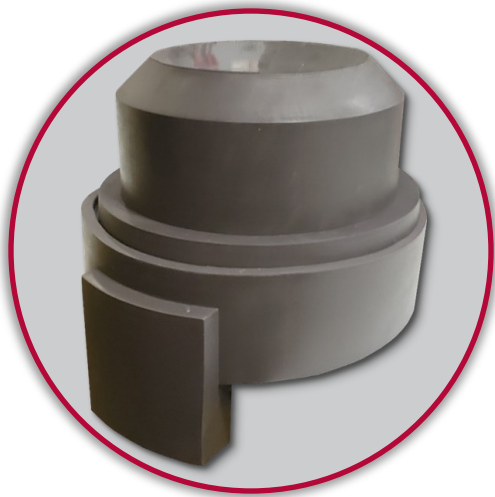
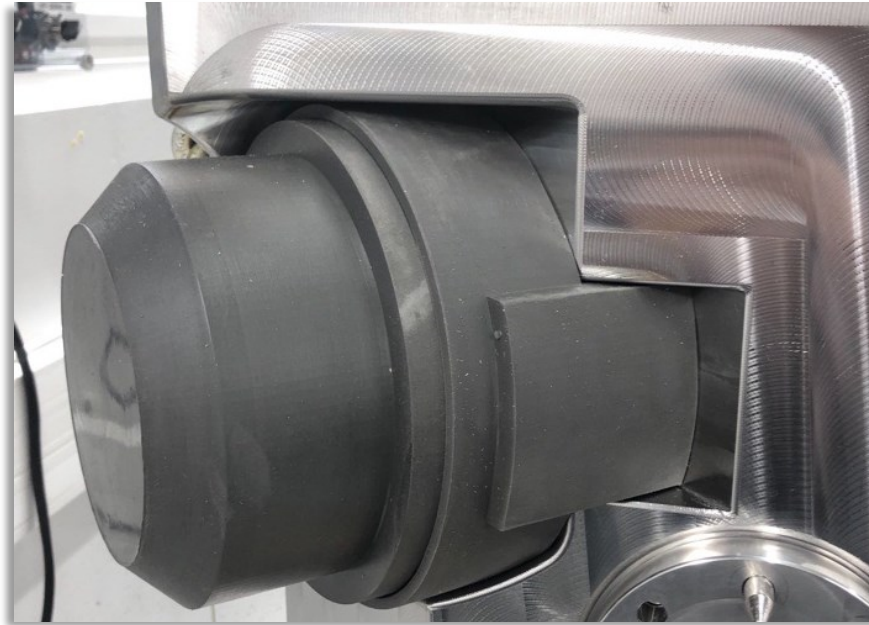


- Sized for standard sample bottles
- Single and multi-vial transport shields
- Shielding thickness tailored to samples carried and dose reduction needed
- Safe and ergonomic carrying—integrated handles and secure lids

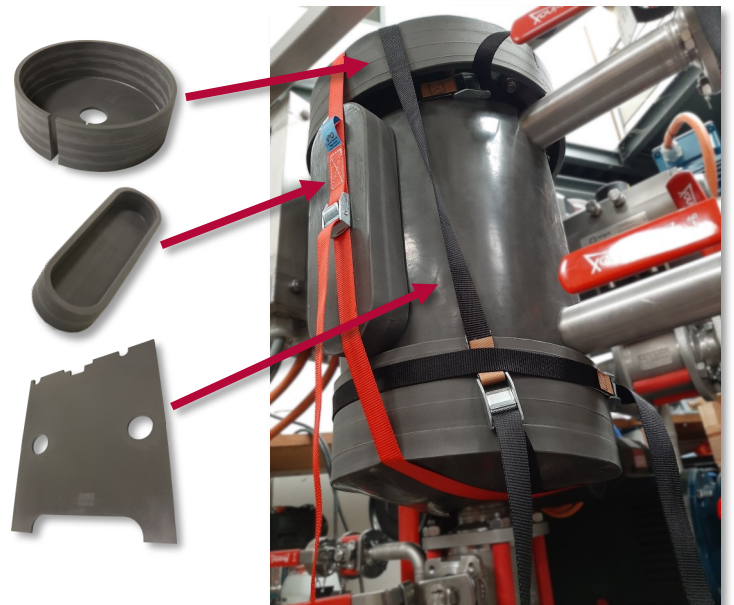




# Custom Applications



- 3D-molds allows for complex shapes
- Engineered and designed around specific needs
- Fit tightly around components
- Add hardware, handles, hooks, magnets, and more



# Radiography



- Gamma shielding for radiography sources such as Co-60, Cs-137, Ir-192 and Se-75
- Flexible shielding blankets for primary beam radiation as well as scatter radiation
- Guide tube shielding for projection style radiation
- Custom T-Flex pieces to shield specific instrumentation

Radiography Blankets	
Isotope	Attenuation
Se-75	85%
Ir-192	60%

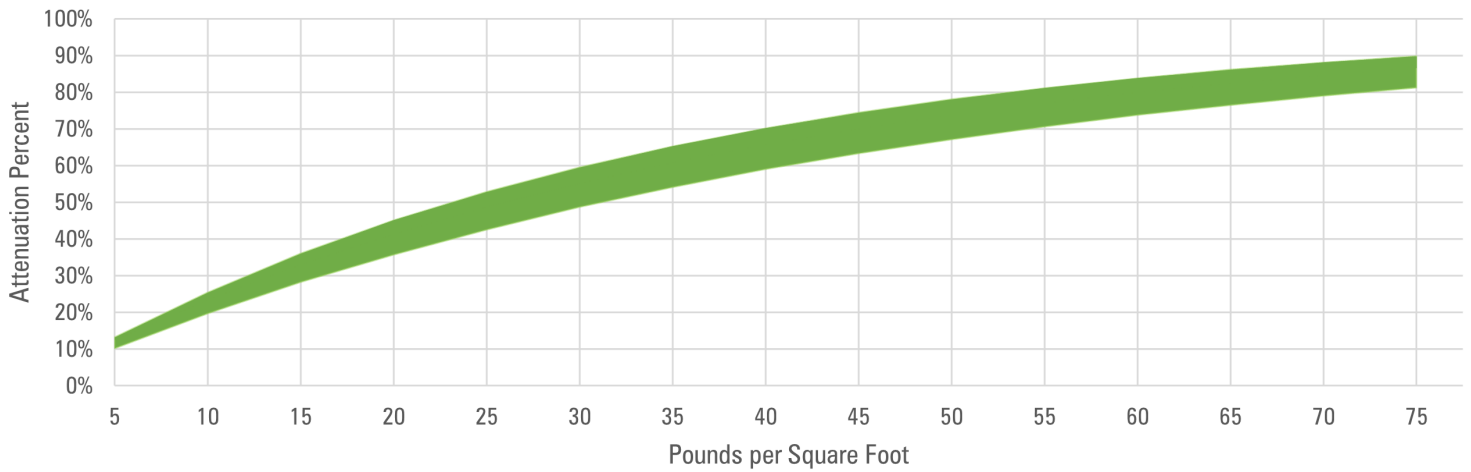
Guide Tube Shielding	
Isotope	Attenuation
Se-75	80%
Ir-192	55%

# Technical Specifications

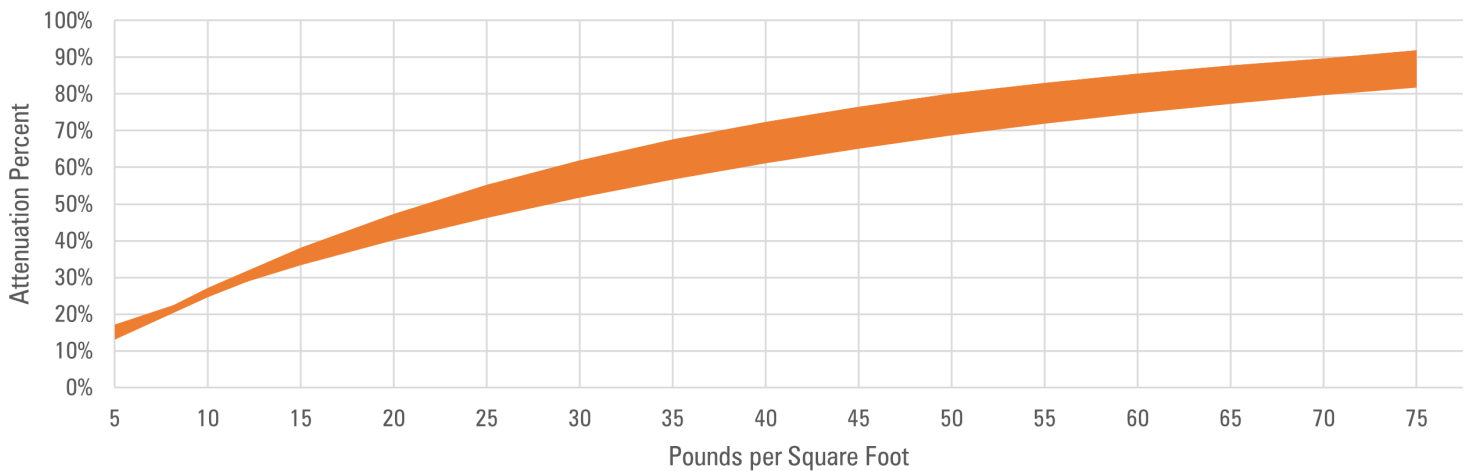
SPECIFICATIONS	
MATERIAL:	METAL IMPREGNATED POLYMER (TUNGSTEN, BISMUTH, IRON, BORON, BISMUTH/BORON BLEND)
SAFETY:	REFER TO SDS (SEPARATE DOCUMENT)
SITE PREPARATION:	ENSURE SURFACE IS FREE OF PROTRUSION OR SHARP AREAS. CONSIDER ALL INSTALLATION CONDITIONS
USAGE:	SECURE TO SURFACE VIA MAGNETS, STRAPS, OR OTHER SPECIFIED DEVICES
GENERAL CONDITION:	FLEXIBLE WITH NO SIGNS OF CRACKING OR BRITTLINESS, DARK GREY IN COLOR
HANDLING:	USING PRIOR TRAINING OR A MOCK UP DEMONSTRATION IS RECOMMENDED BEFORE INSTALLATION
PHYSICAL PROPERTIES:	<ul style="list-style-type: none"> <li>TENSILE: 320 psi</li> <li>ELONGATION: 158%</li> <li>TEAR: 34.5 lbf/in</li> <li>DUROMETER: 46</li> </ul>
MATERIAL DENSITY:	<ul style="list-style-type: none"> <li>T-FLEX TUNGSTEN: 0.25 lb/in<sup>3</sup></li> <li>T-FLEX BISMUTH: 0.16 lb/in<sup>3</sup></li> <li>T-FLEX BORON: 0.045 lb/in<sup>3</sup></li> <li>T-FLEX NEUTRON (BORON/BISMUTH BLEND): 0.093 lb/in<sup>3</sup></li> </ul>
THERMAL PROPERTIES:	<ul style="list-style-type: none"> <li>CONTINUOUS OPERATING TEMPERATURE (REGULAR): 350°F (177°C)</li> <li>CONTINUOUS OPERATING TEMPERATURE (HIGH TEMP): 400°F (204°C)</li> <li>MAXIMUM TEMPERATURE: 450°F (232°C)</li> <li>ASTM E-84: CLASS A</li> </ul>
RAD STABILITY:	INCIPIENT TO MILD DAMAGE (25% DAMAGE) UP TO OVER 10E8 RADS (1000 KGY)
BORIC ACID SUBMERSION:	<ul style="list-style-type: none"> <li>AFTER 96 HOURS: NO NOTICEABLE DEGRADATION OF THE T-FLEX</li> <li>ICP-OES ANALYSIS DID SHOW MEASURABLE AMOUNTS OF LEACHED TUNGSTEN IN BORIC ACID SOLUTION</li> </ul>
LEACHABLES TEST:	<ul style="list-style-type: none"> <li>ASTM D4327-03: ACCEPTABLE</li> </ul>

# Gamma Attenuation

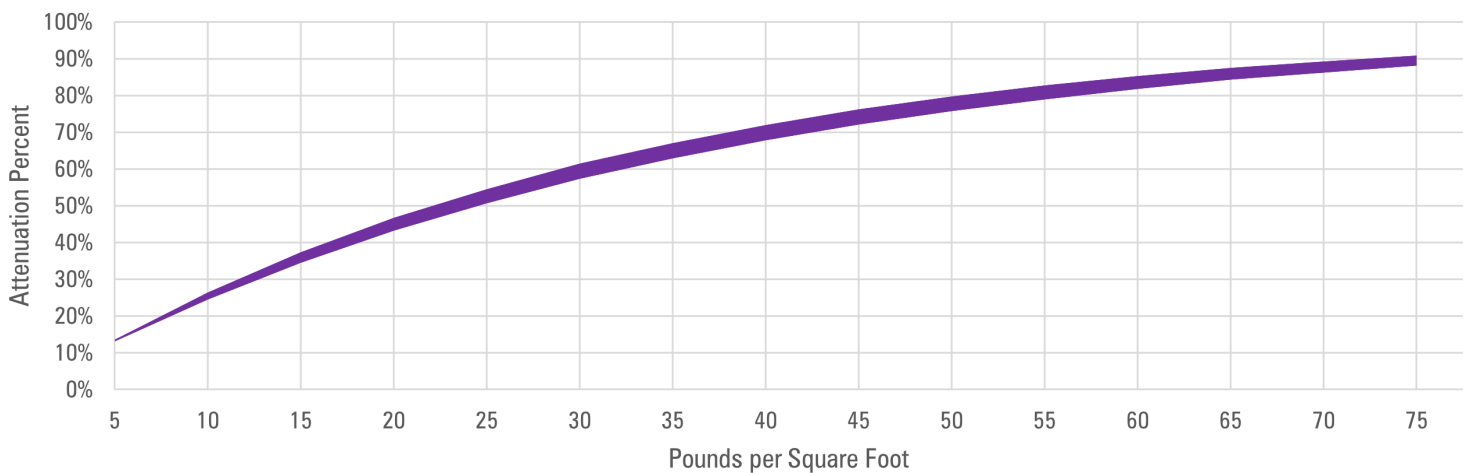
T-Flex Tungsten Gamma Attenuation Range at Co-60 (1250 keV)



T-Flex Bismuth Gamma Attenuation Range at Co-60 (1250 keV)



T-Flex Neutron Gamma Attenuation Range at Co-60 (1250 keV)



# Neutron Attenuation

