UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

71-9295

Decemvber 14, 1999

MEMORANDUM TO: Susan F. Shankman, Deputy Director
Licensing and Inspection Directorate
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

FROM: Michael D. Waters, Project Engineer MDW
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SUMMARY OF MEETING WITH PACKAGING TECHNOLOGY, INC., REGARDING THE MIXED OXIDE (MOX) FRESH FUEL PACKAGE (TAC NO. L23014)

On December 7, 1999, the Nuclear Regulatory Commission (NRC) staff met with representatives of Packaging Technology, Inc., (PacTec), at NRC Headquarters in Rockville, Maryland. The purpose of the meeting was to discuss licensing plans and preliminary design information for the MOX fresh fuel package. This meeting was noticed on November 23, 1999, and the staff made no regulatory decisions during the meeting. Persons that attended the meeting are listed in Attachment 1 and the presentation notes provided by PacTec are included as Attachment 2.

The staff opened the meeting with a discussion of the Spent Fuel Project Office organization. PacTec then discussed the intended use of the package by the Department of Energy (DOE). DOE plans to convert excess Defense Department plutonium into MOX fuel as part of their fissile disposition program. The MOX fresh fuel package will be used to transport the fuel within Safe Secure Transport Vehicles from a fabrication facility to "mission" commercial nuclear power plants. DOE awarded a contract to a consortium of Duke, Cogema, and Stone and Webster to design, license, and build a MOX fuel fabrication facility, MOX PWR fuel assemblies, and MOX fresh fuel transportation packages. PacTec has been subcontracted by Cogema to design the MOX fresh fuel package.

PacTec then presented the preliminary design of the package. The design consists of a cylindrical, stainless-steel containment shell that can transport three MOX fresh fuel assemblies. The MOX fuel will be similar to the Westinghouse 17x17 fuel design and will have a maximum plutonium enrichment of approximately 6.0 weight percent. The fuel is positioned in a triangular pitch and supported by a strongback (with attached neutron poisons) and support discs within the package. The package is leaktight and is sealed with a bolted closure lid. Impact limiters will also be installed on the ends of the package. PacTec stated that they plan to perform full-scale prototype testing in conjunction with analyses as part of their certification approach. The staff asked several questions regarding technical aspects of the package, including the availability of criticality benchmark data to validate criticality analyses and the

NTO3

ability of the package to survive puncture tests at oblique angles. PacTec indicated they would consider issues raised by the staff during further development of the package design.

Staff and PacTec discussed the potential licensing schedule of the package. PacTec indicated that they plan to begin prototype testing in about a year and submit an application approximately a year after. PacTec also stated that additional meetings with the staff prior to their license application would be beneficial.

Docket No.: 71-9295

Attachments: 1. Attendance List
2. Packaging Technology Meeting Notes

Distribution: (TAC No. L23014) *w/Att. 1 only

NRC File Center	PUBLIC	*NMSS R/F	*SFPO R/F	*NRC Attendees
EWBrach	EEaston	PEng	SGagner, OPA	APersinko, FCSS

OFC	SFPO	E	SFPO	E	SFPO	E*		
NAME	MWaters:mw MW		EZiegler EZ		CRChappell			
DATE	12 / 14 / 99		12 / 14 / 99		12 / 14 / 99			

C = COVER E = COVER & ENCLOSURE N = NO COPY

OFFICIAL RECORD COPY G:\PackTech\meet-sum01.wpd

ATTENDANCE LIST

Meeting with Packaging Technology regarding the MOX fresh fuel package

- December 7, 1999 -

Name	Organization
Wayne Hodges	NRC/NMSS/SFPO
Ross Chappell	NRC/NMSS/SFPO
Eric Leeds	NRC/NMSS/SFPO
Nancy Osgood	NRC/NMSS/SFPO
David Tang	NRC/NMSS/SFPO
Joe Kovacic	NRC/NMSS/SFPO
Sheena Whaley	NRC/NMSS/SFPO
Michael Waters	NRC/NMSS/SFPO
Gary Clark	Packaging Technology
Phil Nos	Packaging Technology
J. Greg Field	Packaging Technology
Joe Nichols	Packaging Technology
Skip Copp	Duke
Scott Ludwig	ORNL
Patrick Rhoads	DOE
Sidney Crawford	Public

Attachment 1

Presentation to the NRC

MOX Fresh Fuel Package Concept Design and Certification

December 7, 1999

PacTec
Packaging Technology, Inc.
A TRANSNUCLEAR, INC. Company

file: NRC_mox1.doc

Meeting Agenda

- Introductions
- Purpose
- Background
- Proposed Contents
- Packaging Concept
- Packaging Description
- Tiedown and Lifting
- Planned Certification Approach
- Preliminary Certification Test Plan

Purpose

- Begin dialogue with NRC Transportation Section
- Discuss New mixed oxide (MOX) fresh fuel transportation package (MFFP) concept
- Obtain NRC views on design concept and licensing approach

Background

- Excess plutonium (PU) from Defense Department to be processed into MOX fuel
- Consortium of Duke, Cogema, & Stone & Webster (DCS) awarded contract by DOE-MD (Materials Disposition) to design, license and build:
  - MOX Fuel Fabrication Facility (MFFF)
  - MOX PWR fuel assemblies
  - Transportation packages
- Fuel Fabrication Facility and Transportation Package to be NRC-licensed
- Fuel to be transported between MFFF and Mission Reactors by DOE using Safe Secure Transport (SST) Vehicles

Proposed Contents

- MOX PWR, 17 × 17 Type, Fuel Assemblies
  - Maximum Total Pu enrichment: 6.0 weight percent (approximate)
  - Maximum assembly weight: 1,500 pounds (approximate)
- Physical configuration and cladding similar to commercial PWR fuel
- MOX Fuel Material does not require specific radiation shielding

Packaging Concept

General Configuration:

- Type B(U)F-85 packaging
- Separate inner containment not required per 10 CFR §71.63(b)(1)
- Cylindrical containment shell with conventional, polyurethane foam filled impact limiters at each end

Containment Boundary:

- Cylindrical, stainless steel shell, reinforced flat ends, and a bolted closure lid at one end
- Leaktight containment boundary (shell, closure lid, and seal)

Strongback:

- Symmetric, triangular arrangement of assemblies
- Fuel supported by strongback and support discs within shell
- Neutron poison securely located on strongback

Overall Envelope Parameters (Approx.)

- Length: 170 inches (w/o impact limiters)
- Containment Shell Outer Diameter: 29¼ inches
- Impact Limiter Outer Diameter: 56 inches
- Package Gross Weight: 12,000 pounds
- Weight of Internals (strongback, support discs, payload): 6,000 pounds

Strongback Assembly

- Purpose of strongback is to support fuel assemblies for operations and for criticality control
- Relatively low reactivity, triad design
- Strongback securely locates fuel assemblies and neutron poison for all transportation conditions
- Strongback forms backbone to which support discs are attached
- Structural analysis of strongback neglects strength of fuel assemblies

Package Structural Details

Containment Design Criteria:

- ASME B&PVC, Section III, Division 1, Subsection NB
- Service Level A for NCT and Service Level D for HAC

Containment Shell:

- 5/8-inch thick, XM-19 stainless steel
- Full penetration containment boundary welds, radiographic inspected

End Structures:

- Lightweight, reinforced flat ends
- Designed for end drop impact without aid from impact limiter backpressure

Package Structural Details (cont.)

Closure Lid:

- Sealed by three, bore-type O-ring elastomer seals
- Attached by approx. (20), 3/4-inch bolts
- Lid contains vent and test port penetrations

Impact Limiters:

- White painted, thin section carbon steel shells
- Filled with polyurethane foam of approx. density 12 lbs/ft^3
- Attached by long, necked bolts for energy absorption
- Conical outer shape reduces attachment loads
- Protects containment seals in HAC thermal event

Strongback Structural Details

Strongback Design Criteria:

- ASME B&PVC, Section III, Division 1, Subsection NG
- Service Level A for NCT and Service Level D for HAC

Strongback:

- 1/4-inch thick stainless steel welded plate
- Strongback slides in & out on low friction polymer pads

Support Discs:

- 1/4-inch thick stainless steel, sandwich construction, bolted to strongback at each grid strap location and at each end
- Three segments at each location
- Fuel clamping mechanisms within each support disc

Strongback Structural Details (cont.)

Neutron Poison:

- Borated material is mechanically retained using clips, straps, buttons, etc, of structural material
- Optionally located on the outside or the inside of central strongback section

Tiedown and Lifting

Tiedown:

- Package rests in cradles that are shock mounted to a shipping skid
- Package secured to cradles using over-the-top flexible tiedowns
- No tiedown devices are a structural part of the package

Lifting:

- Package normally remains secured to shipping cradles during handling
- Underbody slings used if lifted separately
- No lifting devices are a part of the package

Planned Certification Approach

- Application for a Type B(U)F-85 transportation package designed to transport fresh MOX fuel assemblies
- Certification by analysis, with confirmatory testing
- Use of full-scale test article(s), including simulated fuel assemblies

Planned Certification Approach (cont.)

Normal Conditions of Transport (NCT):

- All NCT by analysis, following Reg. Guides 7.6 and 7.8, including thermal

Hypothetical Accident Conditions (HAC):

- All HAC by analysis, following Reg Guides 7.6 and 7.8, including thermal, except puncture by test
- Side drop buckling approach uses Plastic Collapse Load (Appendix F-1341.3→ F-1321.6→ Appendix II-1430) with confirmatory testing (Reg Guide 7.6 Section C.5)

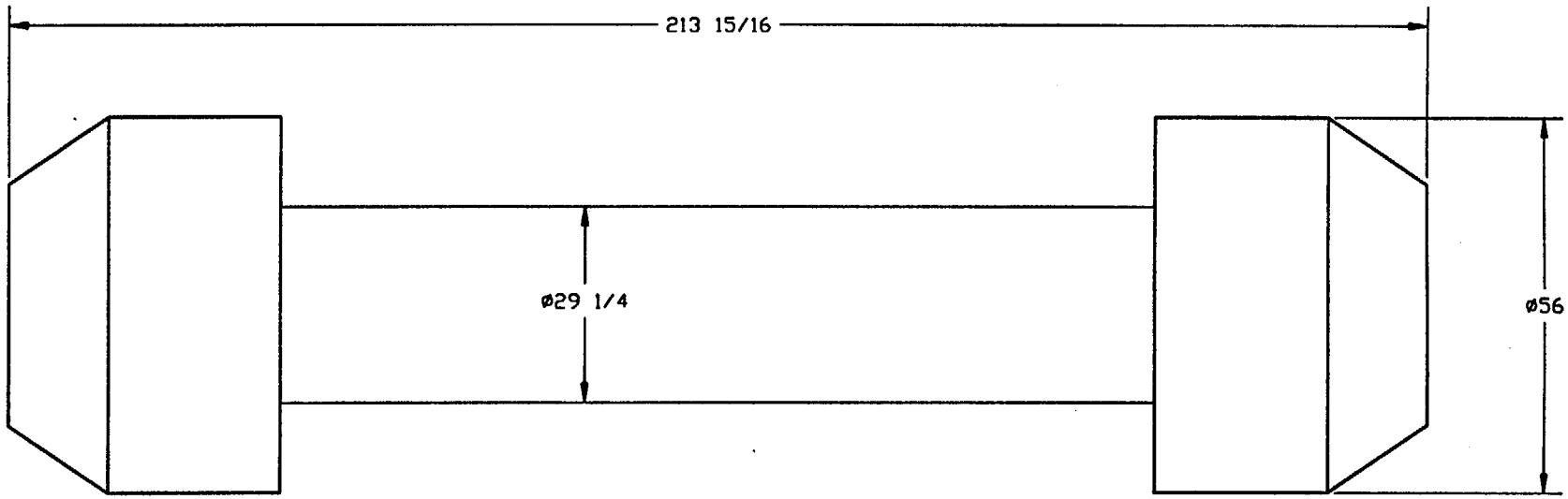
Preliminary Certification Test Plan

30 ft Free Drop:

- Side drop (worst case azimuth relative to strongback)
- Worst case slapdown drop
- End drop

Puncture Drop:

- Through package c.g. at center of package
- Through impact limiter aiming at seal area (several)
- Through impact limiter on closure lid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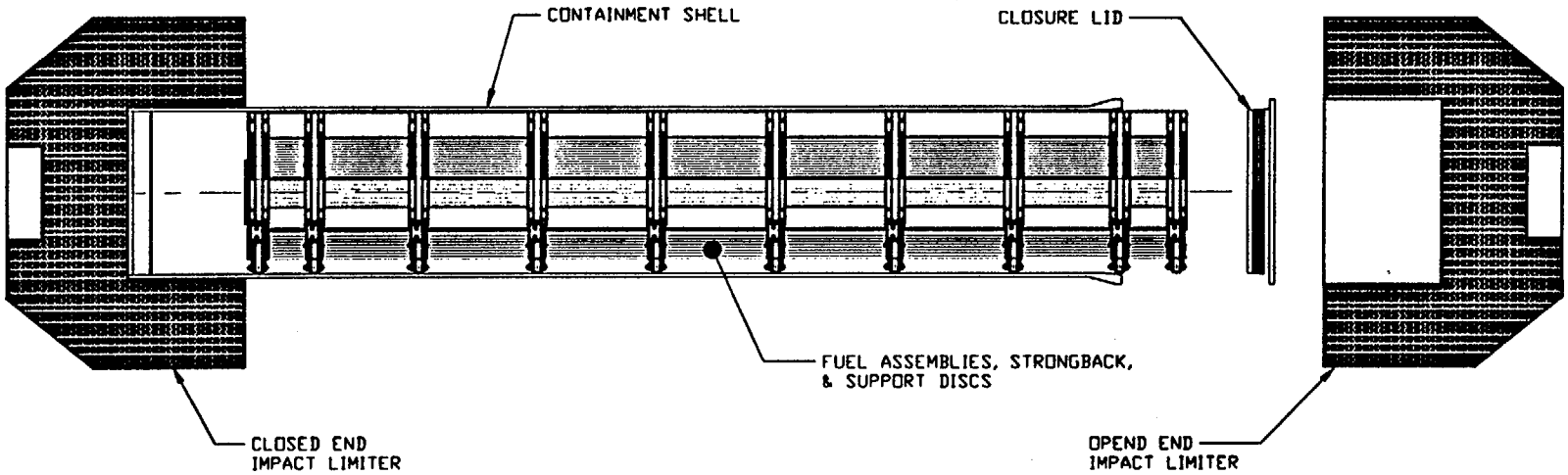
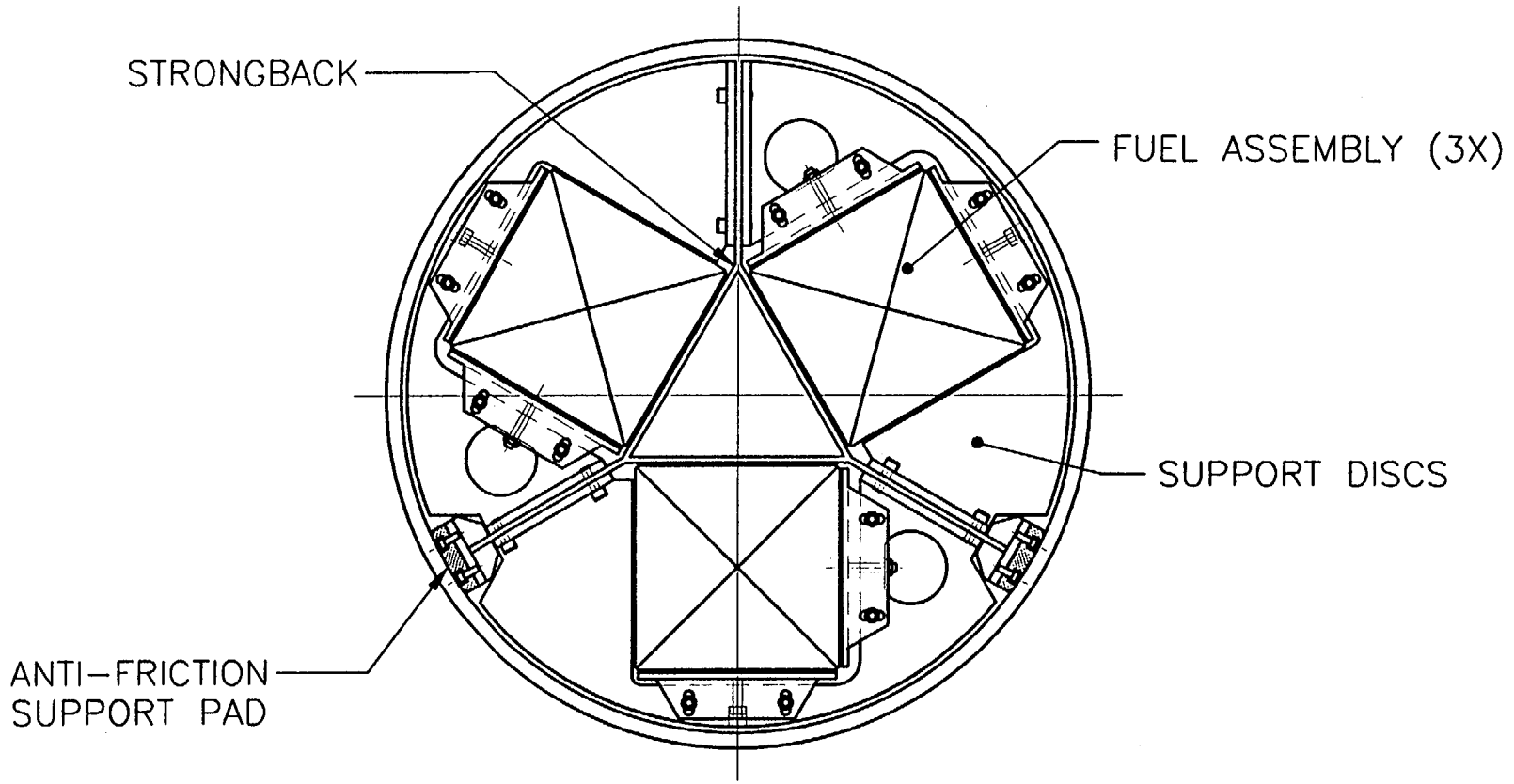
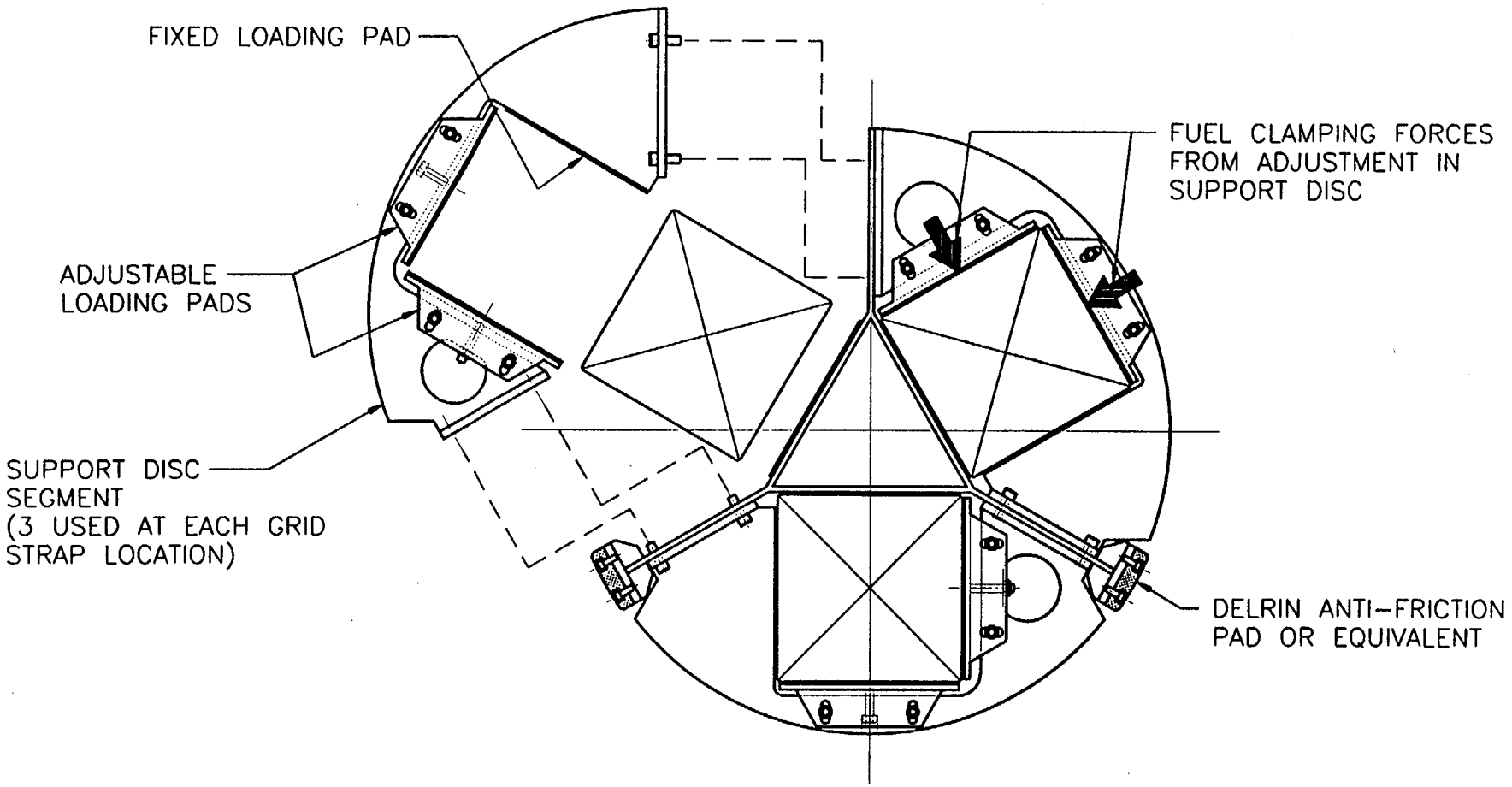
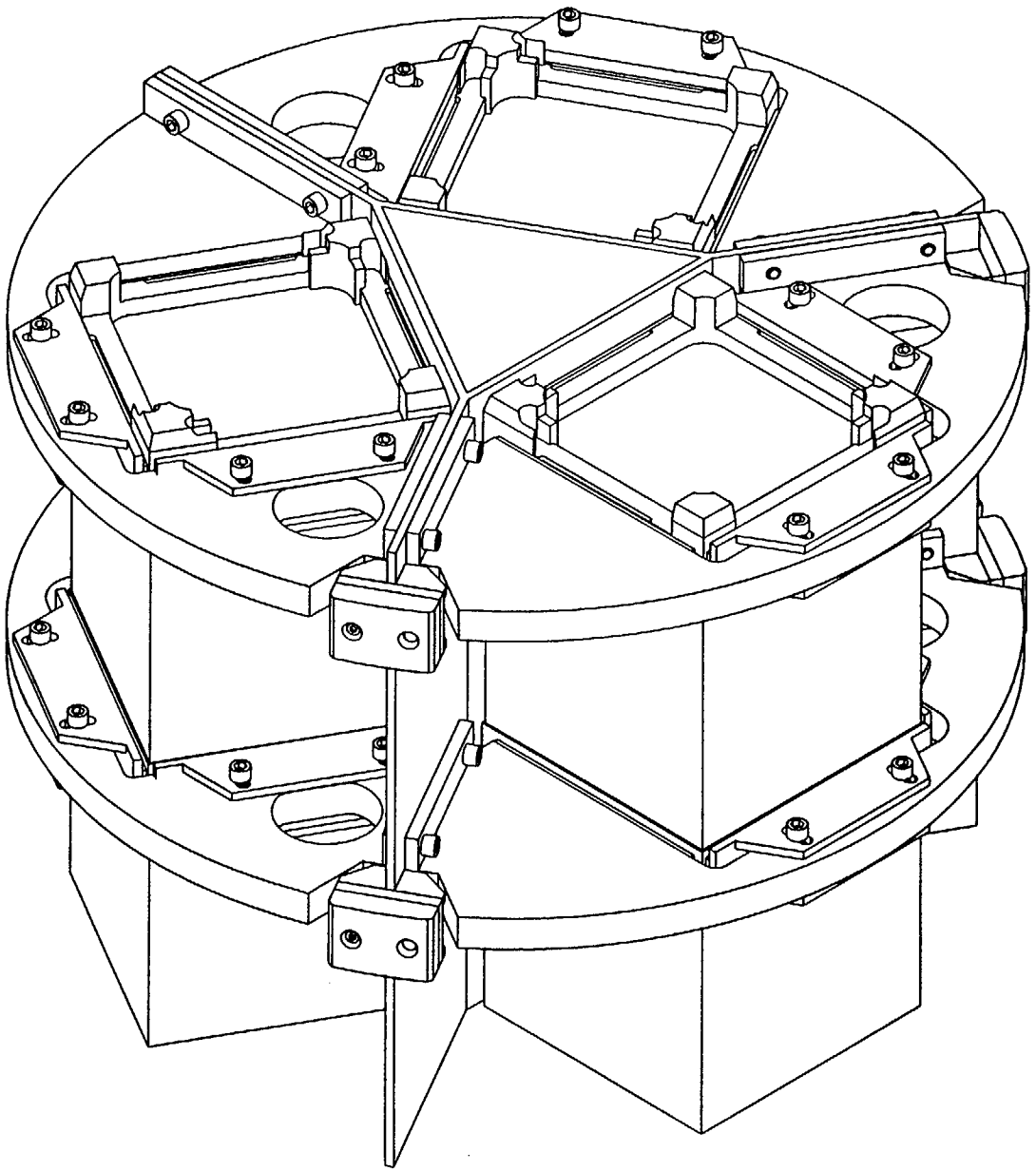
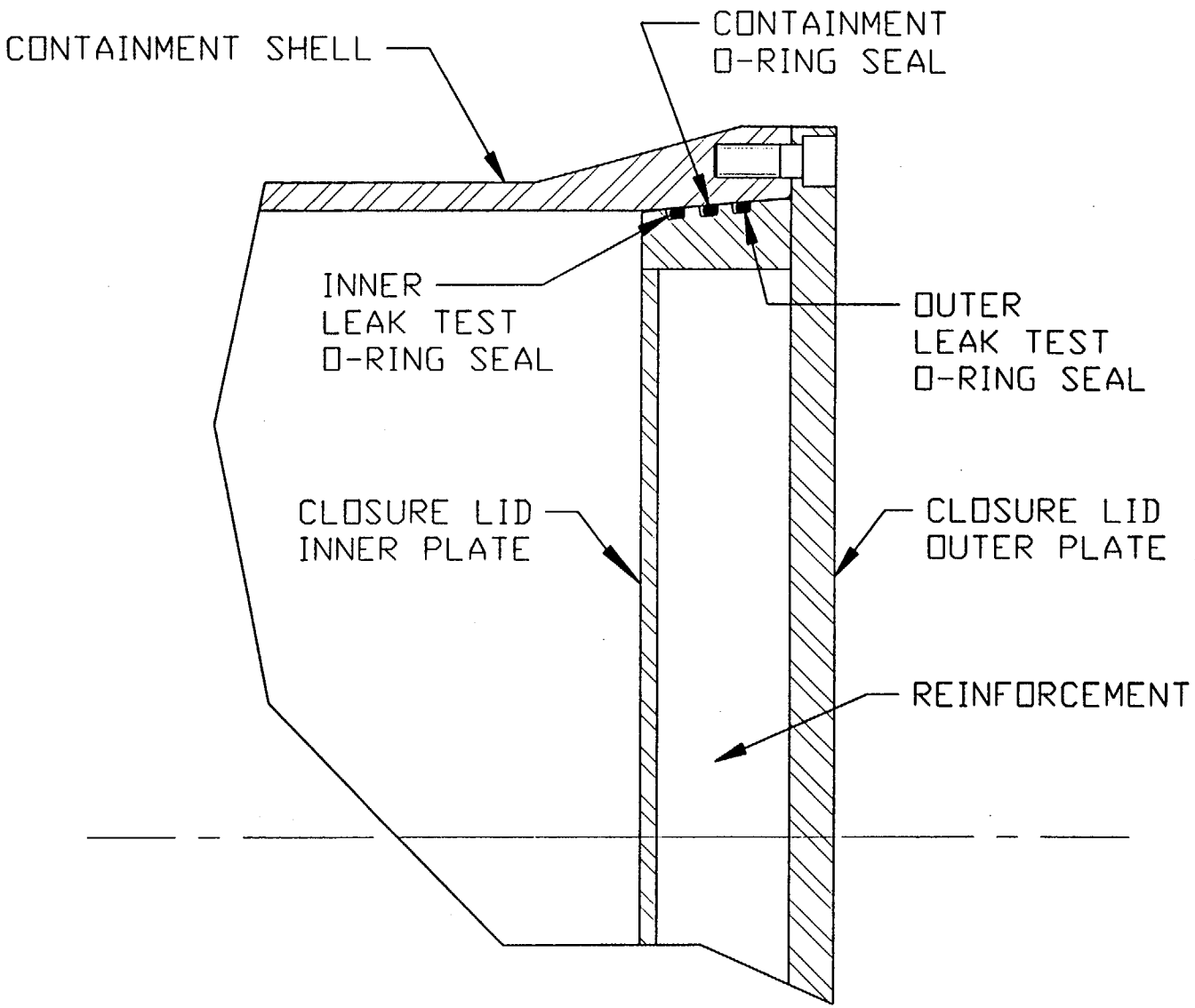
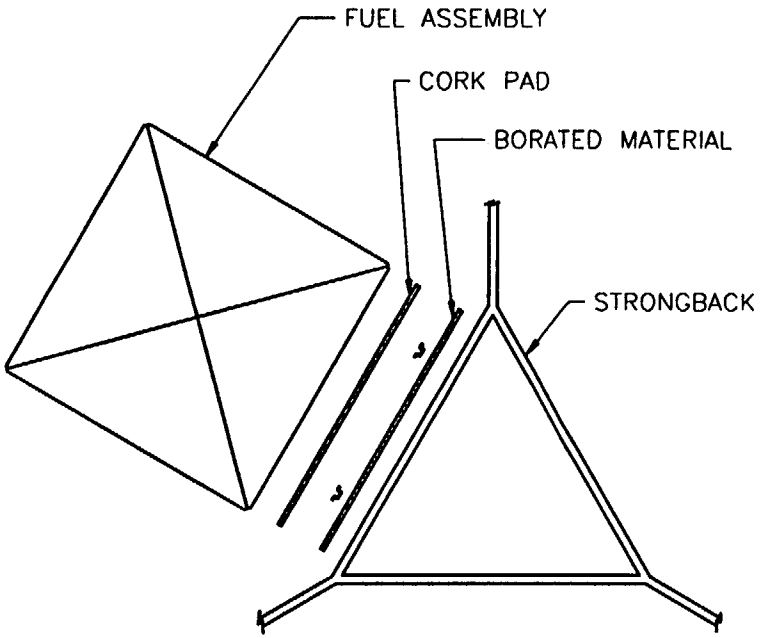

CONTAINMENT SHELL
CLOSURE LID
FUEL ASSEMBLIES, STRONGBACK,
& SUPPORT DISCS
CLOSED END
IMPACT LIMITER
OPEND END
IMPACT LIMITER


STRONGBACK
FUEL ASSEMBLY (3X)
SUPPORT DISCS
ANTI-FRICTION
SUPPORT PAD

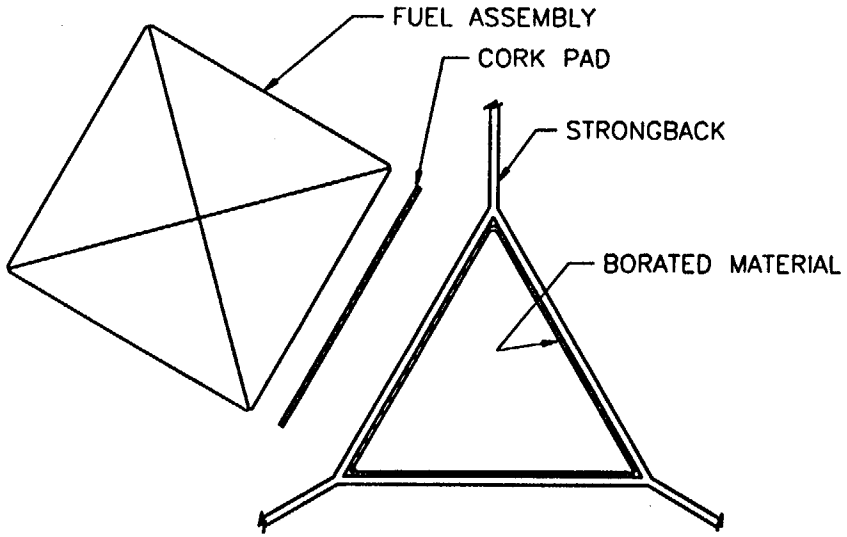

FIXED LOADING PAD
ADJUSTABLE LOADING PADS
SUPPORT DISC SEGMENT (3 USED AT EACH GRID STRAP LOCATION)
FUEL CLAMPING FORCES FROM ADJUSTMENT IN SUPPORT DISC
DELRIN ANTI-FRICTION PAD OR EQUIVALENT




CONTAINMENT SHELL
CONTAINMENT
O-RING SEAL
INNER
LEAK TEST
O-RING SEAL
OUTER
LEAK TEST
O-RING SEAL
CLOSURE LID
INNER PLATE
CLOSURE LID
OUTER PLATE
REINFORCEMENT



POISON OUTSIDE STRONGBACK



POISON INSIDE STRONGBACK