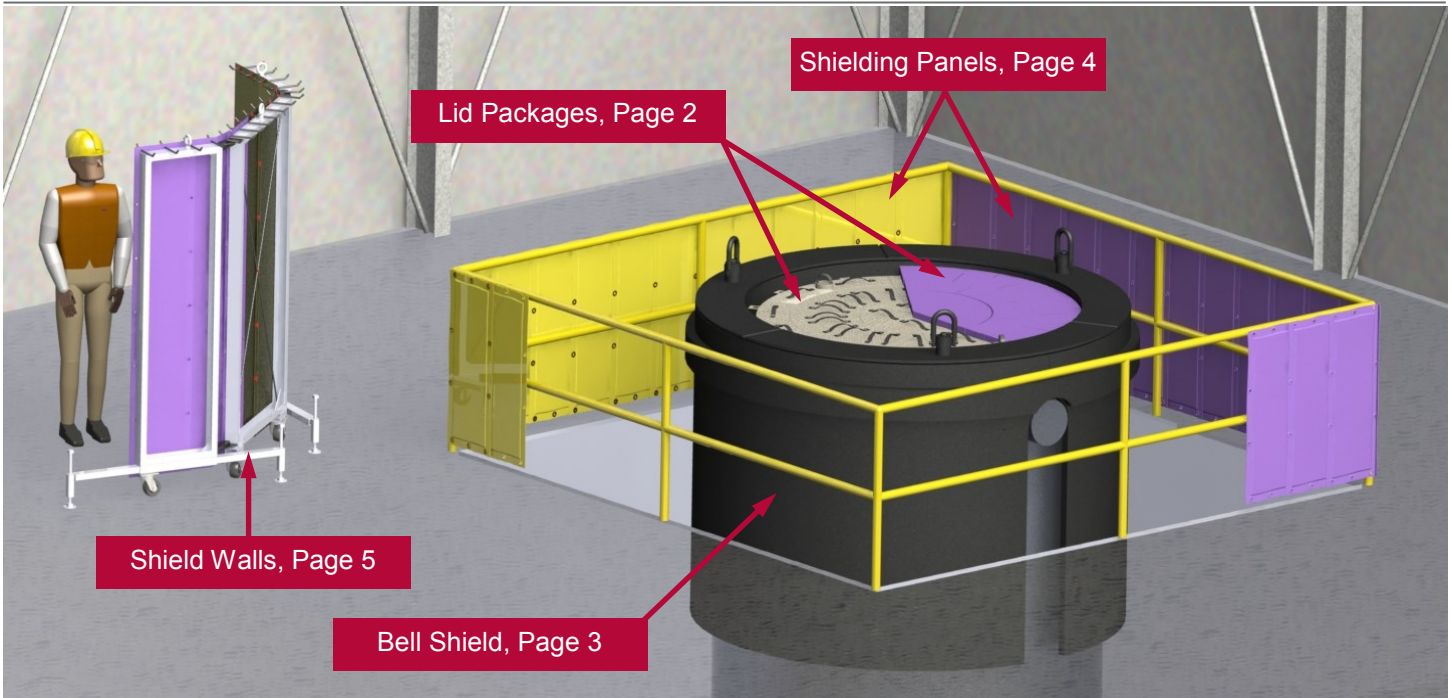


Dry Cask Operations

Various Shielding Packages

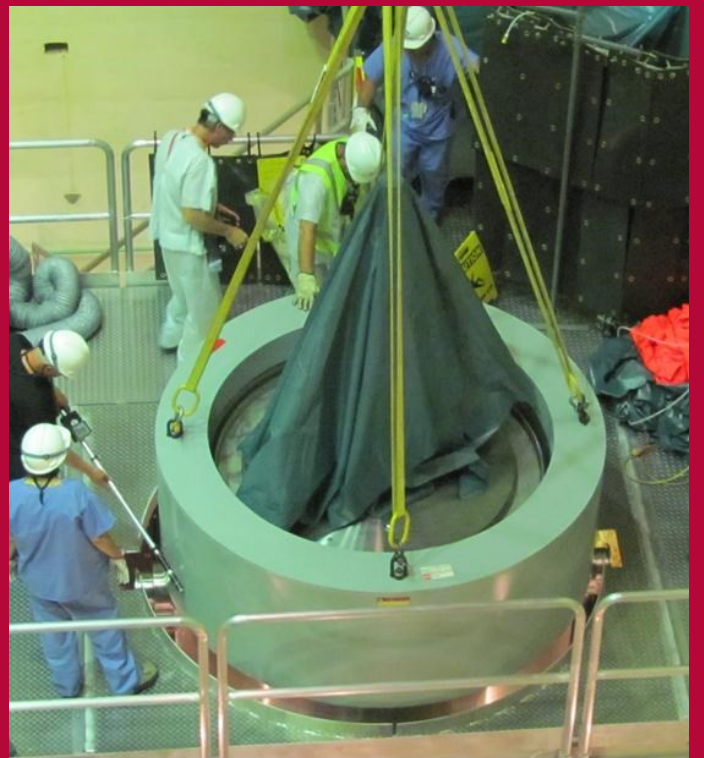
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product description

Dry cask operations are a significant contributor to overall dose at plants who employ them. Recent trends of storing radiologically hotter fuel in dry casks and increased push to reduce neutron dose exposure has made the implementation of shielding into the process all the more important. NPO has worked directly with the manufacturers of the casks, the crews that move the fuel and the RP departments to create the most integral and effective Dry Cask shielding in the industry.

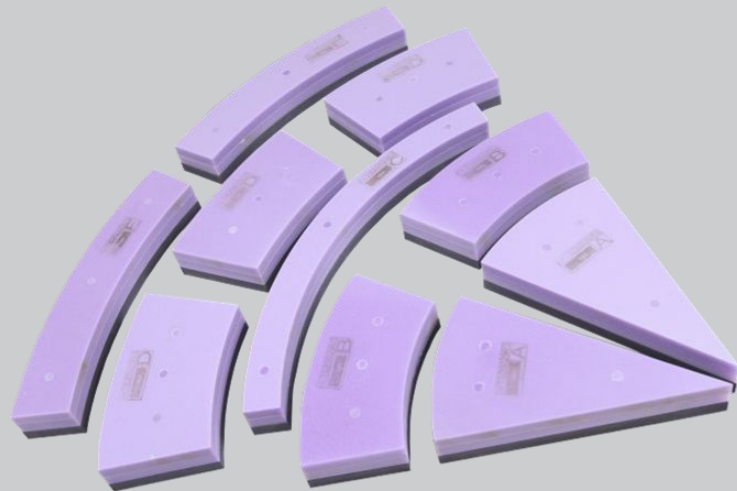


Dry Cask Operations

Lid Packages

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composite lid shield

- Neutron + Gamma Shielding
- Borated PE and Tungsten T-Flex
- 70% gamma attenuation (Co-60)
- 60% neutron attenuation
- 50 lb max weight per piece
- Custom configurations available.

high temp lead wool shield

- Implemented by over 12 sites in the US
- 60 % gamma attenuation (Co-60)
- +500°F continuous service temp max
- 35 lb per piece

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Dry Cask Operations

Shielding Panels/Blankets



neutron shield panels

Solid shield panels with mitered edges to eliminate streaming gaps and holes for attachment via tie-wrap / carabiner / S-hook to hand rails, etc. Typical 2" thickness provides approximately 61% neutron attenuation.

- Typical 2" thickness = 12 lb / ft²
- Custom sizes available
- Magnetic flexible neutron shielding also available

gamma shield blankets

NPO makes shield blankets in all sizes, shapes and materials such as high temperature, lead wool, Tungsten and Bismuth T-Flex, and magnetic. While the primary function of these blankets is to reduce gamma radiation, T-Flex blankets also provide a reduction to neutron radiation. Tell us your requirements and we'll recommend the right blanket for the job.

Dry Cask Operations

Bell Shields

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composite bell shield

The composite bell shield provides gamma and neutron shielding during dry cask operations. The cylinder provides shielding around the transfer cask and above the work platform. Typically, atop the cylinder is a 6" tall and 6" thick ring that reduces shine from the canister lid and annulus gap areas. The bell shield is supported by sitting atop the transfer cask, and can be manufactured for use with any dry cask system. The amount of borated polyethylene, steel, and/or lead can be designed to each site's individual needs.

- Rated Lifting Lugs
- Epoxy Coated Finish
- Custom sizes available
- For use with NPO Lid Shield
- Approx Weight: 5000 lb

gamma bell shield

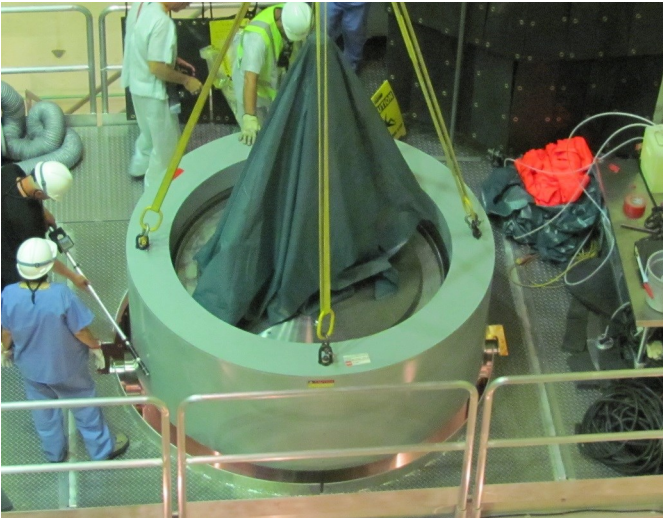
Same design principles as Composite Bell Shield except shield material is for gamma only. For use at sites with older fuel such as those in the decommissioning process.

Dry Cask Operations

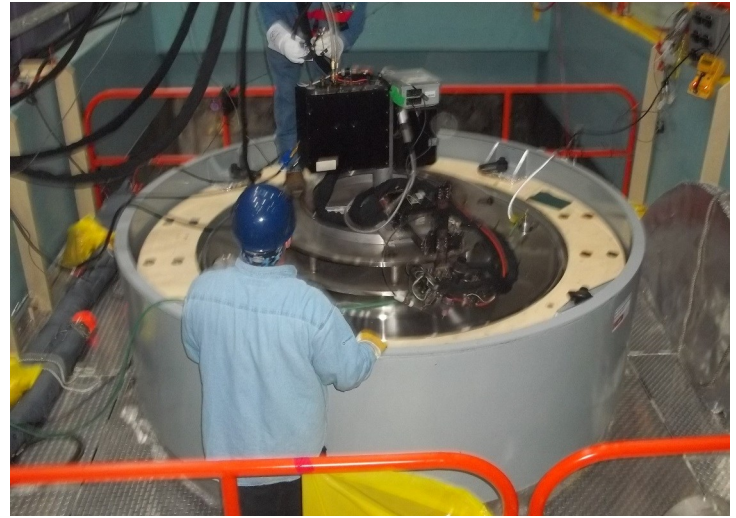
Bell Shields and Other Shielding

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Kewaunee - Transnuclear Shield Bell



VC Summer - Holtec Shield Bell



Millstone - Lower transfer cask shielding. Primarily provides neutron reduction and has large doors for bringing in and taking out transfer cask.

Clinton - Holtec Shield Bell with integrated work platform. Platform can be stood on and provides gamma and neutron reduction.



Dry Cask Operations

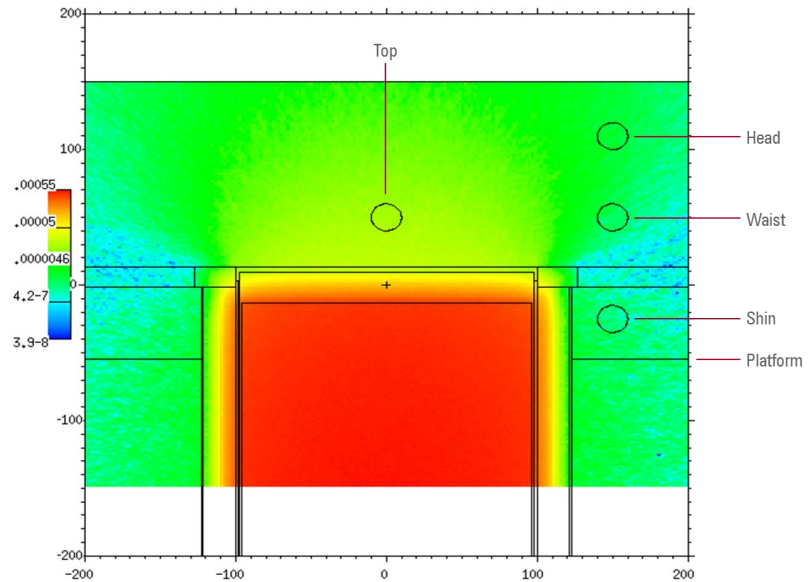
Monte Carlo N-Particle Simulation



Monte Carlo N-Particle (MCNP) is a software package used for simulating nuclear processes. Lines of code are entered into the program with information on the source and environment. The program can be used to determine shielding effectiveness, calculate dose, and visually depict dose fields. NPO utilizes MCNP to evaluate shielding materials and placement, supplement experimental shielding data, and engineer effect shielding solutions. The example below depicts a spent fuel canister and transfer cask with a typical spent fuel neutron emission profile. The

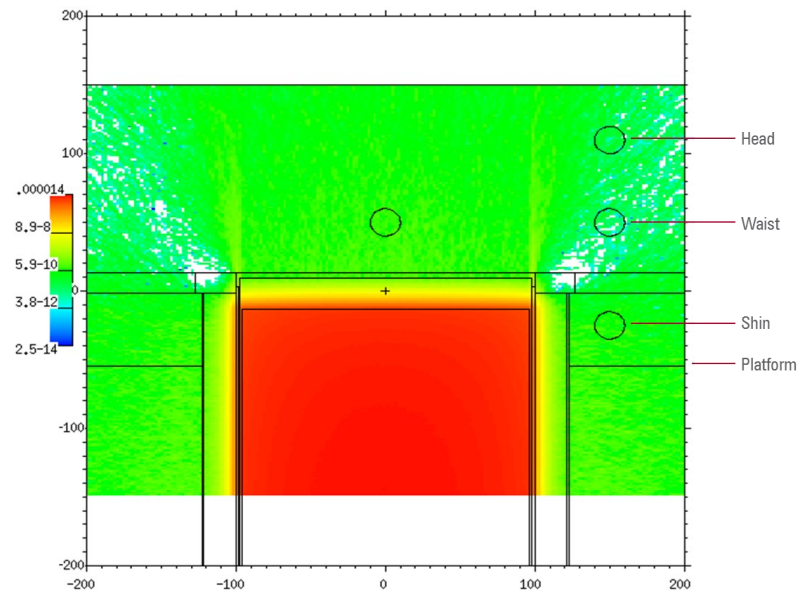
Neutron Dose - mRem/hr

	Unshielded	w/ Shield Bell/Floor	w/ Shield Bell/Floor + Lid
Shin	280	53	50
Waist	392	230	17
Head	566	484	29
Top	3533	3533	221



Gamma Dose - mRem/hr
(Includes gamma emitters and gamma produced from neutron - gamma reactions)

	Unshielded	w/ Shield Bell/Floor	w/ Shield Bell/Floor + Lid
Shin	700	222	222
Waist	55	31	21
Head	89	69	24
Top	578	578	193

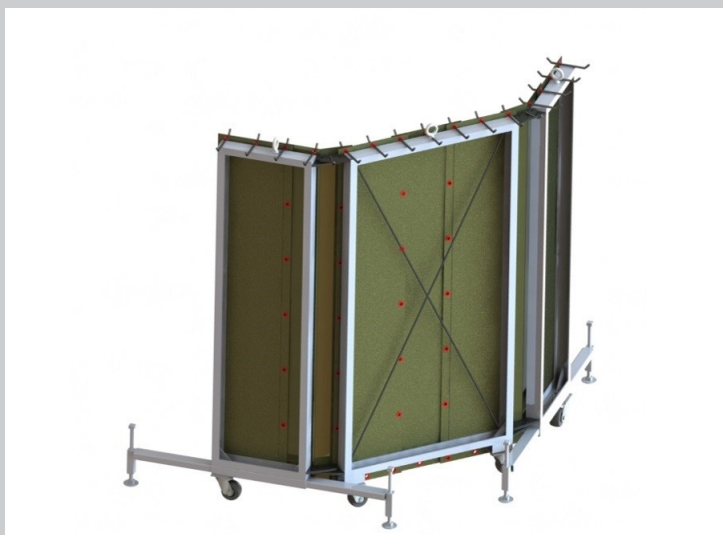
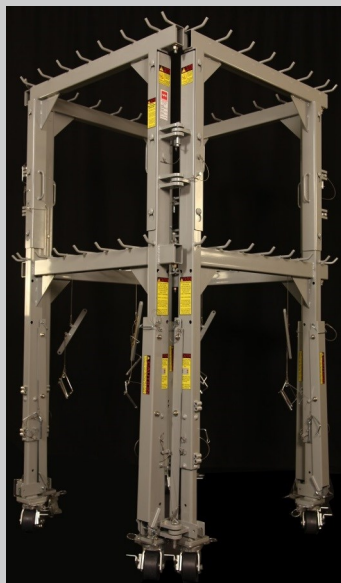


Dry Cask Operations

Shield Walls

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serpentine rack

NPO's serpentine system is designed to provide virtually any shielding wall configuration, including low dose waiting areas, portable frisking caves, shadow shield walls, and shields for rad materials transfers.

This sturdy and adjustable system was designed to replace scaffolding, currently used to hang lead blankets. By placing the installation process in the hands of the RP department, setup time and potentially critical path time is saved.

NPO serpentine racks are compatible with 10#/sq. ft. and 15#/sq. ft. blankets, up to six layers and totaling 3,060 pounds per three-foot wide section.

H-frame rack

H-Frame racks can be assembled as a single- or double-tiered support rack, including telescoping options. These racks are constructed to hold three layers of blankets—3', 4' and 6' per side. Staggered leg heights permit "L-shaped" shield walls. All legs include provisions for outriggers (optional).

flyable rack

The flyable rack can be loaded with blankets in a low dose area and moved into place with a crane. Perfect for low dose waiting areas in hard to access places. Folds neatly for storage when not in use.

Dry Cask Operations

Contact Us

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As a 35+ year veteran company to the shielding industry, employees at NPO attribute a great deal of our success to the partnerships established with our customers. At NPO, we work synergistically with our customers, adapting product designs that conform to their specifications. In fact, over the last three years alone, NPO has customized 199 new product parts to meet the unique ALARA challenges our customers have faced. We would like to extend this partnership to your team as well. Please contact us today to discuss how NPO can support you.

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