CP&L
Carolina Power & Light Company

August 2, 1978

File: NG-3514(B) Serial: GD-78-2166

Office of Nuclear Reactor Regulation
Attn: Mr. T. A. Ippolito, Chief
Operating Reactors Branch No. 3
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

BRUNSWICK STEAM ELECTRIC PLANT UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 AND 50-324
LICENSE NOS. DPR-71 AND DPR-62
CONTROL OF HEAVY LOADS NEAR SPENT FUEL

Dear Mr. Ippolito:

Your letter of June 12, 1978 to Carolina Power & Light Company (CP&L) requested information on the physical layout of the Brunswick Steam Electric Plant (BSEP) fuel handling areas and on the heavy loads which are handled over spent fuel. Your questions and the CP&L responses for the BSEP are listed below:

Question 1. Provide a diagram which illustrates the physical relation between the reactor core, the fuel transfer canal, the spent fuel storage pool and the set down, receiving or storage areas for any heavy loads moved on the refueling floor.

Response: Please see the attached Figure 1, which is representative of both units.

Question 2. Provide a list of all objects that are required to be moved over the reactor core (during refueling), or the spent fuel storage pool. For each object listed, provide its approximate weight and size, a diagram of the movement path utilized (including carrying height) and the frequency of movement.

Response: 2.1 Reactor Core

a. The drywell head which weighs approximately 85 tons is moved to the storage area shown on Figure 1. The head would be lifted six or seven feet above the operating floor.

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b. The reactor head which weighs 70 tons is moved to the storage area shown on Figure 1. The head would be lifted approximately four feet over the operating floor.

c. The dryer and separator are each lifted from the reactor vessel and placed in their designated storage pool.

d. The "cattle chute" provides additional shielding along the bottom of the refueling path from the spent fuel storage pool to the reactor vessel. The "chute" is approximately 6' x 6' x 12' and weighs approximately 12 tons. When it is in place, personnel can perform repairs in the drywell while fuel is being moved from the reactor to the storage pool. It is never transported over either the spent fuel pool or the reactor core, but is moved in an East-West direction from the refueling floor and is lowered to the bottom of the spent fuel gate on the reactor side.

e. The service platform is approximately 18 feet in diameter, six feet high, and weighs about one ton. The platform is lowered onto the reactor vessel flange when the head is removed to support maintenance and repairs inside the vessel. It is normally lowered into and removed from this position several times during a refueling outage.

f. The work box is approximately 4' x 4' x 4' and weighs about four tons.

This is a shielded box that allows one or two workers to be lowered inside the reactor vessel for inspection or repairs. The depth to which the box is lowered is limited by the water level in the vessel at the time. It is normally used for several inspections for repairs during a refueling outage.

2.2 Spent Fuel Pool

a. Spent Fuel Cask

Weight: Approximately 70 tons
Size: Approximately 6' in diameter and 18' long
Use: The cask is transported from the decontamination pad to the southeast corner of the spent fuel pool. The cask is not carried to or moved on the refueling floor unless the shield blocks are in place over the reactor. It is never transported directly over the spent fuel storage racks. Redundant lifting devices are employed.

b. Debris Cask

Weight: Approximately 11 tons
Size: Approximately 3' in diameter and 6' long
Use: This cask is used to transport debris such as fuel channels and radiation level detectors to a burial site. It is never transported directly over the spent fuel storage area. Redundant lifting devices are employed.

Question 3. What are the dimensions and weights of the spent fuel casks that are or will be used at your facility?

Response: The only spent fuel cask CP&L plans to use is the IF-300 which weighs approximately 70 tons and is approximately six feet in diameter and 18 feet long.

Question 4. Identify any heavy load or cask drop analyses performed to date for your facility. Provide a copy of all such analyses not previously submitted to the NRC staff.

Response: In lieu of detailed cask drop analyses, CP&L has committed to the use of single failure-proof cranes and lifting apparatus. See the response to Question 7 for the appropriate references.

Question 5. Identify any heavy loads that are carried over equipment required for the safe shutdown of a plant that is operating at the time the load is moved. Identify what equipment could be affected in the event of a heavy load handling accident (piping, cabling, pumps, etc.) and discuss the feasibility of such an accident affecting this equipment. Describe the basis for your conclusions.

Response: The only such loads would be the various casks which are lifted from a floor level which is over the torus. However, these casks are lifted only by an approved, single failure-proof crane using redundant lifting apparatus.

Question 6. If heavy loads are required to be carried over the spent fuel storage pool or fuel transfer canal at your facility, discuss the feasibility of a handling accident which could result in water leakage severe enough to uncover the spent fuel. Describe the basis for your conclusions.

Response: The only loads which could do significant damage to the spent fuel pool would be the casks, and as stated above, they could not be a part of a credible accident due to the redundancy of the cranes and lifting apparatus. The other loads in the pool are too light to cause any leakage.

The worst drop accident possible in the reactor cavity would be a puncture of the drywell cover. Even if this very unlikely event occurred, the fuel in the reactor vessel would remain covered and while the pool could conceivably drain to the bottom of the pool gate, this would still leave the spent fuel covered by water.

Question 7. Describe any design features of your facility which affect the potential for a heavy load handling accident involving spent fuel, e.g., utilization of a single failure-proof crane.

Response: CP&L utilizes single failure-proof cranes at Brunswick. Details of the cranes were provided to the NRC by letter on June 18, 1976 and July 26, 1976.

Question 8. Provide copies of all procedures currently in effect at your facility for the movement of heavy loads over the reactor core during refueling, the spent fuel storage pool, or equipment required for the safe shutdown of a plant that is operating at the time the move occurs.

Response: The operating and maintenance procedures at the Brunswick Plant cover each separate piece of equipment. Due to the number and bulk of the procedures and since they are all always available for review by I&E at the plant site, they are not all attached. Attached to this letter you will find a typical procedure for handling a "heavy" load, specifically the IF-300 spent fuel cask.

Question 9. Discuss the degree to which your facility complies with the eight (8) regulatory positions delineated in Regulatory Guide 1.13 (Revision 1, December, 1975) regarding Spent Fuel Storage Facility Design Basis.

Response: The regulatory positions and CP&L's responses are given below:

1. The spent fuel storage facility (including its structures and equipment except as noted in paragraph 6 below) should be designed to Category I seismic requirements.

   The Reactor Building is a seismic Class I structure as described in section 12.2.1 of Reference 1 and section 3.7 of Reference 2. The spent fuel storage racks are seismic Class I as described in section 2.1.2 of Reference 2.

2. The facility should be designed (a) to keep tornadic winds and missiles generated by these winds from causing significant loss of watertight integrity of the fuel storage pool and (b) to keep missiles generated by tornadic winds from contacting fuel within the pool.

   The possibility of damage to the spent fuel pool resulting from tornadic winds or missiles generated by tornadic winds is discussed in section 5.3.4.4 of Reference 1.

3. Interlocks should be provided to prevent cranes from passing over stored fuel (or near stored fuel in a manner such that if a crane failed, the load could tip over on stored fuel) when fuel handling is not in progress. During fuel handling operations, the interlocks may be bypassed and administrative control used to prevent the crane from carrying loads that are not necessary for fuel handling over the stored fuel or other prohibited areas. The facility should be designed to minimize the need for bypassing such interlocks.

   See the CP&L letters of June 18, 1976 and July 26, 1976.

4. A controlled leakage building should enclose the fuel pool. The building should be equipped with an appropriate ventilation and filtration system to limit the potential release of radioactive iodine and other radioactive materials. The building need not be designed to withstand extremely high winds, but leakage should be suitably controlled during refueling operations. The design of the ventilation and filtration system should be based on the assumption that the cladding of all of the fuel rods in one fuel bundle might be breached. The inventory of radioactive materials available for leakage from the building should be based on the assumptions given in Regulatory Guide 1.25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors "(Safety Guide 25).

The Reactor Building Ventilation System is described in section 5.3 of Reference 1. Additional information is contained in section 3.6 of Reference 2. The analysis of Reference 2 is based on the worst case spent fuel pool loading at which time the pool contains 981 BWR assemblies and 152 PWR with 1% failed fuel.

5. The spent fuel storage facility should have at least one of the following provisions with respect to the handling of heavy loads, including the refueling cask:

   a. Cranes capable of carrying heavy loads should be prevented, preferably by design rather than by interlocks, from moving into the vicinity of the pool; or

   b. Cranes should be designed to provide single-failure-proof handling of heavy loads, so that a single failure will not result in loss of capability of the crane-handling system to perform its safety function; or

   c. The fuel pool should be designed to withstand, without leakage that could uncover the fuel, the impact of the heaviest load to be carried by the crane from the maximum height to which it can be lifted. If this approach is used, design provisions should be made to prevent the crane, when carrying heavy loads, from moving in the vicinity of stored fuel.

   See the CP&L letters of June 18, 1976 and July 26, 1976.

6. Drains, permanently connected mechanical or hydraulic systems, and other features that by maloperation or failure could cause loss of coolant that would uncover fuel should not be installed or included in the design. Systems for maintaining water quality and quantity should be designed so that any maloperation or failure of such systems (including failures resulting from the Safe Shutdown Earthquake) will not cause fuel to be uncovered. These systems need not otherwise meet Category I seismic requirements.

   All drains and supply headers permanently connected to the spent fuel pool are described in section 10.5 of Reference 1.

7. Reliable and frequently tested monitoring equipment should be provided to alarm both locally and in a continuously manned location if the water level in the fuel storage pool falls below a predetermined level or if high local-radiation levels are experienced. The high-radiation-level instrumentation should also actuate the filtration system.

   a. A low fuel pool water level is alarmed at three locations. An annunciator is located in the control room, and visual alarms are provided at the Fuel Pool Panel on the 80' elevation and on the refueling floor (elevation 117').

   b. A radiation detector is located on the refueling floor between the spent fuel pool and the reactor cavity. It provides an annunciator in the control room and an audible alarm on the refueling floor.

8. A seismic Category I makeup system should be provided to add coolant to the pool. Appropriate redundancy or a backup system for filling the pool from a reliable source, such as a lake, river, or onsite seismic Category I water-storage facility, should be provided. If a backup system is used, it need not be a permanently installed system. The capacity of the makeup systems should be such that water can be supplied at a rate determined by consideration of the leakage rate that would be expected as the result of damage to the fuel storage pool from the dropping of loads, from earthquakes, or from missiles originating in high winds.

   The primary and backup sources of water for the spent fuel pool are described in section 10.5 of Reference 1.

References

1. BSEP FSAR.

2. Request for Modification to License - Spent Fuel Storage Expansion forwarded to Mr. Bernard K. Rusche, Director via letter NG-76-1281 dated September 23, 1976.

Yours very truly,

M. A. McDuffie
Senior Vice President
Engineering & Construction

CSB/jc
Attachments

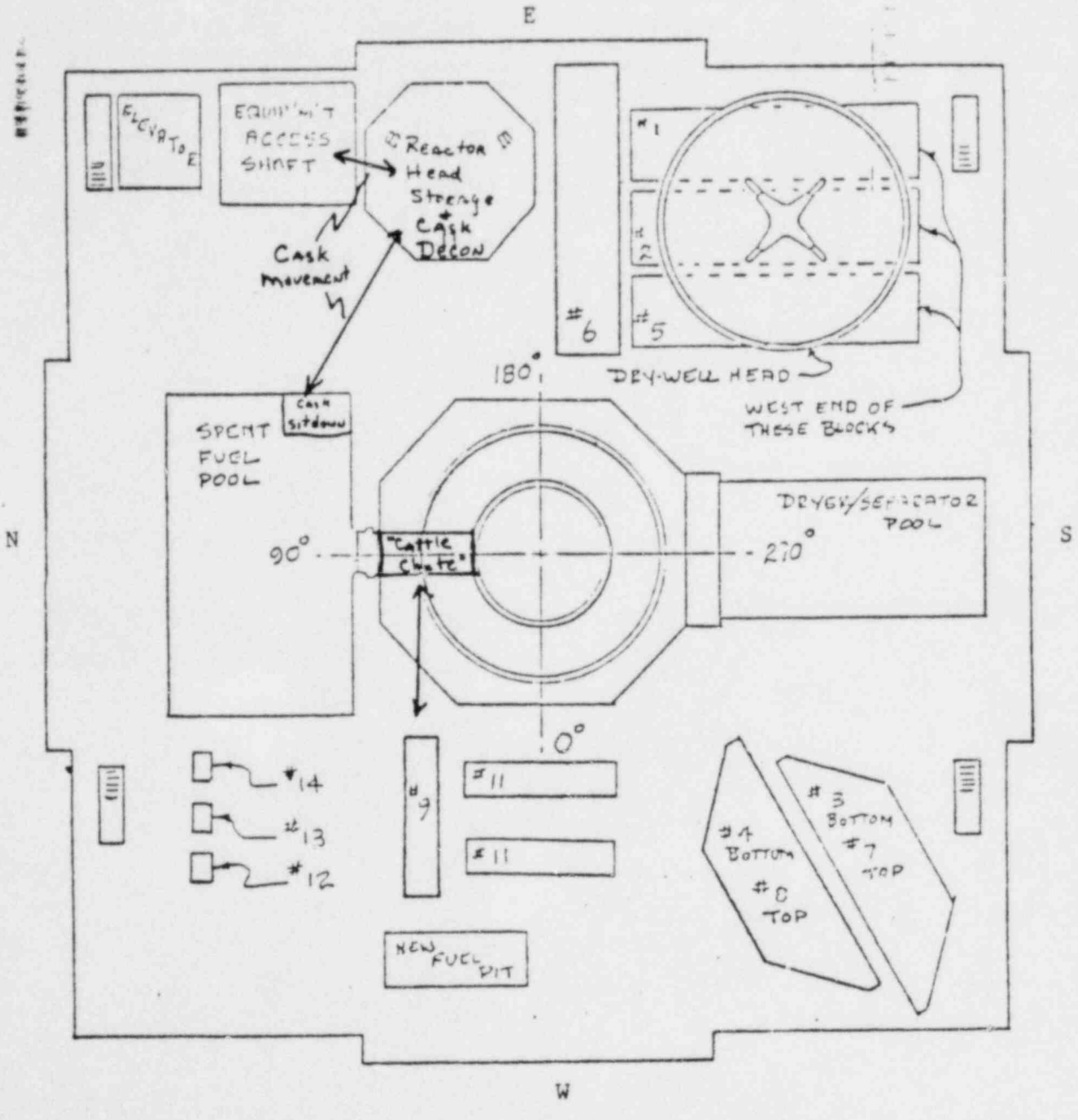

FIGURE 1

BRUNSWICK STEAM ELECTRIC PLANT

CAROLINA POWER & LIGHT COMPANY
BRUNSWICK STEAM ELECTRIC PLANT

Southport, N. C.

Maintenance Procedure MP-27

Handling the IF-300 Cask

December 27, 1977

	APPROVALS	
TITLE	SIGNATURE	DATE
Maintenance Supervisor	[illegible]	1/3-7[illegible]
QA Supervisor	E. M. Allen	1/4/75
PNSC	J M Brown	1/4/75
Plant Manager	J M Brown for	1/4/75

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1.0 Purpose

This procedure provides step-by-step instructions for handling the General Electric IF-300, Spent Fuel Cask, when spent fuel is being received for storage at Brunswick Unit No. 1 or Unit No. 2.

2.0 Scope

This procedure applies only to receiving spent fuel for storage at the Brunswick Site. It does not apply for transporting spent fuel from one unit to the other or for transporting spent fuel from the Brunswick Site. This procedure does not authorize any repairs to the cask except for replacement of a worn out or damaged head seal. If replacement of the head seal is necessary, a plant trouble ticket is to be issued and a copy attached to the data sheet.

3.0 Responsibilities

The Maintenance Department is responsible for all cask movements. However, the Shift Foreman must be informed of work progress and must authorize all major evolutions. A Senior Reactor Operator must be on the 117' elevation when the cask is being lowered into or removed from the spent fuel pool. Movement of the fuel from the cask to the pool storage racks will be performed by Operations. The RC&T Department will monitor all activities in accordance with RC&T Procedure 0009.

4.0 Procedure

4.1 References

4.1.1 GEI-92817A General Electric Operating Instruction for the IF-300 Irradiated Fuel Shipping Cask

4.1.2 GEI-92821 General Electric Maintenance Instruction for the IF-300 Irradiated Fuel Shipping Cask

4.1.3 RC&T Procedure 0009

4.2 Special Equipment

4.2.1 ISCO Shuttle Wagon

4.2.2 2TM Trackmobile

4.2.3 Hi-Snear Torque Wrenches

4.2.4 Never Seez Pure Nickel Special Lubricant

4.2.5 Temperature Recorder

4.3 Precautions

4.3.1 The cask and all handling tools are massive and heavy, and many pinchpoint hazards exist.

4.3.2 Even a very slow swing of the suspended cask can transfer a large amount of energy upon impact, which may result in severe injury to personnel and damage to equipment.

4.3.3 The cask is 18 feet high in the vertical position, thereby constituting a fall hazard.

4.3.4 Improper rigging can cause a cask or equipment drop, possibly resulting in injury to personnel or damage to equipment.

4.3.5 Should the closure head seal become damaged at any time during the performance of this test, install a new seal in accordance with Typical Procedure 11.8 of GEI-92821.

4.3.6 The railcar air brakes should be set and the wheels chocked when the cask is being lifted from or lowered onto its support saddle.

4.3.7 The IF-300 cask is to be secured in its redundant yoke during all lifting operations except when the cask is being raised from a horizontal position to a vertical position on the railcar and vice versa.

4.4 Initial Conditions

4.4.1 The reactor primary vessel head, the drywell head, and the plugs covering the reactor cavity on elevation 117' are to be installed during performance of this procedure.
Verified_____ Date_____

4.4.2 The top portion of the redundancy yoke must be connected to the Reactor Building crane hook in accordance with Section 5.3.1 of Appendix F to GEI-92817A.

4.4.3 The periodic inspection of the redundant yoke must be current. Date inspected_____.
QC Review _____ Verified _____ Date _____

4.4.4 The calibration record of the temperature recorder must be current. Date calibrated _____.
Verified _____ Date _____

4.5 Recieving the Cask

4.5.1 Upon arrival of the fuel cask, the Radiation Control and Test Group shall be notified as soon as possible, but within three hours during a normal working schedule and 18 hours during non-working hours.

4.5.2 RC&T personnel shall complete an inspection of the railcar and cask in accordance with RC&T Instruction 7007 prior to movement into the Reactor Building. The shipping seals can be broken as necessary to permit performance of this inspection.
Verified _____ Date _____

4.6 Moving Cask Railcar into the Reactor Building

4.6.1 Open the outer doors of the air lock. This step is to be performed only as directed by Operations.

4.6.2 Using the ISCO Shuttle Wagon, push the cask railcar into the airlock. Position the railcar such that the interior doors can be opened and the outer doors can be closed. Disconnect the ISCO and connect the 2TM. Secure the 2TM.

4.6.3 Close the outer doors and open the interior doors of the airlock. This step is to be performed only as directed by Operations.

NOTE

The interior doors can be left open during the entire procedure unless plant conditions require closing. The 2TM will be used as necessary to relocate the railcar while the cask is being prepared for lifting.

4.6.4 Set up, rope off, and post (as required) the cask handling area in accordance with RC&T Instruction 0009.

4.6.5 Receive handling instructions from RC&T. Obtain a Radiation Work Permit, if required. RWP #_____, if required.
Verified _____ Date _____

4.7 Opening of Enclosures, Extending Cooling System Air Ducts, and Preparing Valve Boxes

4.7.1 Refer to Figure 1. Remove the two retaining pins (1) or two padlocks (4) on the front corners of the large enclosure.

4.7 Opening of Enclosures, Extending Cooling System Air Ducts, and Preparing Valve Boxes (Cont'd)

4.7.2 Unlatch the six enclosure handles in turn as follows:

4.7.2.1 Rotate the keeper (8) until the handle (2) is released.

4.7.2.2 Rotate the handle (2) out 90° while pulling up on the handle.

4.7.2.3 Release the keeper (8). Hold the handle up in the raised position and rotate the handle back into the enclosure.

4.7.2.4 With the handle raised to its limit, rotate the handle into the retaining notch (3) to hold the handle pin in the unlocked position.

4.7.3 Remove the padlocks (4) securing the lock handles (5) (one on each side of the enclosure). Raise the handles to their limit and rotate them outboard 90 degrees into the retainers to hold them open.

4.7.4 Grasp the operating levers on either side of the center enclosure and push the handles toward the small enclosure. The levers will rotate approximately 30 degrees (as shown in Figure 1) to lift the enclosure onto the rollers. One man on either side is sufficient to move the enclosure. A coordinated effort will prevent binding.

4.7.5 Continue pushing on the levers until the center enclosure is over the small enclosure and has come against the stops on the rails.

4.7.6 Release the levers to lower the center enclosure off the rollers. Maintain it in position over the small enclosure, after reaching the stops.

4.7.7 Using the operating levers (7) on either side of the large enclosure, perform Steps 4.7.4 through 4.7.6, above, until the large enclosure is positioned over the center and small enclosures.

4.7.8 Refer to Figure 2. Remove the two rectangular band couplings (1); one per upper air duct.

4.7 Opening of Enclosures, Extending Cooling System Air Ducts, and Preparing Valve Boxes (Cont'd)

CAUTION

Each coupling should be loosened sufficiently to slide onto the duct. Excessive spreading will damage the coupling.

4.7.9 Raise the four lock pins (2); two on the outside of each air duct. Raise each pin until it clears the top of the guide (3), then turn the pin so that it rests in the guide and is retained in the open position.

4.7.10 Remove the lock pins (9) between the vertical duct support leg (10) and the walkway on the skid.

4.7.11 Raise and lock the vertical duct support leg to the diagonal strut support leg, using the removed lock pins. Grasp the duct support tube (4) and extend the duct outward to its limit.

4.7.12 Remove the four bolts from the hinged end panel at the back of the IF-300 cask. Lower the end panel to the horizontal position.

WARNING

In performing Step 4.7.13, below, a 300-lb-capacity (minimum) lifting aid is required. The upper and lower valve box covers are heavy and capable of causing injury to personnel if improperly handled.

4.7.13 Unfasten the four capscrews on the upper and lower valve box covers using a 3/4-inch hexagonal key wrench. Attach the lifting aid slings to the holes provided in the cover fins. Remove and store each valve box cover.

4.7.14 Disengage the overflow drain hose from the upper valve box.

4.8 Removal of Cask Tiedown Pins

To remove the two 3-inch-diameter tiedown pins (5,Figure 2) which secure each side of the cask to the front saddle, remove the four bolts (6) and the two keepers (7) which hold the two pins in place, using a 3/4-inch wrench.

4.8 Removal of Cask Tiedown Pins (Cont'd)

NOTE

Use the removal and insertion tool (Part No. M22-21) supplied with the IF-300 cask to remove the tiedown pins.

4.9 Installation of Lifting Trunnions

Each trunnion should be lifted by means of a shackle placed through the lifting tab hole. Install one trunnion on each side of the cask, between the upper pair of lifting rings. Secure each trunnion in place by means of the tiedown pin (5), pin keepter (7), and bolts (6), using removal and insertion tool (Part number M22-21).

4.10 Preparing Bottom Portion of the Redundant Yoke

4.10.1 Place the cradle on the bottom end of railcar, or other suitable location, with the lugs to the sides of the car and the 1" offset in the lugs toward the end of the car on which the cradle resides.

4.10.2 Attach the fixed arms to the cradle with the bolts stored in their holes in the cradle.

NOTE

A crane and nylon sling rated at 1000 lbs. is needed for this operation.

4.10.3 Plumb the fixed arms to the cradle by using a level or square. This may need readjusting after the cask is installed.

4.11 Attachment of Lifting Yoke to Cask

Proceed as follows to engage the lifting yoke to the cask:

CAUTION

This operation should be accomplished without using tag lines or other aids in positioning the yoke to avoid possible misalignment during the lift.

4.11.1 Using an approved lubricant such as Never-Seez pure nickel special, lubricate the yoke hooks.

4.11.2 Align the crane hook to the centerline of the railroad car.

4.11.3 Using the crane, move the yoke fore or aft along the centerline of the car until the yoke hooks are on the cask head side

4.11 Attachment of Lifting Yoke to Cask (Cont'd)

of the trunnions, with the open hooks of the yoke facing the bottom of the cask.

4.11.4 Lower the yoke until the yoke hooks are positioned for engagement to the trunnions.

4.11.5 Raise and traverse the crane hook until the yoke hooks have fully and simultaneously engaged the trunnions.

4.12 Lifting the Cask from a Horizontal to a Vertical Position

NOTE

During performance of this section the crane cables must be maintained in a vertical position. This can be accomplished by moving the crane trolley toward the west wall. At this time, the vertical lift must be stopped and the trolley and railcar moved to the east. The trolley and railcar may be moved simultaneously or one may be moved a few inches, then the other moved a few inches. This sequence must be repeated until the cask is in a vertical position.

4.12.1 Disengage the thermocouple from the cask.

CAUTION

To avoid damage to equipment during the performance of the following steps, make certain that the yoke hooks are properly engaged to the lifting trunnions on the cask; verify that the retractable enclosure sections are fully open and the air ducts extended; verify that the tilting cradle on the equipment skid is free of encumbrances; and verify that the railroad car brakes are set and the wheels are chocked.

4.12.2 Using the crane, lift and rotate the cask to a vertical position above the tilting cradle by carefully raising the crane hook and moving the crane trolley or bridge parallel to the centerline of the railroad car in order to maintain vertical load lines.

4.12 Lifting the Cask from a Horizontal to a Vertical Position (Cont'd)

4.12.3 A few degrees before the cask reaches the full-upright position, slowly move the crane horizontally so that the vertical lift will maintain the full load of the cask when the cask reaches the full-upright position; this will prevent the cask from rocking on the tilting cradle at the top of the arc. The pivot point is 3 inches off center; therefore, "rockover" should not occur.

CAUTION

This operation must be done carefully. Serious damage to the tilting cradle and railroad car may occur if the cask hands in the tilting cradle due to misalignment.

4.12.4 Deleted

4.12.5 Stop horizontal travel at the top of the arc, and continue the vertical lift of the cask until the cask bottom clears the tilting cradle and the enclosure end wall at the back of the railroad car.

4.12.6 Stop the crane vertical lift.

4.12.7 All steps of 4.12 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.13 Connecting the Bottom of the Redundant Yoke

CAUTION

Do not place the entire weight of the cask on the railcar.

NOTE

Moveable arms must be in the up position. This is the normal way of shipping the yoke. If they are not, connect the control system and raise them.

4.13.1 Using the crane, place the cask in the cradle.

4.13 Connecting the Bottom of the Redundant Yoke

NOTE

The cask must be placed in the cradle in the proper orientation to ensure proper alignment of upper and lower arms, since the off-set trunnions are off-set one inch toward the valve box side of the cask.

4.13.2 Attach the cradle clamps to the cradle using the bolts stored on the cradle. Shim as required by removing the shim from the top clamp and placing it under the clamp, refer to Figure 3 for details.

4.13.3 Place the distribution box along side the cask.

4.13.4 Connect the cable and hose assembly between the distribution box and the valve box on the yoke.

NOTE

Each hose and cable is marked on the appropriate ends to assure correct placement.

4.13.5 Connect the control cable between the distribution box and the control pendant box.

4.13.6 Connect the facility 115V AC and air supply hose to the distribution box.

4.13.7 Fill the oiler with Texaco Regal oil A-R and 0 or equivalent. Clean the filter and adjust the air supply to 90 psig rising the regulator in the distribution box.

4.13.8 Push the test light button on the control pendant and check all lights. Replace all burned out lights.

4.13.9 Lower both arms until they are about one inch from engaging the fixed arm.

4.13.10 Jog the blue arm down until the down indicator light comes on.

4.13.11 Insert the blue pin. Be sure the indicator "in" light comes on.

4.13.12 Repeat Paragraphs 4.13.10 and 4.13.11 for the white system.

4.14 Transporting the Cask to the 117' Elevation

4.14.1 Disconnect the cask distribution box from the plant 115VAC and air supply. Carry to the 117' elevation.

4.14.2 Raise the cask to the height required to clear the handrails around the access hatch at 117' elevation. Move the cask westward until it is just clear of the hatch.

4.14.3 Rotate the cask so that the valve boxes face westward. While maintaining this orientation, move the cask southward until it is directly in front of the decontamination pad and then eastward until it is centered over the pad.

4.14.4 Lower the cask to the pad.

4.14.5 RC&T shall post the 117' area in accordance with RC&T Procedure 7007.

4.14.6 Connect a temperature recorder to the cask thermocouple.

4.14.7 All steps of 4.14 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.15 Disconnecting the Yoke

4.15.1 Attach control system to yoke and facility air and power.

4.15.2 Disengage the blue pin. Disengagement is complete when the indicating light is "on."

4.15.3 Raise the blue arm until exhaust air stops.

4.15.4 Repeat Steps 4.15.2 and 4.15.3 for white system.

4.15.5 Disengage the primary yoke.

4.16 Flushing the IF-300 Cask

4.16.1 Remove the valve caps (dust covers) from the vent and drain valves in the upper and lower valve boxes on the cask.

4.16.2 Connect a source of demineralized water to the drain valve in the lower valve box. Open the drain valve.

4.16.3 Connect a vent hose to the vent valve in the upper valve box. Route the other end to a suitable medium to prevent the release of airborne radioactivity. Open all vent valves.

4.16 Flushing the IF-300 Cask (Cont'd)

4.16.4 Open the demineralized water supply and fill the cask until water flows from the vent hose.

4.16.5 Upon completion of filling, close the drain and vent valves. Connect a hose from the valve in the lower valve box to a radwaste drain. Connect a 5 psi source of air to the valve in the upper box. Open the valves and drain the cask until bubbles appear in the line from the lower valve. Sample the water as it is being drained. After bubbles appear in the drain line, secure the air pressure and allow the cask to finish draining.

NOTE

Repeat Steps 4.16.2 through 4.16.5 until the samples reveal a Boron content of less than or equal to 5 ppm.

4.16.6 Fill the cask with demineralized water in accordance with Steps 4.16.2 through 4.16.4.

4.17 Preparing the Cask for Transporting to the Spent Fuel Pool

4.17.1 Beginning with nut number one, proceed clockwise and loosen the 32 closure head nuts. Due to the head seal preload, each nut should be slackened 10 to 15 degrees and the sequence repeated as required.

NOTE

Removal of the closure head nuts as described above must be accomplished with care. The total preload is approximately 1/2 inch of gap betweeen flange faces. Each complete slackening cycle produces less than 1/32 inch of gap widening.

WARNING
RADIATION HAZARD

If radiation monitoring results are excessive, the cask closure head must be removed under water. Care must be taken to properly store the closure head because of possible contamination on the inside surface.

4.17 Preparing the Cask for Transporting to the Spent Fuel Pool (Cont'd)

4.17.2 Use sleeve nut removal tool MFR-C-10012. Remove all but four closure head nuts. Leave one nut in each closure head quadrant. Place nuts in a storage location.

4.17.3 Raise the crane hook and cask lifting yoke and re-center the yoke over the cask for attachment of the lifting yoke cables to the cask closure head.

CAUTION

Prior to engaging the closure head, ensure that the cables and turnbuckles are adjusted to the same length so that the closure head does not bind during removal.

4.17.4 Connect the four yoke lifting cables to the closure head using the shackles provided.

CAUTION

The cables must remain slack at all times except when the yoke is centered over the cask. This prevents the possibility of tipping the cask or breaking the cables.

4.17.5 Lower the yoke until the cables have slackened sufficiently to permit traversing the yoke 9 to 15 inches. The hooks of the yoke will then clear the trunnions.

4.17.6 Engage the lifting yoke to the cask lifting trunnions by lowering the yoke parallel to the cask until the hooks are slightly below the trunnions. The open portion of the hooks should be facing in the direction of the valve boxes. Traverse and raise the yoke until both trunnions are fully engaged.

4.17.7 Reconnect the redundant yoke by performing Steps 4.13.8 through 4.13.12 of this procedure.

4.17.8 Connect a short length of hose (about two feet) to the vent valve. This opens the Snaptite valve and permits venting the cask while in the pool.

4.18 Transporting the Cask from the Decontamination Pad to the Spent Fuel Pool

NOTE

A Senior Reactor Operator must be on the 117' elevation when the cask is being lowered into or removed from the spent fuel pool.

4.18.1 Disconnect the temperature recorder. Attach the chart to this procedure. Verified _____ Date _____

4.18.2 Lift the cask from the pad and move westward until it clears the pad. Rotate the cask so that the valve boxes face southward.

4.18.3 While maintaining the valve boxes in a southward direction, transport the cask northward until it is adjacent to the spent fuel pool sit down area and westward until it is directly over the sit down area.

4.18.4 Establish communications with the Control Room.

4.18.5 Lower the cask into the pool until the flange of the cask is a few inches above the surface of the pool water.

NOTE

Should the Control Room receive any unexpected alarms or annunciators that indicate to the Shift Foreman that the cask lowering procedure should not continue, the cask is to be raised and transported back to the decontamination pad over the path outlined in Steps 4.18.2 and 4.18.3 above. The cask is not to be left suspended above the pool for extended periods of time.

4.18.6 Remove the four remaining head nuts.

4.18.7 Attach tag lines to yoke.

4.18.8 Lower the cask until it rests on the pool floor.

4.18.9 All steps of 4.18 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.19 Removal of IF-300 Cask Head

4.19.1 Disconnect primary and secondary yokes.

4.19.2 Re-center the yoke over the cask.

CAUTION

During the performance of the following step, closely observe the cask for any indication of movement. If the cask moves, immediately halt the closure head lift. Determine the cause of cask movement in order to prevent severe equipment damage due to such movement of the cask.

4.19.3 Slowly raise the crane hook until the closure head removal cables are taut between the lifting yoke and the closure head. Continue lifting the closure head until it is clear of the cask.

4.19.4 Using the crane, raise the closure head to its storage location.

NOTE

The closure head seal may be examined and/or replaced at this point. Refer to Precaution 4.3.5 of this procedure.

4.20 Unloading the IF-300 Cask

4.20.1 Operations Submit will unload the cask in accordance with approved test procedures.

4.20.2 Verify the cask is completely unloaded.
Verified _____ Date _____

4.21 Installation of Closure Head

CAUTION

This is a difficult operation which requires care and skill.

4.21.1 Using the main crane, carefully lower the closure head into the fuel storage pool.

4.21 Installation of Closure Head (Cont'd)

4.21.2 Carefully lower the closure head over the cask so that the holes in the closure head engage the guide pins on the cask.

4.21.3 Continue lowering the crane hook so that the closure head is seated on the cask and sufficient slack exists in the lifting cables to permit attachment of the yoke to the cask.

4.21.4 Make the following observations to ascertain that the closure head is seating properly.

(1) Observe the flow of air bubbles around the closure head as the gasket enters the cask. A uniform pattern of bubbles completely around the cask indicates proper seating. Excess bubbling on one side indicates a cocked condition.

(2) Ascertain that all four cables slacken simultaneously.

(3) Observe the penetration of the guide pins to see that they have the same relative seating position observed during closure head removal with the cask in the pool. Skill and experience is required for accurate observation.

NOTE

The gasket support ring on the closure head must uniformly penetrate the cask cavity about 2 inches for proper gasket seating.

4.21.5 Corrective actions which may be necessary if the closure head becomes cocked include:

(1) Slowly raise the closure head from the guide pins. When clear of the guide pins, laterally move the crane trolley about 1/2 inch toward the low side of the cocked head.

(2) Re-seat the closure head. Inspect for correct seating. Repeat several times if necessary, making slight lateral adjustments to the crane trolley travel.

4.21 Installation of Closure Head (Cont'd)

(3) If this fails, it may be necessary to adjust the length of the cables between the closure head and the yoke. This is accomplished by bringing the closure head out of the pool and placing it on a pedestal. Loosen the set screws, adjust the turnbuckles, and tighten the set screws. Raise the closure head above the floor and check with a level for a slope which is parallel to the bottom of the pool. Return the closure head to the pool and resume operations.

NOTE

The need for the cable adjustment indicates that the closure head was not parallel to the bottom of the pool because of improper initial adjustment of the cables or because the pad at the bottom of the pool is not level. If the latter is true, the slope of the pad must be determined as accurately as possible in order that the cables may be properly adjusted. Some trial and error may be necessary.

4.22 Connecting the Primary Yoke

4.22.1 Move the crane laterally to the point where the yoke hooks clear the lifting trunnions.

CAUTION

Do not permit the cables to become taut during engagement of the yoke to the cask.

4.22.2 Lower the crane hook to the point where the yoke hooks are below the cask lifting trunnions.

4.22.3 Move the crane laterally to center the yoke over the cask.

4.22.4 Carefully raise the crane hook until the yoke hooks engage the cask lifting trunnions.

4.22.5 Stop the crane and verify that the yoke hooks are properly engaged to the trunnions.

4.23 Connecting the Secondary Yoke

4.23.1 Push the test light button on the control pendant and check all lights. Replace burned out lights.

4.23.2 Lower both arms until they are about one inch from engaging the fixed arm.

4.23.3 Jog the blue arm down until the down indicator light comes on.

4.23.4 Insert the blue pin. Be sure the indicator "in" light comes on.

NOTE: Some jogging up or down may be required for this operation. The fixed arm may need to be realigned (first time only) by loosening the bolts and repositioning the arm and then re-tightening the bolts.

4.23.5 Repeat Paragraphs 4.23.3 and 4.23.4 for the white system.

4.24 Transporting the Cask from the Spent Fuel Pool to the Decontamination Pad

NOTE: A Senior Reactor Operator must be on the 117' elevation when the cask is being lowered into or removed from the spent fuel pool.

4.24.1 Raise the cask until the head flange is a few inches above the surface of the pool water.

4.24.2 Install four head nuts, one in each quadrant.

4.24.3 Raise the cask until the bottom will clear the 117' elevation.

4.24.4 Transport the cask eastward until it is over the 117' elevation and southward until it is directly in front of the decontamination pad.

4.24.5 Rotate the cask so that the valve boxes face westward. While maintaining this orientation, move the cask eastward until it is centered over the pad. Lower the cask to the pad.

4.24.6 Disconnect the yokes by repeating Section 4.13 of this procedure.

4.24.7 Disconnect the head cables from the yoke.

4.24.8 All Steps of 4.24 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.25 Securing the Closure Head to the Cask

4.25.1 Lubricate the threads and turning surfaces on the closure head sleeve nuts with Never-Seez Pure Nickel Special Lubricant. Install the 32 nuts into the closure head sleeves.

4.25.2 Establish parallelism between the flange faces by adjusting the nuts as required. Tool Numbers M22-15 and M22-8 may be used.

4.25.3 Check parallelism by using a suitable set of feeler gages.

4.25.4 Start tightening the nuts in the sequence stamped on the top of the closure head, applying 100 foot-pounds of torque for the first two complete cycles. Recheck parallelism. Adjust if necessary by tightening down only on the high side.

4.25.5 Continue with two complete cycles at 300 foot-pounds. Recheck parallelism. Adjust if necessary by tightening only on the high side.

4.25.6 Continue torquing at 650 foot-pounds until the closure head is within 1/32 inch of metal-to-metal contact with the cask body. Recheck parallelism and adjust if necessary every three or four cycles.

4.25.7 Reduce the torque to 370 foot-pounds. Continue the torquing operation until metal-to-metal contact is achieved, either through an indication of 0.005 or less gap between the surfaces or by going through a complete cycle during which no nuts will rotate.

4.25.8 Lockwire all head nuts.

Verified _____ Date _____

NOTE

Approximately 16 to 20 tightening cycles will be required to close the gap between the cask and the closure head. Care must be taken to ensure that this gap is decreased evenly so that the surfaces remain essentially parallel to avoid cocking the closure head. If this occurs, the closure head must be carefully unbolted, and the tightening operation resumed from the beginning.

4.25 Securing the Closure Head to the Cask (Cont'd)

CAUTION

It is mandatory that the closure head is fully tightened and that metal-to-metal contact exists with the cask body. This is a requirement of NRC Certificate of Compliance Number 9001.

4.26 Draining the Cask and Performing Pressure Test

4.26.1 Remove the short length of hose (installed during Step 4.17.8) from the cask vent valve (V, Figure 4) and install a pressure gage (G) to the fitting on the outlet side of the valve. Open the vent valve.

4.26.2 Attach a hose from the high pressure pump (P) discharge to the outlet side of the cask drain valve (D).

NOTE

Add demineralized water to the pump as necessary to perform the pressure test.

4.26.3 While operating the pump (P), slowly open the cask drain valve ( ). When the pressure (as measured on the pressure gage (G)) reache 200 ±5 psig, close the cask drain valve and disconnect the pump discharge hose from the cask drain valve.

4.26.4 Observe the pressure gage (G) and record below. Hold for 10 minutes and again note the pressure. If the pressure changes, more than 2 psig determine the cause and repeat the pressure test.

Pressure at beginning of test _____
Pressure after 10 minutes _____

Performed by _____ Date _____
QC Verification _____ Date _____

4.26.5 Remove the pressure gage (installed during Step 4.26.1) from the cask vent valve (V, Figure 4).

4.26.6 Connect a hose from the valve in the lower valve box to a radwaste drain or to the spent fuel pool. Open the drain valve. Connect a 5 psi source of air to the valve in the upper box, and open the valve. Drain the cask until bubbles appear in the line from the lower valve. After bubbles appear in the drain line, secure the air pressure and allow the cask to finish draining. Remove the hoses, and install the valve caps on the valves.

Verified _____ Date _____

4.26.7 Perform a radiological survey in accordance with RC&T Procedure 0009.

Verified _____ Date _____

4.27 Transporting the Cask to the 20' Elevation

4.27.1 Attach the primary yoke to the cask by repeating Step 4.17.6.

4.27.2 Reconnect the secondary yoke by performing Steps 4.13.8 through 4.13.12 of this procedure.

4.27.3 Lift the cask from the pad and move westward until it clears the pad. Move northward until it is adjacent to the hatch.

4.27.4 Rotate the cask so that the valve boxes face westward. Move the cask eastward until it is over the hatch. Verify sufficient clearance around the cask for lowering through the hatch.

4.27.5 If the railcar has been moved, reposition it so that the end is under the cask. Lower the cask until the redundant yoke contacts the railcar. Do not place the entire weight of the cask on the railcar.

4.27.6 Connect the redundant yoke distribution box to the yoke.

4.27.7 Disconnect the redundant yoke by performing Steps 4.13.8 through 9.13.12.

4.27.8 Disconnect the redundant yoke distribution box.

4.27.9 Remove the cradle clamps.

4.27.10 Lift the cask until the bottom is slightly higher than the folded down end of the cask enclosure.

4.27.11 Position the railcar so that the cask is directly over the tilting cradle.

4.27.12 All steps of 4.27 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.28 Lowering the Cask from a Vertical Position to a Horizontal Position

NOTE

During performance of this section, the crane cables must be maintained in a vertical position. This can be accomplished by moving the crane trolley toward the east as the cask is being lowered until the trolley reaches its end stops. At this time, the lowering must be stopped and the trolley and railcar moved to the west. The trolley and railcar may be moved simultaneously, or one may be moved a few inches, then the other moved a few inches. This sequence must be repeated until the cask is in a horizontal position.

4.28 Lowering the Cask from a Vertical Position to a Horizontal Position (Cont'd)

4.28.1 Slowly lower the cask to the top of the tilting cradle. Align the cask so that the two undersized fins which act as guides fit into the two 1-1/8-inch slots in the tilting cradle which, at this time, are at the centerline of the railroad car and at a 90-degree angle with the trunnions.

4.28.2 Slowly lower the cask into the tilting cradle. When the cask bottom contacts the socket and the cask begins to tip, simultaneously lower the crane hook and travel the crane to the opposite end of the equipment skid so that the load line will remain vertical as the cask lowers to the horizontal position. Be sure that the guide fins are fully engaged in the sockets.

4.28.3 Stop horizontal travel of the crane when the cask is fully seated on the equipment skid.

4.28.4 Continue down travel of the crane hook until the yoke hooks are below the cask lifting trunnions.

4.28.5 Move the crane laterally until the yoke hooks are free of the cask lifting trunnions.

4.28.6 Move the primary and secondary yoke to storage area.

4.28.7 All steps of 4.28 have been completed satisfactory.
Verified _____ Date _____
Maintenance Foreman

4.29 Preparation of Cask on Skid

WARNING: The trunnions are heavy and capable of causing injury to personnel if improperly handled. The ratchet hoisting mechanism suspended from the cask lifting yoke may be used for lifting and removing the trunnions.

4.29.1 Attach hoisting mechanism to the trunnions. Take up slack to relieve the pins of the load.

4.29.2 Disengage the tiedown pin, pin keeper, and bolts from each trunnion.

4.29.3 Remove the trunnions from the cask.

4.29.4 Install the tiedown pins through the equipment skid saddle, one on each side of the cask. Secure the pins in place by means of the pin keeper and bolts. Secure the bolts in place with lockwire.

4.29.5 Lockwire all valves and replace the valve dust caps. Be sure that valves are tightly closed prior to lockwiring.
Verified _____ Date _____

4.29 Preparation of Cask on Skid (Cont'd)

WARNING: In performing Step 4.29.6, below, a 300-pound capacity (minimum) lifting aid is required. The upper and lower valve box covers are heavy and capable of causing personnel injury if improperly handled.

4.29.6 Attach the lifting aid slings to the holes in the valve box cover fins, and replace the covers on the upper and lower valve boxes. Fasten the capscrews to hold the valve box covers in place.

4.29.7 Attach the overflow drain hose to the connector on the upper valve box.

4.30 Preparation of Cooling System

4.30.1 Attach the temperature alarm system connector to the thermocouple at the base of the cask.

4.30.2 Rotate the upper ducts into position.

4.30.3 Rotate and lower the four lockpins on either side of the air ducts. Install the support shoe/tube lockbolts.

4.30.4 Install the two rectangular band couplings to hold the air ducts in place.

4.30.5 Perform a radiological survey in accordance with RC&T Procedure 0009.
Verified _____ Date _____

4.31 Closing Enclosures and Related Panels

4.31.1 Raise the end panel at the back of the large enclosure to the closed position and secure in place by means of the four bolts provided.

4.31.2 Grasp the operating levers on either side of the large enclosure and push the handles toward the directions of travel. The levers will rotate approximately 30 degrees to lift the enclosure onto the rollers.

4.31.3 Continue pushing the levers until the large enclosure is fully moved into the closed position. A coordinated effort with both levers will prevent binding. Install the two retaining pin padlocks at the upper corners of the end panel.

4.31.4 Release the levers to lower the large enclosure off the rollers and maintain it in position.

4.31.5 Using the operating levers on either side of the center enclosure, perform Steps 4.31.2 through 4.31.4, above, until the center enclosure is moved to the closed position between the small enclosure and the large enclosure.

4.31 Closing Enclosures and Related Panels (Cont'd)

4.31.6 Close the instrument panel doors, and lock the engine access panels.

4.31.7 Rotate the six locking pins and the two lock handles out of the retaining positions, and lower them into the securing positions. Lock the two handles.

4.31.8 Lock the access doors on the fixed enclosure. Place a seal on each lock hatch. Record seal numbers _____

_____

QC Review _____ Verified _____ Date _____

4.32 Removing Cask Railcar from the Reactor Building

4.32.1 Using the 2TM Trackmobile, push the cask railcar into the airlock. Position the railcar such that the interior doors can be opened.

4.32.2 Close the interior doors, and open the outer doors of the airlock. This step is to be performed only as directed by operations.

4.32.3 Disconnect the 2TM Trackmobile, and reconnect the TSCO. Remove the railcar from the airlock. Close the outer doors.

5.0 Check-Off List

Shipment Identification:

Received from: _____

Receiving date: _____

Fuel Bundle Identification Numbers taken from FH-13:

1 _____

2 _____

3 _____

4 _____

5 _____

6 _____

7 _____

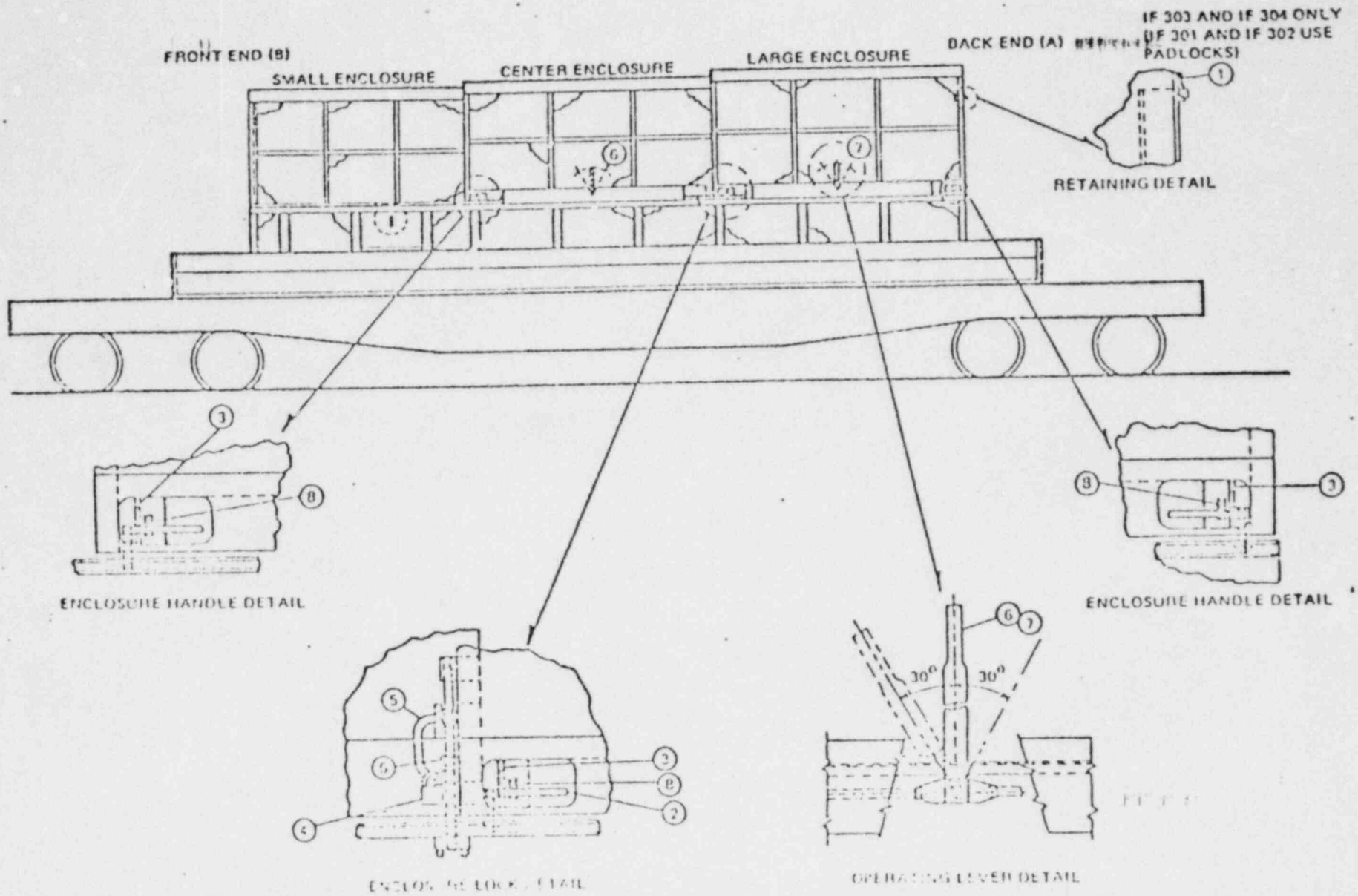


FIGURE 1

Figure 1. Enclosure Lock and Handle Details

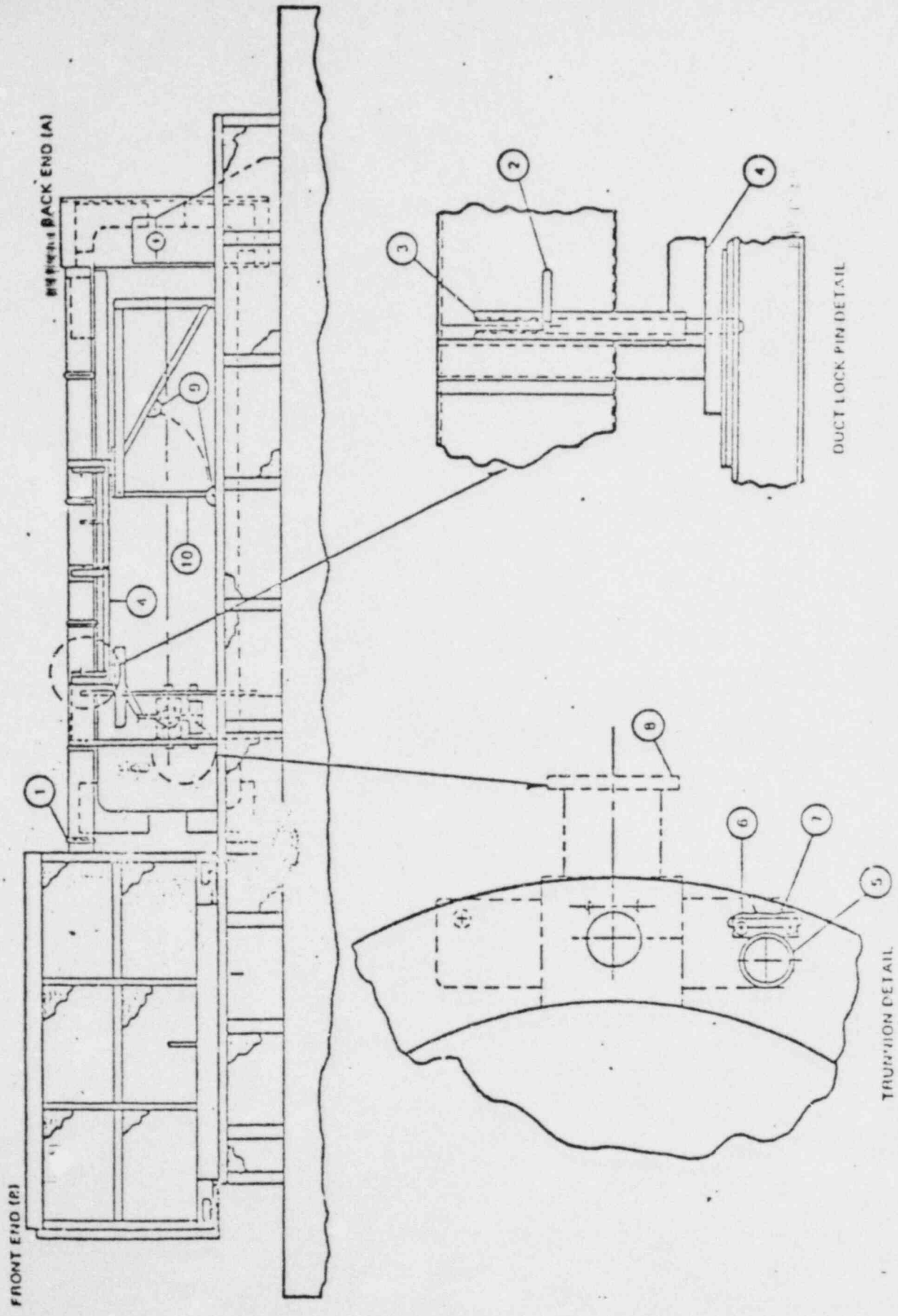
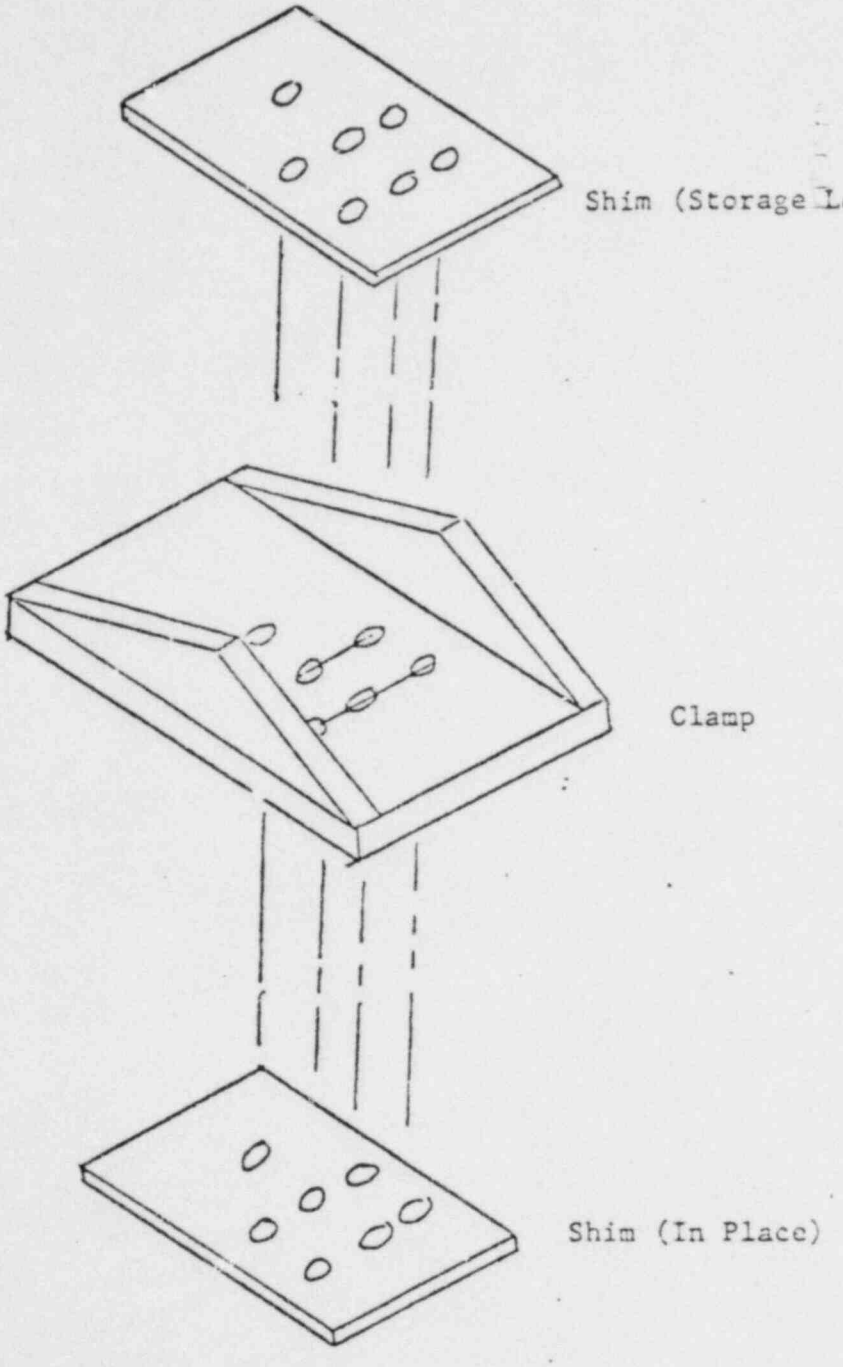


Figure 2. Duct Lock and Lifting Trunnion Details

FIGURE 3



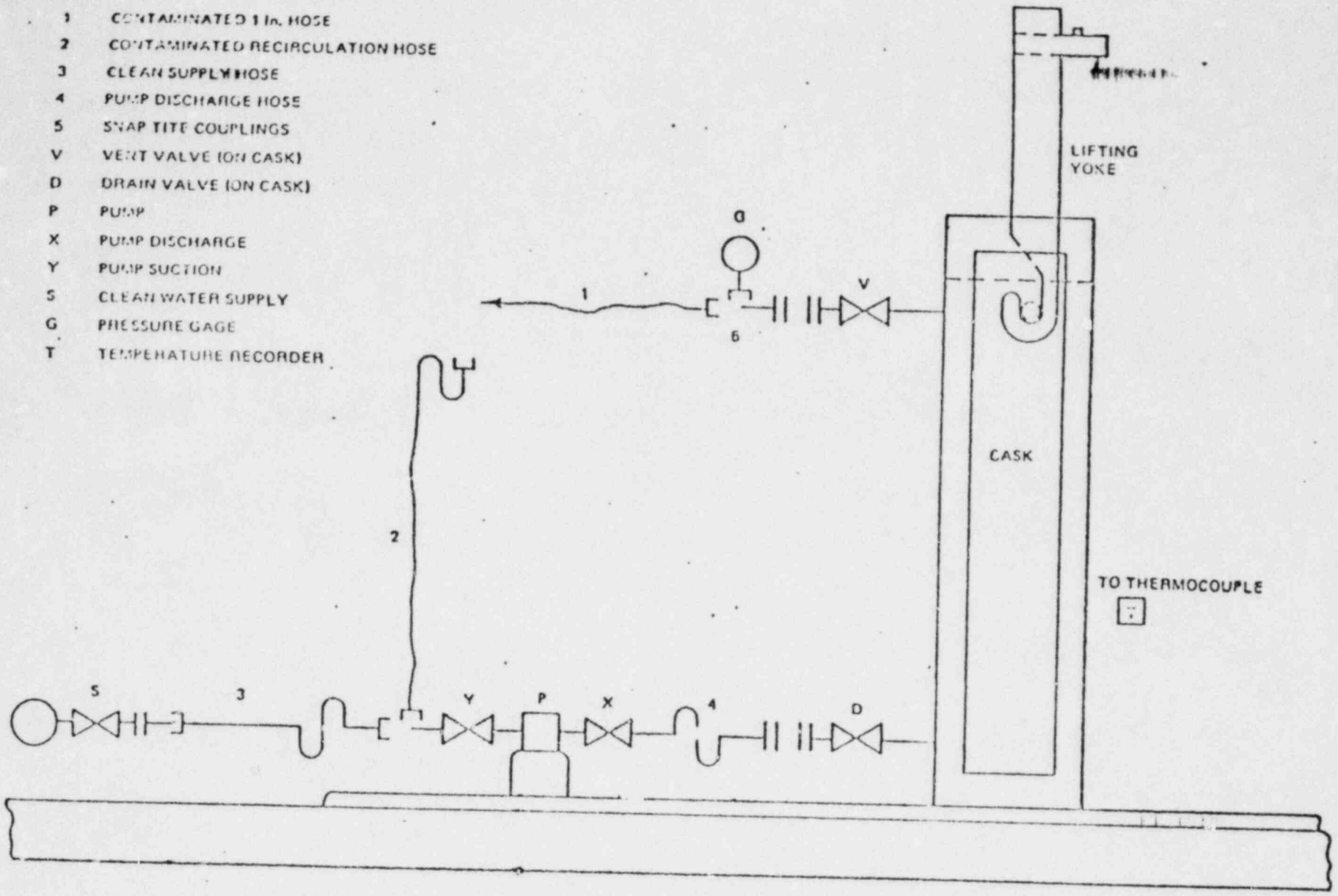


FIGURE 4

Figure 4.. Cask Testing, Flushing and Monitoring Arrangement