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7. Abstract

This document summarizes the testing performed on the Entry/Exit Port assembly. The Entry/Exit Port was designed by United Engineers and Constructors (UE&C) for the Waste Receiving and Processing Module 1 (WRAP-1) facility. Several deficiencies were discovered during testing. These deficiencies must be solved before further testing can be performed.

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ENTRY/EXIT PORT TESTING
TEST REPORT

May 1993

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ENTRY/EXIT PORT TESTING TEST REPORT

1.0 INTRODUCTION

The Waste Receiving and Processing Module 1 (WRAP-1) facility must have the ability to allow 55-gallon drums to enter and exit glovebox enclosures. An Entry/Exit Port (Appendix 1, Figure 1), designed by United Engineers and Constructors (UE&C), is one method chosen for drum transfer. The Entry/Exit Port is to be used for entry of 55-gallon drums into both process entry gloveboxes, exit of 55-gallon drum waste pucks from the low-level waste (LLW) glovebox, and loadout of waste from the restricted waste management glovebox.

The Entry/Exit Port relies on capture velocity air flow and a neoprene seal to provide alpha confinement when the Port is in the open and closed positions, respectively. Since the glovebox is in a slight vacuum, air flow is directed into the glovebox through the space between the overpack drum and glovebox floor. The air flow is to direct any airborne contamination into the glovebox. A neoprene seal is used to seal the Port door to the glovebox floor, thus maintaining confinement in the closed position.

Entry/Exit Port testing took place February 17, 1993, through April 14, 1993, in the 305 building of Westinghouse Hanford Company. Testing was performed in accordance with the Entry/Exit Port Testing Test Plan, document number WHC-SD-W026-TP-005. A prototype Entry/Exit Port built at the Hanford Site was tested using fluorescent paint pigment and smoke candles as simulant contaminants.

This test report is an interim test report. Further developmental testing is required to test modifications made to the Port as the original design of the Port did not provide complete confinement during all stages of operation.

2.0 SUMMARY

Entry/Exit Port testing revealed that the current design of the Port does not provide complete confinement during all stages of operation. Confinement is lost during the last inch of Port door closure (Appendix 1, Figure 2). A "puff" of potentially contaminated air escapes the overpack drum, overcomes the capture velocity air flow, and spreads to the environment.

The "puff" is created as the recessed overpack lid is placed onto the drum. The lid displaces a volume of air from within the drum causing the air, or "puff", to be directed radially outward from the drum, normal to the capture velocity air flow. Turbulent air flow through the port allows the "puff" to overcome the capture velocity air flow and spread to the environment.

Three modifications were made to the Port to try and alleviate the "puff." Two of these, the Constant Air Flow Method and the Depressurized Overpack Method, proved successful. However, neither method alleviated the "puff" without creating other problems. For instance, the Constant Air Flow Method requires the use of an inflatable seal to seal the Port while it is in the closed position. An inflatable seal is typically not used as the primary confinement for a glovebox. The Depressurized Overpack Method requires a

filter in the overpack lid that is capable of a 1 cfm flow rate. WHC has not been able to find a filter that allows for this large of flow rate while meeting HEPA filter requirements.

WHC has used the data collected during testing to modify the Port similar to that shown in Appendix 2 - Entry/Exit Port Modification. WHC plans to test this method in June, 1993.

Following testing as noted above, the specific recommendations made to improve the current system operation should be reviewed by UE&C and incorporated into the design.

3.0 TEST METHOD AND TEST EQUIPMENT

A prototype Entry/Exit Port Assembly built at the Hanford Site was installed into the WHC development glovebox. The Entry/Exit Port can be configured for either an 85-gallon drum overpack or a 55-gallon drum. The 85-gallon version was used during this testing. A fan and damper was used to regulate capture velocity air flow while a control panel provided remote operation. Smoke bombs were used to track air movements while fluorescent paint pigment assessed confinement capabilities. Representative portions of all testing were recorded on video tape and archived at WRAP Document Control.

The fan was turned on generating air flow into the glovebox. The overpack drum was centered in the Port and the scissor lift raised until the drum mated with the Port. The lid vacuum was turned on and the Port door opened. The damper was adjusted to allow a capture velocity of approximately 190 feet per minute as measured by a hot wire anemometer. The Port door was then closed, the lid released, and the following tests performed.

3.1 OPEN/CLOSE PORT DOOR

The overpack drum was centered and mated to the Port. Simulant was placed in the overpack drum through a hole near its base and the hole was sealed. The lid vacuum was turned on and the Port door opened. Air flows and simulant migration were visually examined. The Port door was closed and locked. The overpack lid was released and the scissor lift lowered. Where applicable, UV light was used to examine pigment migration.

3.2 RAISING/LOWERING 55-GALLON DRUM

With the Port door opened, an overhead crane latched to the top of a 55-gallon drum. Simulant was placed in the overpack drum. The 55-gallon drum was then raised and lowered by the overhead crane at approximately 2 inches per second. Air flows and simulant migration were visually examined. Where applicable, UV light was used to examine pigment migration.

3.3 SIMULANT INTRODUCTION INSIDE GLOVEBOX

Simulant was introduced inside the glovebox. The Port door was opened and closed to determine if the simulant could migrate out of the glovebox through the Entry/Exit Port.

4.0 TEST RESULTS

4.1 OPEN/CLOSE PORT DOOR

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
1	197	1.95	1.89	Blue Smoke

Observations:

- None. The smoke candle did not work properly.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
2	200	1.95	1.89	Red Smoke

Observations:

- The smoke enters the glovebox similar to an inverted cone.
- Can visibly see smoke being pulled from the rim of the overpack into the glovebox as well as smoke rising from the center of the overpack.
- Smoke creeps up the inner wall of the drum to the leading edge of the rim and is then carried into the glovebox.

Pigment Open/Close

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
6	192	1.95	1.89	Paint Pigment

Observations:

- The paint pigment acted similar to the smoke candle. Needed to atomize the pigment to make it airborne. This was done using a compressed air line.
- It takes roughly 11 seconds for the cylinder to build enough air pressure to open the Port door.
- A ring of contamination has developed on the bottom of the port door between the edge of the restrictor plate and the contact point of the overpack lid on the neoprene seal. The total width of this ring is on average 1-1/16".
- There is a leak in the seal between the vacuum gasket bracket and the lid plate. This caused pigment to enter the region between the gasket bracket and the overpack lid.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
7	191	1.95	1.89	Paint Pigment

Note:

- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.
- Used silicon to seal the vacuum gasket bracket to the lid plate.

Observations:

- Paint pigment is "puffing" into the environment as the overpack lid is placed on the drum.
- Pigment concentration is light near the hinge and becomes greater toward the locking guide region of the Port door.
- The inner vacuum gasket separated from the vacuum gasket bracket around the outer edge of the gasket. The adhesive on the gasket is non-uniform in the region where the two ends are joined.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
8	198	1.95	1.89	Paint Pigment

Note:

- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.
- Replaced inner vacuum gasket.

Observations:

- Pigment is not escaping during the open cycle of the Port door. The restrictor plate and overpack drum were checked with UV light and found to be clean when the Port door is in the full open position.
- Pigment is escaping as the overpack lid is placed back on the overpack drum.
- The lid is displacing a volume of air from within the overpack which is forced out into the environment as capture velocity is disrupted during this part of the stroke.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
9	198	1.95	1.89	Paint Pigment

Note:

- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- Paint pigment is "puffing" radially outward of the overpack drum into the environment.
- Air flows inside of the drum become turbulent as the overpack lid is placed back on the drum.

Slow Cylinder Open/Close

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
10	195	0.5	0.5	Purple Smoke

Note:

- Slowed the Port door open/close cylinder to evaluate its effect on the "puff".

Observations:

- "Puffing" still occurred, however, at a lesser concentration and with lesser dynamic turbulence in the overpack drum.

Bolt

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
11	app. 190	0.5	0.5	Paint Pigment

Note:

- Placed an obstruction on the restrictor plate near the locking guide to keep the port door from fully closing. This allowed for constant airflow while closing the lid to the overpack drum.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The method assisted the pigment to be pulled into the glovebox.
- The size of the "puff" released to the environment was decreased.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
12	190	0.5	0.5	Paint Pigment

Note:

- Same setup as test 11. Using UV light to gain better vision.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The witness "puff" was less substantial in this series of tests as the lid was not fully placed on the drum.
- The obstruction to the port door closure did not allow the drum lid to be fully closed. This was part of the reason that the puff was reduced, since the puff being expelled from the drum becomes stronger as the lid and drum mate closer together
- A small "puff" of pigment was released to the environment as the lid was released from the vacuum bracket.

4.1.1 Constant Air Flow Method

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
13	65 - closed 189 - open	1.9	1.9	Paint Pigment

Note:

- A 1-inch "donut" plywood piece was placed between the restrictor plate and base plate to act as a collet to aid in bringing simulant into the glovebox (Appendix 1, Figure 3). There is now air flowing into the glovebox between the outer edge of the lid weldment and base plate when the door is closed.
- Increased cylinder upstroke and downstroke rates.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The simulant changed direction of the puff from radially outward to a downward motion.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
14	70 - closed 190 - open	1.75	0.5	Paint Pigment

Note:

- Similar to test 13 except changed the cylinder upstroke and downstroke rates.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- Slowing down the Port door had little effect. The simulant "puffed" in a downward motion.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
15	183 - closed 193 - open	1.75	0.5	Paint Pigment

Note:

- Inserted 1" shims to raise the Port door. Retained the 1" "donut" plywood piece (Appendix 1, Figure 3).
- Using a piece of angle iron as a door stop so that the locking shaft penetrates the locking guide.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The overpack lid was placed on the drum without the simulant "puffing" into the environment.
- Simulant fell onto the side of the overpack drum directly beneath the angle iron when the lid was released. Changing location of door stop for next test.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
16	183 - closed 193 - open	1.75	0.5	Paint Pigment

Note:

- Changed location of door stop and slowed the flow rate of air used to release the lid from the vacuum gasket bracket.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The restrictor plate and overpack drum are free of simulant. Did not encounter the "puff".

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
17	180 - closed 190 - open	1.75	0.5	Paint Pigment

Note:

- No simulant was added during the test.
- Ran 20 cycles for verification of simulant containment.
- Cleaned restrictor plate, vacuum gasket bracket, seals, overpack, and lid plate prior to test. Checked with UV light.

Observations:

- The restrictor plate and sides of overpack drum was free of simulant.
- Minute particles of simulant on overpack lid.
- Paint pigment particles present on the vacuum gasket bracket.

4.1.2 Depressurized Overpack Method

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
19	190	1.75	0.5	Green Smoke

Note:

- This system uses a 1" hole in the center of the overpack lid to pull air through the Port door and into the glovebox (Appendix 1, Figure 4).

Observations:

- This method did not make a significant difference. The puff was still present.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
20	190	1.75	Varied	Paint Pigment

Note:

- This test was used to determine the optimum cfm required through the 1" hole in the center of the overpack lid, as well as the Port door speed required.
- Configured the system to easily manipulate the speed at which the Port door closes. This allows different speeds to be tested.

Observations:

- The last 1" of Port door closure is the critical distance. This distance must be traveled slowly and smoothly.
- One cfm air flow through the 1" hole in the overpack lid stops the "puff" from occurring. This value seems to be the threshold, lower cfm values do not consistently work.
- The cfm and Port door closing speeds are independent of each other. A slower closing speed does not mean a lower cfm is required.
- The one cfm air flow along with a Port door closing speed of 20 seconds for the last inch of Port door travel consistently creates the air flow required to negate the "puff".

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
21	Varied	1.75	Varied	Paint Pigment

Note:

- The capture velocity was varied to determine its effect on the cfm required to negate the "puff".

Observations:

- There is no direct correlation between the cfm required and the capture velocity.
- One cfm and 160 fpm capture velocity stopped the puff. However, at capture velocities lower than 160 fpm, one cfm did not stop the "puff" from occurring.
- There are some bizarre turbulent air flows occurring during the last portion of closing the Port door. Air flow constantly changes direction as the lid plate mates to the restrictor plate.
- Turbulent air flow occurs near the rim of the overpack drum.

4.1.3 Shimmied Vacuum Bracket Method

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
22	190 - open 250 - closed	1.75	Varied	Paint Pigment

Note:

- A wedged shaped shim was placed between the lid plate and vacuum gasket bracket (Appendix 1, Figure 5).

Observations:

- The ring of contamination was increased by the width of the shim.
- It's extremely difficult to align the drum/port.
- Pigment collects on the bottom of the restrictor plate opposite the Port hinge.

4.2 RAISING/LOWERING 55-GALLON DRUM

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
3	187	N/A	N/A	Blue Smoke

Note:

- The Port door was open prior to starting this test. An overhead crane was used to raise and lower the 55-gallon drum out of and into the overpack drum at approximately 2 inch/sec.

Observations:

- As the 55-gallon drum was raised out of the overpack, smoke is pulled toward the bottom of the overpack due to air displacement.
- As the bottom of the 55-gallon drum enters the glovebox, smoke begins to exit the overpack and go into the glovebox.
- Capture velocity direction changes as the 55-gallon drum is lowered back into the overpack. However, the capture velocity does not allow any smoke to exit the glovebox.
- Air flow is directly up the sides of the 55-gallon drum as it is lowered into the overpack.

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
4	172	1.95	1.89	Purple Smoke

Note:

- The distance from the overpack drum rim to restrictor plate is 0.75" (under normal operations this distance is 0.5") to evaluate incorrect overpack height on capture velocity.

Observations:

- Capture velocity is very similar to previous tests. The height of the cone shaped smoke swirl entering the glovebox may not have been as high.

4.3 POWER LOSS TO SCISSOR LIFT

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
5	10 or less	N/A	N/A	Green Smoke

Note:

- Lowered scissor lift to simulate a loss of power to scissor lift. The distance from the overpack rim to restrictor plate is 9 1/2".

Observations:

- There is small air flow into the glovebox. Not nearly enough to capture the smoke.

Recommendation:

- The scissor lift should have a device that locks it into position during Port door operations.

4.4 SIMULANT MIGRATION

Test #	Capture Velocity (FPM)	Upstroke (in/sec)	Downstroke (in/sec)	Simulant
18	190	1.75	0.5	Blue Smoke

Note:

- The Port was put back to its original design prior to this test.
- The smoke was introduced inside the glovebox near the Entry/Exit Port.

Observations:

- There is no visible smoke loss out of the glovebox to the environment.

5.0 CONCLUSIONS AND RECOMMENDATIONS**5.1 OPERABILITY**

The following items effect the operability of the Entry/Exit Port.

- The "drum lid in position" proximity switch (Item 81 on drawing H-2-132010 Sht 1) is not long enough to indicate when the overpack drum lid is touching the vacuum gaskets, and the Port is ready for lid vacuum to begin.

Recommendation:

A 3/4" longer proximity switch would allow room for the nuts to hold the switch in position and provide the necessary length to make the switch functional.

2. The overpack lid sometimes sticks to the gaskets on the vacuum gasket bracket. It is extremely important that the overpack lid is attached to the overpack drum as it is lowered from the Port. A separation between the lid and drum can allow the lid to fall onto the overpack drum causing confinement problems.

Recommendation:

- The overpack drum should not be lowered away from the Entry/Exit Port until it is confirmed that the overpack lid is fully released from the vacuum gasket bracket. This may be done by lowering the overpack drum only after the "drum lid in position" proximity switch indicates that the lid is no longer touching the vacuum gaskets. This ensures that the overpack drum is lowered with the lid attached.

3. The gaskets to seal the drum lid to the port door tended to pull away from their mounting. The purchased seal was an extrusion, cut to size and its ends vulcanized together to form a ring. It was purchased with an adhesive backing similar to contact adhesive. To attach the seals to the port door, the mounting area was cleaned, the adhesive's protective backing paper was removed, and the seal was attached. The eventual failure was attributed to adhesive which was unable to withstand the stresses incurred by bending an extrusion.

Recommendation:

A stronger adhesive should be identified which can withstand the seal's internal stresses. Silicone adhesive was used, with adequate results, to reattach the seal during testing.

4. The vacuum which holds the drum lid to the port door can dissipate over time. If this happens and the seal is lost, it cannot be regained by reapplication of the vacuum generator. The drum lid will instead fall from the port door as the port is closed.

Recommendation:

The design should provide a method to monitor seal vacuum, maintaining it at 1" Hg or more.

5.2 CONFINEMENT

The following items have a direct effect on the Entry/Exit Port's confinement capabilities.

1. It is difficult to obtain and maintain Port/overpack drum alignment prior to and during Port operations. Especially if Port operations are through an arc motion. Misalignment can cause the

lid to interfere with Port opening as well as cause the lid to momentarily bind with the rim of the drum, causing the Port to close abruptly.

Recommendation:

The original purpose of the toggle clamps was to center the overpack drum in the Port. However, the clamps are located too high with respect to the overpack drum and interfere with lid removal. Also, the clamps do not lock into place, which is necessary during Port operations.

A device should be installed that aligns the drum in the Port near the base of the drum. The device should also hold the drum in place during Port operations.

2. Scissor lift hysteresis can cause incorrect overpack drum height positioning. Insufficient elevation can prevent the port door from mating with the drum lid, while excessive elevation causes the port door locking mechanism to bind.

Recommendation:

Ensure that the design alleviates the sensitivity to elevation hysteresis, or provide controls which will tightly regulate lift elevation.

3. The size of the ring of contamination will impact the operations cleanup requirements and room air quality.

Recommendation:

Modifications made to the Entry/Exit Port assembly should not increase the size of the ring of contamination. A flange such as that shown in the enlargement of Item 1 of sketch ER3361-2A (Appendix 2) is to be tested during the future developmental testing.

4. Testing has demonstrated that confinement is lost as air "puffs" out of the overpack into the environment as the overpack lid is placed back onto the drum (Appendix 1, Figure 2). The "puff" originates because of two phenomena. First, turbulent air flow during lid closure inhibits capture velocity. Second, the recessed overpack lid displaces a volume of air from within the overpack that is able to overcome the inhibited capture velocity.

Recommendation:

WHC and UE&C have developed and tested three methods to try and stop the "puff" from occurring. Two of these methods, the Constant Air Flow Method and Depressurized Overpack Method, proved successful. However, neither method alleviated the "puff" without causing other problems.

The following summarizes the different methods tested.

1. Constant Air Flow Method (Appendix 1, Figure 3):

Constant capture velocity air flow is achieved by raising the Port door 1" creating a 1/2" gap between the lid plate and base plate. A 1" "donut"

spacer is placed between the base plate and restrictor plate to act as a collet and assist in pulling the "puff" into the glovebox. Initial testing of this method was successful, however other methods were pursued because an inflatable seal is required to seal the glovebox when the Port is closed.

2. Depressurized Overpack method (Appendix 1, Figure 4):

This method employs a vacuum eductor to create air flow through the center of the overpack lid. This air flow creates another air flow directed into the overpack drum between the overpack lid and rim of the drum during the critical last inch of closure, thus negating the "puff". A minimum flow rate of 1 cfm through the overpack lid and a Port closure rate of 20 seconds per inch is required to stop the "puff" from occurring. Smaller flow rates did not consistently work no matter what speed the Port door was closed. Various capture velocities were tested but did not significantly change the cfm required. This method was not pursued because WHC has not found a bung filter that allows for this large cfm flow rate while meeting HEPA filter requirements.

3. Shimmed Vacuum Gasket Method (Appendix 1, Figure 5):

A wedge shaped shim was placed between the lid plate and vacuum gasket bracket. The shim allows constant capture velocity air flow into the glovebox while the lid is placed back on the drum. However, simulant collected on the edge of the restrictor plate opposite the Port hinge. Other problems are that it was extremely difficult to align the drum correctly in the Port and the ring of contamination was increased by the width of the shim.

WHC has used the data gathered during testing to modify the Entry/Exit Port to perform the operations shown in Figure 6 of Appendix 1 - WHC Test Method. Initially, the overpack drum is centered in the Port and raised to mate with the scissor lift. The drum is used to raise the lid plate, creating constant capture velocity. The cylinder is then activated, removing the lid in a vertical motion. The Port then opens through the arc and the 55-gallon drum removed. The Port then closes such that the lid is normal to the overpack drum. The cylinder is de-activated, lowering the lid back onto the drum while constant capture velocity air flow remains. The scissor lift then lowers the drum, sealing the glovebox.

The advantages of testing this system are:

1. to determine the minimum distance that the overpack drum must be inserted into the glovebox to allow confinement.
2. that the lid is removed and placed onto the drum in a vertical motion. Overpack lid/overpack drum alignment is easier to manage vertically as opposed to an arc.
3. that constant capture velocity air flow is obtained as the overpack lid is placed back onto the drum.
4. that the ring of contamination is minimized.

In addition, WHC plans to test a seal designed to cover the ring of contamination. The design of the p-shaped seal and modifications made to the Entry/Exit Port are shown in Engineering Sketch ER3361-2 of Appendix 2.

6.0 CURRENT DEVELOPMENT PLAN

The modifications made to the Entry/Exit Port (Appendix 2) are to be tested in June, 1993. Also, filters that allow for the 1 cfm flow rate necessary for the Depressurized Overpack Method are to be investigated.

7.0 DISPOSITION OF TEST ITEM

The prototype Entry/Exit Port assembly is to remain at the test site until supplementary testing is complete.

APPENDIX 1 ENTRY/EXIT PORT MODIFICATIONS

Figure 1 CURRENT DESIGN

Figure 2 CONFINEMENT IS LOST

Figure 3 CONSTANT AIR FLOW

1" SPACER BETWEEN BASEPLATE AND RESTRICTOR PLATE
 1" SPACER BETWEEN BASEPLATE AND LID ASSEMBLY
 POSSIBLE ADDITION OF AN INFLATABLE SEAL BETWEEN
 RESTRICTOR PLATE AND PORT DOOR

Figure 4 DEPRESSURIZE OVERPACK

ADD A VACUUM EDUCTOR TO DEPRESSURIZE THE OVERPACK
THROUGH THE FILTER OF THE OVERPACK LID.

SHIMMED VACUUM BRACKET

Figure 5

CONSTANT AIR FLOW IS PROVIDED WHILE THE OVERPACK LID IS PLACED ON THE DRUM. THIS ARRANGEMENT WOULD ALLOW THE LID PLATE TO SEAL AGAINST THE RESTRICTOR PLATE WHEN THE DRUM IS LOWERED.

Figure 6: Proposed WHC Test Method

6A

The overpack drum mates with the port and the seal annulus is evacuated.

Note: Separate lifting arms from lid plate. Raise lifting arms to allow for y clearance.

6B

Scissor lift raises drum forcing port to open vertically upward. Constant capture velocity air flow is achieved.

Note: Separate lifting arms from lid plate. Raise lifting arms to allow for y clearance.

6C

Cylinder is energized, lid is raised normal to the drum.

Note: Separate lifting arms from lid plate. Raise lifting arms to allow for y clearance.

6D

Port goes through open/close operations, through the arc.

Note: Separate lifting arms from lid plate. Raise lifting arms to allow for y clearance.

Figure 6: Proposed WHC Test Method

APPENDIX B PROTOTYPE ENTRY/EXIT PORT

① ENTRY PORT MODIFICATION

QTY	PRI	DESCRIPTION
1	1	ENTRY PORT MODIFICATION
1	2	SEAL RETAINER
1	3	LEVER ARM STOP
2	4	LEVER ARM SPACER
2	5	BEARING SPACER
1	6	CLEVIS MOUNT SPACER
1	7	SHORT STROKE CYLINDER
2	8	POWER CLAMP
1	9	PI-STRIP EXTRUSION
3	10	SCREW, HEX HD CAP
12	11	SCREW, HEX HD CAP
3	12	SCREW, HEX HD CAP
4	13	BOLT, HEX HD
4	14	SCREW, HEX DASH CAP
1	15	SCREW, HEX DASH CAP
1	16	NUT, HEX
1	17	ALL THREAD

NO ASSEMBLY
MODIFY PER DETAIL A ON SHEET 109

BASE PLATE
MODIFY PER DETAIL B ON SHEET 110

SECTION A-A

TOP PLATE
MODIFY PER DETAIL C ON SHEET 110

NOT SEAL MOUNTING STRIP RADIALLY
AS REQ'D TO FORM SEAL AROUND I/O
IF SEAL RETAINER ENDS IF SEAL ARE
NOT REQ'D TO BE BONDED

SKETCH NO
ER3361-2A

MODIFY HINGE ARMS PER DETAIL A-1 -

GRIND WELDS AS SHOWN
TO SEPARATE HINGE
ARMS FROM LID PLATE
IN PLACES

MODIFY LID PLATE PER DETAIL A-2 -

DETAIL A
LID ASSEMBLY MODIFICATION

1. UNLESS OTHERWISE SPECIFIED ALL
DIMENSIONS ARE IN INCHES
2. MACHINING TOLERANCES SHALL BE:
1X = ±.03
2X = ±.010
ANGULAR ± 1°

ER3361-2B

DETAIL B
 (BASE PLATE MODIFICATION)

2 SEAL RETAINER
 MATL: CS THK LGW CARBON STEEL

NO. 2 EXISTING HOLES
 1/2" DIA. WITH RTT. BELD
 POSITIVE OR FASTENERS, etc

1/2"

1/2"

1/2" UNF-18 X 7.25 MIN
 HOLES 2 PLACES

DETAIL C
 (RESTRICTOR PLATE MODIFICATION)

NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES.
2. MACHINING TOLERANCES SHALL BE:
 .XX = ±.03
 .XXX = ±.010
 ANGULAR = 1°

SKETCH NO.
ER3361-2C

3 LEVER ARM STOP
MATERIAL: ASTM A36

5 BE
MATERIAL

4 LEVER ARM SPACER
MATERIAL: ASTM A36

6 CLEV
MATERIAL: A5

RING SPACER
DIM 436

RING MOUNT SPACER
DIM 436

NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES.
2. MACHINING TOLERANCES SHALL BE:
 $\pm .03$
 $\pm .010$
 ANGULAR $\pm 1^\circ$

ETCH NO
ER3361-20

**DATE
FILMED**

12 / 01 / 93

END