VIBRATION TESTING OF
L-3 AND L-10 SHIPPING CONTAINERS

BY

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INTRODUCTION

Plutonium nitrate solutions are normally shipped by motor freight; air and rail have been used. The solution is packaged in 3-liter or 10-liter polyethylene bottles which are enclosed in DOT Specification 2-R containers protected by an overpack. The shipping systems are designated L-3 and L-10 for the 3-liter and 10-liter size lading respectively. The packages are normally transported in the vertical position.

The polyethylene bottles are closed with standard 83 mm carboy closures which have been modified to permit venting. Two types of vented closures in use are designated the Duo-Vent cap and the slit vent cap. The construction of the vented closures is shown in Drawings H-2-26325 and H-2-26354, attached.

The presence of liquid plutonium nitrate solution has been observed in the crowns of bottle closures of both types in shipments received at Hanford. This was observed in shipments in which there was no evidence that the shipping container had been tipped or laid down.

It was postulated that normal vibration incident to transport would be capable of generating standing waves in the nitrate solution that would possess sufficient energy to "pump" liquid through the vents.

A possible mechanism is described:

1. In the case of the Duo-Vent cap, solutions could impinge on the surge chamber, gradually filling it until solution was forced through the valve to the crown of the cap.
2. With the slit vent cap, solutions impinging against the slit vent could have a similar effect with the solution forced through the slit and accumulating in the crown of the cap.

A test program was arranged with the U.S. Naval Torpedo Test Station, Quality Evaluation Laboratory, Keyport, Washington, to:

1. Determine the resonant frequencies of the L-3 and L-10 shipping systems.
2. Simulate the conditions encountered in transport and observe their effect on the lading in the two shipping systems.
3. Develop corrective measures and demonstrate their effectiveness in the laboratory.

The test program was conducted in three phases during eight non-consecutive working days.

The work was performed under Atomic Energy Commission purchase order HA-70-886-149, dated September 12, 1969.

SUMMARY

The resonant frequency of the L-3 shipping system was found to be 15.5 Hz; the L-10 system 19.4 Hz. These frequencies approximate the 17 Hz and 1 g conditions observed in an instrumented truck transport of a heavily shielded cask from Philadelphia, Pa. to Los Alamos, New Mexico.[1]

It was demonstrated in the test program that the pumping action postulated could occur and could create the conditions observed in shipments received at Hanford.

Maximum pumping action occurred at or near the resonant frequency of each system; approximately 15.5 Hz for the L-3 systems and 19.4 Hz for the L-10 systems at accelerations from 0.1 to 0.9 g.

The polyethylene bottle in both systems was found to be moving independently of the 2-R container and cage assembly in the resonant frequency range.

A 3-liter bottle containing 3 liters of water was secured to a smaller shake table to enable visual observation of wave formation. The test was run as a sweep of frequencies from 5 to 20 Hz. While agitation of the fluid was evident across the spectrum of frequencies, the most violent agitation occurred at 17 Hz.

Installation of a restraint between the closing flange of the 2-R container and the top of the bottle cap forced the bottle to vibrate at the same frequency as the 2-R container. The restraint dampens the standing wave formation such that the waves then have insufficient energy to force solution through the vents.

The restraints used in the test program consisted of short sections of rubber hose, sized to fit closely between the shoulder of the 83 mm bottle closures and the underside of the closing flange. The hose was 2-1/2 inch I.D., with two fabric plies, manufactured by the Boston Woven Hose and Rubber Company, and designated Type OED.

CONCLUSION

The use of restraining devices to eliminate the differential movements of the 3-liter and 10-liter bottles within their respective 2-R containers will prevent the formation of the standing waves which force the solution through the vents of the bottle closures.

RECOMMENDATION

It is recommended that a restraining device of the design shown in Drawing H-2-35742 be used in all L-3 and L-10 shipping containers to assure that the polyethylene bottle will vibrate at the same frequency as the 2-R container during transport.

DISCUSSION1. Vent Leakage

Shipments have been received at Hanford with plutonium nitrate solution in the crown of the polyethylene bottle closure. An explanation for the escape of solution from the bottle was sought.

There was no evidence that the shipping containers had been tipped or laid on their sides during transit. Had they been laid on their sides the vents would have been submerged in solution which would have been forced through the vents by internal pressure in the bottles.

Another possible explanation was that vibration encountered during normal transport could generate standing waves with sufficient energy to force solution through the vent in the bottle cap. Drain-back of the solution to the bottle by gravity is precluded by the following:

- a. The bottle is pressurized by gases generated by radiolysis of the plutonium nitrate solution.
- b. The high surface tension of the plutonium nitrate solution and the fact that the polyethylene is not wetted by the solution, prevents back-passage of solution through the surge chamber and slit cap.
- c. The Duo-Vent valve functions as a check valve to prevent gas flow from the 2-R container to the bottle.
- d. While the slit vent could permit gas to flow into the bottle, the differential pressure is such that the flow of gas is out of the bottle.

The testing of the L-3 and L-10 shipping containers was performed to (1) confirm the presence of standing waves

in the bottles under simulated transport conditions which could cause vent leakage, and (2) find and test a method which could prevent the leakage.

2. Description of the L-3 and L-10 Containers

Plutonium nitrate solution is packaged in polyethylene bottles of 3-liter or 10-liter capacity and protected by a DOT Specification 2-R container centered in a Spec. 17H steel drum by a cage of steel tubing. The annular space between the Specification 2-R container and the inner wall of the drum is filled with loose vermiculite which provides a thermal barrier between the lading and the environment.

Drawings describing these containers are attached.

Both containers are designed to be upright while in transit.

Single containers are secured to standard wooden pallets to ensure their remaining in the vertical position during transport. In a multi-container shipment, containers are either shored or banded together in the transport vehicle to prevent tipping during transit.

3. Test Equipment

The primary test equipment used in the program was a Ling A-335 shake table rated at 70,000 watts audio output at frequencies of 10 to 900 Hz and amplitudes to produce upward to 100 g. Figure 1 shows the L-10 container mounted on the shake table.

A smaller shake table, a Ling A-300-B machine, was utilized for establishing the frequency at which maximum excitation of fluid in the 3-liter bottle would occur.

During the initial phase of testing, one accelerometer was mounted on the lid of the 2-R pressure vessel and another on the base plate of the fixture holding the container under test. These accelerometers were used, one at a time, for input to a Model 2106 Honeywell three-pen Visicorder which provided an X, Y, Z readout on a strip chart.

A third accelerometer, mounted on the holding fixture base plate, controlled the shake table and provided response signal display on an oscilloscope.

In the first and second phases of the test program, water, colored with potassium permanganate solution, was used as a "stand-in" for plutonium nitrate solution in the polyethylene bottles. In the final phase of the program, aluminum nitrate solution with a specific gravity of 1.2 was used in the bottles to closely simulate the specific gravity of the nitrate solution.

4. Test Program

The test program, conducted in three separate phases, involved the testing of both the L-3 and L-10 systems during each phase of the program.

All testing was performed in the vertical position.

a. L-10 Shipping Container

Phase 1

The program was initiated by testing the L-10 system.

Ten liters of water were added to the polyethylene bottle, and the 2-R pressure vessel was closed. The packaged vermiculite was not used, and the drum lid was not installed.

A series of short runs were made at frequencies ranging from 5.0 to 60 Hz at 0.3 g acceleration to determine the natural resonant frequency of the system. This frequency was determined to be at approximately 19.4 Hz.

The noise made by the system gave indication that the polyethylene bottle was moving within, and independently of, the 2-R container. Using a stethoscope, it was possible to hear the bouncing of the polyethylene bottle. Its response to the input to the system was random in nature and apparently reflected motion in the horizontal axes simultaneously with the vertical acceleration imparted by the shake table. The randomness of motion was visually confirmed in later testing with the closing flange of the 2-R container removed. The maximum vertical displacement of the bottle within the 2-R container approached 3/4 inches.

A series of dwells at frequencies between 18 and 19.4 Hz and acceleration levels between 0.3 and 1.0 g produced pumping action, half filling the Duo-Vent surge chamber (Figure 2).

A restraint was placed between the 2-R closing flange and the bottle cap, and a 1.5 hour test was run at frequencies and accelerations which produced the pumping action in the previous test. The surge chamber remained dry.

A change in resonant frequency was noted from 19.4 Hz to 18.5 Hz on the next run and with the bottle restraint removed it was not possible to reproduce pumping action following 30-minute runs at either 18 Hz and 1.0 g acceleration or 18.5 Hz and 0.9 g.

The reason for the change in resonant frequency of the system was not known, but subsequent examination of the bottom of the steel drum revealed that the bottom had cracked. It was concluded that the damage occurred at the time that the change in resonance was noted.

A series of runs, lasting 2.5 hours, was made over a range of frequencies from 15.5 to 18.2 Hz and at accelerations from 0.5 to 1.0 g. The closing flange of the 2-R was removed for the series to allow visual observation of bottle action to be made. It was determined that maximum displacement of the bottle occurred at 16 Hz and 1.0 g. A run of 1 hour at this frequency and acceleration resulted in the transfer of approximately 1.0 cc of fluid to the surge chamber.

During the 5 hours of testing described above, the 2-R pressure vessel was not secured to the cage holding ring since testing was performed with the closing flange removed (the closing bolts engage nuts welded to the underside of the cage holding ring). As a consequence, the pressure vessel was free to "float" under the action of the shake table. The loose vermiculite in the overpack drum was slowly compacted beneath the cage and the 2-R pressure vessel and ultimately displaced the entire assembly upward approximately 2 inches. Testing was discontinued at this point.

Phase 2

A series of 30-minute dwells made at various frequencies and g forces, duplicated the Phase 1 testing, except the resonant frequency resulting in maximum pumping action was found to have decreased from the range 18.5 to 19.4 Hz to 15.6 Hz.

It was established in a series of runs where the volume of water was reduced in 1.0 liter increments from 9.5 liters to 6.5 liters, that the surge chamber of the Duo-Vent cap would continue to fill. The fact that the pumping action was not too dependent on the level of solution in the bottle was not anticipated.

Phase 3

The third and final phase of L-10 testing was performed using 1.2 Sp.Gr. aluminum nitrate solution as the stand-in for plutonium nitrate solution.

The test series was initiated with 9.5 liters of solution in the bottle with a 30-minute run at 18.9 Hz at a displacement of 0.1 inches. Approximately 0.2 cc of fluid was pumped into the surge chamber. The restraint was not used in the test series. Frequency was decreased from the starting frequency in a series of 30-minute runs to 18.9 Hz, 16.2 Hz and a 15-minute run at 14.6 Hz. The double amplitude setting of 0.1 inch remained unchanged. No increase in surge chamber fluid was observed.

A series of runs at frequencies ranging from 18.2 to 21.1 Hz and at amplitude settings from 0.1 to 0.35 inches produced no pumping action. The Keyport Naval Station Test Engineer concluded that this lack of pumping action was due to the split drum bottom sustained earlier in the testing program. The resonant frequency of the system had changed which made it impossible to reproduce the data taken during earlier tests. L-10 testing was terminated at this point.

b. L-3 Shipping Container

The L-3 shipping container was tested within the same parameters as the L-10 system.

A series of short runs at 0.5 and 1.0 g established that the resonant frequency of the system was 15.5 Hz.

Following the resonant frequency determination, a series of 15 and 30-minute runs were made at frequencies from 15.5 to 18.5 Hz at 1.0 g acceleration. Only a small amount of fluid was forced into the Duo-Vent surge chamber.

These results were not consistent with the L-10 test results and the three-liter bottle, containing

three liters of water, was mounted on an A300B shake table (Figure 3) to observe the action of the fluid.

A frequency sweep from 5 to 20 Hz at 0.1 inch double amplitude was run. Fluid agitation was observed over the entire frequency range and was observed to be most violent at 17 Hz. The formation of standing waves was evident at 5 Hz, with the waves increasing in height to a maximum at 17 Hz and decreasing slightly at the higher frequencies. Extended runs were not made in this test although a small amount of fluid was pumped into the Duo-Vent surge chamber at 17 Hz when the standing waves had sufficient energy to slosh up into the bottle neck.

In the final phase of testing of the L-3 shipping container, the polyethylene bottle was filled with 3.0 liters of 1.2 Sp.Gr. aluminum nitrate solution.

Under test conditions of 15.7 Hz and 0.2-inch double amplitude, a 30-minute run pumped the surge chamber approximately one-third full. Fluid was not removed from the chamber, and a second 30-minute run under the same operating conditions resulted in pumping additional solution until the surge chamber was half full.

The solution was removed from the surge chamber and the run repeated using the restraint between the closing flange of the 2-R container and the bottle. Under the same conditions as the previous runs, no fluid was pumped into the surge chamber.

Three repeated cycles with and without the bottle restraint demonstrated the effectiveness of the restraint in preventing pumping action.

Brief testing of the slit vent closure under the conditions described above gave identical results.

The test program was terminated at this point.

REFERENCES

- [1] SC-RR-66-677, "The Environment Experienced by Cargo on a Flatbed Tractor-Trailer Combination," J. T. Foley, Sandia Corporation.
- [2] Vibration Study of Plutonium Nitrate Shipping Containers, Naval Torpedo Station, Keyport, Washington, June 17, 1970.

Figure 1
L-10 CONTAINER MOUNTED ON
LING A335 SHAKE TABLE

US Navy Photo

AEC RL RICHLAND WASH

Figure 2
DUO-VENT SURGE CHAMBER
SHOWING ENTRAPPED LIQUID

US Navy Photo

UNCLASSIFIED

Figure 3
3-LITER BOTTLE MOUNTED
ON LING A300B SHAKE TABLE

QTY.	DESCRIPTION
1	ASSEMBLY GROUP I
1	CAGE
1	PRESSURE CHAMBER
1	CHAMBER COVER
1	VENT VALVE COVER
1	HEX HD CAP SCREW 1/2" DIA. x 1/2" LG. C. STEEL
1	VALVE-TEFLON PACKING 1/2" NPT MALE HOSE 1/2" B.S.P.
1	PIPE CAP 1/2" NPT 304L SSF
1	3/4" VERMICULITE FILLED 6"x6"x6" CLOTH
1	INSULATION APPROX. 700 FT. 3/4" VERMICULITE
1	33 GAL. DRUM REMOVABLE HEAD 16 GA. BOLT TYPE RING C. STEEL
1	HEX HD BOLT 1/2" DIA. x 1/2" LG. C. STEEL
1	LOCKWASHER 1/2" ID. C. STEEL
1	BOTTLE ASSEMBLY N.E. 38973
1	O-RING 5/8" O.D. x 1/2" I.D. x 1/4" THK. 316 SSF
1	ASSEMBLY GROUP II
1	VALVE-TEFLON PACK 1/2" NPT. FEM. HOSE 1/2" B.S.P.
1	PIPE PLUG 1/2" NPT. 304L SSF
1	GASKET 5/8" O.D. x 5/8" I.D. x 1/4" THK. VITON A DUFFON V-224-7
1	CLOSE NIPPLE 1/2" NPT. 304L SSF

GENERAL NOTES:

1. TOLERANCES: FRACTIONAL $\pm 1/16$
DECIMAL $\pm .010$
2. BREAK ALL SHARP CORNERS & EDGES

NOTE I - REF. ASSEMBLY PART I
A. LID TO BE VENTED BY DRILLING 6 1/8" DIA HOLES EQ. SPACD. ON 18" B.C.

NOTE II - REF. PART 2
A. ALL TUBING WELDS TO BE WATER & AIR TIGHT
B. STRESS RELIEVE AFTER WELDING BY:
1. HEATING PARTS TO 1050°F IN A RECIRCULATING ATMOSPHERE FURNACE FOR 2 HOURS.
2. ALLOW FURNACE TO COOL TO ROOM TEMPERATURE BEFORE REMOVING PARTS
C. DO NOT REMOINT ALL WELDS AFTER STRESS RELIEF & BEFORE PRINTING TO DISCLOSE ANY CRACKING. CRACKS MUST BE REPAIRED.

NOTE III - REF. PART 3
A. PRIOR TO FINAL MACHINING, FULL ANNEAL ASSY. HEAT TO 1850°F, HOLD FOR 2 HRS, WATER QUENCH & PICKLE TO CLEAN.
B. HYDROSTATIC PRESSURE TEST THE PRESSURE CHAMBER ASSEMBLY @ 300 PSI. HOLD PRESSURE TEST FOR 10 MIN. THERE SHALL BE NO DETECTABLE LEAK.

NOTE IV - PRINTING:
PART 2, CAGE. ONE COAT ZINC CHROMATE PRIMER & COATS ALUMINUM
PART 1, DRUM ASSY. 3 COATS AMERCOAT "33" GREY. PREPARE SURFACE & PRIME PER MFG. RECOMMENDS.

NOTE V
PART "IT" HAS VEE STEM POINT & IS AS SPECIFIED OR APPROVED EQUAL.

U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland, Washington 99312		Pu(NO ₃) ₄ L-3 Class II	
SHIPPING CONTAINER		Assembly & Details	
200-GEN.		3902	
H-2-33695			

DATE	BY	DESCRIPTION	REVISIONS
10-1-65	W. J. H. / J. H. H.	REVISED NOTE II B	1
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	2
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	3
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	4
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	5
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	6
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	7
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	8
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	9
10-1-65	W. J. H. / J. H. H.	REVISED PT. 3 FABRICATION (P. 6, F)	10

5 CAGE ASSEMBLY

QTY.	REF.	DESCRIPTION
1	1	ASSEMBLY
2	2	DRUM - OPEN TOP - SS GAL - 16 GA (22 1/2 I.D. x 32 1/2 H.T.) STEEL
1	3	LID - 16 GA - DROP CENTER TYPE C STEEL
1	4	CLAMP RING - 12 GA BOLT TYPE (I.C.G. 17C DRUM) STEEL
1	5	CAGE ASSEMBLY
A.R.	6	TUBING - 2" O.D. x 16 GA. WALL C STEEL
1	7	NUT RING - MODIFIED 5" 300° BLIND FLANGE C STEEL
1	8	SPACER - SEE DETAIL C STEEL
A.R.	9	ANGLE 1 1/2" x 1 1/2" C STEEL

H-2-26141 7-2

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
FRACTIONS DECIMALS ANGLES
1/8 .125 30°
SURFACE ROUGHNESS IN ACCORDANCE
WITH ASA B46.1-1955
2. BREAK ALL SHARP CORNERS & EDGES

NO.	DESCRIPTION	REV.	DATE	APP'D BY	FOR	DATE
1	TOP OF RLG. (R.I.C.) FCN 08208					
2	REVISED DIM. TAKEN FROM					
3	ALOG HAS 2MS FCN 08208					
4	AS-BUILT FCN 81242					

CHECKED	DATE	COMMENT	DATE	APPROVED FOR CONST.	DATE	U. S. ATOMIC ENERGY COMMISSION
						Atlantic Richfield Hanford Company
						Edwards, Washington 99122
						Pu (NO ₃) ₄ LID - CLASS II
						SHIPPING CONTAINER
						DRUM & CAGE
						ASSEMBLY & DETAILS
						200 GEN 3902
						H-2-26141

3 12
8 9 FOR GR. I, 16 17 FOR GR. II
11 10
5 13 FOR GR. I, 18 FOR GR. II
14 7

3 VALVE COVER

1/2 DIA HOLE THRU WITH
CROSS 1 DIA 1/8 OR
4 PLACES EQ. SPAC. ON
6 1/2 B.C.

QTY.	PT. NO.	DESCRIPTION
1	1	ASSEMBLY GROUP "I"
1	2	DRUM ASSEMBLY H-2-26141
1	3	VALVE COVER C. STEEL
1	4	POLY. BOTTLE ASSEMBLY H-2-26142
1	5	PRESSURE CHAMBER LID 304 SST.
1	6	PRESSURE CHAMBER 304 SST.
1	7	INSULATION - APPROX. 14 CU. FT. SIZE #1 VERMICULITE
1	8	PIPE CAP 1/2 NPT 304 SST.
1	9	VALVE - TEFLON PACK 1/2 NPT (MALE) HOKE Y-328A 316 SST.
8	10	NER NO BOLT 1/2-10 UNC x 5 1/2 LG C. STEEL
8	11	LOCKWASHER 1/2 C. STEEL
4	12	Soc. HD. CAP-SEP 1/2-20 UNC-2A x 1 1/2 LG. C. STEEL
1	13	1/2" RING 3/4 NOM D.D. 1.125 TUBE x 20 W-301 SST. PRESSURE, FILLED TEFLON LINED ADVANCE PROD. #2320-23.75 (P. 2 OF 2)
1	14	DRG - 8 TDS MILL (SIZE AS REQD. TO PACK DRUM) POLY.
1	15	ASSEMBLY GROUP II
1	16	VALVE - TEFLON PACK 1/2 NPT (FEM) HOKE Y-328A 316 SST.
1	17	PIPE PLUG 1/2 NPT 304L SST.
1	18	GASKET 1/2 OD x 5 1/2 ID x 1/8 THK. VITON A DUPONT V-434-7
1	19	CLOSE LIPPLE 1/2 NPT 304L SST.

5 PRESSURE CHAMBER LID
5" 300° BLIND FLANGE

NOTE PT. 16 HAS VEE STEM POINT & IS
AS SPECIFIED OR APPROVED EQUAL.

1 ASSEMBLY GROUP I (SHOWN)
15 ASSEMBLY GROUP II (AS NOTED)

6 PRESSURE CHAMBER 5" 300° S.O. FLANGE

NOTES:
1. FULL ANNEAL ASSEMBLY BEFORE MACHINING
FINISHED SURFACES TO SOLUTION QUENCHING
CONDITION BY HEATING PART TO 1850°F. HOLD
FOR 2 HOURS, FOLLOWED BY A WATER QUENCH.
PICKLE TO CLEAN.
2. HYDROSTATIC PRESSURE TEST CHAMBER @ 900 PSIG

H-2-26140 2

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
±.010 ±.020
SURFACE ROUGHNESS IN ACCORDANCE
WITH ASA B46.1-1959
B. BREAK ALL SHARP CORNERS & EDGES

2	ADDED GR. I, PT. 16-19 PER FCU 18584. REVISED PT 13 IN M.L.	REV. BY AGS 8-21-65	REV. DATE 8-21-65	FOR DATE 8-21-65	APPROVED FOR CONST. DATE 8-21-65	APPROVED FOR PURCHASE DATE 8-21-65	APPROVED FOR DESIGN DATE 8-21-65	U. S. ATOMIC ENERGY COMMISSION RICHMOND PATENT & RESEARCH Atlantic Richfield Company Richmond, Washington 22312	Pu (NO ₂) ₄ L-10 CLASS II SHIPPING CONTAINER ASSEMBLY & PRESSURE VESSEL DETAILS	FILE NO. 200-GEN. H-2-26140	WORK NO. 3902	REV. NO. 2
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1	1.	ASSEMBLY	
2	1	2. MODIFIED 83MM CAP	SEE NOTE 4
2b	1	3. VENT CAP	H-2-32984
	1	4. POLY. BOTTLE	SEE NOTE 4
2c	1	5. VENT CAP COVER	H-2-33097

② MODIFIED CAP
SEE NOTE 4 FOR
MATERIAL

④ POLY BOTTLE
SEE NOTE 4 FOR
MATERIAL

3	DELETED NOTE #3 FCN-01413	FCN 07141-2110	R	12/13/66	12/13/66	12/13/66	12/13/66	12/13/66	12/13/66
		e) BLDG WAS 234-5							
		d) ADDED PT 5							
		c) REVISED NECK OF PT. 4							
		b) ADDED REF DNG #2 32984							
		a) VOIDED DETAIL OF PT 3							
2	WAS 88 MM	DI 4040	R	12/13/66	12/13/66	12/13/66	12/13/66	12/13/66	12/13/66
		DI 4220							
1	ADDED 25915 TO NEXT USED ON		R	9 8 66	9 8 66	9 8 66	9 8 66	9 8 66	9 8 66
NO.	DESCRIPTION		REV BY DATE		APPRO BY		FOR		DATE
REVIEWS									

CHECK PRINT ☐		COMMENT PRINT ☐		APPROVED FOR CONST		U. S. ATOMIC ENERGY COMMISSION	
BY		FOR		DATE		REV	
INSTR NO.		DATE		ISSUE NO.		DATE	
APPROVED FOR PURCH		BY		FOR		DATE	
SCALE NONE		20 Kilo		PM 2-14		Pu(NO ₃) ₄ L-10 CLASS II	
DRAWN STAFFORD 4-266		DATE		APPROVED FOR DESIGN		SHIPPING CONTAINER	
CHECKED M. Raine		DATE 7-14-54		BY		FOR	
ISSUED		DATE		20 Kilo		PM 2-14	
DESIGN W. J. J. J.		DATE		20 Kilo		PM 2-14	
PROJECT 1069		DATE		20 Kilo		PM 2-14	
CLASSIFIED BY		DATE		CLASSIFICATION		NONE	
REV. NO.		DATE		H-2-26142		H-2-26142	
PLD. NO.		200 GENERAL		INSTR. NO.		3902	
REV. NO.		H-2-26142		REV. NO.		H-2-26142	
DATE		7-14-54		DATE		7-14-54

SLIT - SEE NOTE

MATERIAL

POLYETHYLENE
ASTM, D 1248
TYPE I, CLASS A

NOTE:

1. SLIT IS CENTERED IN RECESSED AREA.
2. SLIT IS CUT FROM THE TOP USING A KNIFE 0.050" LONG X 0.004" THICK.
3. WHEN ASSEMBLED IN AN 83 MM CAP, THE VENT MUST RELIEVE PRESSURE BETWEEN 1 & 3 PSI.

SECT. A-A

REV. NO.		REV. BY DATE		DRAWING STATUS		APPD. BY DATE		FOR		MICRO F'M'D	
DFTS APPD		DATE		APPD		DATE					
CHECKED				APPD		DATE					
DRAWN				ENGR		DATE					
BLDG NO.		200 GENERAL		INDEX NO.		3902					
SCALE		NONE		CLASSIFIED BY		DATE		CLASSIFICATION		NONE	
DWG NO.		H-2-26354		SHEET NO.		—		SHEETS		—	

DWG NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
U. S. ATOMIC ENERGY COMMISSION		
RICHLAND OPERATIONS OFFICE		
Atlantic Richfield Hanford Company		
Richland, Washington 99352		
VENT CAP - 3 & 10 LITER		
POLYETHYLENE SHIPPING BOTTLE

NOTE

1. MATERIAL, FABRICATION & TESTING PER. SPECIFICATION HWS-8813

NEXT USED ON H-2-26289
H-2-32973

1		JLE		CHANGED NOTES		HWS		FES		DWG NO.		REV NO.		DRAWING TITLE OR INDEX NO.	
11-8-68		2)CHANGED TITLE (P.I. 5036)		11-12-68											
REV. NO.	REV. BY	DRAWING STATUS				APPD. BY	FOR	MICRO F'M'D		U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE					
DFTG	APPD	DATE	APPD	DATE	DATE	Atlantic Richfield Hanford Company Richland, Washington 99352									
6/11/68	J. M. J. J. J.		6/19/68			VENTED. CAP ASSEMBLY FOR POLYETHYLENE BOTTLE.									
CHECKED			APPD	6/18/68											
WN	AGS	6/13/68	ENGR	6/18/68											
BLDG NO.		200 G		INDEX NO.		3902									
SCALE		FULL		CLASSIFIED BY		NONE									
DATE		6/18/68													
DWG NO.		H-2-26325		SHEET NO.		-		SHEETS

	<u>LENGTH</u>
L-3	1 1/4"
L-10	1"

MATERIAL

BOSTON WOVEN HOSE & RUBBER CO.
GREEN JACK WATER DISCHARGE, 4-PLY
HOSE OR EQUIVALENT

REV. NO.		REV. BY DATE		DRAWING STATUS		APPD. BY DATE		FOR		MICRO F'M'D	
DFTG APPD		DATE		APPD		DATE					
CHECKED				APPD							
DRAWN				ENGR							
BLDG NO.		200 GEN.		INDEX NO.		3902					
SCALE		CLASSIFIED BY		CLASSIFICATION							
FULL SIZE		DATE 9-2-70		NONE							

DWG NO.	REV NO.	DRAWING TITLE OR INDEX NO.
REFERENCE DRAWINGS		
U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE		
Atlantic Richfield Hanford Company Richland, Washington 99352		
RESTRAINTS FOR 3 LITER - & 10 LITER POLYETHYLENE BOTTLES		
DWG NO.	H-2-35742	SHEET NO. 5