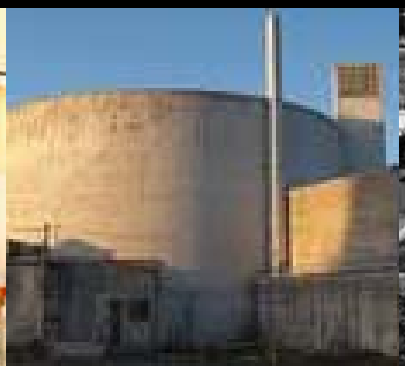
Specialized Packaging to Meet Operational and Cleanup Objectives

Bruce Cohen, Associated Container Sales and Fabrication

Presentation Topics

- Disposal of Argonne CP-5 Lower Inner Shield Plug
- Oversized IP-2 Side & End Loading Container
- Intermodal Containers




History of the Argonne CP-5 Reactor

The CP-5 reactor was considered Argonne's principle nuclear reactor used for scientific research from 1954 through its shutdown in 1979. CP-5 was used for neuron beam, neutron flux, gamma ray and biological studies as well as serving as a training facility.

Initiating research work in 1954, Chicago Pile – 5 , or CP-5, was the last of the historic Chicago Pile reactors. Starting with CP-1, built by Enrico Fermi, in 1942 located beneath Stagg Field at the University of Chicago, the CP series left a legacy of groundbreaking nuclear research.

Originally designed to operate at a capacity of 1 MW, the capacity was upgraded to 5 MW in 1959. During its 25 years of operation, CP-5 attracted hundreds of scientists from industry, universities and government laboratories from all over the world.

History of the Argonne CP-5 Reactor

In 1980 all of the nuclear fuel and heavy water was removed from CP-5 and shipped to the DOE Savannah River Plant in Georgia. Decontamination and Decommissioning (D&D) of CP-5 commenced in 1991 and was completed in June 2000. The D&D activities included disassembly and removal of all of the radioactive components, equipment and systems.

Over the eight years of D&D, the majority of this waste was packaged and shipped offsite for treatment and/or disposal. One of the last remaining items associated with the CP-5 reactor consisted of the Lower Inner Shield Plug.

History of the Argonne CP-5 Reactor

The Lower Inner Shield Plug was used as a radiation shield resting atop the reactor vessel. The Plug sealed the reactor and also provided reactor access through vertical penetrations through the Plug. The Plug weighed nearly 28,000 lbs. At the time of removal in 1997, total Plug activity was 122 curies with an contact dose rate of 300 R/hr.

The Plug was removed from the reactor using a remote controlled 20-ton polar crane and placed in a NuPac 7-100 cask. The shielded cask reduced the contact dose rate to less than 200 mR/hr. The cask was loaded to an on-site transport vehicle where it was transferred to an on-site storage location where it remained for nearly 13 years.

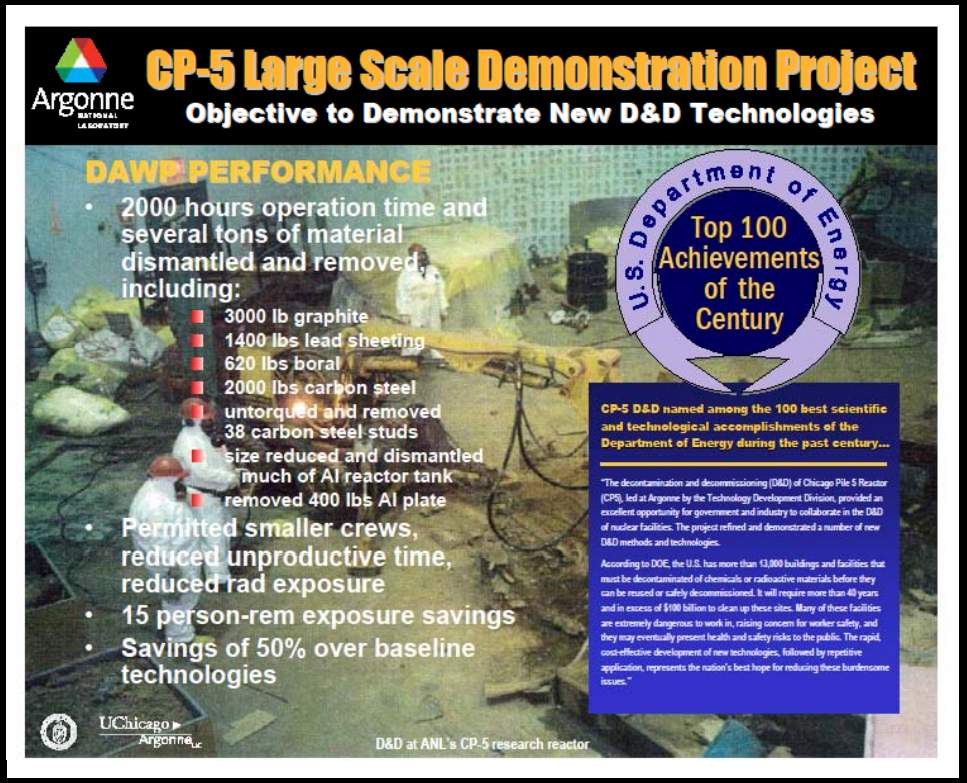
Waste Description

72 inches diameter by 30 inches high

Net waste weight 27,700 lbs
- 4,000 lbs lead
- 1,500 lbs steel
- 22,200 lbs high density concrete

Total 1997 activity: 122 Curies
- Co-60: 54 Curies
- Ni-63: 63 Curies
- Fe-55: 5 Curies

EPA Characteristic Waste Code D008



Type B shipping cask required, RCRA treatment (macroencapsulation) required: no means to ship, no treatment/disposition site available.

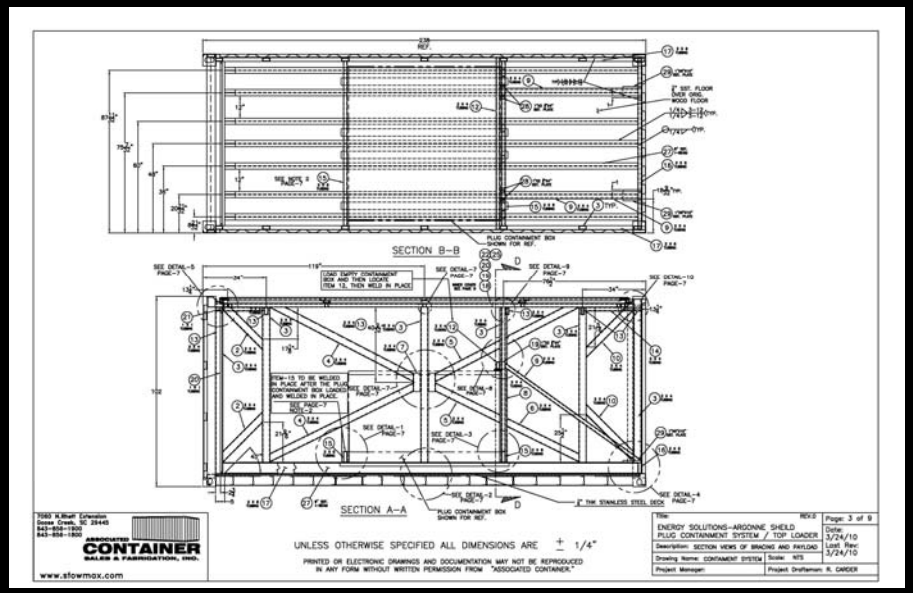
Package Design and Fabrication

- EnergySolutions contracted Associated Container Sales and Fabrication, located in Charleston, South Carolina, to design and build an IP-2 certified shipping container for the shield plug.

- Associated Container also contracted to build Shielded Inner container. Shielding specifications based on dose modeling.

Package Design and Fabrication

The outer container and closure devices are the standard used throughout the shipping container industry. This 20’ standard height ISO shipping container modified by Associated Container Sales and Fabrication meets the IP-2 design requirements of 49CFR, 173.411 and 173.465 after the addition of ¼” thick steel plate to the interior of the walls, and floor. The container is reinforced by 2” x 4” and 2” x 6” structural steel tube and after the inner Shield Plug containment box is loaded and secured in place, ¼” thick inner lid and door plates are seam welded to provide a completely air tight enclosure. There are seven I-beams welded to the floor to provide for loading the inner containment box through the door-end with a fork truck.



Package Design and Fabrication

The inner Shield Plug containment box is a weldment consisting of layers of 1” thick steel plate. Two plates compose the 4 side walls and lid while seven plates make up the bottom. Once loaded with the radioactive payload this inner box must remain within the ISO container in the event of a drop. These impact forces are resisted by the steel tube framing which securely cradles the box. The inner box is welded in place to this framework as well as to the I-beams on the floor. All fabrication welds and post-loading welds were thoroughly examined by an ACSF certified weld inspector. All calculations supporting the IP-2 recertification were performed by Mesa Associates in Oak Ridge, TN.

Package Specifications

Inner Box	Outer Container
Length: 91”	Length: 20’
Width: 83"	Width: 8’
Height: 49"	Height: 8’6”

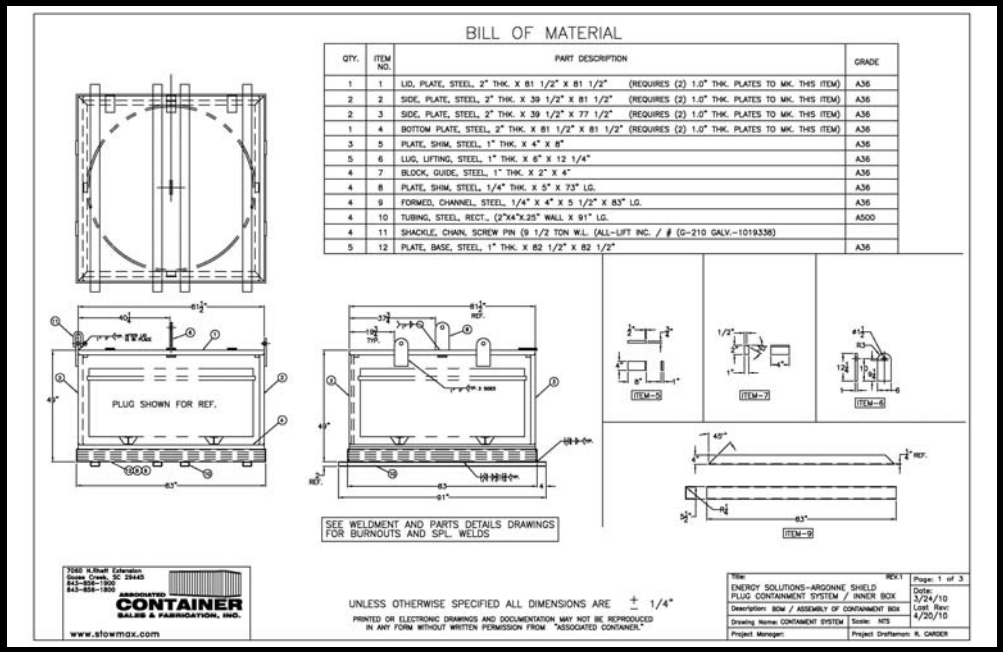
Tare Weight (total):	44,980 lbs.
Payload Capacity:	28,845 lbs.
Max. Gross Weight:	73,825 lbs.
Cubic Capacity:	1,173 cu. Ft.

Package Design and Fabrication

Inner Shield Container

Tare weight: 25,540 lbs
Lid weight: 1,830 lbs

Shielding: 2” plate steel top
and sides
9” base weldment



BILL OF MATERIAL

QTY.	ITEM NO.	PART DESCRIPTION	GRADE
1	1	LID, PLATE, STEEL, 2" THK. X 81 1/2" X 81 1/2" (REQUIRES (2) 1.0" THK. PLATES TO MK. THIS ITEM)	A36
2	2	SIDE, PLATE, STEEL, 2" THK. X 39 1/2" X 81 1/2" (REQUIRES (2) 1.0" THK. PLATES TO MK. THIS ITEM)	A36
2	3	SIDE, PLATE, STEEL, 2" THK. X 39 1/2" X 77 1/2" (REQUIRES (2) 1.0" THK. PLATES TO MK. THIS ITEM)	A36
1	4	BOTTOM PLATE, STEEL, 2" THK. X 81 1/2" X 81 1/2" (REQUIRES (2) 1.0" THK. PLATES TO MK. THIS ITEM)	A36
3	5	PLATE, SHIM, STEEL, 1" THK. X 4" X 8"	A36
5	6	LUG, LIFTING, STEEL, 1" THK. X 6" X 12 1/4"	A36
4	7	BLOCK, GUIDE, STEEL, 1" THK. X 2" X 4"	A36
4	8	PLATE, SHIM, STEEL, 1/4" THK. X 5" X 73" LG.	A36
4	9	FORMED, CHANNEL, STEEL, 1/4" X 4" X 5 1/2" X 83" LG.	A36
4	10	TUBING, STEEL, RECT., (2"X4"X.25" WALL X 91" LG.	A500
4	11	SHACKLE, CHAIN, SCREW PIN (9 1/2 TON W.L. (ALL-LIFT INC. / # (G-210 GALV.-1019338)	
5	12	PLATE, BASE, STEEL, 1" THK. X 82 1/2" X 82 1/2"	A36

PLUG SHOWN FOR REF.

SEE WELDMENT AND PARTS DETAILS DRAWINGS FOR BURNOUTS AND SPL. WELDS

ITEM-6 ITEM-7 ITEM-8 ITEM-9

ASSOCIATED CONTAINER SALES & FABRICATION, INC.
www.stowmax.com

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE ± 1/4"

PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM "ASSOCIATED CONTAINER."

ENERGY SOLUTIONS–ARGONNE SHIELD PLUG CONTAINMENT SYSTEM / INNER BOX

Description: BOM / ASSEMBLY OF CONTAINMENT BOX

Drawing Name: CONTAINMENT SYSTEM Scale: NTS

Project Manager: Project Draftsman: R. CARDER

Page: 1 of 3

Date: 3/24/10

Last Rev: 4/20/10

Plug to be lifted and craned into container. Designed to allow lead blankets in annular between plug and shield walls if required. Lid welded in place.

Loading and Transport

ANL conducted a preliminary examination of plug lifting eyes and evaluated general physical and radiological condition of plug. The lifting eyes showed slight rusting, and were removed for further examination and to permit inspection of the threaded holes. It was decided that the threaded holes were in good condition, and new lifting eyes would be procured in order to assure the largest margin of safety for the removal of the Shield Plug.

It was decided not to move the 7-100 cask containing the Shield Plug, so the repackaging effort was laid out around the existing location of the cask. Due to the weight of the components involved, particularly the lifting of the loaded sealand onto the shipping trailer, and the distances involved in transferring the loads, a 155 ton mobile crane was specified, in consultation with a local crane company.

Loading and Transport

The work area surrounding the 7-100 cask was cleared, the mobile crane brought onto the site, set up and inspected, and the packaging components delivered and placed into position. Removing the Shield Plug from the 7-100 cask, transferring it to the inner container, and placing the lid onto the container were accomplished without difficulty. Remote readings of the contact dose rate on the bottom of the shied plug as it was being removed from the cask confirmed the high levels expected; maintaining safe distance from the plug while it was exposed, per the Argonne Radiation Work Permit written for this job, kept personnel exposure within site guidelines. Dose rate readings at the lower sides of the inner container were lowered by inserting lead blankets between the Shield Plug and the walls of the container; in addition, sand was placed in the space between the Shield Plug and the container walls per the WCD in order to stabilize the plug inside the container.

Loading and Transport

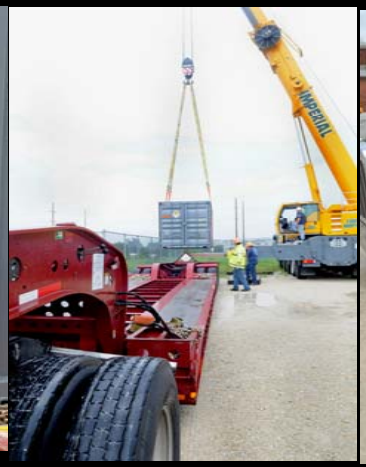
Finally, the top and door plates were installed and welded into place. The CWI was brought back to Argonne for the final inspection and certification of the IP-2 package. The sealand's standard top was reinstalled over the welded plate, the doors were shut, and the package marked and labeled. Although Argonne and Energy Solutions were ready to load and ship the completed package at this time, this step was delayed by a construction workers' strike in the Chicago area, which prevented our contracted crane operators from immediately loading the sealand. Following resolution of the strike, the IP-2 was loaded and left Argonne for Energy *Solutions* on August 3, 2010.

Treatment and Disposition

The conveyance arrived as a Quantity of Concern (QOC) shipment at the Energy*Solutions* Clive treatment and disposal facility on Friday August 7, 2010 and was received under the existing Argonne macroencapsulation profile. The offloaded package was placed in secure storage through the weekend while the in-cell macroencapsulation forms were prepared. On Monday August 10, 2010 the package was transferred to the mixed waste embankment and placed within the forms. Several penetrations were made in the roof of the IP-2 sealand; the inner container was not compromised and there were no dose issues encountered during treatment. The macroencapsulation grout mixture was introduced and allowed to fully flow through sealand, completely encapsulating the inner container. The grout was then allowed to flow through the annular space (>4") between the sealand and the forms until the entire package was encapsulated. Treatment was complete August 10, 2010.

Conclusion

The success of this project can be attributed to an excellent working relationship between Argonne staff, Energy*Solutions*, and Associated Container. Weekly status calls, site visits and frequent informal communication all led to fostering the trust necessary to complete this unique and challenging project.



TPMC IP-2 Side & End Load, 10x11x32

In early 2013 ACS&F was contracted to design and build two DOT compliant, side and end loading, IP-2 certified shipping containers for Los Alamos National Laboratory. The container dimensions were to be 23'L x 10'W x 12' H and include side and end loading capabilities.

Drawings and calculations were generated and verified to have sufficient structural capacity to resist the effects of stacking, payload, lifting and rigidity as outlined in ISO 1496-1 for a payload capacity of 100,000 lbs and resist a free drop of 1' as required in Section 173.465(c)(5) Table 10. The containers successfully shipped in March of 2013.

TPMC IP-2 Side & End Load Features

- 32’6”L x 10’W x11’H
- IP-2 with Supporting Engineering Calculation Package
- Side & End Loading Capabilities
- Payload up to 100,000 lbs
- ISO Locks on all 8 corners and fork pockets to allow for lifting by either Forklift or Crane
- Placard mounts on all 4 sides for DOT Transportation
- D-rings set in the internal vertical struts 3’ above the floor on side walls for strapping

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25.4 Intermodal

•Associated Container also contracted to build ACS&F was contracted by National Security Technologies & Fluor B&W to design and build a new high performance 25.4 cubic yard intermodal container. This container has been designed to meet the testing requirements of ISO 1496-1, the American Bureau of Shipping, and the International Convention for Safe Containers.

•The model, 254-7-ROSSD, is intended for rail usage and is built using 7GA material for the sides and ends and is adequate to carry a payload weight of 75,765 pounds. To date NST & Fluor have shipped over 1000 successful shipments.

25.4 Intermodal

25.4 Intermodal Special Features

- IP-1 with Supporting Engineering Calculation Package
- Side Swing Door
- Carbon Steel Lid
- Ratchet Binder Closure System
- Stackable with Lid in Place
- Customers Choice of Color
- Production Line Capability & Automation to Insure Predicted Quality & Delivery
- (2) Models Available:
  - Standard
  - Heavy Duty

FEATURES

- 7 GA Side Walls & Lid
- Tare Wt: 9,085 lbs
- Payload: 75,760 lbs
- Gross Wt: 84,845 lbs
- Stack Wt: 423,280 lbs
- Stronger Side Walls & Lid help prevent punctures from bulk loading

Swing Away Heavy Duty Sealing Door

Easy Lock Loading

Perimeter 5” channel with complete sealing gasket system for multi removal & reseal along with guide tabs for lid loading ease

Unobstructed interior

Reinforced Fork Pockets

Full seal for door

Largest opening of any intermodal available along with a heavy duty bar hinge

Extra cross members for added strength

Heavy Duty Ratchet Binders

Ratchet security latch to prevent binder from falling off

Retractable wheels on both ends of container

Interior design enables loaded bags & other debris to slide out unobstructed reducing the possibility of snag damage

Multi coat premium paint interior & exterior for years of reliability

Bruce Cohen 843-856-1900 x222

bruce@stowmax.com

Specialized Packaging to Meet Operational and Cleanup Objectives

Bruce A. Cohen, President/ CEO

Associated Fabrication & Container Sales Inc., Goose Creek, SC 29445

Introduction

In providing responsive and effective support related to current needs, the DOE has challenged all personnel to accelerate its environmental management, closure, and clean up goals as a means to reduce expenses. Radioactive waste is being generated through operations, support, and closure activities at increasing rates stemming from accelerated cleanup goals.

In support of the accelerated cleanup challenge, personnel at Associated Container Sales & Fabrication (ACS&F) have been tasked with designing and fabricating cost effective waste containers that can be used to package a voluminous amount of radioactive waste in order to meet DOE milestones.

Disposal of Argonne CP-5 Lower Inner Shield Plug

ACS&F was tasked to design and build an IP-2 certified shipping container for the historic Argonne CP-5 shield plug.

The outer container and closure devices are the standard used throughout the shipping container industry. This 20' standard height ISO shipping container modified by Associated Container Sales and Fabrication meets the IP-2 design requirements of 49CFR, 173.411 and 173.465 after the addition of ¼" thick steel plate to the interior of the walls, and floor. The container is reinforced by 2" x 4" and 2" x 6" structural steel tube and after the inner Shield Plug containment box is loaded and secured in place, ¼" thick inner lid and door plates are seam welded to provide a completely air tight enclosure. There are seven I-beams welded to the floor to provide for loading the inner containment box through the door-end with a fork truck.

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Oversized IP-2 Side Load

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Intermodal Containers

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This model is equipped with a side swing door. The lid is a heavy gauge steel, reinforced structure, with the capacity of removing it for loading and resealing each and every time to avoid water leaks. The lid is closed with ratchet binders and has no moving parts, which avoids the necessity to purchase costly damaged replacement parts. Unlike others, when the lid is removed for loading there is a two foot longer opening, enabling the unit to be loaded faster. The lid can be removed with a standard forklift with a fork spread similar to the pockets on the container.

The model, 254-7-ROSSD, is intended for rail usage and is built using 7GA material for the sides and ends and is adequate to carry a payload weight of 75,765 pounds. To date NST & Fluor have shipped over 1000 successful shipments.