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VIRGINIA ELECTRIC AND POWER COMPANYSURRY POWER STATIONUNIT NO. 1 AND 2SHIPPING OF SPENT FUELTN-8L SHIPPING CASKLOADING AND HANDLING PROCEDURESDOCKETED
USNRC

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OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH1.0 References

- 1.1 Operating Manual, TN-8L Spent Fuel Cask Operations
- 1.2 NUREG 0612 Heavy Loads

2.0 Purpose

- 2.1 This procedure outlines the methods of receipt, placement in the Spent Fuel Pool, loading Spent Fuel, Removal from Spent Fuel Pool, decontamination, dryness verification, Integrity Testing and shipment of the TN-8L Spent Fuel Shipping Cask.
 - 1.1.1 Unloading Cask from truck
 - 1.1.2 Preparation of Cask for loading spent fuel
 - 1.1.3 Cask loading
 - 1.1.4 Preparation of Cask for departure

NUCLEAR REGULATORY COMMISSION

Docket No. 50-338-014-1 Official Ex. No. #1
In the matter of Virginia Electric & Power Co

Staff _____ IDENTIFIED _____
Applicant ☒ RECEIVED ☒
Intervenor _____ REJECTED _____
Cont'g Off'r _____
Contractor _____ DATE 5-21-85
Other _____ Witness _____
Reporter Myrtle H. Taylor

8506120014 850521
PDR ADOCK 05000338
G PDR

3.0 Initial Conditions

- 3.1 The cask has arrived at Security Gate.
- 3.2 Security has notified Health Physics and Operations of Cask arrival.
- 3.3 Security has verified seals have not been tampered with and recorded Seal Numbers.
- 3.4 QC has been notified.
- 3.5 Fuel Building Roll-up Doors and Decon Bldg. North access hatch at operating deck of Fuel Building are accessible.
- 3.6 The water level in the Spent Fuel Pool is at less than maximum.
- 3.7 A current Fuel Storage Area map is available. *to whom*
- 3.8 Health Physics has performed its initial Radiation Survey at the gate and is prepared for the Cask to be brought on Station.
- 3.9 The Spent Fuel Handling Tool is available. The Spent Fuel Cask Handling Crane, and th Fuel Pit Bridge Crane, are operable. Also, hand tools are provided in storage boxes outside, in Decon. Bldg. and in Fuel Building.
- 3.10 Portable underwater lighting in Spent Fuel Pool is available.
- 3.11 A VNF-7 Form has been initiated and approved for shipment of Fuel from Surry Power Station and Fuel Assembly and device History Sheets are available.
- 3.12 The Cask Service Equipment, Utilities, and special tools are on hand and operable.

3.0 Initial Conditions (continued)

- 3.13 Health Physics Coverage available for Cask Handling Operation per the applicable H.P. Procedures and Radiation Work Permit.
- 3.14 Area prepared and accessible to Crane for lifting beams.
- 3.15 Access to Fuel Building via the stairwell between the Fuel Bldg. and Decon. Bldg. is made available during operation.
- 3.16 The Crane hook, block and cables are clean and lubricated.
- 3.17 Personnel involved have been instructed in the proper use of tools and equipment utilized.
- 3.18 The continuous Radiation Monitoring System of the Fuel Bldg. is in service, and air activity is being continuously monitored.
- 3.19 Decon Bldg. ventilation in operation.
- 3.20 Condensate Water Supply and hoses are available at Spent Fuel Pool to wash down Cask upon leaving water.
- 3.21 Spent Fuel Data has been obtained from Fuel Resources and is on copy of Cask Loading Report. Cask Loading Report to be provided by Surry Power Station and transmitted with the shipment.
 - 3.21.1 Spent Fuel Shipment Number
 - 3.21.2 Spent Fuel Assembly Serial Number and Insert Number.
 - 3.21.3 Spent Fuel Location within the Cask
 - 3.21.4 Decay Heat content (KW)
 - 3.21.5 Total Activity of Element (CURIES)
 - 3.21.6 Weight of Fissile Uranium (GRAMS)
 - 3.21.7 Weight of Fissile Plutonium (GRAMS)

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3.0 Initial Conditions (continued)

- 3.22 A Supervisor from Operations will be in charge of fuel movements in order to certify the proper records are completed and to ensure a smooth evolution.
- 3.23 Fuel Resources Personnel will be notified prior to any fuel movements.
- 3.24 The Transportation Documents have been received from the carrier and are in good order.
- 3.25 All fuel assemblies stored in Region 1 (SfSA rows 31 through 48) of the Surry spent fuel pool are on the most recent revision of the "Surry Region 1 Fuel Eligibility List".
- 3.26 Auxiliary cask handling equipment has been tested in accordance with ANSI N14.6.

4.0 Precautions and Limitations

- 4.1 All Fuel Handling Equipment will have been tested prior to handling the shipping Cask and Fuel Assemblies.
- 4.2 Positive and accurate records will be maintained at all times.
- 4.3 Cask shall not be moved outdoors when threat of severe weather disturbance exists.
- 4.4 Slings, shackles, and cables shall be checked to verify that they appear to be in good working order.
- 4.5 The cask and all handling tools and equipment are massive and heavy. Many pinch point hazards exist. A very slow swing of the suspended cask will contain a large amount of energy. Be careful in the cask equipment moves.
- 4.6 The Cask in the upright position is sixteen (16) feet high, which constitutes a fall hazard. Improper rigging can cause a cask or equipment drop.
- 4.7 The surface of a loaded cask at equilibrium may be uncomfortably hot.
- 4.8 It is imperative that the cask handling crew be thoroughly familiar with cask equipment, potential hazards and proper handling procedure. Also, all safety rules and equipment are available to perform all areas of cask handling safely.
- 4.9 All personnel in Fuel Building, taking part or observing work, shall be familiar with Station Emergency Plan and AP for Fuel Failure.

4.0 Precautions and Limitations (continued)

- 4.10 Care should be taken to keep the skirt inlet and vent hoses as short as possible. Excessive lengths may result in interference problems. The hoses should be allowed to hang freely but not allowed to become entangled.
- 4.11 Thorough planning should be done prior to cask immersion to ensure that immersion times are minimized. Normally, the shorter the immersion time, the less severe the contamination problems incurred and associated decontamination efforts.
- 4.12 Do not allow Cask to dry prior to decontamination.
- 4.13 Operation of the Fuel Building Bridge and Trolley Crane will be accomplished by qualified crane operators.
- 4.14 Safety belts will be worn by personnel as necessary to prevent falling into Spent Fuel Pool.
- 4.15 All hand tools used over Spent Fuel Pool or Cask Area will have lines attached to prevent their dropping into the pool.
- 4.16 When fuel handling is in progress, all doors will be shut in the Spent Fuel Building, except for the movement of people or equipment.
- 4.17 Prior to moving Fuel Building Bridge Crane into the vicinity of the Cask Area, ensure cask crane has been moved clear so as not to obstruct the path of the bridge crane.

4.0 Precautions and Limitations (continued)

- 4.18 Whenever the lifting beam or special service tools are being moved underwater, at least one person other than the man controlling or directing the crane movement, must be observing the lifting beam or service equipment. The lifting beam or service equipment shall not be moved when visibility problems obscure their underwater movement.
- 4.19 DELETE
- 4.20 Avoid excessive "jerky" motion of crane when carrying fuel.
- 4.21 When handling fuel, the fuel handling tool should be supported by hand, to prevent unnecessary swinging action.
- 4.22 Move trolley and bridge smoothly when moving fuel.
- 4.23 Insure the locking device is in place prior to lifting fuel assembly.
- 4.24 Always ensure adequate clearance exists between the top of the Fuel Assembly Storage Racks and the bottom of the Fuel Assembly prior to moving fuel horizontally in pool, and when placing Fuel Assembly over the shipping cask.
- 4.25 Minimum allowable depth of water between top of Spent Fuel and surface of water is 8 feet while moving fuel.
- 4.26 Minimize axial loading during the last few inches of travel when setting an assembly down or attaching a handling tool by jogging the crane at minimum possible speed.

4.0 Precautions and Limitations (continued)

- 4.27 The Fuel Building Bridge Crane should be parked over the new Fuel Storage Area and the power supply disconnect switch shall be open and padlocked with an Administrative Control Lock whenever it is not in use.
- 4.28 Any fuel assembly movement will be proceeded by Form VNF-7 issued from the Refueling Office with the Superintendent of Operations approval signature affixed for fuel assembly position changes.
- 4.29 In the event of anything abnormal occurring during operations, stop and have situation evaluated by the Supervisor.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck

_____ 5.1.1 Initial conditions are noted and satisfied.

systematically

_____ 5.1.2 Precautions and Limitations as noted.

_____ 5.1.3.1 Release the tarpaulin in tie-down along
the sides of the trailer by pulling the
elastic tie-down ropes from the trailers
tie-down hooks.

_____ 5.1.3.2 Release the trailer rear tarpaulin
section by unbuckling the leather straps
along each side of the tarpaulin
releasing the bottom of the tarpaulin.

_____ 5.1.3.3 Roll-up the rear tarpaulin section and
secure it in this position by placing
the straps around the tarpaulin and
buckling the straps to the tarpaulin
roof section.

FOR REFERENCE USE ONLY

INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

5.1.3.4 Slide the enclosure forward by having one man at ground level on each side of the trailer grasp the side section of the tarpaulin and pull it towards the front of the trailer (this will result in sliding the roller mechanism forward). Slide the enclosure until the tarpaulin is drawn as far as possible against the front of the enclosure. A rope and pulley are also located on the inside of the trailer front wall to assist in pulling the tarpaulin forward. The mechanism can then be locked in place by the pin locks on the rails.

NOTE: If it is undesirable to limit the cask or cover lift height during removal from the trailer, the lengths of the slide mechanism roller tracks may be removed between the track support posts. This removal is done by retracting the spring loaded pins from the ends of the track and removing the track section.

NOTE: Steps in the "Loading Procedure", marked by an asterisk(*), indicate information is required to be entered on the referenced form or report.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ *5.1.4 Perform Cask and Trailer Radiation Surveys and
Record Data on "Cask Receipt Radiation Survey".
Complete the Survey Forms and retain for
documentation requirements. This is performed and
document by Station Health Physics Department.

_____ 5.1.5 Health Physics requirements should be checked to
determine if protective clothing (e.g. gloves) are
required.

_____ *5.1.6 Remove Security Seals. (Seals on front and back
shock absorbing covers). Remove seals.

_____ 5.1.7 Remove (6) trunnion impact limiters per the
following instructions: (two on lower end of cask,
four on upper end of cask). See figure 2,
Attachment 1.

Required Equipment

Waterproof Tape

Ratchet

13/16 inch socket

Ratchet drive extension

50 ft. tape measure

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INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

Trunnion

#1 #2 #3 #4 #5 #6

5.1.7.1 Remove the limiter 9/16" bolt.

NOTE:

As the bolt is removed, manually restrain the trunnion impact limiter (approximate weight of a trunnion impact limiter is 45 lbs).

5.1.7.2 When the bolt is removed, remove the trunnion impact limiter from the trunnion.

5.1.7.3 Inspect the threads of the 9/16" bolts trunnion hole. Tape over the bolt holes.

5.1.7.4 Store the bolts and trunnion impact limiter in their prescribed storage area.

NOTE:

If storage is made in a contaminated area the trunnion impact limiters should be covered with a sheet of plastic, etc. to avoid their contamination. Repeat steps 5.1.7.1 thru 5.1.7.4 for the remaining trunnion impact limiters. The front cradle dust cover plate must be swung back to gain access to front trunnion on underside of cask.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.8 Position trailer under unloading crane and release front trunnion guide assembly and rear trunnion tie-down per the following instructions: Make reference mark of position of trailer for loading/unloading operations, by taping a line on the side of the trailer midway $\pm \frac{1}{2}$ inch between cask front and rear trunnion center lines. Locate the trailer centered laterally on the road way $\pm \frac{1}{2}$ inch so that the cask trunnion mid point is over the crane centerline mark on the road ± 1 inch.

Required Equipment

Ratchet

3/4 inch socket (for trunnion guide assembly bolts)

1 1/8 inch socket (for rear trunnion bolts)

1 1/8 inch open end wrench

RIGHT

LEFT

Front Trunnion

_____ 5.1.8.1 Remove the load binder handle restraint chain from the trailer chain securement hook.

_____ 5.1.8.2 Release tension from the front trunnion restraint by lifting up on the binder handle.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

RIGHT

LEFT

5.1.8.3 Remove the binder attachment hook from
beneath the trunnion tie-down support
lip.

5.1.8.4 Swing the binder assembly free of the
cask trunnion by pivoting around the
tie-down rod pivot pin. Lay the binder
assembly on trailer deck.

5.1.8.5 Repeat steps 5.1.8.1 through 5.1.8.5 for
the second front trunnion tie-down.

Trunnion Guide Assembly Removal

5.1.8.6 Swing back the front cradle dust cover
plate from the underside of the trailer.

5.1.8.7 Remove the two hex head bolts and their
lock washers.

5.1.8.8 Remove the trunnion guide assembly from
the trailer (this frees the lower
redundant trunnion and allows cask
removal from the trailer).

5.1.8.9 Remove the two bolts and their lock
washer from the rear trunnion tie-down.

5.1.8.10 Lift the rear trunnion collar free of
the cask rear trunnion.

5.1.8.11 Repeat steps 5.1.8.9 and 5.1.8.10 for
the second rear trunnion tie-down.

INITIALS5.0 Procedure (continued)5.1 Unloading Cask From Truck (continued)RIGHTLEFT

5.1.9 Remove the shock absorbing covers per the instructions below and apply two layers of tape over each shock absorbing cover bolt and alignment pin hole on the front and rear front. See figure 1 and 2 in Attachment 2.

Required Equipment

2 legged sling equipped with connections to allow attachment to the lifting crane auxiliary hook (bale) and to the cover connecting shackles (loops, etc.)

2 connecting shackles

Ratchet

Ratchet drive extension

1 7/8 inch socket

Storage area (for covers)

Plastic or tarpaulin cover (if necessary, see step 5.1.9.7 Note).

1/2 ton chain fall with dynamometer

2 25 ft. ropes

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

FRONT

REAR

5.1.9.1 Center the crane auxiliary hook directly over the shock absorbing cover to be handled. There is no preference in the shock absorbing cover removal sequence; either may be removed first. Lower the crane auxiliary hook and attach to chain fall dynamometer assembly.

5.1.9.2 Attach the 2 legged sling lifting bale to to the dynamometer.

5.1.9.3 Attach the 2 legged sling to the 2 lifting lugs of the shock absorbing cover by means of the 2 connecting shackles.

5.1.9.4 Carefully raise the auxiliary hook to take slack out of the cable; then, by use of the chain hoist pick-up approximately 850 to 900 lbs as indicated on the dynamometer.

5.1.9.5 Remove the four shock absorbing cover bolts. The 2 top bolts should be removed before the 2 bottom bolts. Inspect bolts for wear and grease with Never-Seeze prior to re-installation.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

FRONT

REAR

NOTE: Due to the angle of the covers from the vertical, care should be taken when removing these bolts as the bottom of the rear cover could swing out from the cask when its bolts are removed.

5.1.9.6 Gently move the shock absorbing cover away from the cask until the cover centering pins are clear of the cask. Lift the shock absorbing cover using crane auxiliary hook.

5.1.9.7 Move the shock absorbing cover to its designated storage area and disconnect the 2 shackles from the shock absorbing cover lifting lugs.

NOTE: If the storage area is dirty or contaminated, the covers should be stored on a sheet of plastic or a tarpaulin and covered. Care should be exercised in handling and storing cover bolts to prevent thread damage.

5.1.9.8 Transfer the crane hook and 2 legged sling to the other shock absorbing cover.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

FRONT

REAR

5.1.9.9 Repeat steps 5.1.9.1 thru 5.1.9.7 for
the other shock absorbing cover.

5.1.9.10 Remove the 2 legged sling assembly from
crane auxiliary hook.

5.1.10 Attach main hoist of cask crane to horizontal
lifting beam using the following steps:

5.1.10.1 Traverse the crane over the stored
horizontal lift beam. Lower the hook
between the yoke plated, insert the pin,
and lock the pin in place with the
keeper plate. Apply Never-seeze grease
to all four lifting pendant bearing
surfaces.

5.1.10.2 Raise the horizontal lift beam clear of
its supports and rotate it on the hook
swivels to that the front end (short
pendants) is oriented toward the front
of the cask. Raise high enough for the
cask. Apply Never-seeze to cask
trunnions.

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.11 Lower the beam slowly and guide the trunnion plates past the trunnions until they can be slipped on. Raise the locking bars, slip the plates over the trunnions and release the locking bars so that they rest on the trunnions inside the trunnion lip thus preventing the plates from coming off.

NOTE: If difficulty is experience in attaching a rear trunnion plate because the cask is not centered on the trailer, it will be necessary to shift the cask to a central position first.

_____ 5.1.12 The cask should be raised carefully until it is clear above the supports. The front will rise about 8 inches before the rear trunnions lift off their supports. If, at this time, it appears necessary to control lateral movement of the cask, ropes should be attached at the trunnions and held on the ground.

_____ 5.1.13 When the cask is clear of the trailer, the trailer should be driven out. The cask can then be lowered until it is near the elevation of the tilting frame trunnion supports. Rotate cask 90° to align cask with tilting frame. Apply Never-Squeeze to tilting frame trunnion supports.

INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.14 The rotated cask is then traversed over the tilting frame and lowered until the rear trunnions are in their supports. Care must be taken to center the rear trunnions within $\frac{1}{4}$ inch as they contact the supports. Once they are positioned the cask can be fully lowered.

_____ 5.1.15 With the pendants slack, the locking bars can be raised and the trunnion plates removed from the trunnions. Raise the horizontal lift beam and traverse to the storage supports. Lower the horizontal lift beam onto the supports. Disengage the hook pin, raise the hook, store the pin in the yoke plates.

_____ 5.1.16 Attach lifting beam to crane hook using following steps:

5.1.16.1 Lower the crane hook between the strong back plates of the lift beam. Align the four-inch hole in the crane hook with the four-inch hole in the lift beam. (A sleeve adapter is to be required as the center hole of crane is larger than the 4 in. diameter pin). See figure 3, Attachment 1.

INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.16.2 Insert the four-inch diameter pin and
install the keeper plate.

NOTE: If manual engagement of lifting beam is
desired, N/A step 5.1.17.

_____ 5.1.17 Connect air system to lifting beam and insure
operability as follows:

(Refer to figure 4).

_____ 5.1.17.1 Connect the air controller to an air
supply of 75-100 PSIG.

_____ 5.1.17.2 Attach as many 50 ft. long sections of
flexible hose to the three
quick-connectors on the air controller
as needed. The hoses and quick
connectors are color coded to assure
proper connection.

_____ 5.1.17.3 Connect the three hoses to the fittings
on the right hand side of the beam as
one faces the side with the piping.
(hoses, piping and air controller are
color coded).

_____ 5.1.17.4 Verify that the bypass toggle valves on
the beams are in the closed position.

INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.17.5 Observe whether the lifting arms are in the released or engaged position. Set the arm control lever on the air controller to the same position.

_____ 5.1.17.6 Set the green handle of the locking cylinder valve to the "locked" position.

_____ 5.1.17.7 Depress the black handled toggle valve on the air controller until line pressure is indicated on the pressure gauge. Releasing the toggle will close this valve.

NOTE: The system is now operational. It is always operated in the following sequence:
Set the green handled locking cylinder valve to "unlocked".
Move the arm positioning lever to the desired position. Lifting beam latching mechanism fails to "engaged" position. Air may be disconnected once engaged for ease of movement of cask. Visually verify that the arms have moved fully to the desired position.
Set the green handled locking cylinder valve to "locked".

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

CAUTION: Do not attempt to move the arms when the green handle is on "locked". However, if this should happen, return the arm positioning lever to the position corresponding with the current position of the arm of the beam before opening (unlocking) the locking cylinder.

When the system is in the "locked" position, visual confirmation is provided by small metal flags which are moved by the end of the locking pin. These flags extend horizontally when the system is fully locked and can be seen from the surface of the pool when the cask is under water. The location of these flags may influence the position of the beam with respect to the cask (i.e., whether 180° rotation is desired) before the cask goes into the pool.

Note that the arm repositioning will take a few seconds more if:

- . The air lines are especially long
- . Air pressure is on the low side
- . The system is in redundant configuration.

Allow sufficient time before returning the green handled valves to the "locked" position.

INITIALS

5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.18 Apply Never-seeze grease to the lifting shoulder of front horizontal trunnions and to the engagement surface of the lifting arms. Position the lift beam over the front trunnions and engage the lift beam to the trunnions.

_____ 5.1.19 Tilt the cask to the vertical position using the crane. Maintain crane and cables in a vertical position over lifting trunnions as the cask is tilted to the vertical position. Lift the cask off the tilting frame.

_____ 5.1.20 Transfer the cask to the decon. area (Decon Bldg.), installing the bottom protective cover as the cask is lowered onto the pad per the following instructions: See figure 18.

_____ 5.1.20.1 Prior to lowering the cask onto the decontamination pad, place the Bottom Protective Cover onto the decontamination pad.

_____ 5.1.20.2 Lower the cask until its bottom region is approximately 6 inches above the bottom cover.

_____ 5.1.20.3 Manually lift the bottom cover and fit it onto the cask rear face (approximate weight 30 lb.).

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5.0 Procedure (continued)

5.1 Unloading Cask From Truck (continued)

_____ 5.1.20.4 Attach the cover to the cask by looping
the cover attachment cables over the
lower cask trunnions and securing them
to their attachment point on the bottom
cover.

_____ 5.1.20.5 Slowly lower the cask onto the
decontamination pad.

NOTE: Start VDS warm-up.

_____ 5.1.21 Disengage the lift beam and move it to the fuel
bldg. for attachment of the lid lifting sling.

_____ 5.1.22 Attach the lid lifting sling to the lift beam.

_____ 5.1.23 Proceed to section 5.2 for Preparation of Cask prior
to unloading.

Completed By: _____

Date: _____

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5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel.

5.2.1 Initial condition are noted and satisfied.

5.2.2 Precautions and Limitations are noted.

Skirt Operation Precautions

The skirt's condition should be checked on a routine basis. Special attention to leakage inspections is advised. If leaks are identified, the area shall be patched using a reinforced plastic patch kit.

5.2.3 Install the plastic protective skirt around the finned length of the cask per the instructions provided below:

Skirt Installation

Allen wrench - 3/8 inch

Crescent wrench (adjustable)

Never-Seeze grease, or site approved equivalent

Waterproof tape

Ratchet wrench

Torque wrench 0-100#

3/8" hex set screw socket

5.2.3.1 Place plastic protective cover on top surface of cask.

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5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.3.2 Remove the skirt from storage. Unroll it and inspect it to ensure that it is in an acceptable condition (i.e. no holes, acceptable contamination levels, etc.,) Check condition of skirt accessories, water hoses, connectors "J1" and "J2" cables, cable tensioners, and screws. Grease screw threads if necessary.

NOTE: Item numbers used in this section are shown in figures 20, 21, 22, 23, 24.

_____ 5.2.3.3 Insert the 2 pins (4) of the lower bar into the cask skirt lugs (11) and manually wrap the skirt around the cask utilizing the handles (5).

_____ 5.2.3.4 Insert the 2 pins (3) of the upper bar into the corresponding holes of the skirt lower bar (2). Install the 13 screws (22) to close the skirt.

_____ 5.2.3.5 Locate the upper skirt lateral guide (8a) in the cask front drum groove.

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5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.3.6 Position the cable as shown in Fig. 20 detail 1. The cable is wrapped "below" the lateral guide (i.e. between the lateral guide and the cask center). Wrap the cable once around the cask as shown in Fig. 20.

_____ 5.2.3.7 Insert the cable under the upper bar (1) and into the drum groove (insert cable in groove shown in Fig. 20, detail 1 and wrap the cable around the cask a second time, while carefully positioning the cable in the cask drum groove, "below" the lateral guide (as shown in Fig. 20, detail 1).

_____ 5.2.3.8 Pull the cable taut and check that the cable is correctly positioned in the drum groove.

_____ 5.2.3.9 Insert the free end of the cable through the rotation drum hole (15) of the rotation drum (14) of the upper skirt cable tensioner (7). (Refer to Fig. 20 and Fig. 23).

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5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.3.10 Lock the cable by tightening the cable
locking screw (16). (Fig. 23)

_____ 5.2.3.11 Attach the locking O-rings (18) to the
locking handles (17) as shown in Figure
23 (the O-ring forces the locking
handles down onto the rotational drums
(14) and prevents rotation. This keeps
the cables under tension).

_____ 5.2.3.12 Attach wrenches to the cable tensioning
nuts (19) and turn the rotation drums as
indicated by arrows in section AA of
Fig. 24. Turn both drums at the same
time. The locking handle should be
pulled up to allow the rotation drum to
turn. When the cable is sufficiently
tensioned, push the locking handle (17)
firmly down to ensure that it is seated
against the rotation drum (14).
(Fig. 23)

_____ 5.2.3.13 Locate the lower lateral guide (8b) in
the cask rear drum groove. (Fig. 20)

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5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.3.14 Repeat steps 5.2.3.5 through 5.2.3.12
for the lower skirt cable tensioner (6)
(the cables placed between the lateral
guide and the center of the cask).

_____ 5.2.3.15 Install a layer of water proof tape
along the upper and lower edges of the
skirt as shown on Fig. 20, detail 1.
Tape also to be installed over the upper
bar after the screws have been
installed. This reduces skirt water
supply requirements by improving the
skirt sealing.

_____ 5.2.4 Remove the blind flanges from openings "J1" and "J2"
and install the connectors "J1" and "J2" and torque
the bolts to 35 ft-lb per the following
instructions:

_____ 5.2.4.1 One torque wrench equipped with a 3/8
hex set screw socket suitable for
setting torques or 35 ft-lbs is
required.

_____ 5.2.4.2 Install the three bolts for each flange
and torque the bolts to 35 ft-lbs in
counter clockwise direction.

INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.4.3 Repeat the torquing of the bolts to 35
ft-lb in a counter clockwise direction.

_____ 5.2.5 Remove the blind flange from opening "B" using the
3/8 inch hex set screw socket.

_____ 5.2.6 Perform radiation survey of the exposed recess of
opening "B" (γ at contact)

_____ 5.2.7 Seal the cask front face shock absorbing cover bolt
and alignment pin holes by applying two layers over
each hole.

_____ 5.2.8 Remove grease from all trunnions except for areas
that come in contact with the lifting arms during
handling between the decontamination pad and the
pool.

_____ 5.2.9 Equalize the cask cavity atmosphere as follows:

5.2.9.1 Install the VDS in the Sampling Mode as
shown on Figure 7. Ensure valves V-1,
V-2 and V-3 are closed and Connection "B"
is blanked off at the 2 inch vacuum hose
connection prior to connecting to the
cask, (and sample cylinder is attached,
optional).

NOTE: Cask sampling will be optional as
desired by the fuel handling supervisor.

INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.9.2 Measure the cask internal cavity
pressure by opening valve V-2 and
reading the pressure off gauge G-1.
Close valve V-2.

_____ 5.2.9.3 Dependent upon the measured cask
internal cavity pressure, perform the
following:
If the measured pressure is less than
atmospheric, vent the cask cavity to
atmosphere by disconnecting 2" blank
from the "B" connector. See Figure 7
and 14.

NOTE: Insure the Decon bldg. exhaust vent is
in service and is in the filter mode.
If the measured pressure is greater than
atmospheric, release cask pressure by
opening valve V-3 thereby venting the
cask cavity to gaseous radwaste.
Discharge line is connected to valve V-3
prior to opening valve V-3. When cask
is at atmospheric pressure, close valve
V-3.

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INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

NOTE: N/A steps 5.2.9.4 thru 5.2.12 if fuel handling supervisor desires sampling to be deleted.

NOTE: VDS pump must be started for this evolution.

_____ 5.2.9.4 Purge the gaseous sample cylinder, "B" connector and associated piping as follows:

_____ 5.2.9.5 Remove the "B" Connector with sample cylinder from cask.

_____ 5.2.9.6 Open valves V-1, V-2 and V-3.

_____ 5.2.9.7 Start vacuum pump and run for three minutes to evacuate sample cylinder, "B" Connector and associated piping.

_____ 5.2.9.8 Close valves V-1, V-2, V-3 and stop vacuum pump.

_____ 5.2.9.9 Reconnect "B" Connector with sample cylinder to cask Hansen Coupling at "B" flange opening.

_____ 5.2.9.10 Open valves V-1 and V-2 to draw sample from cask cavity into sample cylinder.

_____ 5.2.9.11 After collecting the sample, isolate the sample cylinder by closing valves V-1 and V-2; then remove "B" Connector from cask.

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INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.9.12 Remove the sample flask and analyze cask
gaseous activity for fission gas
content.

_____ 5.2.10 Initiate Cask Filling as follows:

Refer to Figures 2, 8, 12, 15 and 13

_____ 5.2.10.1 Remove the blind flange from opening "C"
and survey the recess.

_____ 5.2.10.2 Remove the shield plug from opening "A".

NOTE: When removing or working in the area of shield plug
"A", care should be exercised as radiation streaming
may be present.

_____ 5.2.10.3 Install the CDS in the Cask
Filling/Cooling Mode as shown in Figure
8. Install Connectors "A2", install the
three bolts and torque to 35 ft-lb as
per steps 5.2.4.1 thru 5.2.4.3 (Fig 13).

Ensure valve line-up is as shown with valves V-9 and
V-10, V-11, V-12 closed.

INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.10.4 Open valve V-9, and V-11.

_____ 5.2.10.5 DELETE

_____ 5.2.10.6 Initiate filling water flow through the
CDS by opening valve V-10.

Establish a cask cavity filling water
inlet flow rate by throttling valve
V-10. Continue to fill the cask cavity
through connector "C".

_____ 5.2.10.7 DELETE

_____ 5.2.10.8 When no entrained air is visible in vent
hose flow, stop the flow of fill water.
Close valve V-10, open V-12.

_____ 5.2.10.9 Remove Connector "A2" and Connectors "C"
and drain the CDS lines.

_____ 5.2.10.10 Install shield plug "A" without bolts.

NOTE: Since the shield plug "A" is not torqued, the cask
cavity is vented providing thermal expansion
protection.

INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.10.11 Attach a drain line to Connector "C" and
reinstall Connector "C" to the cask to
adjust the cask water level until it is
approximately twelve (12) inches below
the top of the cask lid. (i.e. drain 2
gallons).

_____ 5.2.10.12 Disconnect Connector "C" from the cask
(Hansen coupling at "C" is
self-sealing).

_____ 5.2.10.13 Visually inspect the gaskets of the
blind flanges for "B" and "C" to ensure
they are free of cuts, grooves, gouges
or cracks. Particular attention should
be given to observe "feathering" at the
edges. An indication of normal
conditions will be that the seating
surface appears as a somewhat flattened
area. If the inspection indicates a
gasket defect, the gasket should be
replaced.

_____ QC

INITIALS

5.0 Procedure (continued)

5.2 Preparation of Cask for Loading Spent Fuel (continued)

_____ 5.2.10.14 Reinstall the flanges of openings "B"
and "C" per the procedure in Steps
5.2.4.1 - 5.2.4.3 and tape flanges.

_____ 5.2.11 Remove the port plug from opening "D". See Figure
2.

_____ 5.2.12 Loosen and remove lid bolts per the following
procedure: See Figure 25.

_____ 5.2.12.1 Select one bolt and loosen 1/4 turn.

_____ 5.2.12.2 Continue loosening all remaining bolts
by 1/4 turn following the sequence as
numbered on Figure 25.

_____ 5.2.12.3 Repeat the loosening of the lid bolts by
another 1/4 turn by repeating the
procedure in steps 5.2.12.1 and
5.2.12.2.

_____ 5.2.12.4 Upon completion of both 1/4 turn cycles,
all the bolts may then be removed.

_____ 5.2.12.5 Inspect removed bolts for damage, store
and protect bolts from contamination in
bolt storage box.

_____ 5.2.13 Remove plastic protective cover from top surface of
cask.

_____ 5.2.14 Proceed to Section 5.3 for loading of cask.

Completed By: _____

Date: _____

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading

_____ 5.3.1 Apply never-seeze grease to lifting trunnions on areas that come in contact with lifting arms during cask handling between the decontamination pad and the spent fuel cask area of the pool.

_____ 5.3.2 Position lifting beam (still attached to cask crane main hook) over the cask.

_____ 5.3.3 Connect air system to lifting beam and insure operability as follows:
(Refer to figure 4).

_____ 5.3.3.1 Connect the air controller to an air supply of 75-100 PSIG.

_____ 5.3.3.2 Attach as many 50 ft. long sections of flexible hose to the three quick-connectors on the air controller as needed . The hoses and quick connectors are color coded to assure proper connection.

_____ 5.3.3.3 Connect the three hoses to the fittings on the right hand side of the beam as one faces the side with the piping.
(hoses, piping and air controller are color coded).

_____ 5.3.3.4 Verify that the bypass toggle valves on the beams are in the closed position.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.3.5 Observe whether the lifting arms are in the released or engaged position. Set the arm control lever on the air controller to the same position.

_____ 5.3.3.6 Set the green handle of the locking cylinder valve to the "locked" position.

_____ 5.3.3.7 Depress the black handled toggle valve on the air controller until line pressure is indicated on the pressure gauge. Releasing the toggle will close this valve.

NOTE: The system is now operational. It is always operated in the following sequence:

Set the green handled locking cylinder valve to "unlocked".

Move the arm positioning lever to the desired position. Lifting beam latching mechanism falls to "engaged" position. Air may be disconnected once engaged for ease of movement of cask. Visually verify that the arms have moved fully to the desired position.

Set the green handled locking cylinder valve to "locked".

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

CAUTION: Do not attempt to move the arms when the green handle is on "locked". However, if this should happen, return the arm positioning lever to the position corresponding with the current position of the arm of the beam before opening (unlocking) the locking cylinder. When the system is in the "locked" position, visual confirmation is provided by small metal flags which are moved by the end of the locking pin. These flags extend horizontally when the system is fully locked and can be seen from the surface of the pool when the cask is under water. The location of these flags may influence the position of the beam with respect to the cask (i.e., whether 180° rotation is desired) before the cask goes into the pool.

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

Note that the arm repositioning will
take a few seconds more if:

- . The air lines are especially long
- . Air pressure is on the low side
- . The system is in redundant
configuration

Allow sufficient time before returning
the green handled valves to the "locked"
position.

- _____ 5.3.4 Lower the lifting beam into position with the guide
arms resting on the top surface of cask trunnions.
- _____ 5.3.5 Attach the lid lifting sling to the cask lid. Make
trial lid lifts, adjusting the lifting sling as
necessary so that the lid raises in a level attitude
and no binding relative to the cask occurs.
- _____ 5.3.6 Engage the lifting beam to cask trunnions as
described in note in Step 5.3.3. Install four lid
bolts hand tight.
- _____ 5.3.7 Lift the cask off the decontamination pad and
transfer to the Fuel Building.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.8 Rotate the cask to orient the skirt fill and vent connections ("J1" and "J2") in order to facilitate connection and disconnection when cask is in the water. (See Figure 26).

_____ 5.3.9 Attach the fill hose to "J1" when cask is in position over the spent fuel pit cask area.

_____ 5.3.10 Lower the cask into the cask area while filling the skirt volume with cond. water such that the skirt internal volume water level is maintained approximately 6" to 12" above the cask area water surface.

NOTE: When cask is in position establish reference mark on floor (use plumb bob suspended from cab of crane) for future alignment of crane.

_____ 5.3.11 Reduce crane speed and water flow rate into the skirt as the skirt water level approaches the top of the skirt. When the entire skirt volume is full (indicated by water issuing from the "J2" port), connect floating vent to connector "J2", and tie off float at floor level allowing overflow to return to the S.F.P.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

5.3.12 Disconnect water fill line from cond. hose and connect to water level box.

CAUTION: Ensure water fill line is held approximately one half ($\frac{1}{2}$) foot above vent at all time during this step. Make up to water level box with cond. hose.

5.3.13 Maintain an approximate one-half ($\frac{1}{2}$) foot water head over-pressure inside the skirt by maintaining the water level in the water level box approximately one half ($\frac{1}{2}$) foot above the vent.

NOTE: This prevents inleakage of contaminated water, and must be maintained at all times while cask is submerged.

5.3.13.1 Remove the four remaining lid bolts and place them in the bolt box.

5.3.14 Continue lowering the cask to the cask pad at normal crane speed while continuing to maintain the one-half ($\frac{1}{2}$) foot of water over-pressure in the skirt.

5.3.15 Gently place the cask on the pad.
(Figure 26).

NOTE: Utilize underwater camera as an aid to determine distance when cask is approaching bottom.

FOR REFERENCE USE ONLY

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.16 Release the lifting beam from the cask.

(Refer to Section 5.3.3 - Air Locking System Instructions).

_____ 5.3.17 Remove the cask lid as follows:

_____ 5.3.17.1 Slowly raise the crane hook in "jog" speed until the cable is slightly taut. Note the height of the crane hook cables. (This is done by noting a reference point on the crane cables, etc.).

_____ 5.3.17.2 Slowly raise the cask lid in the jog speed until the lid lifts freely out of the lid recess area. Reference mark the crane position.

NOTE: If the lid shows signs of binding, lower the crane hook until the cable is slack and carefully check the crane hook vertical alignment over the lid center and adjust as necessary. Repeat steps 5.3.17.1 and 5.3.17.2 as needed.

_____ 5.3.18 Once lid is free, continue lifting the lid in normal speed.

_____ 5.3.19 Raise the lifting beam from the cask area.

_____ 5.3.20 Wash down the main hook, cables and lift beam with P.G. water as they exit the pool.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.21 Install the Front Face Protective Cover per the instructions below and as shown on Fig. 19. Fuel pit bridge may be used as a working platform.

_____ 5.3.21.1 Attach a tag line to each cover handling cable.

CAUTION: Prior to bridge travel, ensure there are not obstructions.

_____ 5.3.21.2 Orient the cover over the lid recess area such that the 2 lid centering pins are in alignment with the bosses of the cover.

_____ 5.3.21.3 Lower the cover onto the cask until it is fully down (i.e. slack cable). The cover is designed such that the edges of the cover will center it correctly.

NOTE: If the cover position is not correct, slowly lift the cover clear, adjust its position as needed by rotating the crane hook and repeat Steps 5.3.21.2 and 5.3.21.3. Utilize underwater camera as necessary.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

5.3.21.4 Using the tag lines, position the cables such that they hang along the side of the cask and are out of the way of fuel unloading operations. Tie off ends of tag lines at operating level.

*5.3.22 Per the instructions below, load the fuel assemblies into the cask cavity. Fuel Resources will verify each fuel assembly I.D. number, ANSI number and cask location. Record the position of each fuel assembly and insert component (if applicable) in the "Cask Loading Report". Refer to VNF-7 for fuel locations and see Figure 28 for fuel orientation in the cask."

- NOTES:
1. Any lateral position adjustments of the fuel handling tool must be done with the fuel assembly outside the cask fuel compartments during loading operations or with the fuel assembly disengaged from the fuel handling tool during unloading operations (unless otherwise specified in these instructions).
 2. It is recommended that reference height indications be marked on the fuel handling equipment such that they can be referred to, to assist in determining fuel assembly heights.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

NOTES: (continued)

3. During all fuel transfer operations performed in the pool, ensure that the fuel assemblies are free of all obstacles throughout transfer.
4. Fuel Resources personnel will be notified prior to any fuel movements.

Fuel Assembly Loading

-
- 5.3.22.1 Attach the fuel handling tool and load scale to the bridge crane hook, adding a safety sling between the hook and the tool.
-
- 5.3.22.2 Transfer the fuel handling tool to a point directly over the fuel assembly to be loaded into the cask. Refer to VNF-7.
-
- 5.3.22.3 Verify that the fuel handling tool is centered over the desired fuel assembly. If it is not, adjust its position as needed. Ensure that the fuel handling tool is free of any obstacles during these adjustments.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

- _____ 5.3.22.4 When alignment is satisfactory, slowly begin lowering the fuel handling tool onto the fuel assembly.
- _____ 5.3.22.5 Continue lowering the fuel handling tool until it is completely down on the fuel assembly (i.e. no weight on load cell).
- _____ 5.3.22.6 Engage the fuel assembly with the fuel handling tool and lock handle.
- _____ 5.3.22.7 Slowly raise the fuel assembly while closely monitoring the load scale for excessive load changes.
- _____ 5.3.22.8 Continue slowly lifting the fuel assembly until its bottom nozzle is above the storage racks.
- _____ 5.3.22.9 Transfer the fuel assembly to its spent fuel cask location. Refer to VNF-7, and Figure 28.
- _____ 5.3.22.10 Slowly lower the fuel assembly into the designated spent fuel cask location while closely monitoring the load scale for excessive load changes. After the fuel assembly seats on the bottom of the cask, disengage the fuel handling tool from the fuel assembly."

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.22.11 Repeat Steps 5.3.22.2 thru 5.3.22.10
until the cask is load.

_____ 5.3.22.12 Store the fuel handling tool in its
storage area and disconnect it from the
crane hook.

_____ 5.3.23 Remove the front face protective cover from the
cask:

_____ 5.3.23.1 Slowly remove the cover from the front
face by lifting the tag lines. Verify
that cover is removed without binding,
etc.

_____ 5.3.23.2 Transfer the cover to its storage area
and store properly.

_____ 5.3.24 Replace the cask lid on the cask per the following
instructions:

_____ 5.3.24.1 Transfer the lid to the position
directly over the cask cavity lid
seating surface using cask area crane by
positioning crane at reference mark
established in Step 5.3.17.2.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

5.3.24.2 Establish correct cask cavity lid orientation (orientation markers) and lower it to a height of about 4 feet above the cask. Check lid alignment and orientation as needed.

NOTE: This alignment is important and should be done carefully. Angular orientation is to be established by lining up the cask and lid orientation marks prior to installing the lid. The lid should be rotated as needed.

5.3.24.3 Slowly lower the lid into the lid recess.

NOTE: Lateral and rotational adjustments of the lid may be made as the lid nears the cask front face but no lateral movement of the crane should be made once the lid has entered the lid recess. If further lid position adjustments are needed, the lid should be lifted until it is free of the lid recess and above the cask.

5.3.24.4 If the lid indicates significant binding during crane descent, slowly raise the lid in the jog made until it is again free of binding and raise the lid out of the lid recess. Check the lid alignment and repeat Steps 5.3.24.2 and 5.3.24.3.

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION
PROCEDURE

PROCEDURE
NUMBER: OP-4.3

DATE: NOV 4 1983

TYPE PROCEDURE: OPERATIONS PROCEDURE

UNIT #: 1 & 2

TITLE: IRRADIATED FUEL HANDLING & SHIPMENT

LIST OF EFFECTIVE REVISIONS:

<u>SECTION</u>	<u>DATE</u>
1.0	NOV 4 1983
2.0	NOV 4 1983
3.0	NOV 4 1983
4.0	NOV 4 1983
5.0	NOV 4 1983
ATTACHMENT I	NOV 4 1983
ATTACHMENT II	NOV 4 1983
ATTACHMENT III	NOV 4 1983
ATTACHMENT IV	NOV 4 1983
ATTACHMENT V	NOV 4 1983

RECOMMEND APPROVAL:

R. L. Johnson

DATE: 11/4/83

QUALITY CONTROL REVIEW:

Donna M. Hardy

DATE: 11/10/83

APPROVED STATION NUCLEAR SAFETY AND OPERATING COMMITTEE:

R. F. Saunders

DATE: NOV 4 1983

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

5.3.24.5 As the lid nears its full down position, ensure that the 2 centering pins are protruding through their respective lid flange holes.

NOTE: Use binoculars and/or underwater camera as needed to perform this evolution.

5.3.24.6 If they do not protrude stop crane descent. Slowly raise the lid a few inches.

5.3.24.7 Twist the crane hook in whichever direction is needed by referencing the lid orientation marks. Return to Step 5.3.24.3 and continue lid installation.

5.3.24.8 Continue lowering until the lid is fully down as indicated by slack cable in the sling cables. Visually verify the lid for proper installation. (i.e. visual looks to be seated and the alignment pins protrude from the lid plate).

QC

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.25 Lower the lifting beam slowly until its guide arms
are resting on shoulders of lifting trunnions.

_____ 5.3.26 Engage the primary lift beam to the cask lifting
trunnions as outlined in Step 5.3.3.

_____ 5.3.27 Raise the cask from the bottom of the cask area.

_____ 5.3.28 Continue raising cask until top face is
approximately even with operating deck.

_____ 5.3.29 Check and grease (using Never-Seeze) the threads of
all removed cask bolts and screws as needed.

_____ 5.3.30 Remove water from four bolt holes (with an
aspirator) prior to returning four lid bolts which
were removed in Step 5.3.13.1.

NOTE: Each bolt is associated with a specific bolt hole.
Check bolt number with hole number.

_____ 5.3.31 Replace the above mentioned lid bolts in their
respective hole and hand tighten.

_____ 5.3.32 Remove four legged sling from lid lifting lugs by
removing four shackles.

_____ 5.3.33 Continue raising cask form the SFP.

INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.34 As the cask is removed from the water, the water inlet flow should be reduced and finally stopped as the top of the skirt surfaces from the pool. At all times the flow rate should be such that approximately a 1 foot skirt overpressure is maintained. Control the crane speed to maintain but not exceed the one foot skirt overpressure.

_____ 5.3.35 When vent hose connection "J2" reaches surface, remove the hose connection to shorten the drainage flow path. Disconnect from float line. Mate ends of hose together to form a circular hose. This prevents internal contamination of hose. Store hose.

_____ 5.3.36 Slowly remove the cask from the pool while thoroughly washing down the lift beam top, skirt and base of the cask with a water spray to remove particulate and soluble contaminants.

_____ 5.3.37 Disconnect "J1" hose from water level control box.

_____ 5.3.38 Insert hose into Unit 2 transfer canal skirt. Observe level inside skirt while draining; maintain this level approximately one foot above cask area water level by raising cask as required.

_____ 5.3.38.1 Obtain water sample from drain hose flow for isotopic analysis.

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INITIALS

5.0 Procedure (continued)

5.3 Cask Loading (continued)

_____ 5.3.39 When skirt has completely drained and cask has been pulled completely out of the water, disconnect "J1" hose from "1" connection.

_____ 5.3.40 Position the crane above the open Decon Building access doors and lower cask into the Decon building.

_____ 5.3.41 Set cask down gently and disengage primary lifting beam from cask.

_____ 5.3.42 Raise primary lifting beam back up into the Fuel building, and transfer to a position above the storage stand.

_____ 5.3.43 Decon lift beam and crane hook.

_____ 5.3.44 Dry all cask surfaces with clean rags as soon as practicable.

_____ 5.3.45 Decontaminate exposed cask surfaces as necessary including outside of skirt.

_____ 5.3.46 Proceed to Section 5.4 for Preparation Of Cask For Departure.

Completed By: _____

Date: _____

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INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure

_____ 5.4.1 Initial conditions are noted and satisfied.

_____ 5.4.2 Precautions and Limitations are noted.

_____ 5.4.3 Verify that the port plug from opening "D" is removed.

_____ 5.4.4 Remove water from bolt holes using an aspirator and install remaining lid bolts and tighten all lid bolts to the specified torque as follow:

Required Equipment

- torque wrench suitable for setting

_____ SQC#

- torques of 40 to 290 ft-lb

_____ SQC#

- 1-7/8" socket

- drive extension

_____ 5.4.4.1 Install all bolts and tighten to hand tight.

_____ 5.4.4.2 Tighten all bolts to 40 ft-lb in the following fashion:

_____ 5.4.4.3 Tighten the bolts to 40 ft-lb following the numerical sequence as shown in Figure 25.

_____ 5.4.4.4 Repeat the cycle of Step 5.4.4.3 starting with bolt number 1 until all bolts are torqued to 40 ft-lb.

_____ QC

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.4.5 Tighten all lid bolts to the final
_____ QC required torque of 290 ft-lb by
following the procedure in steps 5.4.4.3
and 5.4.4.4.

_____ *5.4.4.6 Perform Lid Gasket Tightness Test per
Addendum #1.

_____ 5.4.5 Remove the blind flanges from openings "B" and "C",
and thermocouple well port plugs "F1", "F2" and
"F3". Install thermocouples.

_____ 5.4.6 Install the CDS in the Cask Draining Mode as shown
on Figure 9. Drain the cask cavity water to the
Decon Building sump until no more water comes out.

_____ 5.4.7 Remove shield plug from "A".

_____ 5.4.8 Connect the VDS to the cask cavity through shield
plug opening "A" as shown on Figure 10, 12. Ensure
valves V-2, V-3, V-4, V-5 and V-7 are closed and
valve V-6 is open. Install drain bottle in Connector
"C".

NOTE: To facilitate operations, it is recommended that a
curve be plotted of cask internal pressure (mbar)
versus pumping time during cask drying.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ *5.4.9 Open valve V-2 and start the vacuum pump with the gas ballast valve open. Observe the cask cavity pressure using the gauge G-1 using valve V-6 to throttle the vacuum pump suction.

NOTE: The cask cavity pressure will normally show an initial steep pressure decrease until a pressure corresponding to the vapor pressure of the residual liquid in the cavity is reached. At this point, the cask cavity pressure will remain nearly constant showing a plateau region. This plateau will be observed to be at a pressure equal to the vapor pressure corresponding to the temperature of the cold wall of the cask cavity (anticipated pressure: 14 mbar - 35 mbar).

_____ 5.4.10 When the vacuum reaches approximately 40 mbar, close valve V-6 and remove blind flange on "B" Connector (Fig. 14) to break vacuum, forcing any water drain into the drain bottle.

CAUTION: Be careful to retain "O" Ring when removing flange; vacuum could suck it in if not careful.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.11 Replace blind flange on "B" Connector, and open valve V-6 and continue pumping until the pressure is back down to approximately 40 mbar. Continue to repeat this step as long as a level increase is observed in the drain bottle.

_____ 5.4.12 When no significant level increase in the drain bottle is noted, disconnect connector "C" from the cask and continue vacuum pumping using valve V-6 to obtain a cavity pressure of approximately 20 mbar.

NOTE: Monitor the cask cavity internal pressure. As the last of the residual moisture is removed by the vacuum pump, the internal pressure as monitored on gauge G-1 will show a second steep pressure decrease. Ensure the cask cavity pressure is not pumped below 7 mbar, which could cause freezing of the remaining water.

_____ *5.4.13 Measure the temperature (T) of the cask cavity walls using the thermocouples installed in wells "F1", "F2" and "F3". Determine the water vapor pressure (P) in equilibrium with the coolest cavity wall temperature reading.

_____ 5.4.14 Continue vacuum drying until a pressure of less than $\frac{1}{2}P$ (but not less than 7 mbar) is achieved).

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FOR REFERENCE ONLY

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ *5.4.15 Isolate the vacuum pump from the cavity by closing
valve V-6. Record initial pressure and time on test
data sheet. (See Form 6)

_____ *5.4.16 The cask cavity is considered dry if a rise in
_____ QC pressure does not exceed $P/4$ or 3.3 mbar, whichever
is less, during a period of 10 minutes (record final
pressure and time on test data sheet). See Form #6.

_____ 5.4.17 If the pressure increase exceeds the above limits,
open valve V-6 and start vacuum pump for further
vacuum drying. Continue to repeat dryness
verification until criteria of Step 5.4.16 are met.

_____ 5.4.18 Upon successful completion of the cask cavity
dryness verification, disconnect the VDS by
disconnecting connector "A1" from the Shield Plug
opening "A".

_____ 5.4.19 Reinstall shield plug "A" and torque bolts to 35 ft.
- lbs. in a clockwise direction from the first bolt.

_____ 5.4.20 Repeat the torquing of the bolts to 35 ft. - lbs.
_____ QC in a counter-clockwise direction.

_____ 5.4.21 Readjust the VDS to place it in the Evacuation Mode
as shown in Figure 11.

_____ 5.4.21.1 Perform Cask Tightness Test per Addendum

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ *5.4.22 Adjust the cask cavity internal pressure to 0.3 bars, absolute (-10 psig) using valve V-3 (not connected to the gaseous radwaste discharge line) as a vent to atmospheric pressure and by the operation of the vacuum pump (valve V-6 must be open during vacuum pump operation). Record the final pressure on the "Cask Loading Report".

_____ 5.4.23 Remove the VDS including Connector "B".

_____ 5.4.24 Remove the tape and plugs from the cask front face bolt holes.

_____ 5.4.25 Check external contamination of all exposed surfaces of the cask and decontaminate as required.

_____ 5.4.26 Survey the recesses for openings "B" and "C".

_____ 5.4.27 Remove thermocouples and replace well port plugs "F1", "F2" and "F3", port plug "D" and the blind flanges for openings "B" and "C", and tighten all bolts and plugs to the specified torque per the following instructions:

_____ 5.4.27.1 Thermocouple well port plugs "F1", "F2" and "F3" and port plug "D". One torque wrench equipped with a 1-3/8" socket, suitable for setting torques of 35 ft-lb is required.

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INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.27.2 Install plug to hand tight, then torque
_____ QC to 35 ft-lb.

_____ 5.4.27.3 Bolts for the blind flanges of openings
"B", and "C".

One torque wrench equipped with a 3/8"
hex set screw socket, suitable for
setting torques of 35 ft-lb is required.

_____ 5.4.27.4 Install the three bolts for each flange
and torque the bolts to 35 ft-lb in a
clockwise direction from the first bolt.

_____ 5.4.27.5 Repeat the torquing of the bolts to 35
_____ QC ft-lb in a counter clockwise direction.

_____ 5.4.28 Remove the protective skirt as follows:

NOTE: Do not remove the skirt until all required external
cask decontamination operations are complete.

Removal of the skirt prior to the completion of
these steps risks contamination of the cask fins.

_____ 5.4.28.1 Remove connectors "J1" and "J2".

_____ 5.4.28.2 Remove any remaining tape from the upper
and lower skirt edges and unwrap the
tensioning cables, freeing the skirt
from the drum grooves.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.28.3 Remove the 13 screws from the upper and lower skirtbars. (Note: Remove the bolts from bottom to top).

_____ 5.4.28.4 Check that both the upper and lower lateral guides are free of the drum grooves.

_____ 5.4.28.5 Remove the skirt from the cask using the skirt handles (Fig. 20) (5). Hang skirt on storage ring.

_____ 5.4.28.6 Check the skirt contamination level. Decontaminate if necessary until acceptable levels are attained. Normally, washing the skirt with clean water and a soft cloth is sufficient to decontaminate the skirt.

_____ 5.4.29 Survey the cask/skirt joints now exposed and the finned surfaces of the cask for contamination and decontaminate as required. Reinstall flanges "J1" and "J2" and torque 3/8" hex head bolts to 35 ft-lb.

_____ 5.4.30 Transfer cask crane to a position above the cask and lower lift beam.

_____ 5.4.31 Grease the surfaces of the lift beam arms, outer front trunnion shoulders and rear trunnion inner shoulders with Never-Seeze.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

5.4.32 Re-engage lift beam arms (see 5.3.3) and lift the cask off the decontamination pad and remove the Bottom Protective Cover per the following instructions:

5.4.32.1 Disconnect the bottom cover attachment cables from the cask trunnions and fold them to the side of the cover so they are not in the way.

5.4.32.2 Slowly lift the cask off the decontamination pad. As the cask is lifted, remove the bottom cover from the cask. Decon the cask bottom surface.

5.4.32.3 Check the bottom cover for contamination. Decontaminate as needed.

5.4.32.4 Transfer the cover to its storage area.

5.4.33 Remove tape from alignment pin and bolt holes and survey for removable contamination and decontaminate the rear cask face as required.

5.4.34 Transfer the cask to a position over the rear trunnion supports of the tilting frame.

5.4.35 Grease rear trunnion supports with Never-Seeze grease.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.36 Lower the cask bottom trunnions onto the tilting frame rear trunnion supports.

NOTE: Cask should be oriented such that drain "C" will face upward, after cask is tilted into a horizontal position.

_____ 5.4.37 Carefully rotate cask to horizontal position.

CAUTION: Maintain crane and crane cables in a vertical position over lifting trunnions while performing tilting of cask.

_____ 5.4.38 Disengage the lifting beam from the cask and return it to its storage stand in the Fuel Building.

_____ 5.4.39 Perform contamination survey required by H.P. on cask surfaces inaccessible after shock absorbing cover and impact limiter installation.

_____ 5.4.40 After releasing lift beam from cask crane main hook, position main hook over horizontal lifting beam.

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INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.41 Lower main hook between the yoke plated, insert the pin, and lock the pin in place with the keeper plate.

_____ 5.4.42 Return truck and trailer to the loading/unloading position as indicated by reference mark established in Step 5.1.8 - "Unloading Cask From Truck".

_____ 5.4.43 Raise the horizontal lift beam clear of its supports and rotate it on the hook swivel so that the front end (short pendants) is oriented toward the front of the cask. Raise high enough for the trunnion plates to clear the cask. Traverse the beam directly over the cask. Grease the bearing surfaces of the lifting pendants and the lifting trunnions of the cask with Never-Seeze.

_____ 5.4.44 Lower the beam slowly and guide the trunnion plates past the trunnions until they can be slipped on. Raise the locking bars, slip the plates over the trunnions and release the locking bars so that they rest on the trunnions inside the trunnion lip thus preventing the plates from coming off.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.45 The cask should be raised carefully until it is clear above the supports. The front will rise about 8 inches before the rear trunnions lift off their supports. If, at this time, it appears necessary to control lateral movement of the cask, ropes should be attached at the trunnions and held on the ground.

_____ 5.4.46 The cask shall be raised high enough to clear its supports on the trailer and rotated 90° to align with trailer.

_____ 5.4.47 Raise cask to an elevation sufficient to clear the tarpaulin rails and position over trailer.

_____ 5.4.48 The cask is lowered onto the trailer. Slight traversing of the crane may be required to center the rear trunnions within $\frac{1}{4}$ inch in their supports. Once the rear trunnions are in contact the cask can be fully lowered.

_____ 5.4.49 With the pendants slack, the locking bars can be raised and the trunnion plates removed from the trunnions. Raise the horizontal lift beam and traverse to the storage supports.

_____ 5.4.50 Lower the horizontal lift beam onto the supports. Disengage the hook pin, raise the hook, store the pin.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure

_____ 5.4.51 Position the cask crane to facilitate the
installation of the shock absorbing covers.

_____ 5.4.52 Perform rear trunnion, front trunnion and trunnion
guide assembly tie-down operations per the following
instructions:

Required Equipment

- Ratchet
- 3/4 inch socket (front trunnion guide assembly
bolts)
- 13/16 inch socket
- Torque wrench (suitable for setting torques of
30 and 125 ft-lbs)
- 1-1/8 open end wrench
- Ratchet drive extension

_____ 5.4.53 Install the rear trunnion tie-down as follows:

Rear Trunnions

_____ 5.4.53.1 Place the trunnion tie-down collars over
the rear trunnions.

_____ 5.4.53.2 Install the two 3/4 inch bolts (with
their lock washers) to hand tight.

NOTE: Ensure that the bolt threads contain an acceptable
grease coating. Ensure that the bolt lock washers
are installed.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

5.4.53.3 Install the rear trunnion support bolts
and tighten each to a torque of 125
ft-lb. Repeat for second rear trunnion.

5.4.54 Front Trunnions

5.4.54.1 Swing the binder assembly over the cask
trunnion.

5.4.54.2 Verify that the collar is correctly
positioned on the trunnion inside
shoulder. The position of the collar
should be such that it restrains the top
half of the trunnion shoulder. If
necessary, adjust the collar position,
by performing Step 5.4.56.

5.4.54.3 With the binder handle in the up
position, engage the binder attachment
hook under the trunnion tie-down support
lip.

5.4.54.4 Push the binder handle down to the full
down position. Verify that the collar
is tight against the cask trunnion. If
it is not, adjust the tie-down assembly
by performing Step 5.4.56.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.54.5 Lock the binder in its down position by
securing the binder handle restraint
chain in the trailer chain securing
hook.

_____ 5.4.54.6 Repeat Steps 5.4.54.1 through 5.4.54.5
for the second front trunnion.

5.4.55 Trunnion Guide Assembly Installation

_____ 5.4.55.1 Swing back the trailer front cradle dust
cover plate.

_____ 5.4.55.2 Install the trunnion guide assembly
around the cask bottom trunnion.

_____ 5.4.55.3 Install the two $\frac{1}{2}$ " bolts with their lock
washers.

NOTE: Grease the bolt threads as needed prior to
installation.

_____ 5.4.55.4 Torque the two $\frac{1}{2}$ " bolts to a torque of
30 ft-lbs.

5.4.56 Front Trunnion Tie-Down Adjustment

(N/A if not necessary)

_____ 5.4.56.1 Using two 1- $\frac{1}{2}$ " open end wrenches, adjust
the lock nuts which secure the collar to
the $\frac{3}{4}$ " tie-down rod. These nuts
should be turned to raise or lower the
collar as needed.

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INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.56.2 Position the tie-down assembly over the trunnion and verify that the adjustment is correct.

_____ 5.4.56.3 Tighten lock nuts (upper and lower) tight against the collar and each other to ensure that they do not loosen.

_____ 5.4.57 Replace the shock absorbing covers per the following instructions. The weight of each cover is approximately 879 lb.

Required Equipment

- 2 legged sling equipped with connections to allow attachment to the lifting crane hook (bale) and to the cover connecting shackles (loops, etc.).

- 2 connecting shackles

- Ratchet

- Ratchet drive extension

- 1-7/8 inch socket

Torque wrench suitable for setting torques of 40 and 290 ft-lbs.

- 1/2 ton chain fall with dynamometer

_____ 5.4.57.1 Attach the 2 legged sling to the 2 lifting lugs of the shock absorbing cover by means of the 2 connecting shackles.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.57.2 Center the crane auxiliary hook directly over the shock absorbing cover to be handled. There is no preference in the shock absorbing cover installation sequence; either may be installed first. Lower the crane auxiliary hook. Attach chain fall and dynamometer assembly to auxiliary hook.

_____ 5.4.57.3 Attach the 2 legged sling lifting bale to the dynamometer.

_____ 5.4.57.4 Slowly raise the crane auxiliary hook until the sling legs are taut.

_____ 5.4.57.5 Transfer the shock absorbing cover to its respective end of the cask.

NOTE: The shock absorbing covers are not interchangeable.

_____ 5.4.57.6 Lower the shock absorbing cover such that its centering pins are in alignment with the cask alignment pin holes. Use chain fall for fine adjustments during alignment.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.57.7 Install the cover by slowly moving the cover toward the cask face. Care should be taken to ensure that the alignment pin holes are aligned correctly and the covers remain vertical during installation. It is recommended that a dynamometer be used to ensure that excessive force is not applied to the bolts.

_____ 5.4.58 Install the four shock absorbing cover bolts and torque them as follows:

_____ 5.4.58.1 Install all cover bolts and tighten to hand tight.

_____ 5.4.58.2 Tighten all bolts to 40 ft-lb. in the following fashion.

_____ (a) Following the numerical sequence shown in Figure (b), tighten the bolts to 40 ft-lb.

_____ (b) Repeat the cycle until all bolts are torqued to 40 ft-lb.

_____ 5.4.58.3 Tighten all cover bolts to the final required torque to 290 ft-lb by following the procedure in 5.4.58.2 (a) and (b).

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

- _____ 5.4.59 Lower the crane auxiliary hook until the 2 legged sling cables are slack.
- _____ 5.4.60 Remove the shackles from the shock absorbing cover and transfer the crane auxiliary hook and 2 legged sling to the other cover, and attach.
- _____ 5.4.61 Repeat Steps 5.4.57.4 to 5.4.60 for the other shock absorbing cover.
- _____ 5.4.62 Store the 2 legged sling, connecting shackles and hand tools and return the crane to the Fuel building. Close roll-up door and Decon building access hatch.
- _____ 5.4.63 Replace the (6) trunnion impact limiters as follows:
- Ratchet
 - 13/16 inch socket
 - Torque wrench suitable for setting torques of 30 ft-lb
 - Ratchet drive extension

#1 #2 #3 #4 #5 #6

- _____ 5.4.63.1 Manually position the trunnion impact limiter on its respective trunnion.
- Note the trunnion impact limiter without gussets is to be installed on the downward facing (in relation to trailer) redundant trunnion (Figure 2).

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.63.2 Install the 9/16" bolt which attaches
the limiter to hand tight.

_____ 5.4.63.3 Tighten the 9/16" bolt to a torque of 30
ft-lb.

_____ 5.4.64 Repeat Steps 5.4.63.1 thru 5.4.63.3 for the
remaining impact limiters to be installed.

_____ *5.4.65 Perform a cask and trailer contamination survey,
recording the results on "Cask Transport Radiation
Survey" and "Trailer Departure Radiation Survey" as
applicable. Decontaminate as required to meet
allowable levels for transport. Complete and retain
the forms for documentation requirements.

NOTE: DOT considers a contamination level significant, if
when averaged over 300 square centimeters of any
part of the package surface, it exceeds $10^{-4} \mu$
 Ci/cm^2 (220 disintegrations per second per square
centimeter) for beta-gamma and $10^{-5} \mu \text{Ci/cm}^2$ (22
disintegrations per second per square centimeter for
alpha). (49CFR 173.397).

_____ 5.4.66 Attach the required regulatory labels to the cask.

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INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.67 Install the trailer protective enclosure as follows:

_____ 5.4.67.1 Install any roller track sections, if
they were removed to position the cask
or cover onto the trailer.

_____ 5.4.67.2 Install the trailer protective enclosure
by sliding the enclosure rearward by
having one man on each side of the
trailer grasp the side section of the
tarpaulin and pull it towards the rear
of the trailer. Slide the enclosure
until the tarpaulin is fully extended.

_____ 5.4.67.3 Release the back section of the
tarpaulin by unbuckling the straps which
fasten it to the tarpaulin roof section.
Allow it to unroll.

_____ 5.4.67.4 Fasten the rear tarpaulin section to the
enclosure sides by buckling the straps
along both sides of the rear tarpaulin
section.

INITIALS

5.0 Procedure (continued)

5.4 Preparation of Cask for Departure (continued)

_____ 5.4.67.5 Tie-down the side tarpaulin walls of the protection enclosure by pulling the elastic tie-down rope over the trailer tie-down hooks. Ensure that the rope is taut and firmly restraining the tarpaulin at all tie-down points. Carefully check the ends of the tie-down rope to assure that they are properly tied and that the rope will not come loose.

_____ 5.4.67.6 Verify that all air vents of the protective enclosure are not obstructed (e.g. snow, etc.)

_____ 5.4.68 Verify that trailer placards read "Radioactive".

_____ 5.4.69 Complete and sign the "Cask Loading Report".

_____ 5.4.70 Provide all required shipping documents and a copy of the "Cask Loading Report" to the carrier.

_____ 5.4.71 Release the package for transport.

_____ 5.4.72 Return all tools and equipment to normal storage.

Completed By: _____

Date: _____

3.10 If leakage rate is greater than 3.0×10^{-2} ATM-CC/SEC the test is unacceptable. Refer to the TN-8L shipping cask operating manual for instructions on corrective action and retesting.

NOTE: Leakage Rate Calculation:

The following equation shall be the basis for the above lid leakage determination.

$$L' = \frac{(\Delta p)}{(\Delta t)} \times (V) \frac{\text{ATM}}{1013 \text{ mbar}}$$

where

- t = actual testing time, sec.
- p = the observed pressure increase (decrease in vacuum) observed during the test, mbar.
- v = test volume, cm³ (115 cm³)
- L' = actual leakage rate (atm cm³/s)

1.0 Lid Gasket Tightness Testing

2.0 Introduction

This Addendum provides the procedure to be utilized for verifying the lid gasket tightness by subjecting the interspace between the inner and outer lid gaskets to a pressure rise test using the VDS installed through the lid gasket port and Connector "D" as shown on Figure 29, Attachment 1.

3.0 Lid Leakage Rate Test Procedure

- 3.1 Following torquing of the lid bolts, remove residual water from lid gasket port opening "D" with an aspirator.
- 3.2 Connect the VDS in the Lid Tightness Testing Mode as shown on Figure 29 with valves V-13, V-5 and V-7 closed.
- 3.3 Start the vacuum pump, with gas ballast valve open, open valve V-13 and begin vacuum drying of the lid gasket interspace by throttling valve V-6 to obtain a vacuum reading of approximately 15-20 mbar.
- 3.4 Continue vacuum drying operations until a vacuum of not less than 10 mbar is obtained as observed on vacuum gauge G-1.
- 3.5 When the specified vacuum is reached, close valves V-13 and V-6. Record pressure as measured on gauge G-1 and the time on Form 6 "Cask Loading Leak Tightness Testing Data Sheet".
- 3.6 Observe the vacuum gauge G-1 for an increase in the test volume pressure for one minute.
- 3.7 At the end of the one minute, record the observed pressure from gauge G-1 and time on the Form 6 data sheet.
- 3.8 Based upon the observed pressure rise (Δp) and the testing time, calculate the actual leakage rate" based upon the formula below and record on the Form 6 data sheet.

$$3.9 \quad L'_{lid} = \frac{\Delta P}{60} (113.52)$$

$$L'_{lid} \text{ must be } < 3.0 \times 10^{-2} \frac{\text{ATM-CM}^3}{\text{SEC}}$$

ΔP must be MBAR

1.0 Cask Tightness Testing

2.0 Introduction

This Addendum provides the procedure to be utilized for verifying the cask openings (Shield Plug "A", Blind Flange "B", and DRAIN Plug "C") are tested to insure that the leaktightness criteria for transport are met. The results of the test are recorded on the Form 6 Data Sheet.

3.0 Cask Tightness Testing procedure.

3.1 Ensure the VDS is lined up in the evacuation mode as shown in Figure 11.

3.2 Open valves V-6 and V-2, check V-1, V-5 and V-7 closed.

3.3 Start the vacuum pump and evacuate the cask until a vacuum of 20-30 mbar is obtained as observed on G-1.

3.4 Close Valve V-6.

3.5 Wait approximately two minutes to allow the observed pressure on G-1 to stabilize.

3.6 Note the vacuum reading and the time.

a) Vacuum _____ mbar

b) Time _____

3.7 After two minutes, note the following:

a) Vacuum _____ mbar

b) Time _____

3.8 Calculate ΔP and ΔT from steps 3.6 and 3.7 above.

- 3.9 Actual Leakage Rate (L') Calculation - Based upon the increase in pressure, as observed on vacuum gauge G-1, over the minimum testing time (t_{min}) period, or during a longer time, the actual leakage rate (L') of the cask observed during the tightness test is determined from the following equation:

$$L' = \frac{(\Delta p)}{(t)} \times (V) \times \frac{\text{atm}}{1013 \text{ mbar}}$$

where: t = actual testing time in seconds

Δp = the observed pressure change (decrease in vacuum) during the test in torr

v = testing volume in cm³

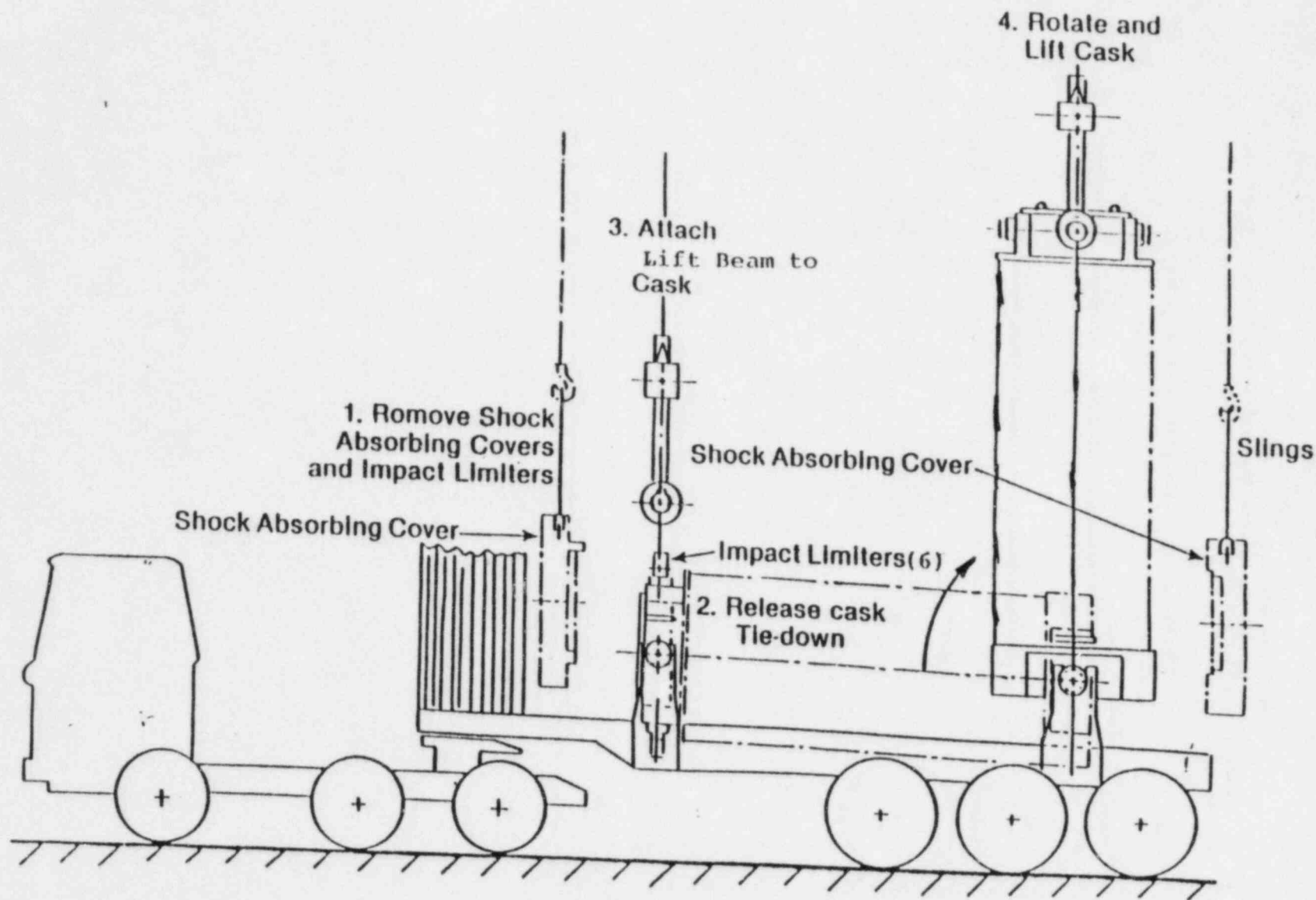
L' = actual leakage rate in atm cm³/sec

- 3.10 Allowable Leakage Rate (L) - The allowable leakage rate (L) as calculated for a 30-day transport are based upon the calculations provided in the "Safety Analysis Report for TN-8 and TN-9 Packagings," Revision 7, dated September 8, 1976, Annex C to Chapter III, pages 131n through 131t. The allowable leakage rate for a 30-day transport has been established as:

$$L = 9.2 \times 10^{-10} \text{ atm cm}^3/\text{sec.}$$

- 3.11 If the test reveals that $L' < L$, the test is acceptable. Record results on Form 6.
- 3.12 If Cask Tightness Test is not acceptable ($L' > L$), refer to the TN-8L Shipping Cask Operating Manual for instructions or corrective action and retesting.

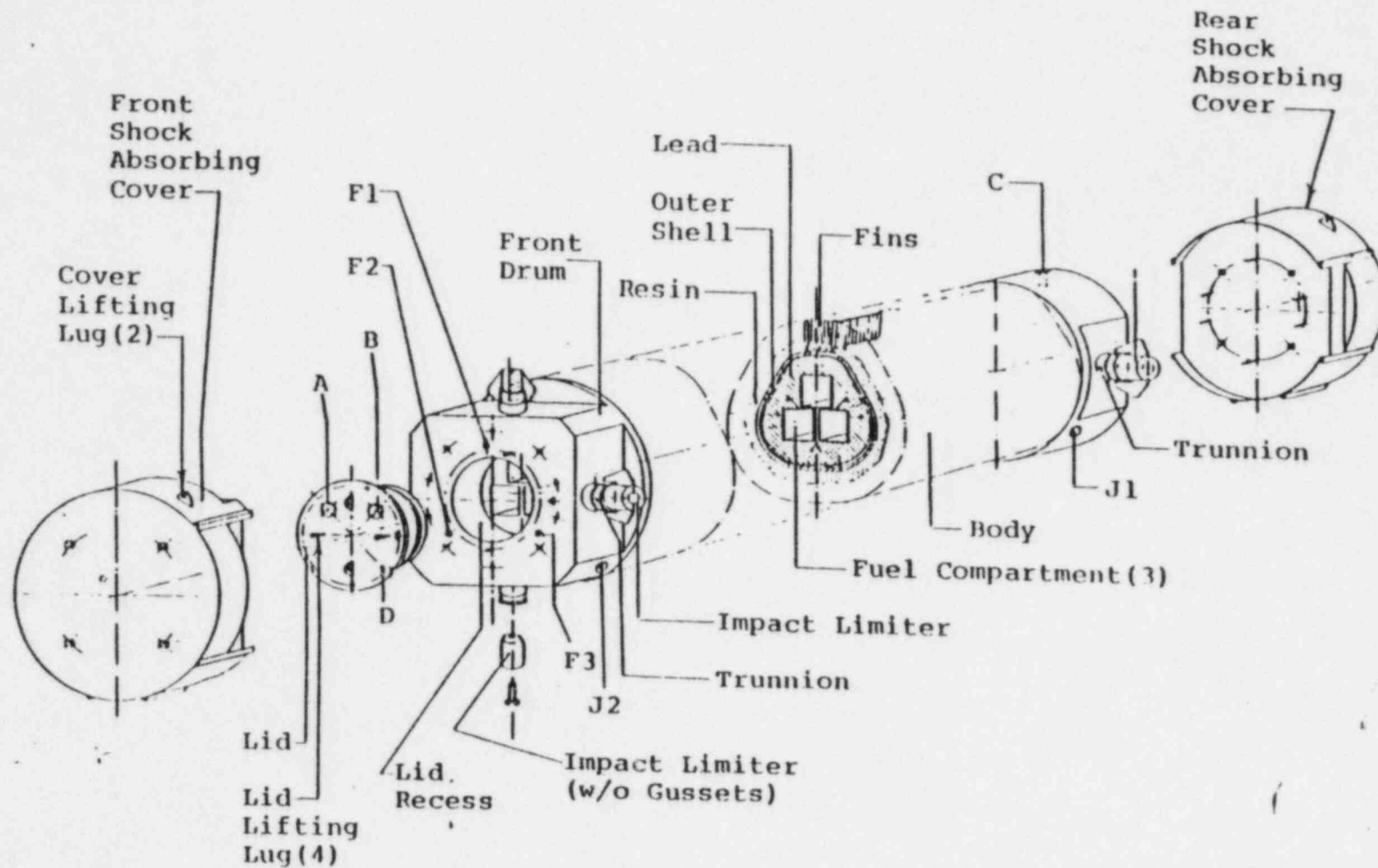
Fig. 1



Trailer Loading/Unloading Operations

Figure 1

FIG. 2



CASK OVERVIEW
Figure 2

FIG. 3

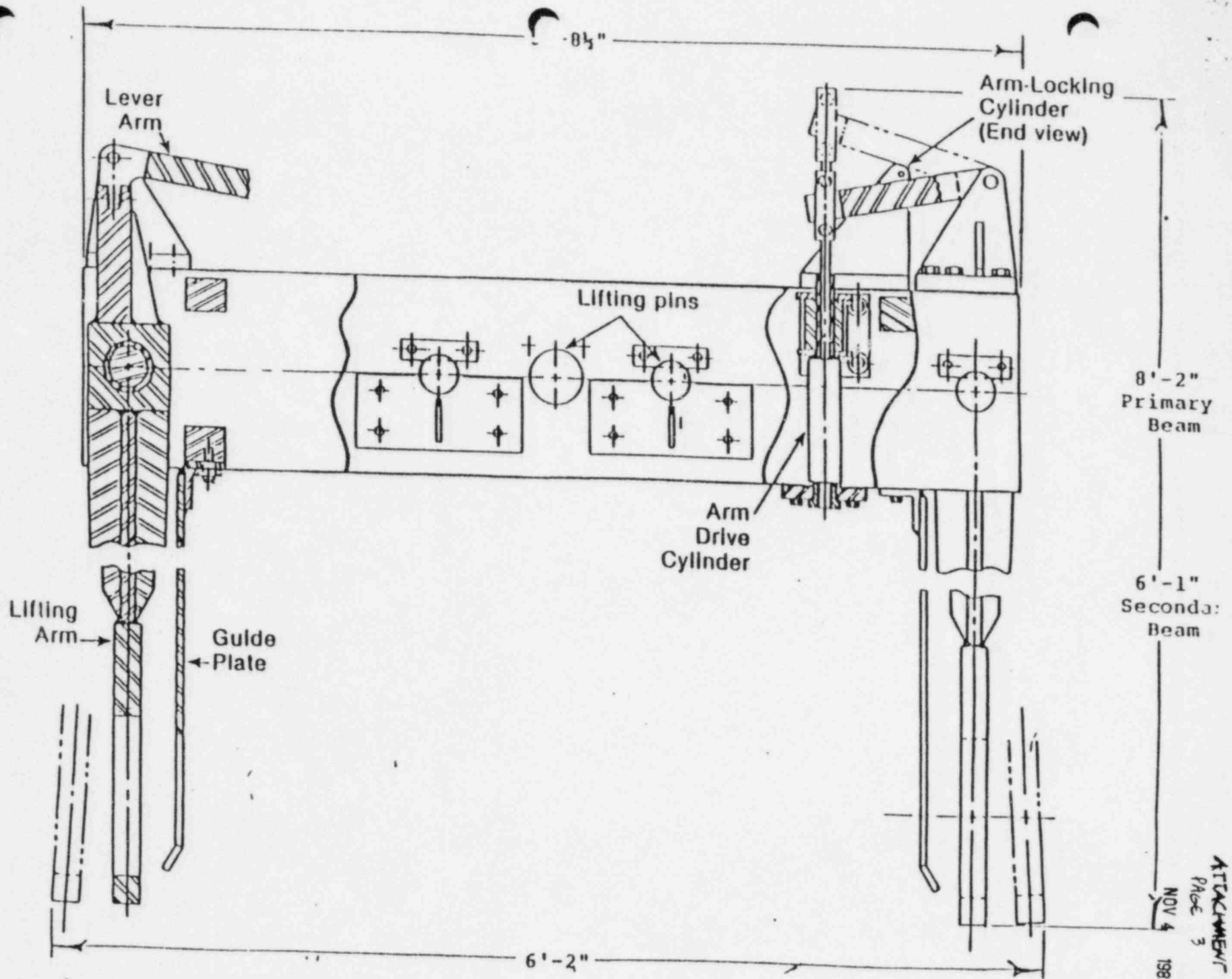
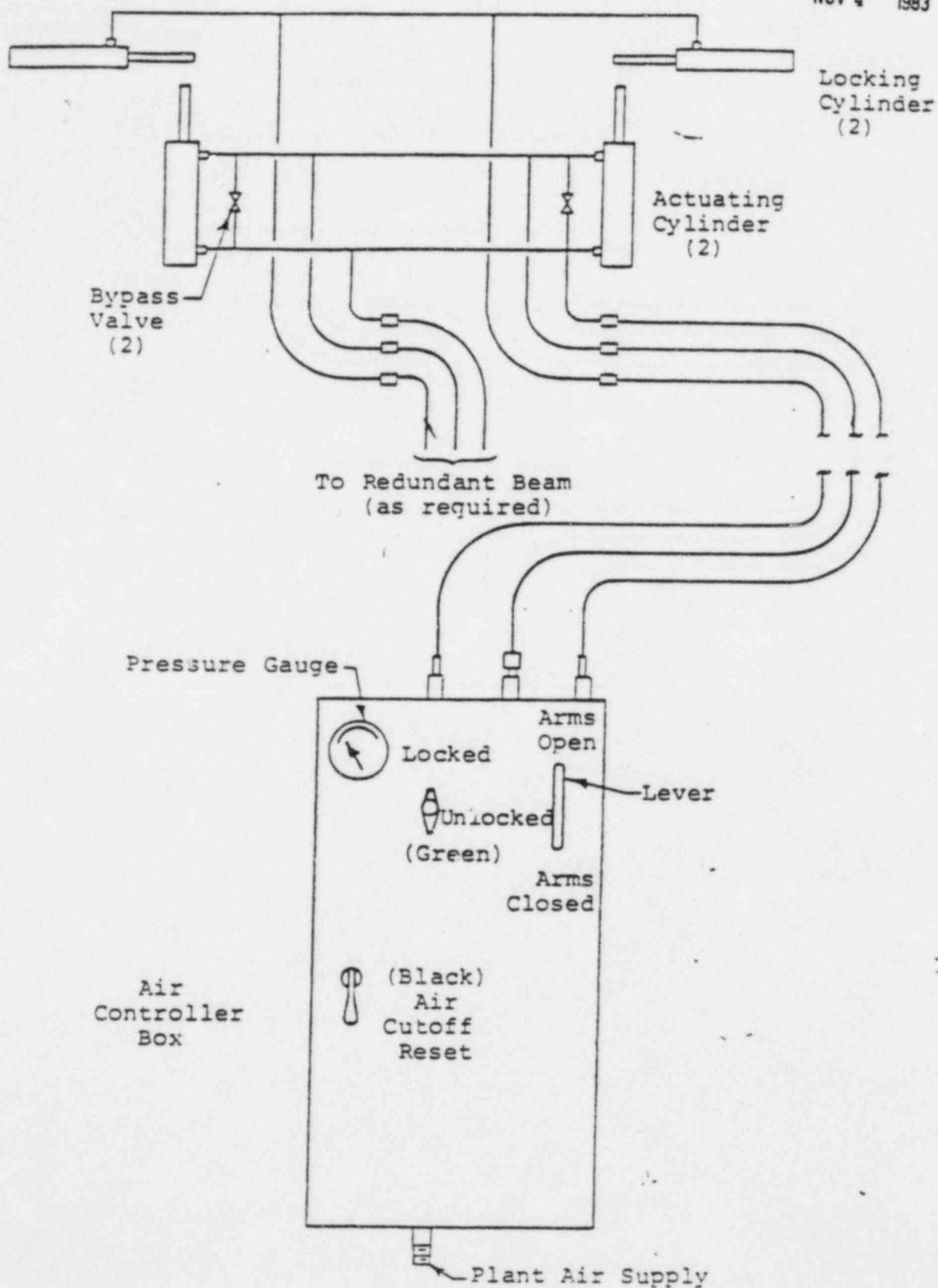


FIGURE 3 Lift Beam Assembly

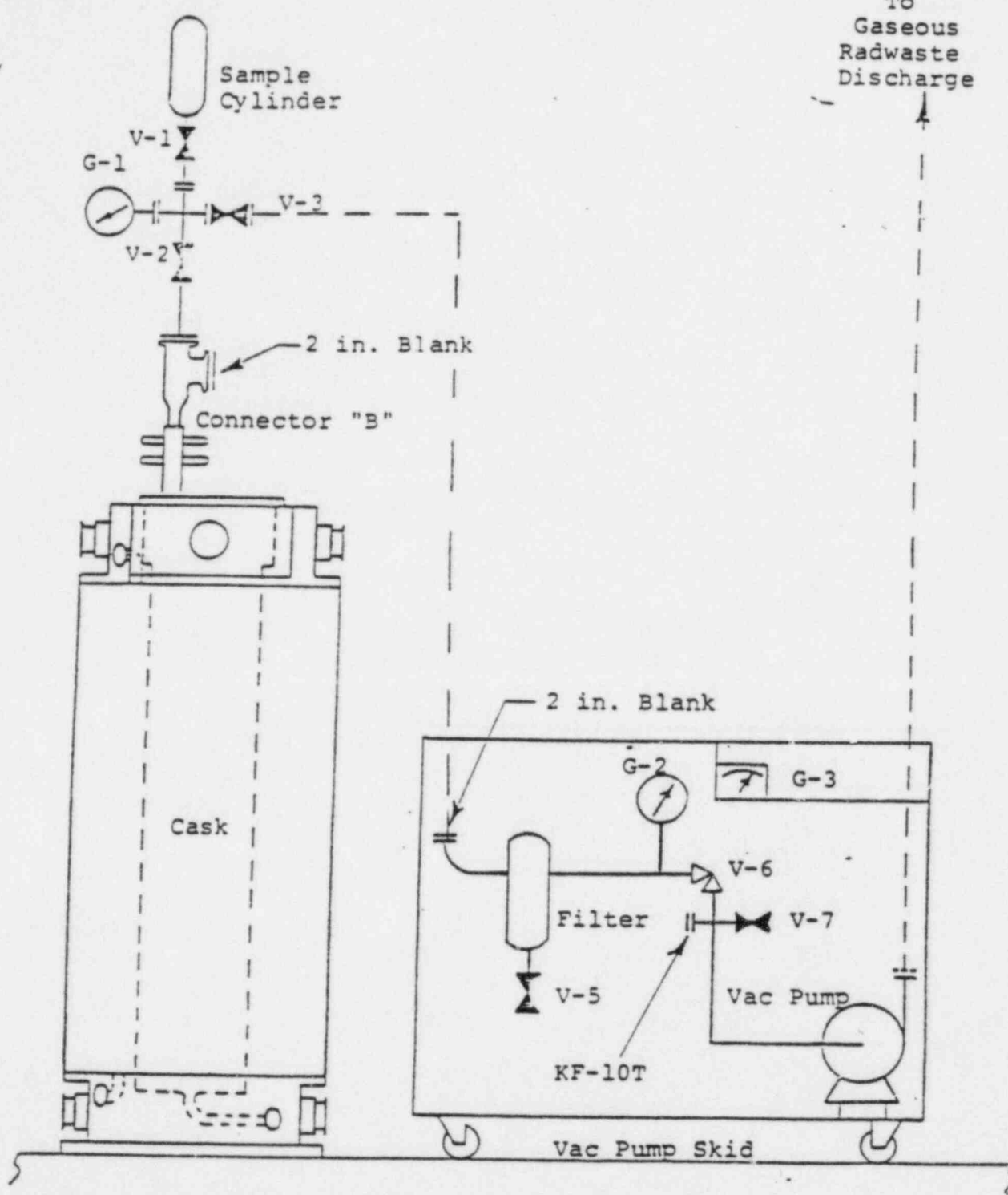
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Schematic of Lift Beam Pneumatic Actuating System

Figure 4

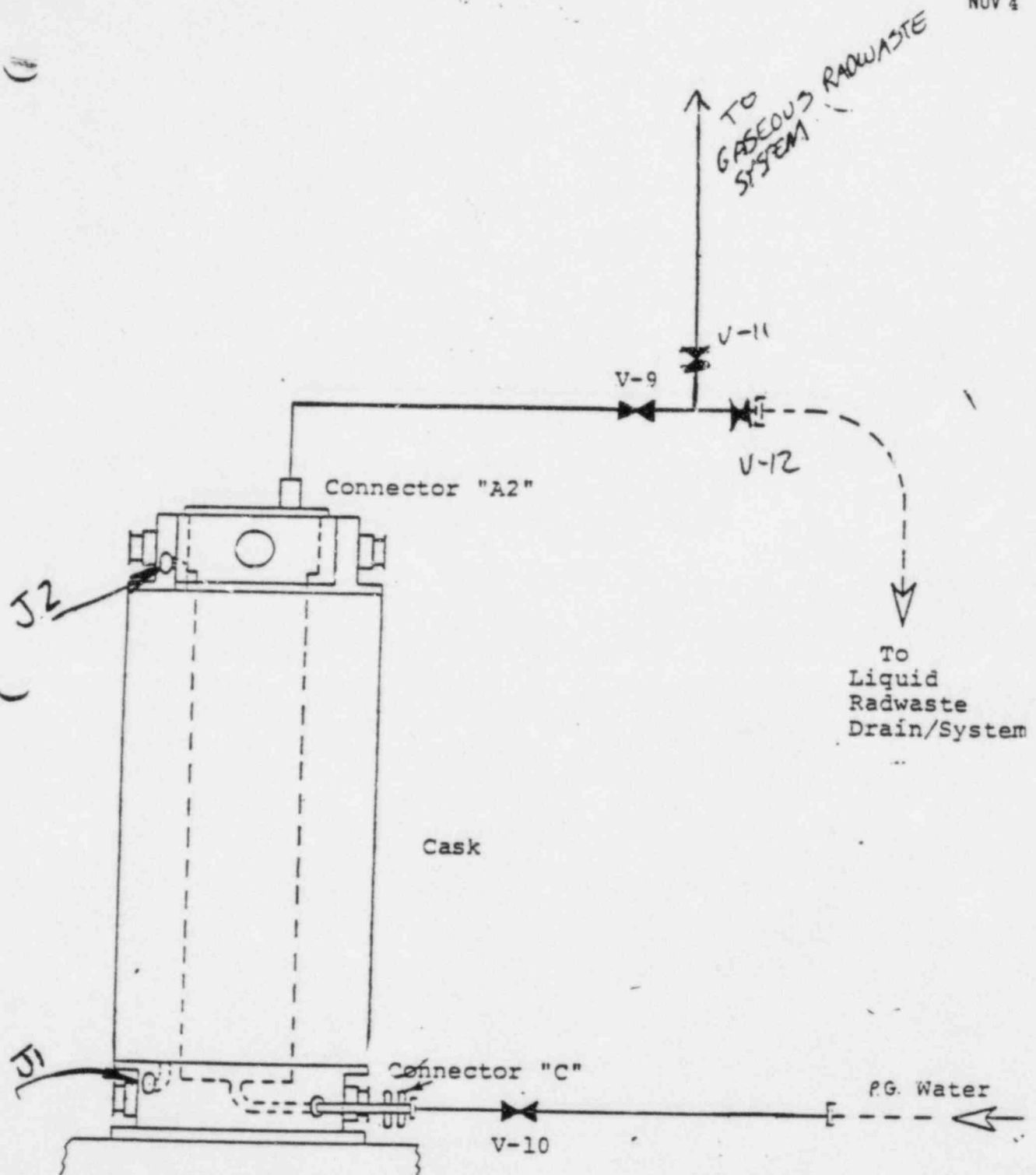
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VDS in Sampling Mode

Figure 7

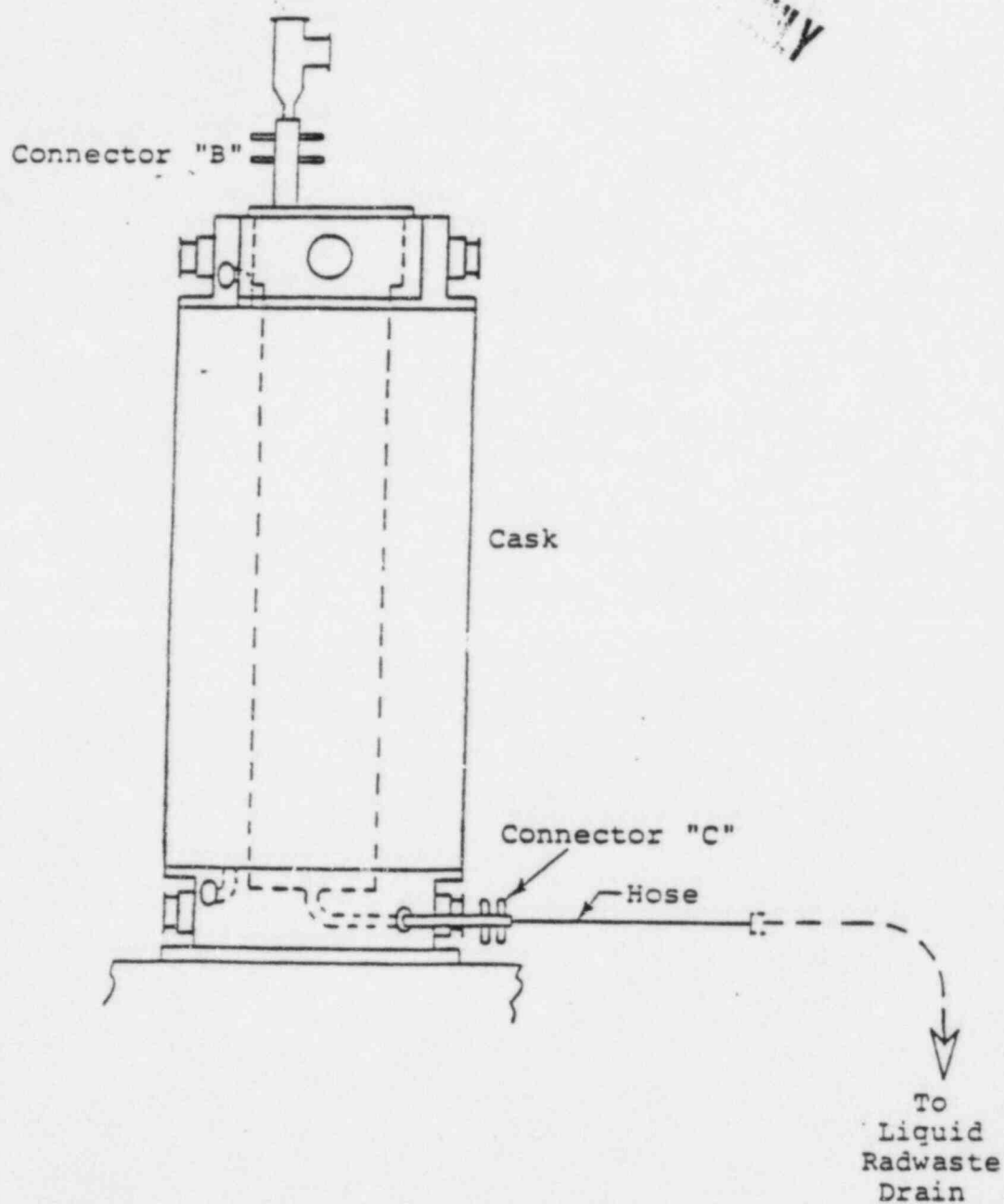
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CDS in Cask Filling/Cooldown Mode

Figure 6

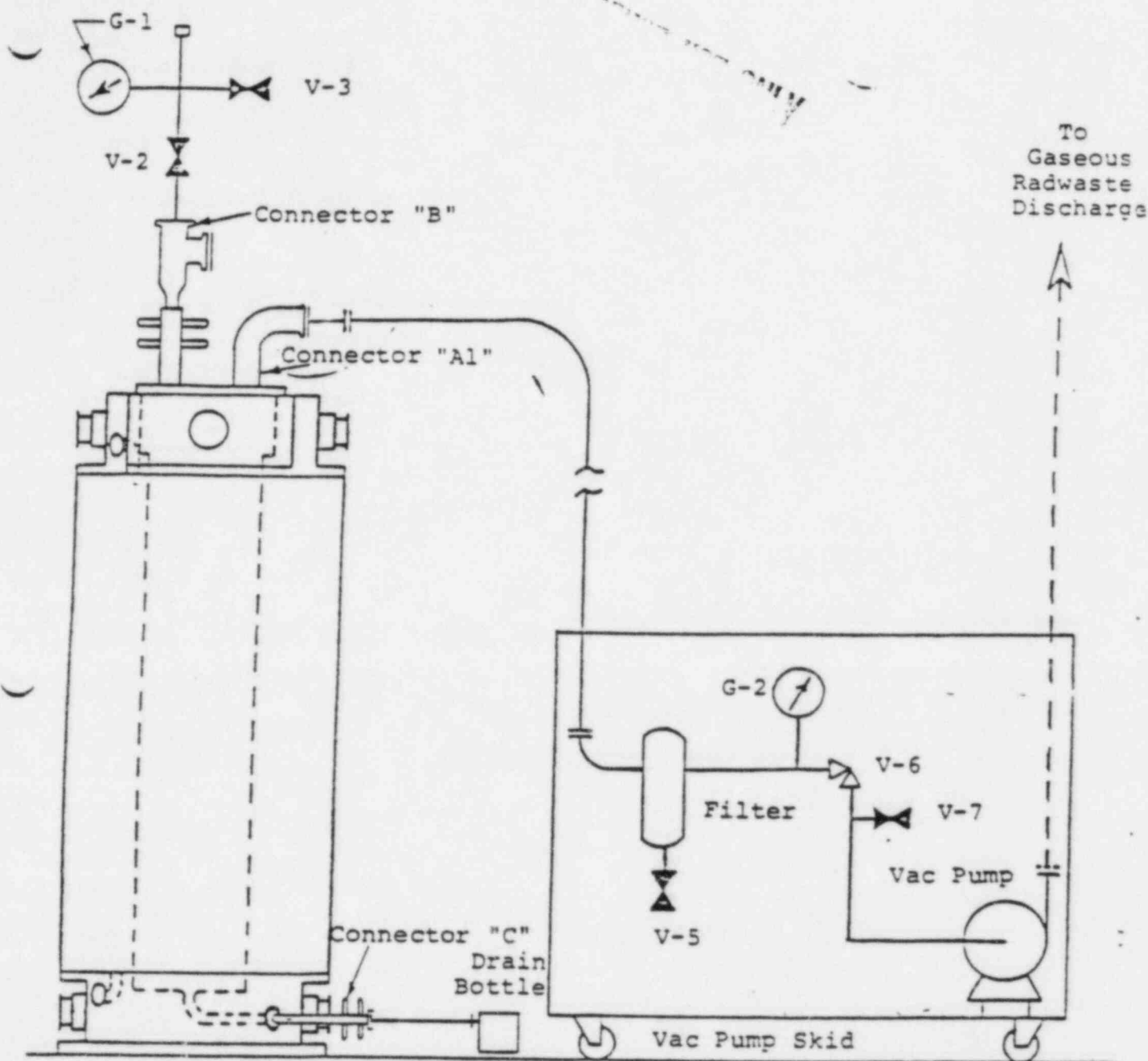
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CDS in Cask Draining Mode

Figure 9

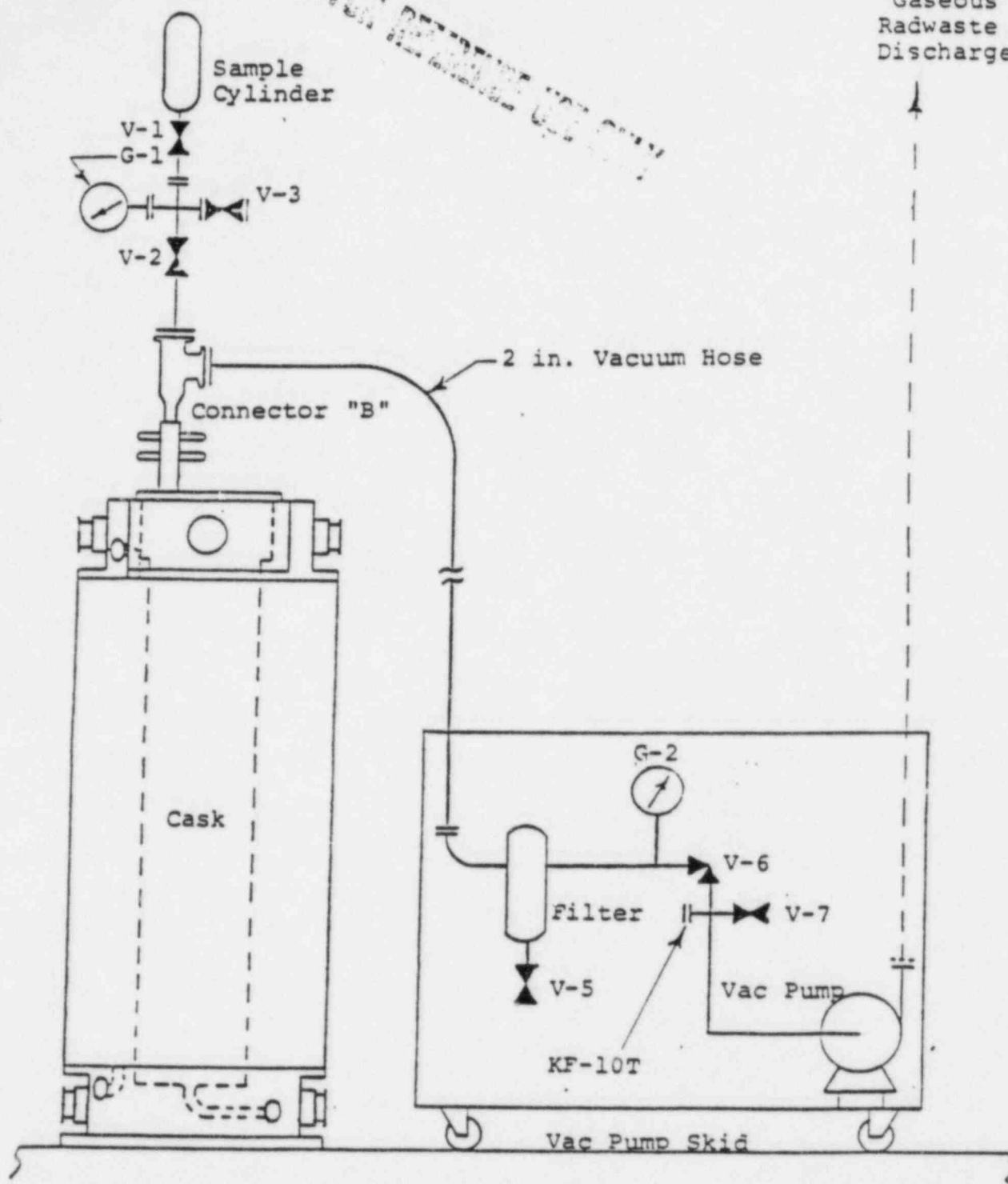
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VDS in Vacuum Drying Mode

Figure 10

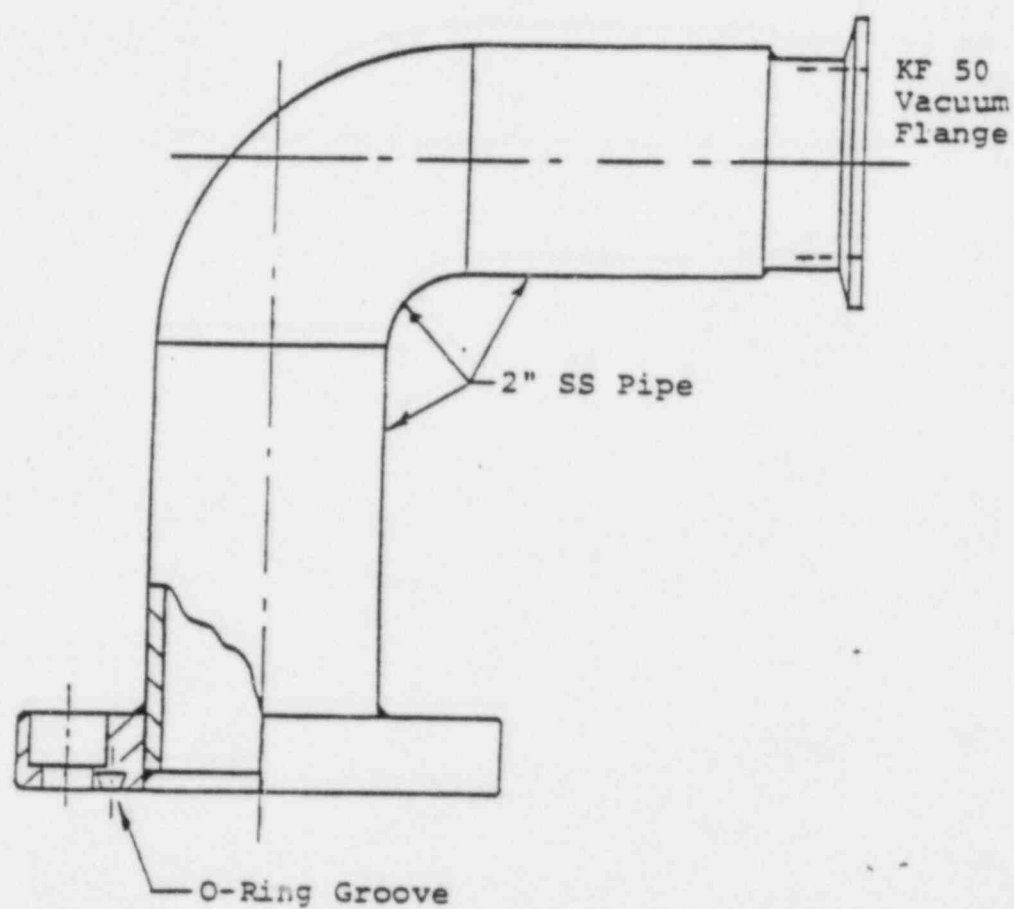
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Gaseous
Radwaste
Discharge

VDS In Evacuation Mode

Figure ||

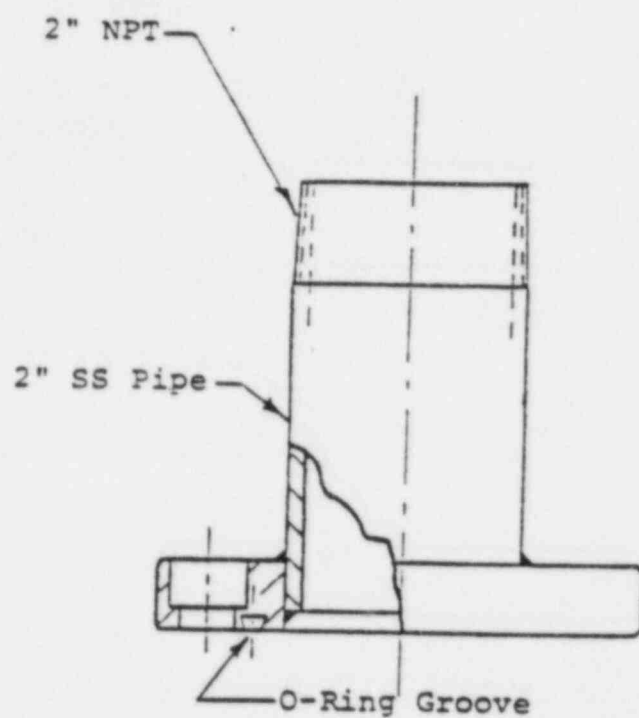
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Connector "A-1"

Figure 12

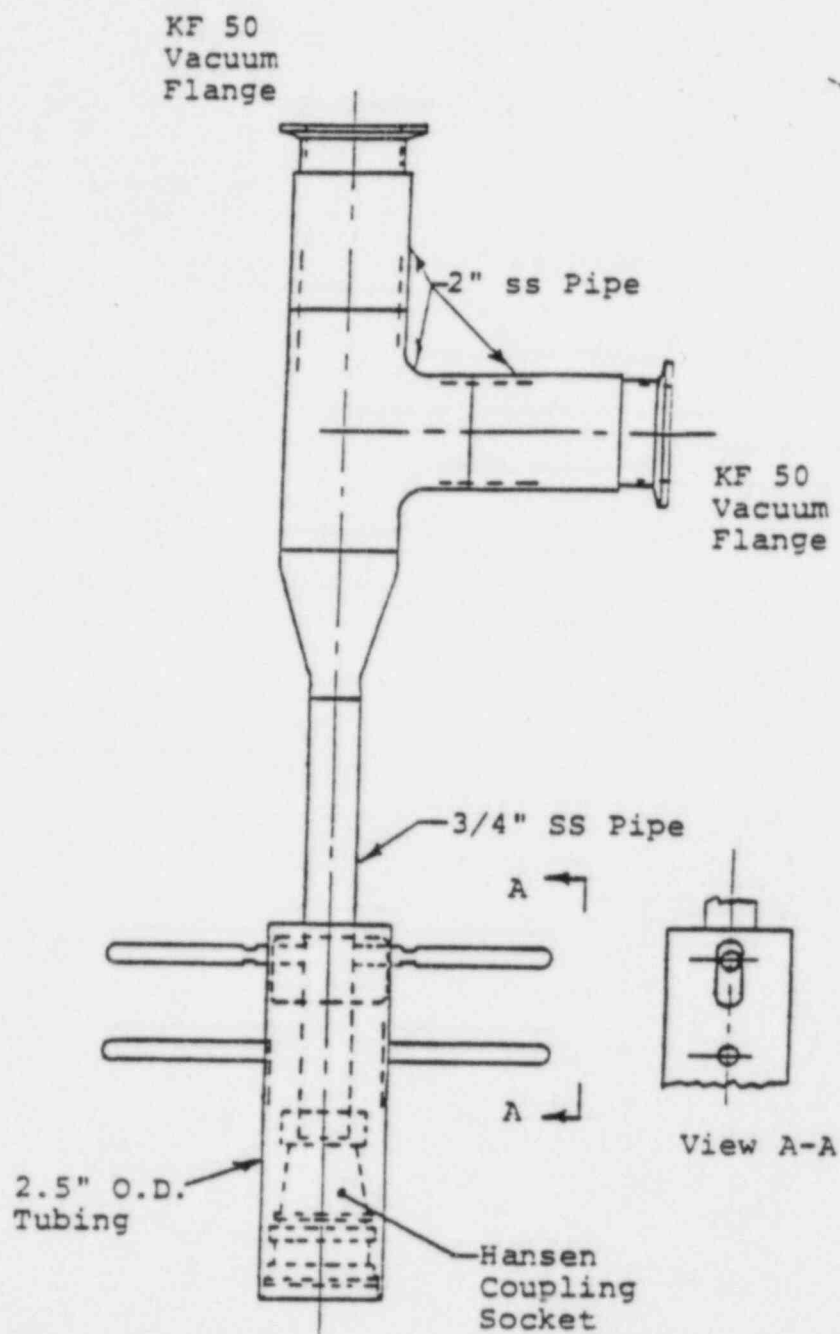
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Connector "A-2"

Figure 13

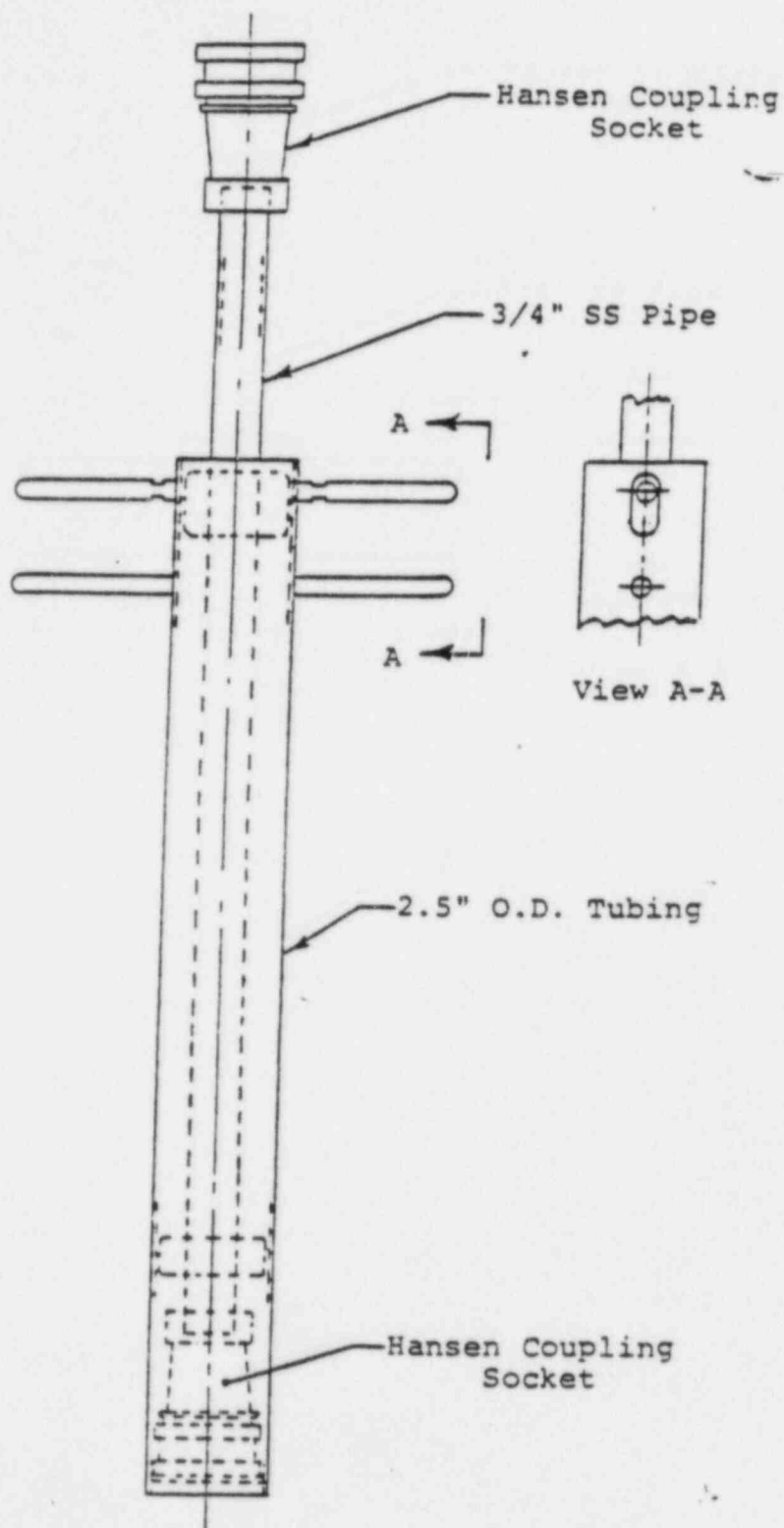
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Connector "B"

Figure 14

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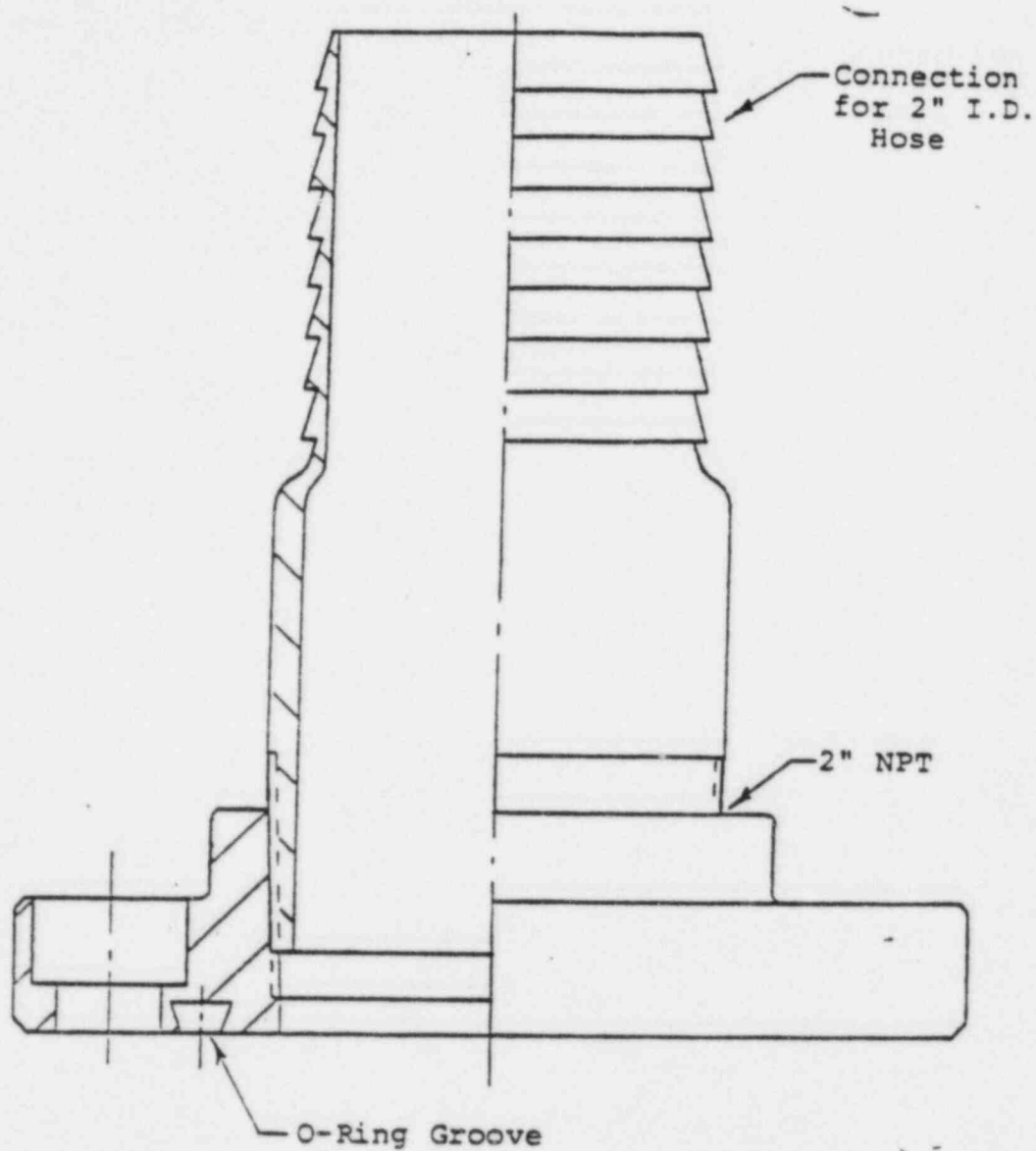


Connector "C"

Figure 15

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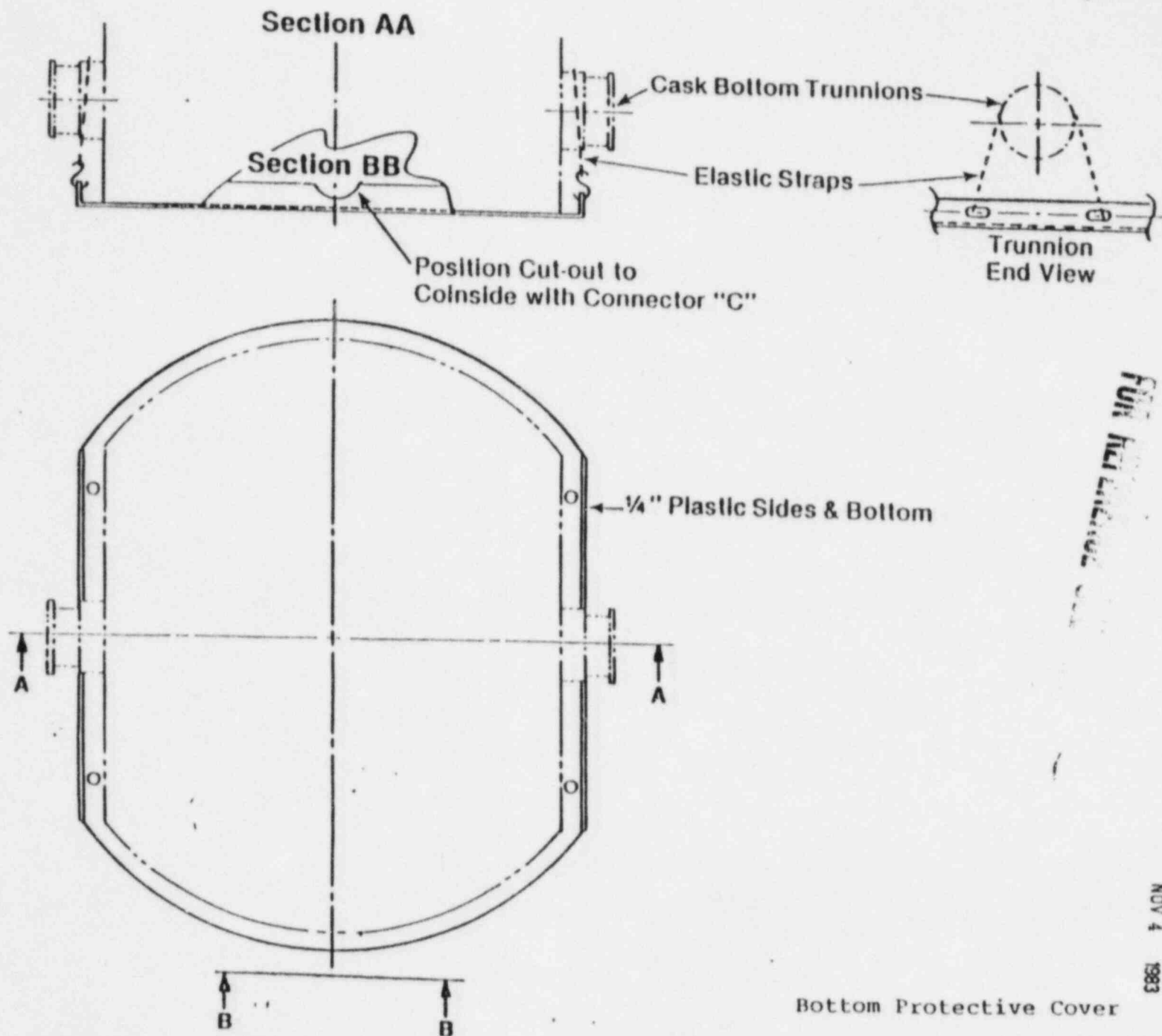
FOR REFERENCE ONLY



Connector "J"

Figure 17

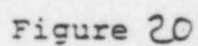
Fig. 18

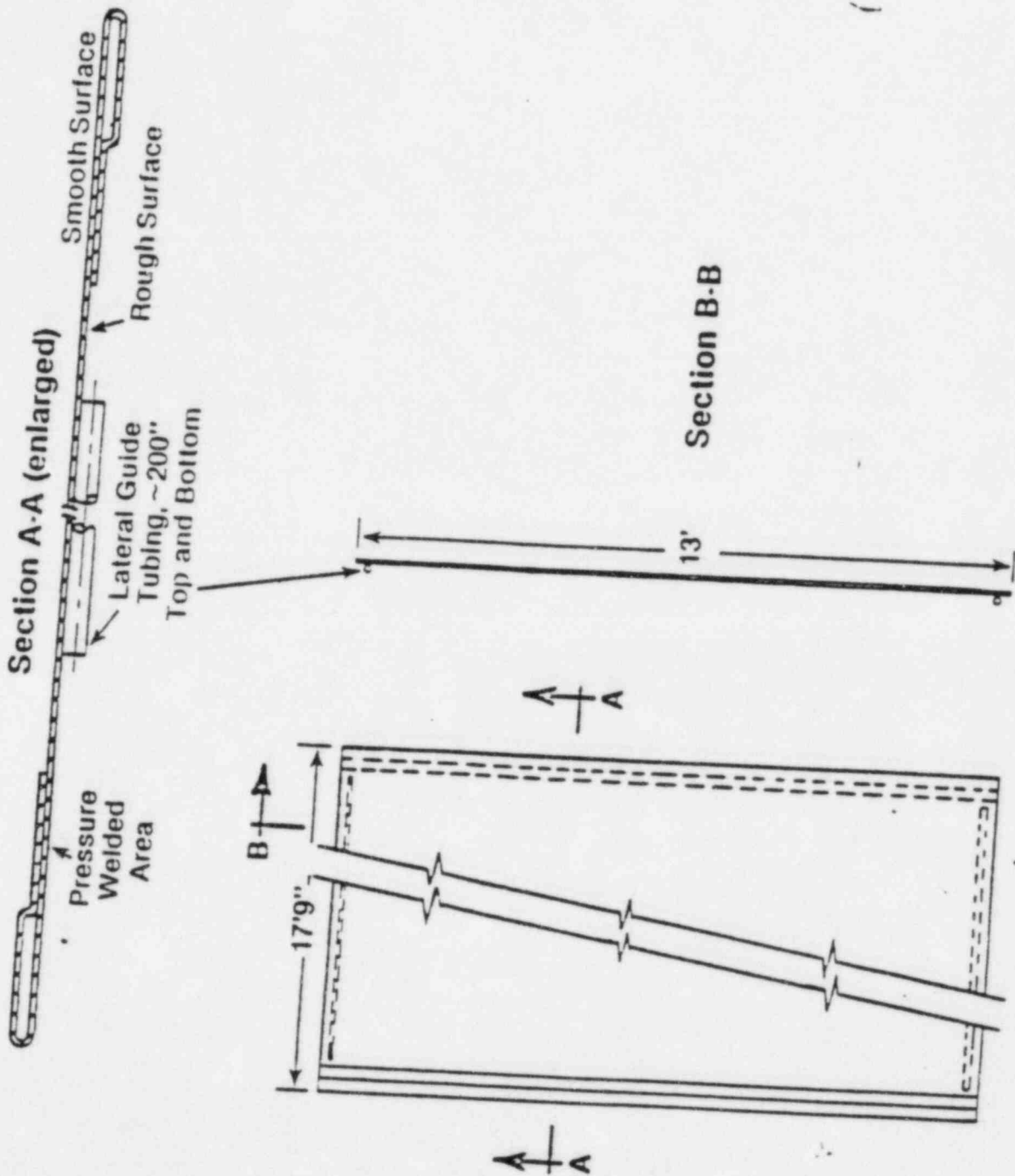


FOR THE LIAISON

Bottom Protective Cover

Figure 18



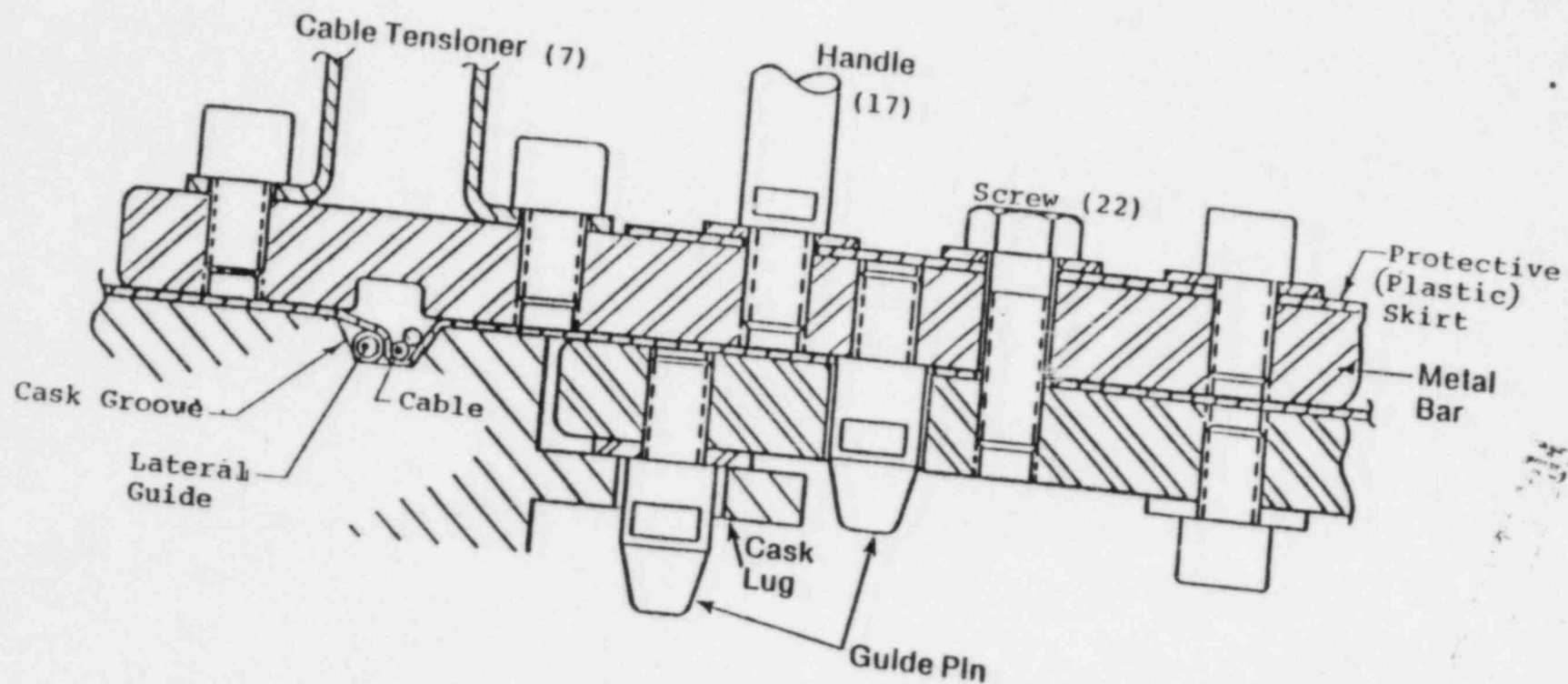


Protective Plastic Skirt

Figure 21

FIG. 21

FIG. 22



Closure Bars for Protective Skirt
Figure 22

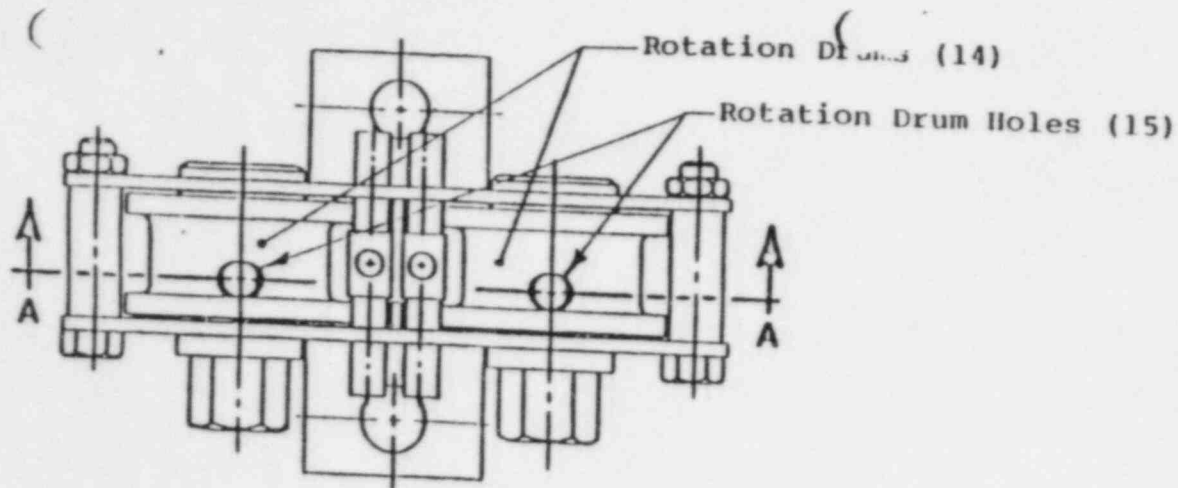
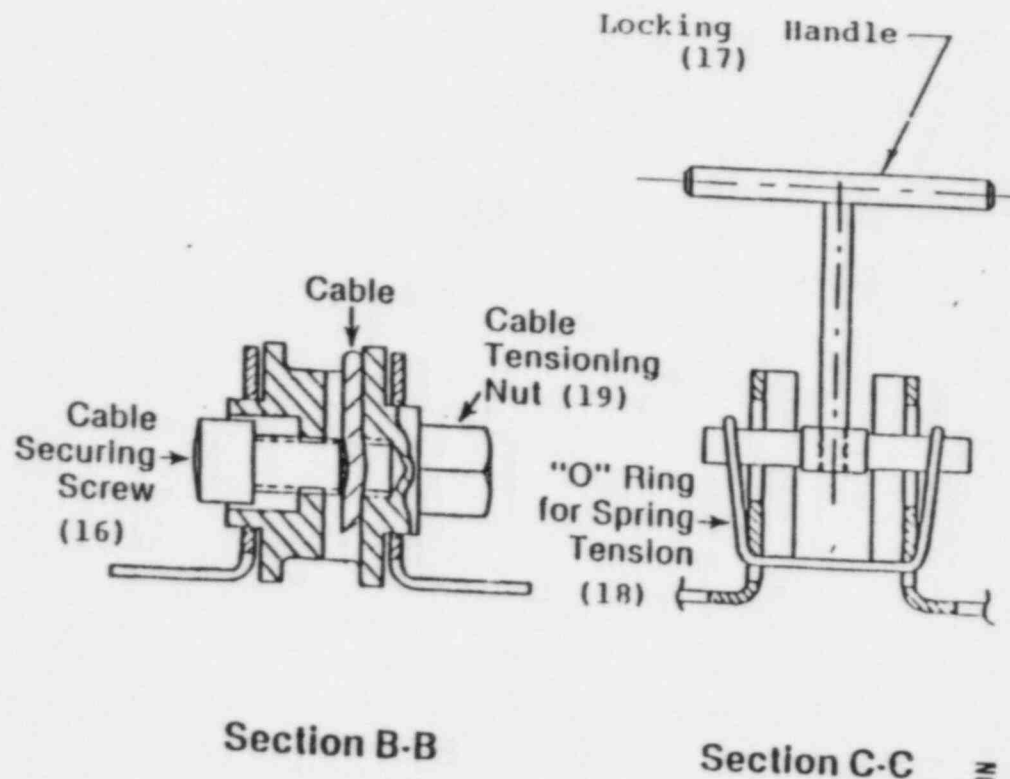
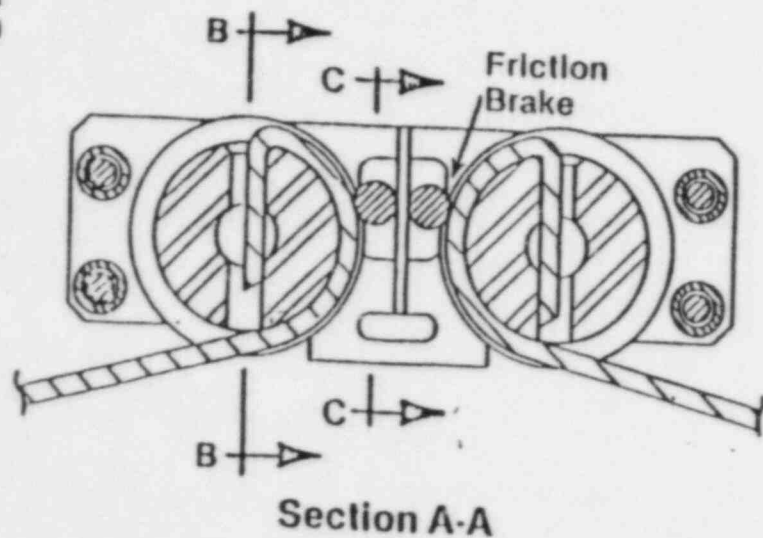


Fig. 23



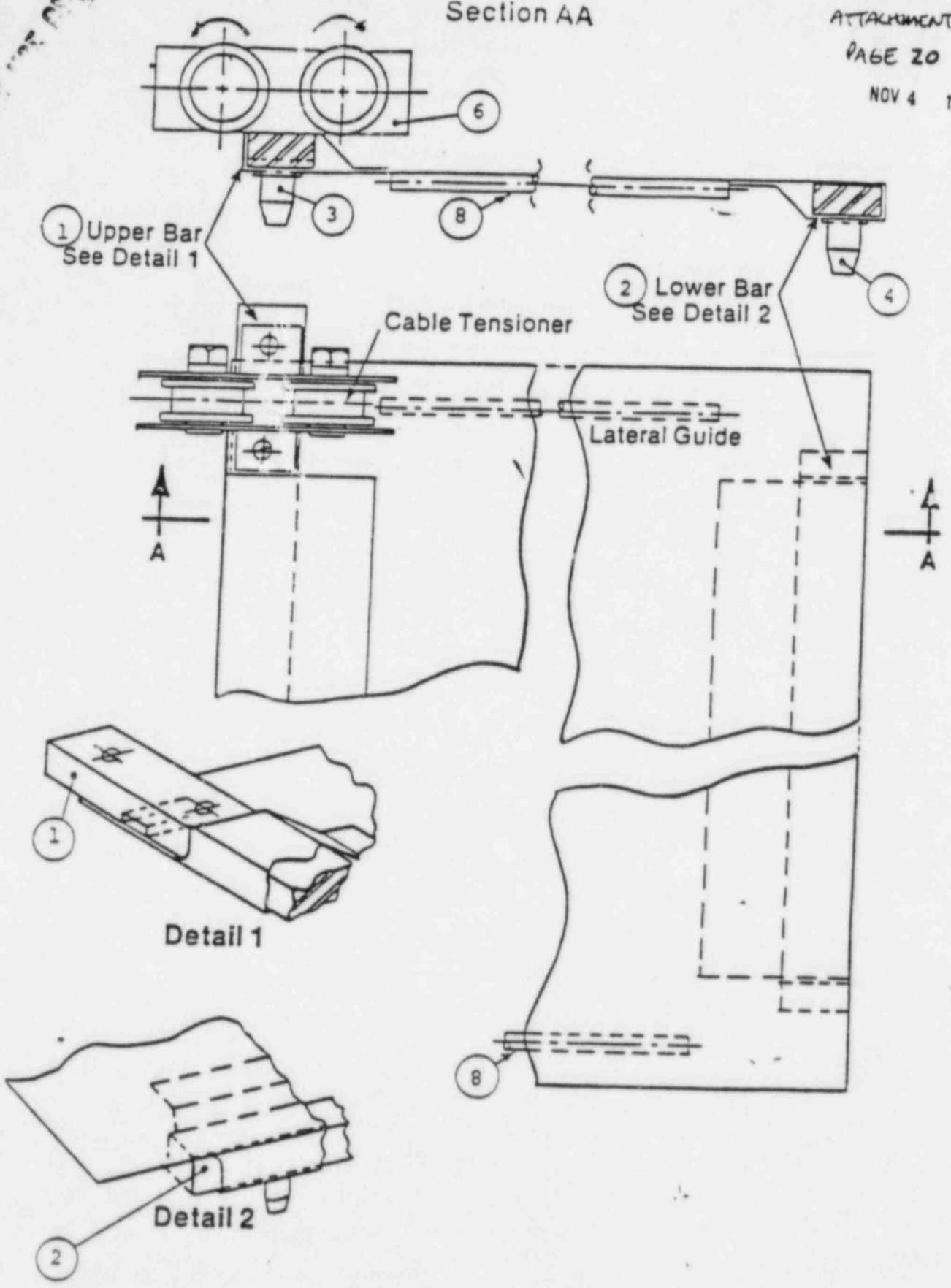
Skirt Cable Tensioner

Figure 23

FOR INFORMATION USE ONLY

Section AA

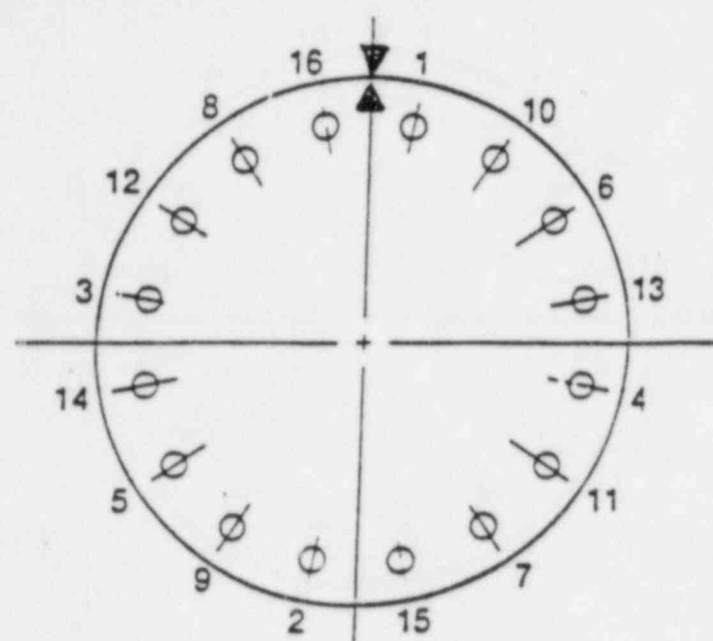
NOV 4 1983



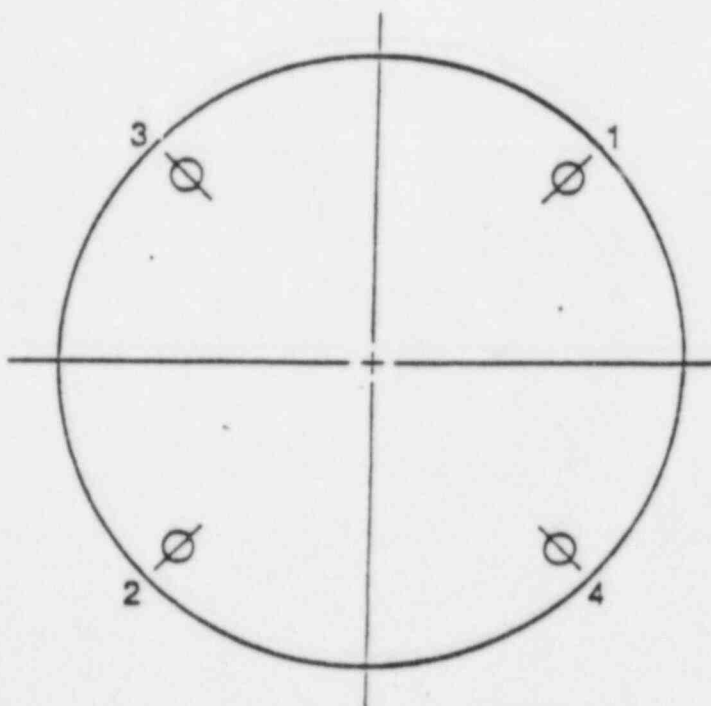
Protective Skirt Assembly

Figure 24

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(a) Lid



(b) Shock Absorbing Covers

Lid and Cover Bolt Tightening Sequence

Figure 25

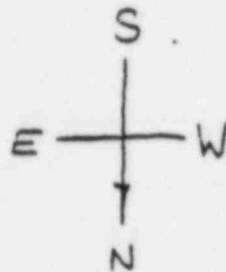
VIEW OF CASK AREA WITH CASK ON SHELF

CASK UNLOADING
AREA (SHALLOW)

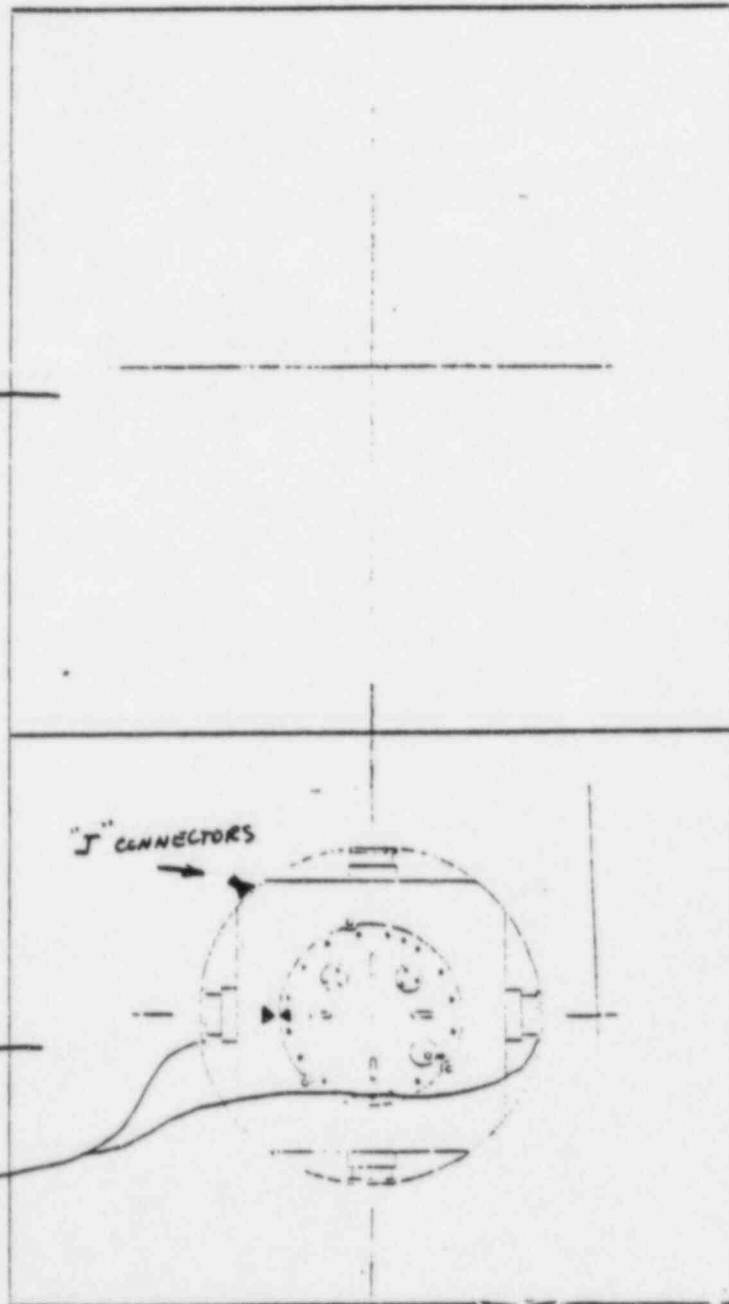
CASK AREA (DEEP)

LIFTING TRANSDUCERS
USED

"J" CONNECTORS



↓ FUEL ROLL UP DOOR
FIGURE 26



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CASK WITH LID REMOVED, FUEL EXPOSED

FUEL ROLL UP DOOR ↑

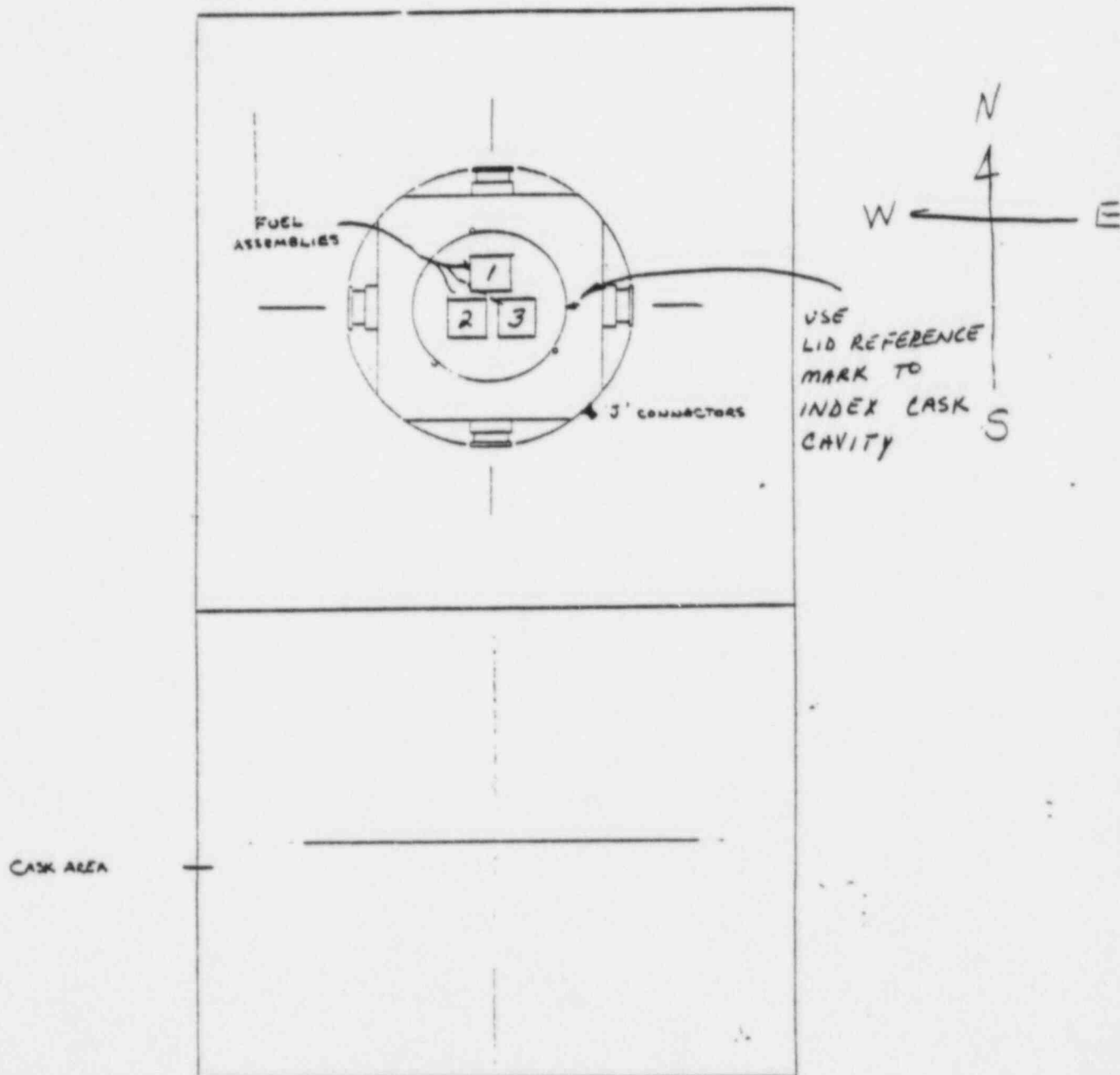
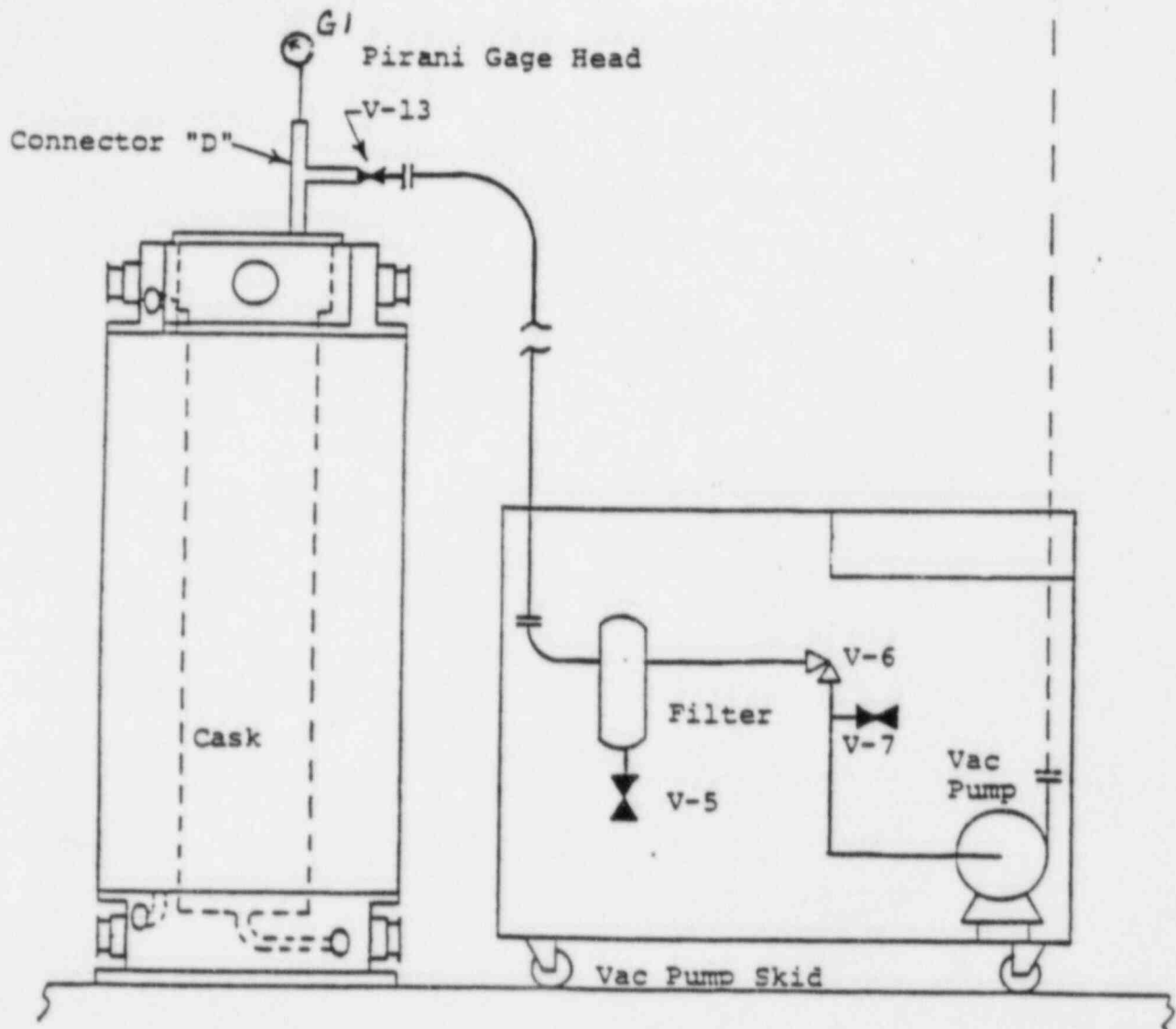


FIGURE 28

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To
Gaseous
Radwaste
Discharge



VDS in Lid Tightness Testing Mode

Figure 29

FORM 6 "CASK LOADING LEADAGE RATE TESTING DATA SHEET"

1.0 Lid Gaskets Leakage Rate Testing - See Addendum 1.

1.1 Initial pressure: _____ mbar

Time: _____

1.2 Final pressure: _____ mbar

Time: _____

1.3 Test ΔP : _____ mbar

Test Δt : _____ seconds

1.4 Calculated leak rate:

$L'_{Lid} =$ _____ atm cm³/sec

1.5 Verify calculated leadage rate is less than

3.0×10^{-2} atm cm³/sec and test is acceptable: _____

2.0 Cavity Drying and Dryness Verification

2.1 Vacuum Drying Operations

2.1.1 Time: _____ at start of vacuum drying
operations

2.1.2 Minimum cold wall temperature (t) as measured by
thermocouple "F1", "F2" or "F3":

Location: _____

Temperature: _____ °F

2.1.3 Water vapor pressure (P) in equilibrium with cold
wall temperature, (t):

Vapor pressure: _____ mbar

2.2 Cavity Dryness Verification

2.2.1 Cavity pressure at beginning of dryness
verification:

Pressure: _____ mbar

Time: _____

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2.0 Cavity Drying and Dryness Verification (continued)

2.2 Cavity Dryness Verification (continued)

2.2.2 Cavity pressure at end of dryness verification:

Pressure: _____ mbar

Time: _____

2.2.3 Verify cavity gas pressure rise is no greater than

P/4 or 3.3 mbar, whichever is less:

ΔP : _____ mbar

Δt : _____

Test is acceptable: _____

3.0 Cask Opening Tightness Testing - See Addendum 2.

3.1 Blind Flange "B" Test

3.1.1 Initial pressure: _____ mbar

Time: _____

3.1.2 Final pressure: _____ mbar

Time: _____

3.1.3 Test ΔP : _____

Test Δt : _____

3.1.4 Calculated leak rate:

$L'_{\text{"B"}} = \text{_____ atm cm}^3/\text{sec}$

3.2 "C" Hansen Coupling Plug Test

3.2.1 Initial pressure: _____ mbar

Time: _____

3.2.2 Final pressure: _____ mbar

Time: _____

3.2.3 Test ΔP : _____ mbar

Test Δt : _____ seconds

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3.0 Cask Opening Tightness Testing (continued)

3.2 "C" Hansen Coupling Plug Test (continued)

3.2.4 Calculated leak rate:

$$L'_{\text{"C"}} = \text{_____ atm cm}^3/\text{sec}$$

3.3 Shield Plug "A" Test

3.3.1 Initial pressure: _____ mbar

Time: _____

3.3.2 Final pressure: _____ mbar

Time: _____

3.3.3 Test ΔP : _____ mbar

Test Δt : _____ seconds

3.3.4 Calculated leak rate:

$$L'_{\text{"A"}} = \text{_____ atm cm}^3/\text{sec}$$

4.0 Total ACutal Leakage Rate

$$4.1 \quad L' = L'_{\text{Lid}} + L'_{\text{"B"}} + L'_{\text{"C"}} + L'_{\text{"A"}}$$

$$L' = \text{_____}$$

4.2 Test is acceptable if:

$$L' \leq 9.2 \times 10^{-2} \text{ atm cm}^3/\text{sec}$$

4.3 Enter total leakage rate calculated above on the Cask Loading Report.

Test is acceptable: _____

QC: _____

DATE: _____

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ATTACHMENT III
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CASK DEPARTURE FORMS

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"SHIPPER'S CERTIFICATION FOR RADIOACTIVE MATERIALS"

Transport No. _____

Consigned to: _____

Place of Departure: _____

Destination: _____

Shipper: _____

Proper Shipping Name: Radioactive Material, Fissile, N.O.S.

Number of Packages: One (1)

Material Quantity: _____

Activity of Package: _____ curies

Packaging Identification: USA/9015/B()F

Material Class: Radioactive Material

Name of Radionuclides: Mixed Fission Products

Transport Group to which material belongs: II

Category Label Applied: Radioactive Yellow II

Transport Index: _____

Fissile Class of Package: Fissile Class III

NOTE: Warning - Fissile Class III Shipment. Do not load more than one package per vehicle. In loading the storage areas, keep at least 20 feet (6 meters) from other packages, bearing radioactive labels.

Description of the physical and chemical form of the material: _____

Irradiated Fuel Assemblies

Highest dose at the external surface of the package: _____

_____ mrem/h

Highest dose rate at one (1) meter from the surface: _____ mrem/h

Highest dose rate at two (2) meters from surface of trailer:

_____ mrem/h

Maximum level of non-fixed contamination of package and trailer:

Beta, gamma: _____ ($< 10^4$ Ci/cm²)

Alpha : _____ ($< 10^5$ Ci/cm²)

This is to certify that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Shipper's Representative: _____
(Signature)

Date and hour of departure: _____

Name(s) of driver(s): _____

Vehicle Identification Number: _____

Date and hour of arrival: _____

Receiver's Signature: _____

CASK TRANSPORT RADIATION SURVEY FORM

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SITE	SURVEYED BY:	DEPARTURE DATE/TIME
CASK SERIAL NO:	INSTRUMENT:	SURVEY DATE:

PT	Contamination Survey Points	dpm/100
1	Front Face - left	
2	Front Face - right	
3	Lid Surface	
4	Front Drum surface - left side	
5	Front Drum surface - bottom	
6	Front Drum surface - right side	
7	Front Drum surface - top	
8	Left Trunnion/Impact Limiter	
9	Right Trunnion/Impact Limiter	
10	Bottom Redundant Trunnion/Impact Limiter	
11	Top Redundant Trunnion/Impact Limiter	
12	Fins - bottom front	
13	Fins - top front	
14	Fins - right side front	
15	Fins - left side front	
16	Fins - bottom rear	
17	Fins - top rear	
18	Fins - right side rear	
19	Fins - left side rear	
20	Left Rear Trunnion/Impact Limiter	
21	Right Rear Trunnion/Impact Limiter	
22	Rear Drum surface - left side	
23	Rear Drum surface - right side	
24	Rear Drum surface - bottom	
25	Rear Drum surface - top	
26	Rear Drum base surface - center	
27	Rear Drum base surface - left	
28	Rear Drum base surface - right	
29	Front Shock Absorbing Cover (inside)	
30	Front Shock Absorbing Cover (outside)	
31	Front Shock Absorbing Cover (inside)	
32	Front Shock Absorbing Cover (outside)	

Radiation Levels (mrem/h)			
	At Contact	3' From Surface	6' From Surface
PT			
a			
b			
c			
d			
e			
f			
g			
h			

TRAILER DEPARTURE RADIATION SURVEY FORM

SITE:	SURVEYED BY:	DEPARTURE DATE/TIME:
VEHICLE NO.:	INSTRUMENT:	SURVEY DATE/TIME:

LOCATION	FIXED	REMOVABLE
	mrem/hr	dpm/100
1 Cask Drum Support		
2 Tarpaulin Support		
3 Rear Deck Plate		
4 Rear Deck Plate		
5 Trunnion Support - Front		
6 Trunnion Support - Front		
7 Trunnion Support - Back		
8 Trunnion Support - Back		
9 Tarpaulin		
10 Trailer Beam		
11 Trailer Beam		
12 Front Deck Plate		
13 Front Deck Plate		
14 Front Deck Plate		
15 Tire Surface		

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H.P. RECEIPT SURVEY FORMS

FORM 1 - CASK RECEIPT RADIATION SURVEY FORM

SITE	SURVEYED BY:	ARRIVAL DATE/TIME
CASK SERIAL NO:	INSTRUMENT:	SURVEY DATE:

PT	Contamination Survey Points	dpm/100
1	Front Face - left	
2	Front Face - right	
3	Lid Surface	
4	Front Drum surface - left side	
5	Front Drum surface - bottom	
6	Front Drum surface - right side	
7	Front Drum surface - top	
8	Left Trunnion/Impact Limiter	
9	Right Trunnion/Impact Limiter	
10	Bottom Redundant Trunnion/Impact Limiter	
11	Top Redundant Trunnion/Impact Limiter	
12	Fins - bottom front	
13	Fins - top front	
14	Fins - right side front	
15	Fins - left side front	
16	Fins - bottom rear	
17	Fins - top rear	
18	Fins - right side rear	
19	Fins - left side rear	
20	Left Rear Trunnion/Impact Limiter	
21	Right Rear Trunnion/Impact Limiter	
22	Rear Drum surface - left side	
23	Rear Drum surface - right side	
24	Rear Drum surface - bottom	
25	Rear Drum surface - top	
26	Rear Drum base surface - center	
27	Rear Drum base surface - left	
28	Rear Drum base surface - right	
29	Front Shock Absorbing Cover (inside)	
30	Front Shock Absorbing Cover (outside)	
31	Front Shock Absorbing Cover (inside)	
32	Front Shock Absorbing Cover (outside)	

Radiation Levels (mrem/h)			
	At Contact	3' From Surface	6' From Surface
PT			
a			
b			
c			
d			
e			
f			
g			
h			

02 000000 000000

OP-4.3
ATTACHMENT IV
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TRAILER RECEIPT RADIATION SURVEY FORM

SITE:	SURVEYED BY:	ARRIVAL DATE/TIME:
VEHICLE NO.:	INSTRUMENT:	SURVEY DATE/TIME:

LOCATION	FIXED	REMOVABLE
	mrem/hr	dpm/100
1 Cask Drum Support		
2 Tarpaulin Support		
3 Rear Deck Plate		
4 Rear Deck Plate		
5 Trunnion Support - Front		
6 Trunnion Support - Front		
7 Trunnion Support - Back		
8 Trunnion Support - Back		
9 Tarpaulin		
10 Trailer Beam		
11 Trailer Beam		
12 Front Deck Plate		
13 Front Deck Plate		
14 Front Deck Plate		
15 Tire Surface		

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CASK LOADING REPORT

CASK LOADING REPORT

1.0 Cask Loading

4.1 The following is a list of the fuel assemblies and insert components (if applicable) that have been loaded into the cask. The fuel assembly I.D. and ANSI numbers (if applicable) and their associated spent fuel cask locations have been verified by Fuel Resources personnel (See Section 5.3.22).

F.R. Representative Signature

Date

SHIPMENT NUMBER			
SPENT FUEL CASK LOCATION	FUEL ASSEMBLY I.D. NUMBER	FUEL ASSEMBLY ANSI NUMBER	INSERT COMPONENT I.D. NUMBER
1			
2			
3			

NOTE: Lid orientation mark is adjacent to #3 fuel cavity.
Refer to Attachment I Fig. 28.

F/A I.D. NUMBER	DECAY HEAT KW	TOTAL ACTIVITY CURIES	WEIGHT OF FISSILE URANIUM GRAMS	WEIGHT OF FISSILE PLUTONIUM GRAMS

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2.0 Cask Preparation for Shipment

2.1 Cavity dryness verification test satisfactory_____

2.2 Record final cask cavity internal pressure:

_____psia

2.3 Maximum dose rate at cask surface:

a) beta, gamma (β):_____mrem/h

b) location:_____

2.4 Maximum dose rate at three (3) feet from cask surface:

a) beta, gamma (β):_____mrem/h

b) location:_____

2.5 Maximum removable surface contamination of the cask
surface:

a) alpha, beta, gamma ():_____dpm/100cm²

b) location:_____

2.6 Maximum removable surface contamination of the trailer:

a) alpha, beta, gamma ():_____dpm/100cm²

b) location:_____

2.7 Maximum dose rate at the outer surface of the vehicle,
(as measured along the trailer protective enclosure
perimeter) with the cask installed:

a) beta, gamma (β):_____mrem/h

b) location:_____

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2.0 Cask Preparation for Shipment (continued)

2.8 Maximum dose rate at six (6) feet from the outer surface
of the vehicle:

a) beta, gamma (β): _____ mrem/h

b) location: _____

2.9 Maximum dose rate inside the truck cab:

a) beta, gamma (β): _____ mrem/h

b) location: _____

NOTE: Attach complete radiation and contamination forms to this
report.

2.10 Cask Departure: TIME: _____

DATE: _____

3.0 Remarks:

QC Inspector: _____

Data Recorder: _____

Date _____

Time _____

Responsible Supervisor: _____