

SEP 23 1985

RETURN TO
A. Machlin
396-SS

MEMORANDUM FOR: The Files

FROM: Richard H. Odegaarden, FCTC, NMSS

SUBJECT: SUMMARY OF MEETING WITH BABCOCK & WILCOX COMPANY
CONCERNING MODEL NO. DHTF SHIPPING CONTAINER

Attendees

B&W

J. C. Del Signore
J. P. Matters
F. M. Alcorn

NRC

W. H. Lake
H. W. Lee
C. R. Marotta
R. H. Odegaarden

Introduction

A meeting was held at Silver Spring, Maryland, on September 19, 1985, to discuss a proposed application for a fuel pellet shipping container (Model No. DHTF).

Discussion

Babcock & Wilcox (B&W) proposes to obtain an NRC certificate of compliance for a new pellet shipping container. The package is basically a 9-1/2" x 9-1/2" x 17-1/4" high inner container centered within a DOT Specification 17C steel drum with industrial cane fiberboard filler. The gross weight is 480 pounds. The inner vessel is sealed with a gasketed, flanged closure. B&W has conducted a number of 4-foot and 30-foot drop and puncture tests on the package.

Water inleakage was assumed in the nuclear criticality analysis for the single package and array calculations. The fire test conducted by B&W showed the inner package gasket would be lost during the fire test.

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PDR TOPRP EMVBW
C PDR

OFFICE						
SURNAME						
DATE						

A question was raised concerning the shipment of powders within the packaging if the inner container seal is lost due to the fire test. B&W will consider the problem.

The drawing should specify the thickness of the drum materials of construction and the bolt closure type (i.e., dropped forged lugs with one lug threaded for 5/8-inch bolt and nut). The welds, welder qualifications, and inspection criteria should also be specified along with bolt closure torquing requirements.

Enclosed are the agenda and copies of the meeting view graphs.

Original Signed by

~~R. H. Odegarden~~
Richard H. Odegarden, Project Manager
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosures: As stated

Distribution: w/encls

FC Central File ✓

NRC PDR

CEMacDonald

GBeveridge

Mtg Attendees w/o encls

FCTC Mtg File Book

NMSS R/F

FCTC R/F

OFFICE ▶	FCTC	FCTC				
SURNAME ▶	RHOdegarden:alm	CEMacDonald				
DATE ▶	09/23/85	09/14/85				

PROPOSED AGENDA

B&W-NRC MEETING

THURSDAY, 19 SEPT. 85, 0900 HOURS

SILVER SPRINGS, MD.

LICENSING OF THE DHTF SHIPPING CONTAINER

1. NEED FOR AND INTENDED USE OF THE PACKAGE
2. PACKAGE DESCRIPTION AND EARLY DESIGN TESTS
3. GENERAL STANDARDS
4. NORMAL CONDITIONS TESTING & RESULTS
5. ACCIDENT CONDITIONS TESTING & RESULTS
6. CRITICALITY EVALUATIONS
7. QA PROGRAM
8. OPERATING PROCEDURES, ACCEPTANCE TESTS, AND MAINTENANCE PROGRAM
9. LICENSE APPLICATION

NEED FOR AND INTENDED
USE OF THE PACKAGE

1. NEED

- o CONSUMERS DOWNLOADING
- o 1973 IAEA STANDARDS

2. ROLES FOR THE DHTF

- o PELLETS TO FRANCE
- o BACKUP TO UNC-2901
- o OTHER POTENTIAL INTERNATIONAL CONTRACTS

3. USE OF THE DHTF

- o PRODUCT UO_2 PELLETS
- o SCRAP PELLETS AND POWDER
- o FISSILE CLASS II AND III
- o TRANSPORT INDEX OF 1.0

PACKAGE DESCRIPTION

1. MAJOR COMPONENTS

- o DOT 17C 55-GALLON DRUM (34"x22.5" I.D.)
- o 14 GAUGE SS INNER CONTAINER (9½"x9½"x17¼")
- o INDUSTRIAL CANE FIBERBOARD FILLER

2. OTHER FEATURES

- o TARE WEIGHT OF 220 LBS.
- o GROSS WEIGHT OF 480 LBS.
- o PAYLOAD OF 100 KGSU

3. BENEFITS

- o COST
- o RUBBER GASKET
- o VERTICAL LOADING AND UNLOADING
- o BOLTS
- o STRENGTH

EARLY DESIGN TESTS

A. BW-170 INSULATION

- o HEAVY (40 LBS/FT³)
- o EXPENSIVE
- o NO STRUCTURAL STRENGTH
- o FAILED

B. PHENOLIC FOAM

- o LIGHT (9 LBS/FT³)
- o PASSED
- o NO LONGER MANUFACTURED
- o LONG LEAD TIMES

C. BW-225 INSULATING BOARD

- o 1" DISKS WITH KAOWOOL INTERSPERSED
- o EXPENSIVE
- o LITTLE STRUCTURAL STRENGTH
- o SURVIVED 30 FT DROP
- o FAILED A SECOND 30-FOOT DROP

D. FIBERBOARD

- o 24 LBS/FT³
- o STRUCTURAL STRENGTH
- o INSULATION
- o SURVIVED FOUR 30-FT DROPS

GENERAL PACKAGE STANDARDS

COMPLIANCE

10CFR71.43 - ALL PACKAGES

(a) SMALLEST DIMENSION \geq 10 CM	X
(b) TAMPER SEAL	X
(c) POSITIVE FASTENING DEVICE FOR I.E.	X
(d) NO SIGNIFICANT CHEMICAL/GALVANIC REACTIONS	X
(e) VALVES	N/A
(f) NC TEST CRITERIA	X
(g) EXTERNAL SURFACE TEMPERATURE < 122°F	X
(h) NO VENTING	X

10CFR71.45 - LIFTING & TIE-DOWN STDS. N/A

10CFR71.47 - EXTERNAL RADIATION STDS.

o <200 MREN/HR ON EXTERNAL SURFACE	X
o TRANSPORT INDEX < 10.0	X

10CFR71.55 - FISSILE MATERIAL PACKAGES

(a) COMPLIANCE WITH 71.41 - 71.47	X
(b) SINGLE PACKAGE SUBCRITICAL WITH INLEAKAGE	X
(c) INLEAKAGE EXEMPTION	N/A
(d) NC TEST CRITERIA	X
(e) AC TEST CRITERIA	X

10CFR71.59 - FISSILE CLASS II PACKAGES

COMPLIANCE

(a)	CALCULATION OF TRANSPORT INDEX	X
(b)(1)	SUBCRITICAL: 5X/UNDAMAGED	X
(b)(2)	SUBCRITICAL: 2X/DAMAGED/INLEAKAGE	X
(c)	TRANSPORT INDEX \leq 10.0	X

TEST CRITERIA

NORMAL CONDITIONS

10CFR71

- o NO LOSS OR DISPERSAL OF CONTENTS 43(f)
- o NO INCREASE IN EXTERNAL RADIATION LEVELS 43(f)
- o SINGLE PACKAGE SUBCRITICAL 55(d)(1)
- o GEOMETRIC FORM OF CONTENTS NOT SUBSTANTIALLY ALTERED 55(d)(2)
- o NO LEAKAGE OF WATER INTO INNER CONTAINER 55(d)(3)
- o <5% REDUCTION IN EFFECTIVE VOLUME OF PACKAGING 55(d)(4)(1)
- o <5% REDUCTION IN SPACING (i.c. to o.c.) 55(d)(4)(11)
- o NO HOLE IN DRUM LARGE ENOUGH TO PASS A 10 CM CUBE 55(d)(4)(111)

ACCIDENT CONDITIONS

- o SINGLE PACKAGE SUBCRITICAL (DAMAGED) 55(e)
- o 2X SUBCRITICAL (DAMAGED + INLEAKAGE) 59(b)(2)

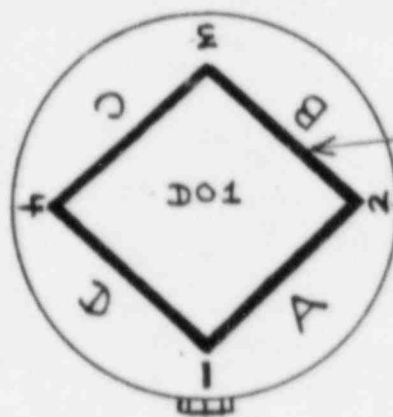
AS DETERMINED BY

- o VISUAL INSPECTION
- o MEASUREMENT BEFORE AND AFTER TESTING
 - DRUM HEIGHT, WEIGHT, DIAMETER
 - INNER CONTAINER DIMENSIONS
 - DISK DIMENSIONS
- o PRESSURE CHANGE (TWO TESTS)

NORMAL CONDITIONS TESTING

- 10 CFR 71.71 (A) THROUGH (C)
- SAFETY SERIES NO. 6 IAEA SAFETY STANDARDS - 1973 AS AMENDED
SECTIONS 709 - 714
- USED 1 CONTAINER THROUGHOUT NORMAL CONDITIONS TESTING "D01"
 - PRESSURE
 - VACUUM
 - WATER SPRAY
 - 8 1' DROPS
 - 6 4' DROPS (DUE TO NON-SYMMETRICAL DESIGN)
 - COMPRESSION
 - PENETRATION
- CONCLUSIONS
 - COMPARED TEST RESULTS TO CRITERIA LISTED IN 10 CFR 71.43(F)
AND 71.55(D)

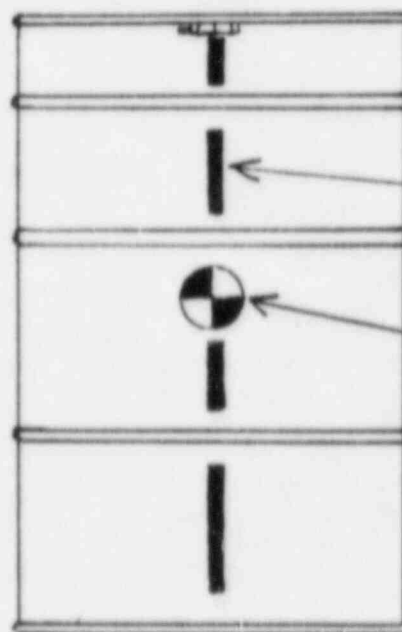
FIGURE 1
DHTF
CONTAINER MARKINGS



CONTAINER LID

Container lid painted to indicate position of inner container (to scale) with relation to lid.

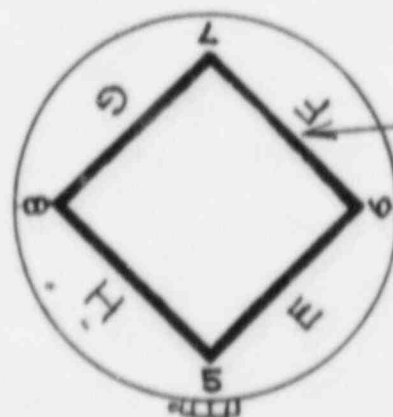
The numbering system will be used to aid in drop testing.



CONTAINER SIDE VIEW

Vertical stripes to show relative position of the 4 corners of the inner container.

C. of G. indicator spaced 90 degrees apart.



CONTAINER BOTTOM

Container bottom painted like lid to indicate position of inner container.

ACCIDENT CONDITIONS TESTING

- 10 CFR 71.73 (A) THROUGH (C)
- SAFETY SERIES NO. 6, IAEA SAFETY STANDARDS - 1973 AS AMENDED SECTIONS 719 - 721
- 6 CONTAINERS USED FOR ACCIDENT CONDITIONS TESTING "D02" THROUGH "D07"
- 1 CONTAINER USED FOR 50' IMMERSION TEST "D08"
- 6 30' DROP TESTS, 1 PER DRUM
- 24 40" PUNCTURE TESTS, 4 PER DRUM
- THERMAL TESTS - ALL 6 DRUMS
- 3' IMMERSION - NOT PERFORMED, WATER IN LEAKAGE ASSUMED IN NUCLEAR SAFETY ANALYSIS
- 50' IMMERSION - CONTAINER - D08 (UNDAMAGED)
- CONCLUSIONS:
 - NUCLEAR SAFETY BASED ON UNC-2901 CALCULATIONS

FIGURE 1

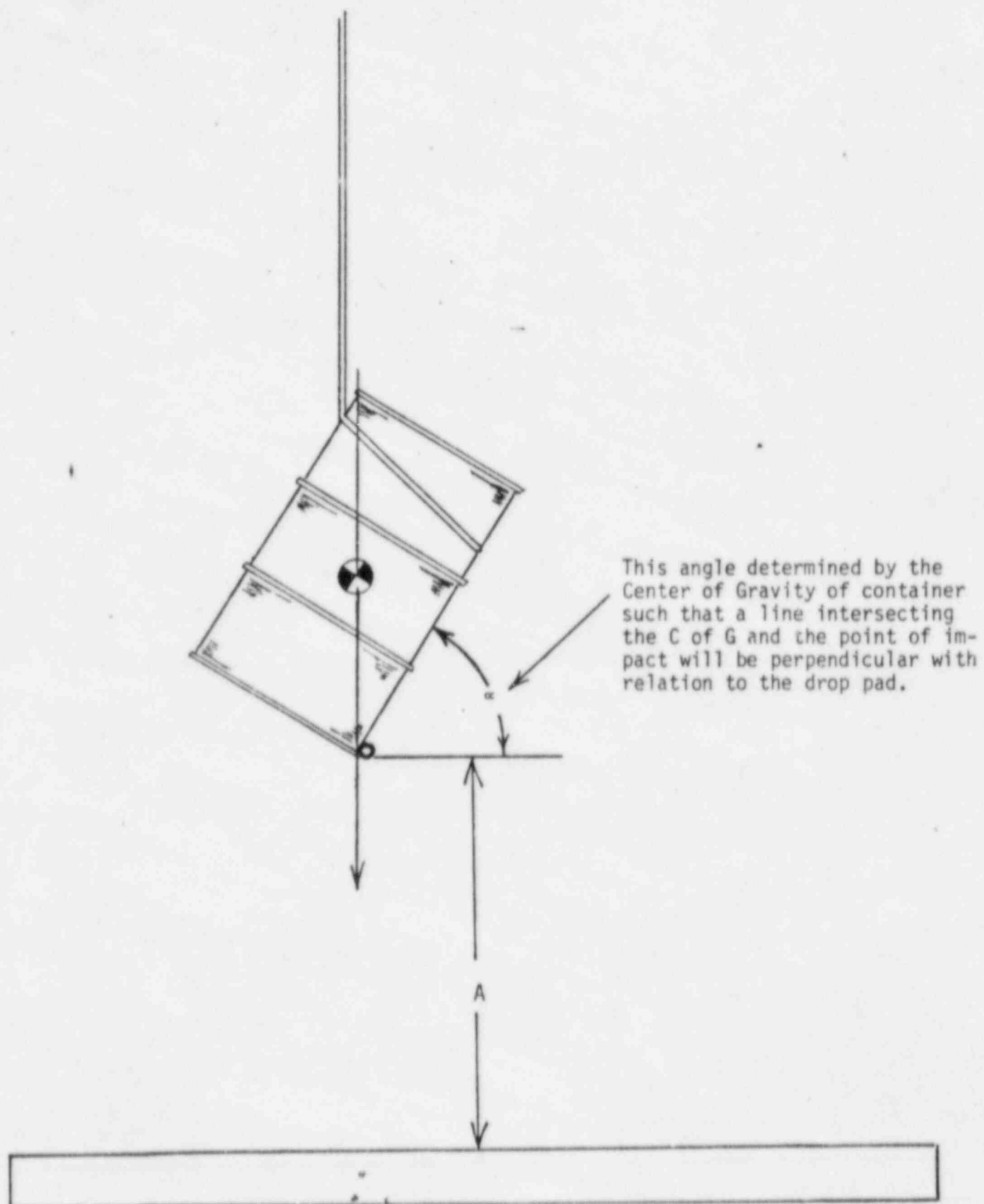


FIGURE 4

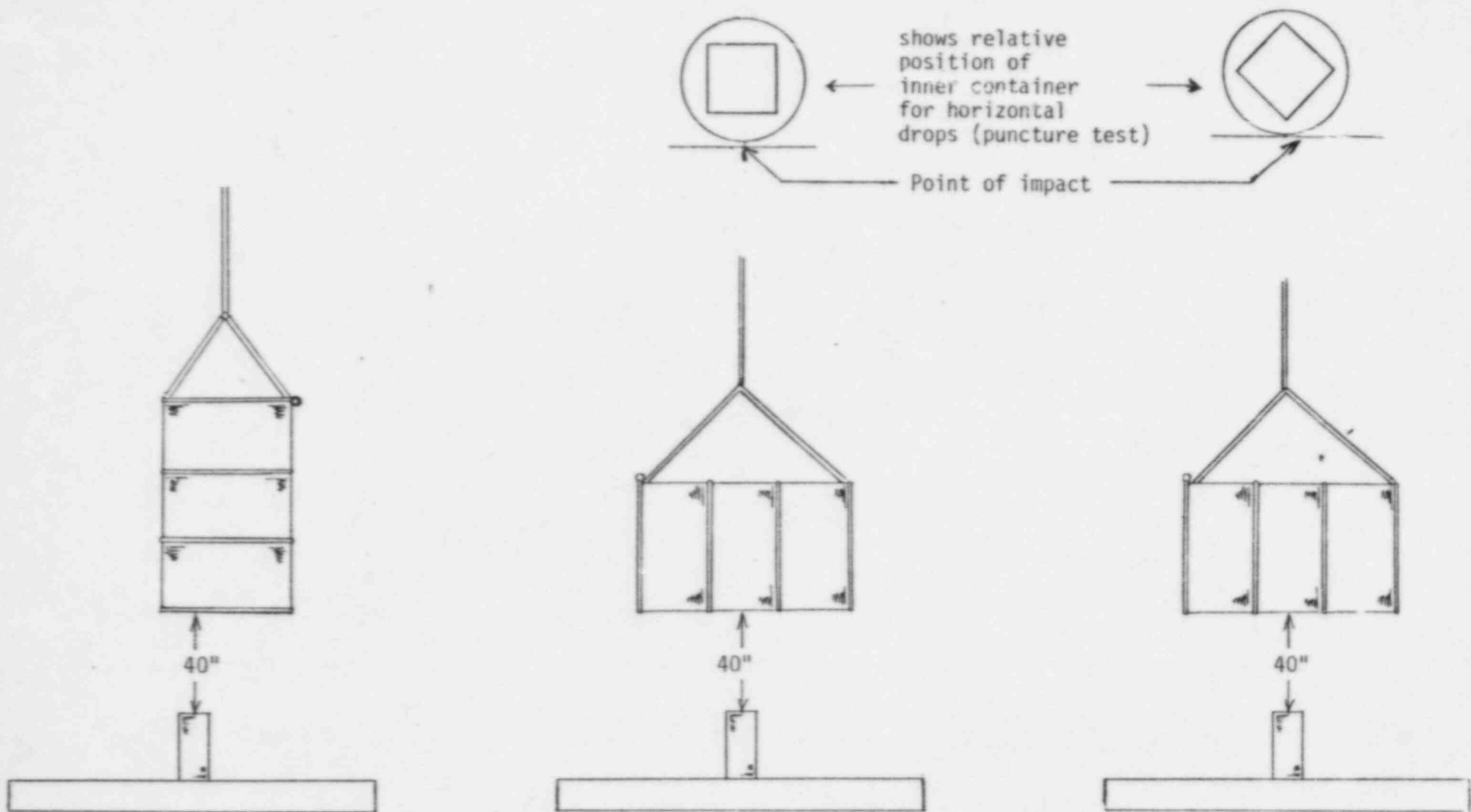
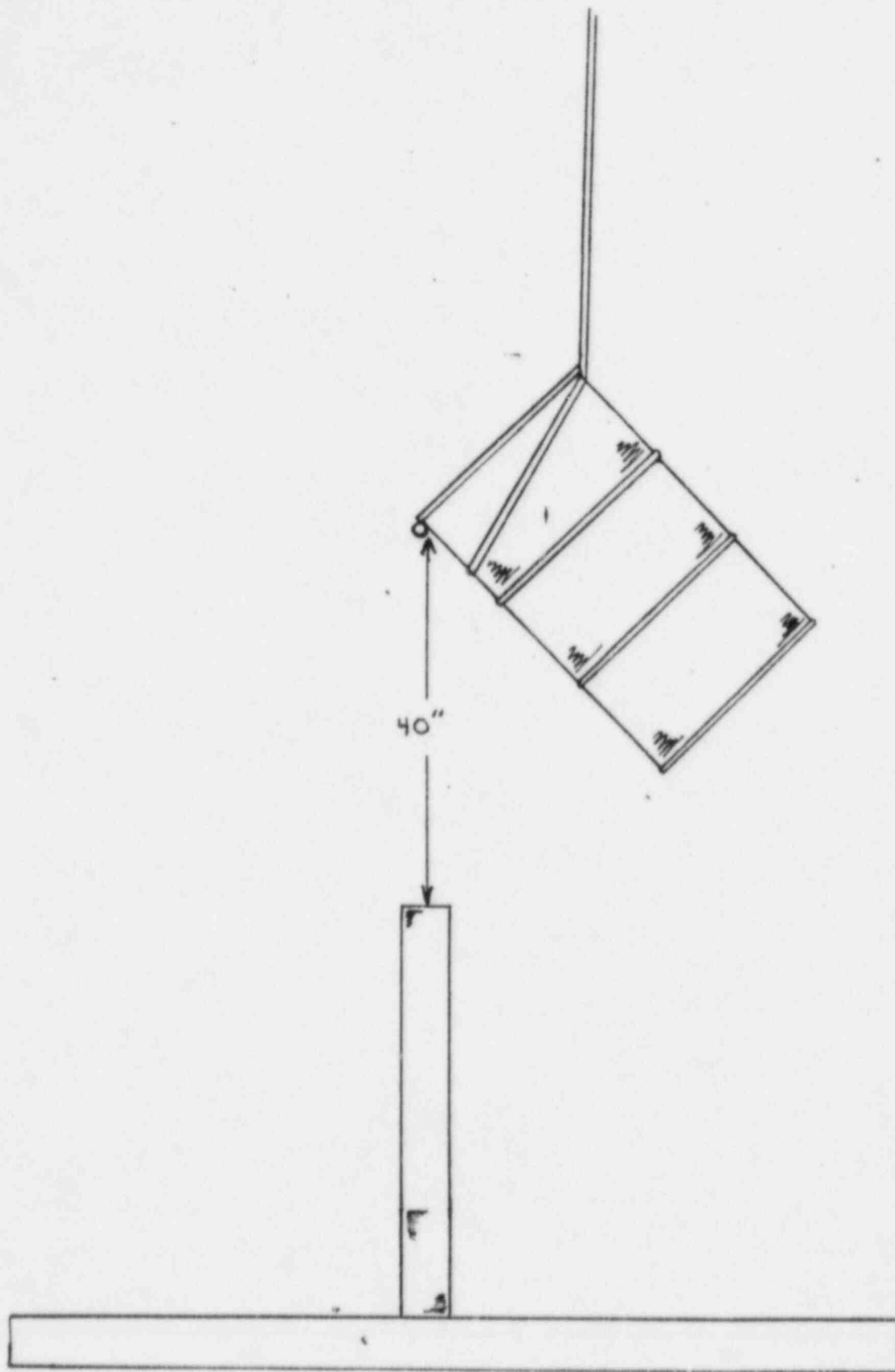


FIGURE 3



DHTF SHIPPING CONTAINER
NUCLEAR CRITICALITY SAFETY

1. Safety of DHTF assured by reference to UNC-2901.
2. DHTF outer container same size and shape as UNC-2901.
3. Centered DHTF inner container same shape but $1/3$ smaller than centered inner container of UNC-2901.
4. Type, form and packaging of DHTF material same as for UNC-2901.
5. Maximum number of DHTF containers per shipment, fissile classes II and III, same as number of UNC-2901.

UNC-2901 VS. DHTF

1. Outer Drum

	<u>UNC-2901</u>	<u>DHTF</u>
Height	34.2 in.	34.6
O.D. - normal	22.6 in.	22.6 in.
O.D. - accident	21.1 in.	>21.3 in.
Material	Carbon Steel	Carbon Steel
Thickness	0.12 cm	0.15 cm

2. Insulation between outer and inner drum

- A. UNC-2901 array K-eff maximum when insulation assumed to be void.
- B. UNC-2901 array with maximum containers safe when insulation assumed to be void.
- C. Insulation therefore not necessary to safety of either UNC-2901 or DHTF.

UNC-2901 VS. DHTF

3. Inner Container

	<u>UNC-2901</u>	<u>DHTF</u>
Material	Carbon Steel	Stainless Steel
Thickness	0.19 cm	0.20 cm
Dimensions	10-3/4"x10-3/4"x29-1/2"	9-1/2"x9-1/2"x17-1/4"

4. Centerboard

	<u>UNC-2901</u>	<u>DHTF</u>
Alternate Pellet Packaging	3/4 inch wood	1/2 inch SS
Bagged UO ₂	1/2 inch SS	1/2 inch SS

5. SNM Packages Per Container

	<u>UNC-2901</u>	<u>DHTF</u>
Dimensions	9-1/8"x8-1/4"x4-1/4"	9-1/8"x8-1/4"x4-1/4"
Number:		
a) Alternate Pellet Packaging	6	4
b) Bagged UO ₂	4 plus 2 Al blocks	4

UNC-2901 VS. DHTF

6. Internal Moderation

- A. Normal conditions - UNC-2901 required specific packaging and maximum H/U or amount CH_2 .
 - DHTF same requirements
- B. Accident conditions - UNC-2901 shown safe with full water flooding for both packaging methods.
 - DHTF therefore safe with flooding

SHIPPING CONTAINER
QA MANUAL

- NRC APPROVED QA PLAN DATED 12-17-84
- COVERS CRITERIA ADDRESSED IN 10 CFR 71, SUBPART H

OPERATING AND MAINTENANCE PROCEDURES

● APPROVED BY PLANT MANAGEMENT

● SUBJECTS COVERED

- PACKAGING
- SHIPPING
- LABELING
- LOADING
- UNLOADING
- STORAGE
- MAINTENANCE

● KEY POINTS COVERED BY PROCEDURE

- EQUIPMENT NEEDED
- OPERATOR QUALIFICATION (IF NEEDED)
- ROUTINE INSPECTION AND MAINTENANCE REQUIREMENTS AND ACCEPTANCE CRITERIA
- STEP BY STEP METHODOLOGY
- IDENTIFY RESPONSIBLE CNFP GROUPS
- HEALTH SAFETY AND NUCLEAR SAFETY REQUIREMENTS

OPERATING PROCEDURES
LOADING THE DHTF

1. PELLET BOXES

- o MAXIMUM U, U235, PLASTIC
- o BOX LABEL

2. DHTF PACKAGES

- o OUTER DRUM - HOLES AND DENTS
- o INNER CONTAINER GASKET - RIPS AND HOLES
- o INNER CONTAINER - BOLTED (8)
- o FIBERBOARD LOADED TO TOP OF DRUM
- o DRUM LID - GASKET AND BOLTED
- o TAMPER SEAL
- o YELLOW RADIOACTIVE LABELS
- o PERMANENT MARKINGS

3. SURVEYS

- o ≤ 2200 DPM PER 100 CM² (REMOVABLE)
- o ≤ 200 MREM PER HOUR ON CONTACT
- o ≤ 10 MREM PER HOUR AT 1 METER

4. SHIPMENT RECORDS

- o SNM CONTENT OF EACH PELLET BOX AND EACH DHTF
- o TAMPER SEAL RECORDS
- o FORM NRC-741
- o PACKAGE INSPECTION RECORDS
- o SURVEY RESULTS

OPERATING PROCEDURES
UNLOADING THE DHTF

1. SHIPMENT RECORDS
 - o FORM NRC-741
 - o SNM CONTENT OF EACH PELLET BOX AND EACH DHTF
 - o TAMPERSEAL RECORDS
2. SURVEYS
 - o ≤ 2200 DPM PER 100 CM² (REMOVABLE)
 - o ≤ 200 MREM PER HOUR ON CONTACT
 - o ≤ 10 MREM PER HOUR AT 1 METER
3. TAMPERSEAL OVERCHECK
4. UNLOADING
5. RECEIVER'S SNM VALUES
 - o PELLET BOXES WEIGHED
 - o PELLET BOXES SAMPLED

OPERATING PROCEDURES
TRANSPORT OF EMPTY PACKAGES

1. DHTF INSPECTION

- o EMPTY
- o INNER CONTAINER GASKET - ATTACHED
- o INNER CONTAINER GASKET - RIPS AND HOLES
- o INNER CONTAINER BOLTED (8)
- o FIBERBOARD LOADED TO TOP OF DRUM
- o DRUM LID BOLTED
- o "EMPTY" LABEL

2. SURVEYS

- o ≤ 2200 DPM PER 100 CM^2 (EXTERNAL)
- o $\leq 22,000$ DPM PER 100 CM^2 (INTERNAL)
- o ≤ 0.5 MREM PER HOUR ON CONTACT

3. SHIPMENT RECORDS

- o SURVEY RESULTS

ACCEPTANCE TESTS

1. VISUAL INSPECTION: OUTER DRUM

- o NO HOLES NOR DENTS > $\frac{1}{2}$ -INCH DEEP
- o DRUM LID GASKET - NOT BROKEN OR DETERIORATED
- o DRUM LID LIP AND TOP DRUM CURL NOT DAMAGED
- o VENT HOLES ($\frac{1}{4}$ -INCH DIAMETER)

2. VISUAL INSPECTION: OTHER

- o INNER CONTAINER GASKET - NO HOLES OR TEARS
- o INNER CONTAINER BOLTS (8 @ $\frac{3}{8}$ INCH)
- o FIBERBOARD LOADED TO TOP OF THE OUTER DRUM
- o INNER CONTAINER WELDS (7X)

3. COMPONENT CERTIFICATIONS

- o DOT 17C OUTER DRUM
- o FIBERBOARD
- o INNER CONTAINER GASKETS
- o SS PLATE
- o CS ANGLE AND PLATE

4. DIMENSIONS OF INNER CONTAINER

MAINTENANCE PROGRAM

1. DHTF PACKAGE

- o NOT A PRESSURE VESSEL
- o NO SHIELDING MATERIALS
- o NO COOLING SYSTEM
- o NO VALVES
- o NO MOVING COMPONENTS

2. PROGRAM

- o INSPECTION PRIOR TO EACH USE
- o SIDESTREAM
- o REFURBISH PRIOR TO NEXT USE

DHTF THERMAL TEST

(4 SEPT 85)

