

November 29, 1994

MEMORANDUM TO: Cass R. Chappell, Section Leader
Cask Certification Section
Storage and Transport Systems Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

FROM: Nancy L. Osgood, Project Manager
Cask Certification Section
Storage and Transport Systems Branch
Division of Industrial and
Medical Nuclear Safety, NMSS

SUBJECT: MEETING SUMMARY REGARDING TRANSPORT OF YANKEE ROWE REACTOR
VESSEL

AttendeesNRC

Marissa Bailey
Ross Chappell
Henry Lee
Nancy Osgood

Yankee

Joseph Bisson
Pete Hollenbeck
Bruce Holmgren
Jim Kay
Donald LeFrancois

Chem-Nuclear Systems

James Jeffrey

Introduction

A meeting was held on November 21, 1994, in Rockville, Maryland, at the request of Yankee Atomic Electric Company, regarding transport of the Rowe reactor vessel. The meeting was a follow-up to a meeting held on November 1, 1994. Yankee plans to prepare the Rowe reactor vessel for transport as low specific activity radioactive material. The meeting was held to discuss details of the radioactive materials which remain in the vessel and to discuss the structural performance of the package.

Discussion

The discussion centered on the meeting handout, Attachment 1, and the following points.

1. Quality Assurance Program. Yankee will use their Part 50 program for transportation activities. They plan to apply for Part 71 QA program approval within a month. Yankee will hold the broad-scope Part 71 QA program as long as they are the holder of a Certificate of Compliance.

150027

9412160192 941129
PDR ADOCK 05000029
P PDR

NRC FILE CENTER COPY

J.P. DFO

2. Loose Radioactive Material in the Vessel. Yankee provided supplemental information regarding the radioactive particulates which are currently accumulated in the bottom of the vessel. The concentration of radioactivity in the particulates was determined based on sample results (Attachment 2).
3. In-Vessel Processing Plan. Yankee presented a proposed approach of processing the particulates within the vessel. The procedure would consist of mounting a processing container within the vessel, vacuuming the debris into the container, then filling the container with solidification materials. The container would include mixers to ensure uniformity of the radioactivity. The container and solidified waste would remain in place within the vessel, and the remainder of the vessel would be filled with low-density concrete. NRC was concerned about how the removal of the particulates from the bottom of the vessel would be verified.
4. Structural Performance of the Package. The conceptual design of the package is shown in Attachment 3. Yankee described the evaluation of the structural performance of the package under the normal conditions of transport in 10 CFR 71.71. The effectiveness of the impact limiter under the 1-foot drop condition was questioned. It was suggested that Yankee evaluate solutions which could be taken to prevent the drop of the package.
5. Schedule. Yankee proposed that an additional meeting be held prior to submittal of the application. Yankee plans to submit the application in February, 1995.

Docket No. 71-9262

Attachments: 1. Meeting Handout
2. Radioactive Particulates Sample Analysis Results
3. Package Design

DISTRIBUTION:

PUBLIC w/att	Docket File w/att	CJHaughney w/att
MBFairtile w/att	JDParrott w/att	NMSS r/f w/o att
STSB r/f w/o att	Meeting attendees w/o att	Meeting Notebook w/o att

To receive a copy of this document, indicate in the box:

"C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFC	NMSS/STSB	E	NMSS/STSB	N	NMSS/STSB
NAME	NLOsgood <i>W</i>		ERZiegler <i>ERZ</i>		CRC Chappell <i>CC</i>
DATE	11/23/94		11/29/94		11/29/94

OFFICIAL RECORD COPY

AGENDA FOR MEETING
BETWEEN

YANKEE ATOMIC ELECTRIC COMPANY
AND
NUCLEAR REGULATORY COMMISSION

NOVEMBER 21, 1994
10:00 am
2 WHITE FLINT

- INTRODUCTION
- QUALITY ASSURANCE
- PROCESS CONTROL PROGRAM FOR UNIFORMITY
- RESIDUAL MATERIAL ACTIVITY CONTENT
- STRUCTURAL EVALUATION
- THERMAL EVALUATION
- SHIELDING EVALUATION
- OPERATING PROCEDURES
- PROJECT SCHEDULE

ATTACHMENT 1

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

QUALITY ASSURANCE

- YANKEE CURRENTLY PLANS TO SUBMIT A REQUEST FOR APPROVAL OF THE YANKEE QUALITY ASSURANCE PROGRAM FOR APPLICATION TO TRANSPORT PACKAGES (DESIGN AND FABRICATION) IN ACCORDANCE WITH 10 CFR 71 SUBPART H
- PLAN TO SEND APPLICATION LETTER TO NRC MNSS IN NEXT FEW WEEKS
- YANKEE QUALITY ASSURANCE PROGRAM, REVISION 24, IS ACCEPTED BY NRC FOR 10 CFR 50, APPENDIX B CRITERIA

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

SHIELD TANK CAVITY AND VESSEL CLEAN-UP

- REACTOR VESSEL CLEAN-UP
 - LARGE DEBRIS REMOVED
 - VACUUMING COMPLETED
 - SURVEY INDICATES ~20 R/H @ 6" FROM BOTTOM

- SHIELD TANK CAVITY CLEAN-UP
 - VACUUMING USING 5μ FILTERS
 - HYDROLASING OF MOAT AREA
 - POST-CLEAN-UP SURVEY INDICATES ~ 200 R/H @ 6" FROM BOTTOM

- FINAL INSPECTIONS
 - VIDEO OF VESSEL BOTTOM
 - OBTAINED DROSS SAMPLE
 - PERFORMED VESSEL WALL AND BOTTOM SURVEY

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

RESIDUAL MATERIAL ACTIVITY CONTENT

- TWO METHODS USED TO ESTIMATE ACTIVITY CONTENT
 - DOSE MODELING
 - SEDIMENT VOLUME ESTIMATE
- DOSE RATE MODELING
 - COMPUTER MODEL OF VESSEL BOTTOM GEOMETRY
 - VESSEL BOTTOM SURVEY
 - 10 CFR 50/61 ANALYSIS OF SEDIMENT
 - TOTAL ACTIVITY 1500 Ci (7/95)
- SEDIMENT VOLUME ESTIMATE
 - VIDEO INDICATES ¼ INCH LAYER OF SEDIMENT
TAPERING TO ZERO AT EDGES OF BOTTOM HEAD
 - SPECIFIC ACTIVITY FROM 10 CFR 50/61 ANALYSIS OF
SEDIMENT
 - TOTAL ACTIVITY 1600 Ci (7/95)

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

STRUCTURAL EVALUATION

FREE DROP

- 10 CFR 71.71(c)(7) REQUIRES AN EVALUATION OF THE PACKAGE FOR A ONE FOOT DROP ONTO AN ESSENTIALLY UNYIELDING SURFACE
- EVALUATED TWO DROP CASES:
 - (1) STRAIGHT DOWN DROP
 - (2) ONE END DROP
- PERFORMED A 3-D NONLINEAR TRANSIENT ANALYSIS USING ANSYS COMPUTER CODE
- RR CLEARANCE: LIMIT OUTSIDE DIAMETER OF IMPACT LIMITERS TO 13'-6" (4 INCHES LARGER THAN CASK OD)
- IMPACT LIMITERS ARE BOLTED TO CASK COVER ON EACH END AND EXTEND 24 INCHES BEYOND END OF CASK
- 3 INCH THICK HUBS WELDED TO CASK COVERS CARRY VERTICAL IMPACT FORCE FROM LIMITERS INTO CASK
- MAXIMUM IMPACT FORCE = 4700 kips*
- IMPACT LIMITERS PREVENT CASK FROM IMPACTING THE UNYIELDING FLAT SURFACE

* GRAPH SHOWS FORCE FOR 1/2 MODEL.

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

STRUCTURAL EVALUATION

FREE DROP

- A516, GRADE 70 LIMITER & HUB MATERIAL

ALLOWABLE STRAIN = 0.105 in./in. (50% OF MINIMUM
REQUIRED ELONGATION IN 2 INCH LENGTH)

ALLOWABLE STRESS = 63.2 ksi BASED ON BILINEAR
STRESS-STRAIN CURVE

- LIMITER MAXIMUM STRESS INTENSITY = 46.5 ksi
(74% OF ALLOWABLE)

- HUB MAXIMUM STRESS INTENSITY = 26.7 ksi
(42% OF ALLOWABLE)

- A516, GRADE 70 CASK MATERIAL ALLOWABLE STRESSES:

MEMBRANE = S_m = 23.3 ksi

MEMBRANE + BENDING = $1.5S_m$ = 34.95 ksi

- CASK MAXIMUM STRESS INTENSITY:

MEMBRANE = 13.6 ksi (58% OF ALLOWABLE)

MEMBRANE + BENDING = 22.4 ksi (64% OF ALLOWABLE)

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

STRUCTURAL EVALUATION

10 CFR 71.71 NORMAL CONDITIONS OF TRANSPORT

• METHODS OF EVALUATION:

CODES STARDYNE / ANSYS & HAND CALCULATIONS
REG.GUIDE 7.8 - LOAD COMBINATIONS

• CONDITIONS AND TESTS

(1) HEAT: 100°F (WITH INSULATION)	-OK
(2) COLD: -40°F	-OK
(3) REDUCED EXTERNAL PRESSURE: $\Delta P = 16.17$ PSI	-OK
(4) INCREASED EXTERNAL PRESSURE: $\Delta P = 8.45$ PSI	-OK
(5) VIBRATION: MAX STRESS < ALLOWABLE STRESS	-OK
(6) WATER SPRAY: NO EFFECT	-OK
(7) FREE DROP:	-OK
(8) CORNER DROP: NOT APPLICABLE	-OK
(9) COMPRESSION: NOT APPLICABLE	-OK
(10) PENETRATION: NO PERFORATION	-OK

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

STRUCTURAL EVALUATION

WELDING OF SHIPPING CASK TOP COVER

- CONTINUOUS, FULL PENETRATION GROOVE WELD USING A TEMPER BEAD TECHNIQUE
- E70T-1 ELECTRODES WILL BE USED WITH A MIG PROCESS
- WELD PRE-HEAT WILL BE PERFORMED USING A HIGH (250°F MINIMUM) PRE-HEAT AND WITH SLOW COOLING AFTER WELDING IS COMPLETE
- NDE WILL BE PERFORMED OF THE ROOT PASS AND AFTER THE FINAL PASS
- FINAL NDE PERFORMED APPROXIMATELY 48 HOURS AFTER WELDING IS COMPLETED TO INSPECT FOR DELAYED CRACKING
- NDE WILL BE PERFORMED USING ULTRASONIC AND MAGNETIC PARTICLE METHODS AS APPROPRIATE
- THE WELD, WELDING PROCESS, AND NDE WILL BE QUALIFIED USING THE ASME CODE AS A GUIDE
- CHARPY TESTING OF WELD TEST COUPONS AND/OR HARDNESS SURVEYS OF THE WELD COUPON HEAT AFFECTED ZONE WILL BE PERFORMED TO VERIFY AS WELDED DUCTILITY

YANKEE ATOMIC ELECTRIC COMPANY
REACTOR VESSEL REMOVAL PROJECT

PROJECT SCHEDULE

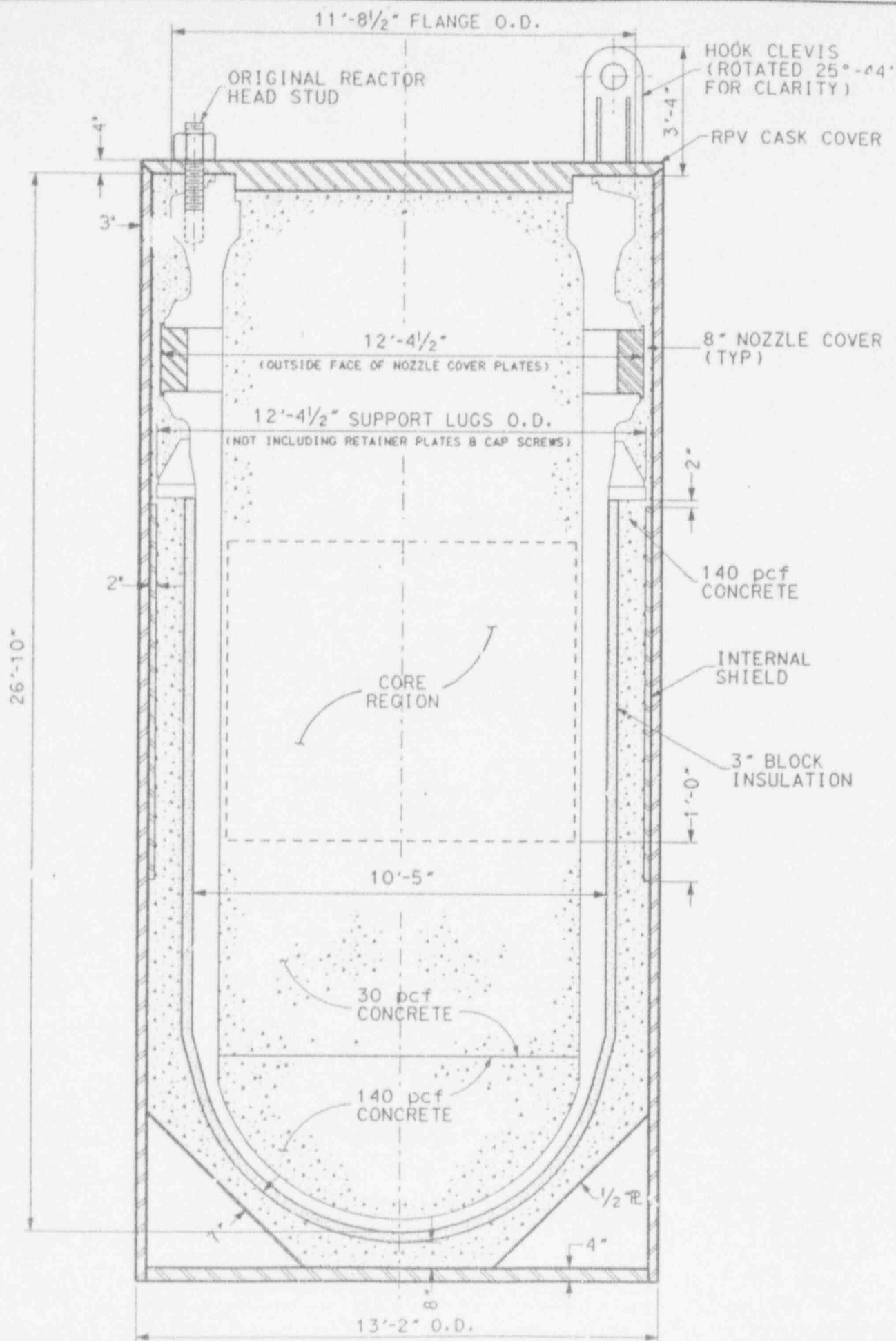
- CERTIFICATE OF COMPLIANCE APPLICATION / SAFETY ANALYSIS REPORT: SUBMIT TO NRC BY FEBRUARY 15, 1995
- REQUEST NRC CONCURRENCE AND ISSUANCE OF C OF C BY JULY 1, 1995
- YANKEE IS PREPARED TO SUPPORT AGGRESSIVE SCHEDULE FOR RESPONDING TO NRC QUESTIONS

ATTACHMENT 2

RX CROSS SAMPLE

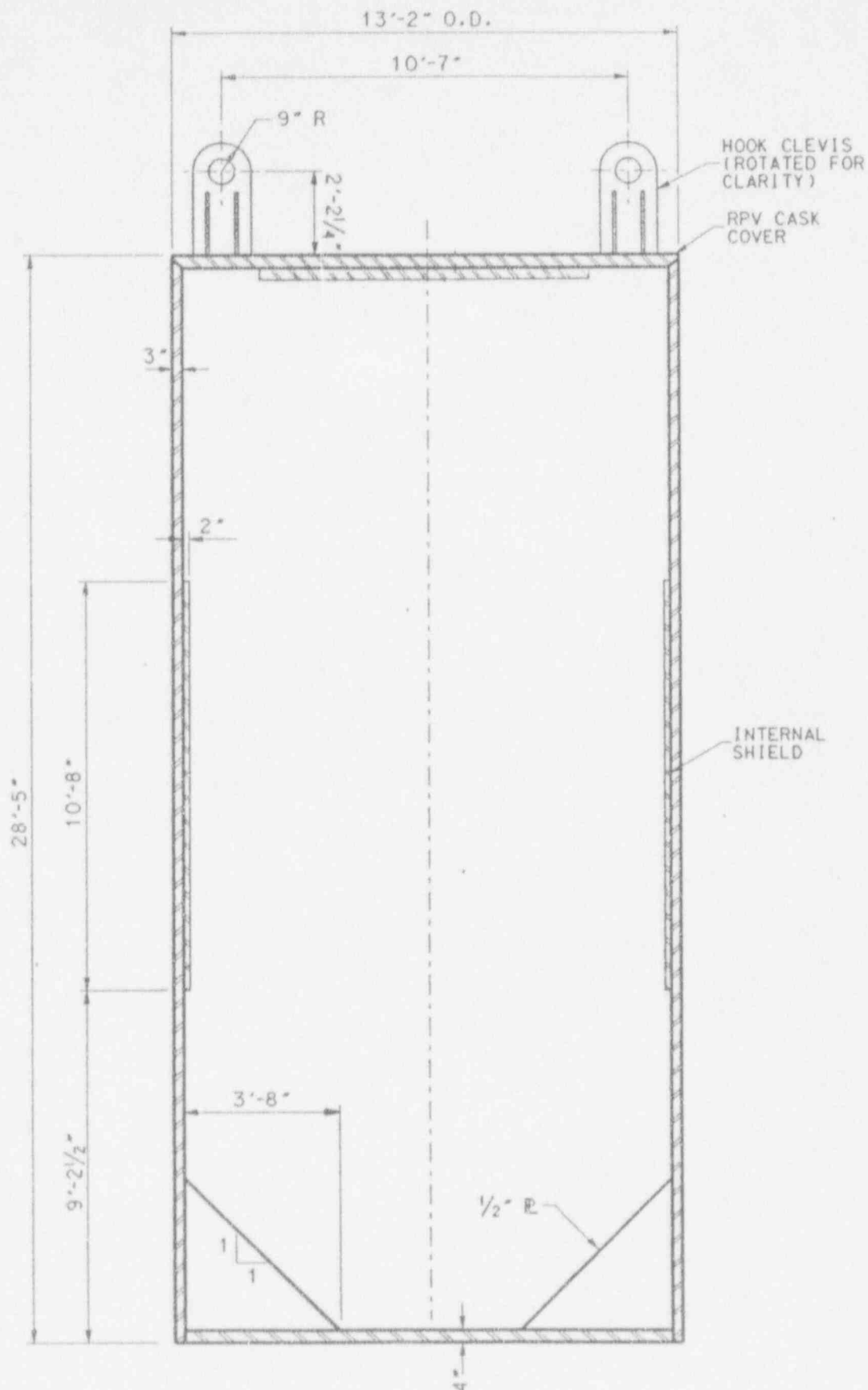
NUCLIDE	Act Conc uCi/g (i)	Frac Total
H-3		
C-14	1.05E-01	4.92E-06
FE-55	1.20E+04	5.60E-01
NI-59		
NI-63	1.87E+03	8.76E-02
SR-89		
SR-90	6.37E-01	2.98E-05
PU-238	1.78E-02	8.34E-07
PU-239/240	4.83E-02	2.26E-06
PU-241	1.64E+00	7.68E-05
AM-241	4.00E-02	1.87E-06
CM-242	3.37E-03	1.58E-07
CM-243/244	2.23E-02	1.04E-06
CR-51		
MN-54	3.92E+02	1.84E-02
FE-59		
CO-57	5.30E-01	2.48E-05
CO-58		
CO-60	7.08E+03	3.32E-01
ZN-65	3.96E+01	1.85E-03
NB-94		
ZR-95		
NB-95		
TC-99		
RU-103		
RU-106		
AG-108M		
AG-110M		
SB-124		
SB-125		
I-129		
CS-134		
CS-137	3.46E+00	1.62E-04
CE-141		
CE-144		
EU-154		
EU-155		
SN-113		
TOTALS	2.13E+04	1.000

© As of 7/94

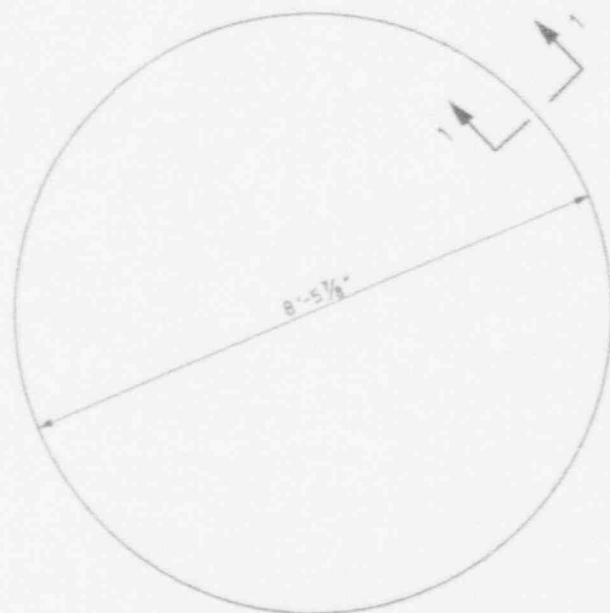


11/1/94

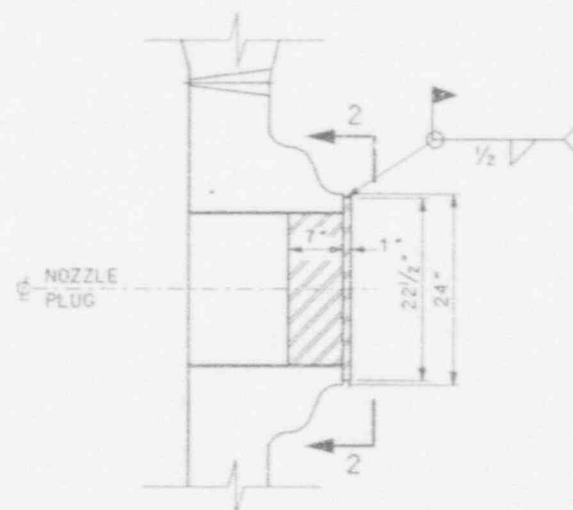
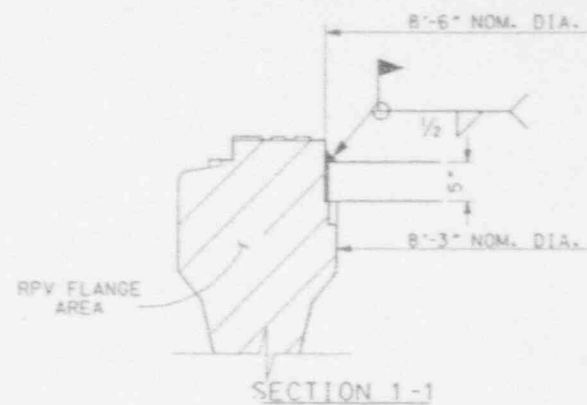
ATTACHMENT 3



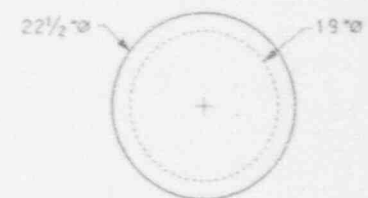
RPV CASK
(CROSS SECTION)



PLAN VIEW VESSEL LID



NOZZLE WITH PLUG
(NO SCALE)

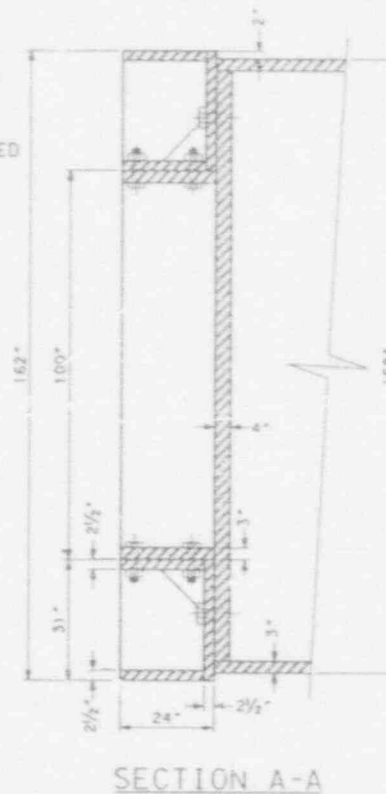
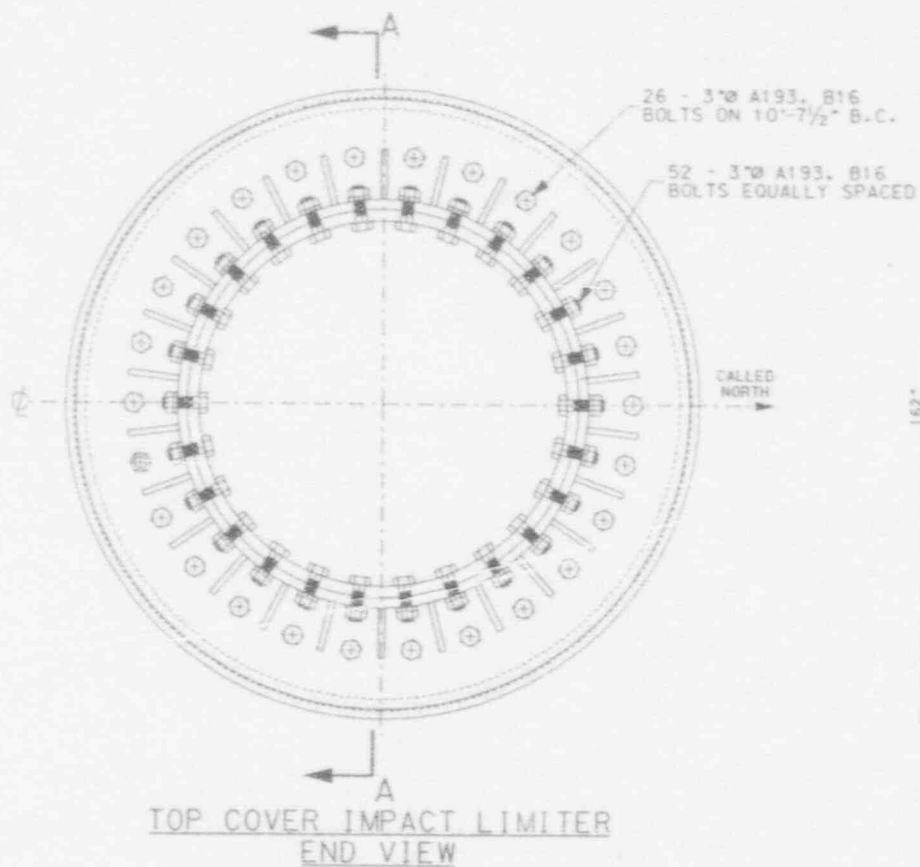


SECTION 2-2
(NOZZLE NOT SHOWN)

TITLE: YNPS RPV PACKAGE
RPV LID & MAIN COOLANT
NOZZLE PLUGS

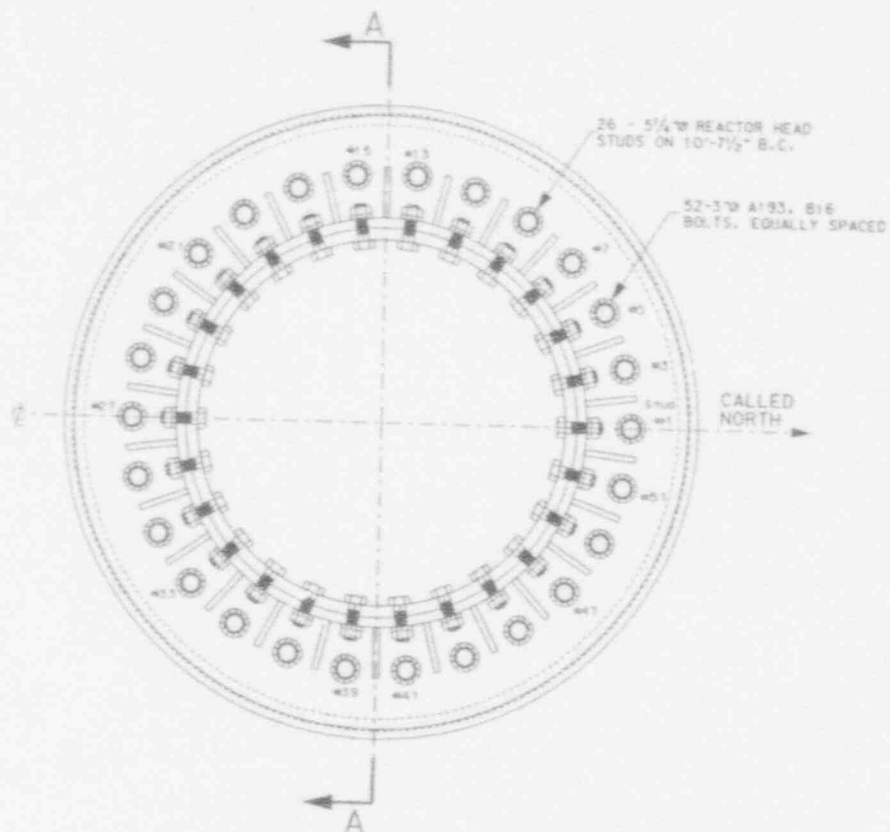
SCALE:
AS NOTED

FIGURE 1.2-6

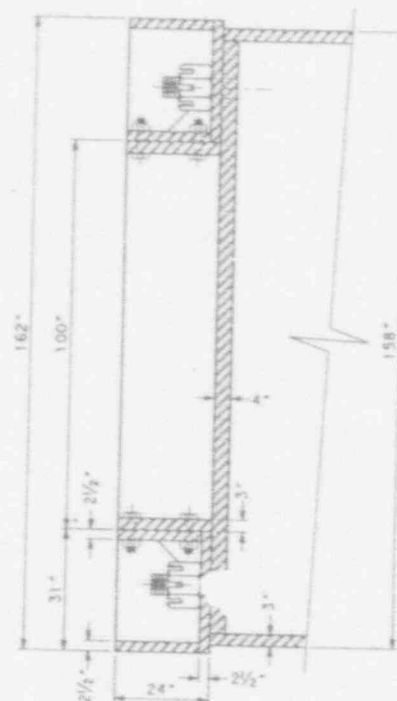


TITLE:	
YNPS RPV SHIPPING CASK BOTTOM IMPACT LIMITER	
SCALE:	FIGURE 2.1-1
1/4"=1'-0"	SHEET 2

YRDECCAM/F 10211-SH2



TOP COVER IMPACT LIMITER
END VIEW



SECTION A-A

TITLE:

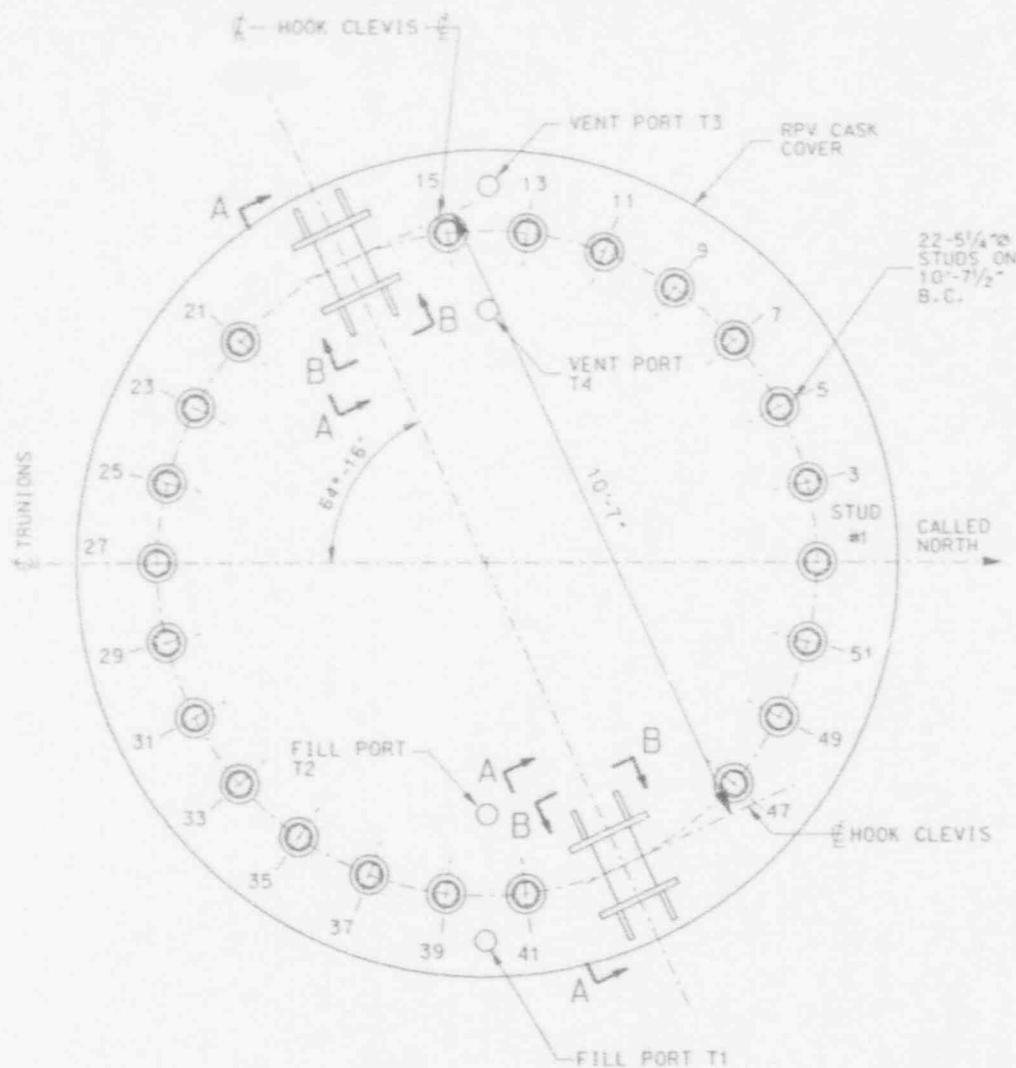
YNPS RPV SHIPPING CASK
TOP IMPACT LIMITER

SCALE:

1/4"=1'-0"

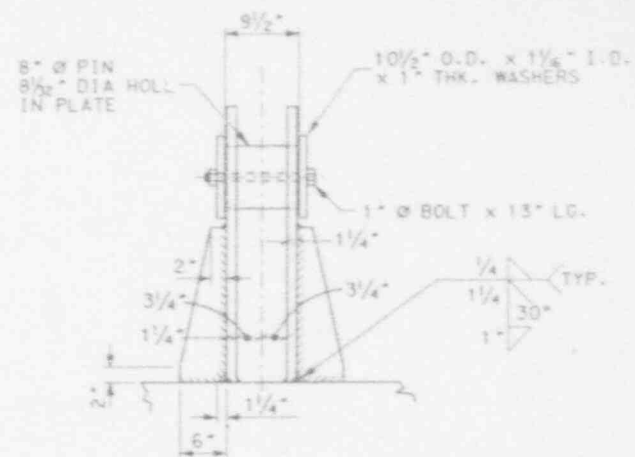
FIGURE 2.1-1
SHEET 1

TRDCOMM/F 10211, SH1



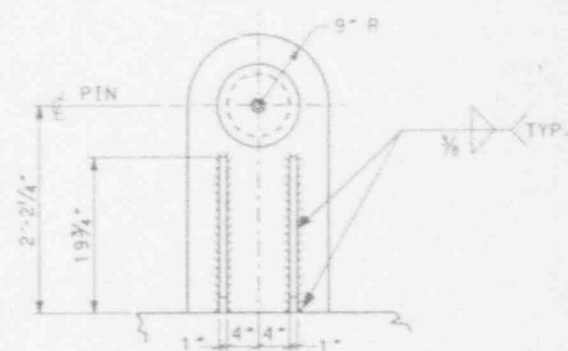
PLAN

SCALE: 1/2" = 1'-0"



SECTION A-A

SCALE: 3/4" = 1'-0"



SECTION B-B

SCALE: 3/4" = 1'-0"

TITLE:

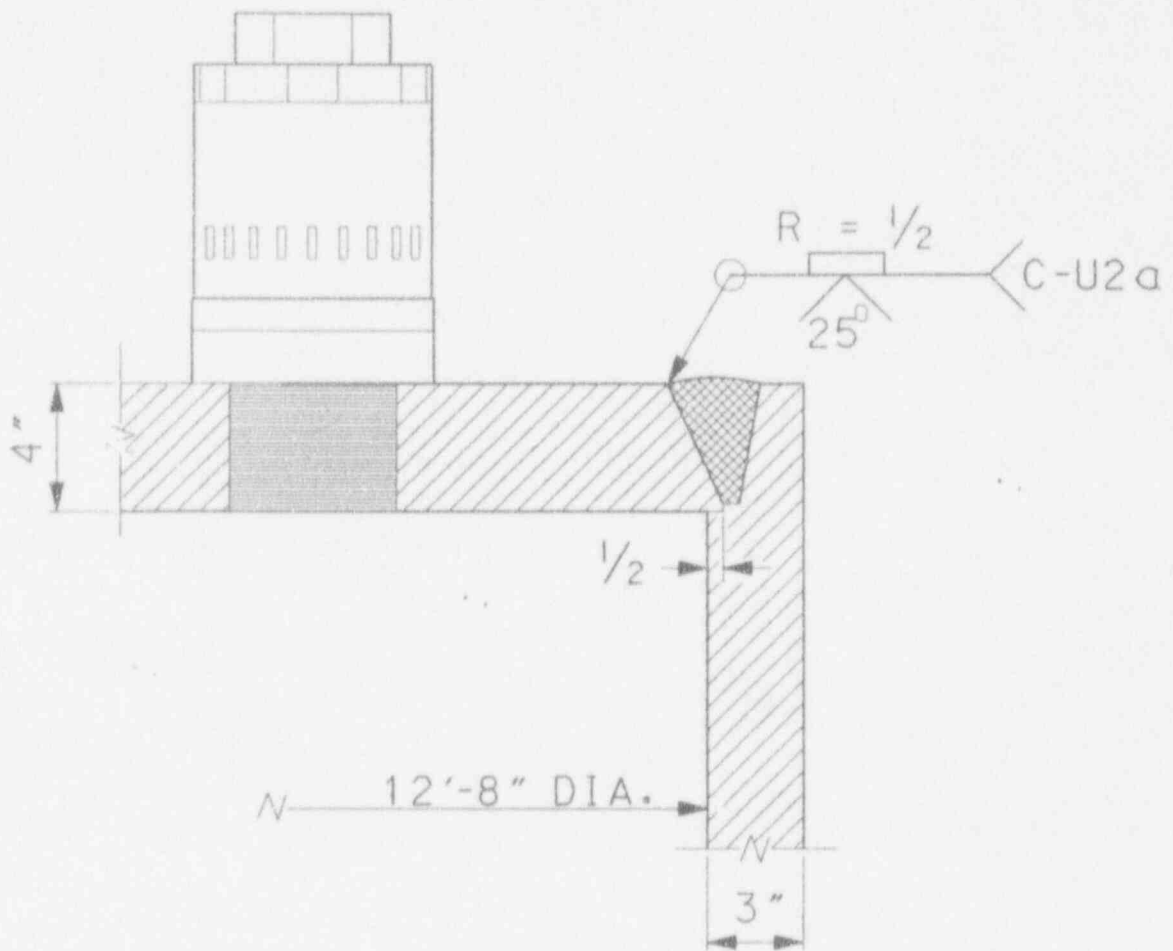
YNPS RPV SHIPPING CASK
PLAN VIEW AND DETAILS

SCALE:

AS NOTED

FIGURE 1.2-4

YRDCOMM-10124.DCN



TOP COVER PROPOSED WELD
Not To Scale