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Florida Power
CORPORATION

W. P. STEWART, DIRECTOR
POWER PRODUCTION

August 18, 1978

Mr. Victor Stello, Jr.
Director
Division of Operating Reactors
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Crystal River Unit 3
Operating License No. DPR-72
Docket No. 50-302

Dear Mr. Stello:

In your letter of May 17, 1978 you requested Florida Power Corporation to submit additional information concerning the movement of heavy loads near spent fuel at Crystal River Unit 3.

Florida Power Corporation hereby submits three (3) originals and forty (40) copies of our response to your request. Should you or members of your staff have any questions concerning our response, please contact this office.

Very truly yours,

FLORIDA POWER CORPORATION

/s/ W. P. Stewart

W.P. Stewart

WPS/ECS/emf
File: 3-0-3-a-3

8008220353

General Office 3201 Thirty-fourth Street South • P.O. Box 14042 St. Petersburg, Florida 33733 • 813 866-5151

STATE OF FLORIDA

COUNTY OF PINELLAS

W.P. Stewart states that he is the Director, Power Production, of Florida Power Corporation; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

/s/ W. P. Stewart
W.P. Stewart

Subscribed and sworn to before me, a Notary Publ:~ i: and for the State and County above named, this 18th day of August, 1978.

/s/ Charles R. Pope
Notary Public

Notary Public, State of Florida at Large,
My Commission Expires: July 25, 1980

FPC RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

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 area for any heavy loads moved on the refueling floor.

Response:

The attached Crystal River Unit 3 FSAR Figure 1-11, Elevation 160'-0" and Auxiliary Building Elevation 162'-0", provides the information requested in Item 1.

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:

See attached Tables 1 and 2.

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

Response:

The fuel cask used at CR #3 is a one-element cask with the following weight and dimensions:

Weight - 50,000 lbs.
Overall Dimensions - 214 in. long, 50 in. diameter

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 response to a Request for Additional Information (see CR #3 FSAR Supplement, Question 9.20, Parts a through k) FPC performed a cask drop anaylsis for CR #3. This analysis is discussed in Section 9.6 of the CR #3 FSAR and Section 9.1 of the Staff Safety Evaluation Report.

5. Identify any heavy loads that are carried over equipment required for 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:

There are no heavy loads that are carried over equipment required for safe shutdown of the plant that is operating at the time the load is moved.

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

Response:

Technical Specificaion 3.9.7 requires that loads in excess of 2,750 pounds, except for movement of the missle shield and pool divider gate as necessary for access to the fuel assemblies, be prohibited from travel over fuel assemblies in the storge pool. The restriction on movement of loads in excess of the nominal weight of a fuel and control rod assembly and associated handling tool over other fuel assemblies in the storage pool ensures that in the event this load is dropped (1) the activity release will be limited to that contained in a single fuel assembly, and (2) any possible distortion of fuel in the storage racks will not result in a critical array. This assumption is consistent with the activity release assumed in the accident analyses.

Technical Specification 4.9.7.1 requires that the interlocks on the Auxiliary Building overhead crane, which prevent movement of load in excess of 2,750 lbs. over the fuel pools, be demonstrated operable. Specification 4.9.7.2 requires that whenever the crane is operated in the cask handling mode, we must verify that no fuel assemblies are stored in the pool adjacent to the cask loading area and that the water-tight gate between the pools is in place and sealed.

In addition to the crane interlocks and administrative controls required by Technical Specifications, FPC analyzed the effects of dropping the fuel cask and subsequently rupturing the cask loading area floor or causing leakage from pool B. As discussed in Section 9.6.1.5 of the FSAR, this postulated event will not result in uncovering of the fuel in pool A or result in any hazard to the public.

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:

Section 9.6.1.5, Fuel Handling Equipment, of the CR #3 FSAR describes the interlock system at CR #3 which precludes the movement of the spent fuel cask over the spent fuel pool area. This section also

Response: (continued)

describes the administrative controls required by Technical Specifications 4.9.7.1 and 4.9.7.2 as well as the conservative design of the Auxiliary Building overhead crane and associated equipment.

In addition to these design features, administrative controls described in the CR #3 procedures are placed on the use of the missile shield crane and the Auxiliary Building overhead crane to insure that heavy loads (except missile shields) are not moved over fuel assemblies stored in the spent fuel pools. The heaviest loads, other than the fuel cask, are the missile shield members. Their design is such that if dropped in the water, they will float and will not damage the spent fuel assemblies.

8. Provide copies of all procedures currently in effect at your facility for the movement of heavyloads 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 following list of procedures are enclosed:

a) SP-434, Fuel Storage Pool Missile Shields
b) SP-530, Demonstration of the Auxiliary Bldg. Overhead Crane (FHCR-5) Interlock Operability
c) SP-531, Spent Fuel Bridge Interlock Surveillance
d) SP-532, R.B. Main & Auxiliary Bridge Interlocks
e) SP-601, Procedure for Load Testing Sling and Lifting Fixtures
f) SP-670, R.B. Bridge Load Test
g) SP-671, Spent Fuel Bridge-Load Test
h) SP-672, Procedure for Load Testing New Fuel Elevator
i) FP-203, Defueling and Refueling Operations
j) FP-401, Reactor Vessel Closure Head Removal and Replacement
k) FP-402, Reactor Vessel Closure Head Stud Removal and Replacement
l) FP-501, Reactor Internals Removal and Replacement
m) FP-601, Fuel Handling Equipment Operations
n) FP-1001, Spent Fuel Handling

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

Response:

The following discussion will address each of the eight Regulatory Positions:

A. Regulatory Position #1 - Section 9.3.2.2 of the CR #3 FSAR identifies which equipment in the spent and new fuel systems that is designed to seismic Class I requirements.

B. Regulatory Position #2 - As discussed in Section 9.3.2.2 of the CR #3 FSAR the spent fuel pools are covered with missile shields designed to preclude penetration of high-energy tornado-generated missiles. Removal and installation of these shields can only be accomplished in accordance with CR #3 Technical Specification 3.9.11.

C. Regulatory Position #3 - Interlocks and administrative controls are utilized to preclude carrying loads in excess of 2750 pounds, except those loads identified in the CR #3 Technical Specification necessary for fuel handling, over stored spent fuel assemblies.

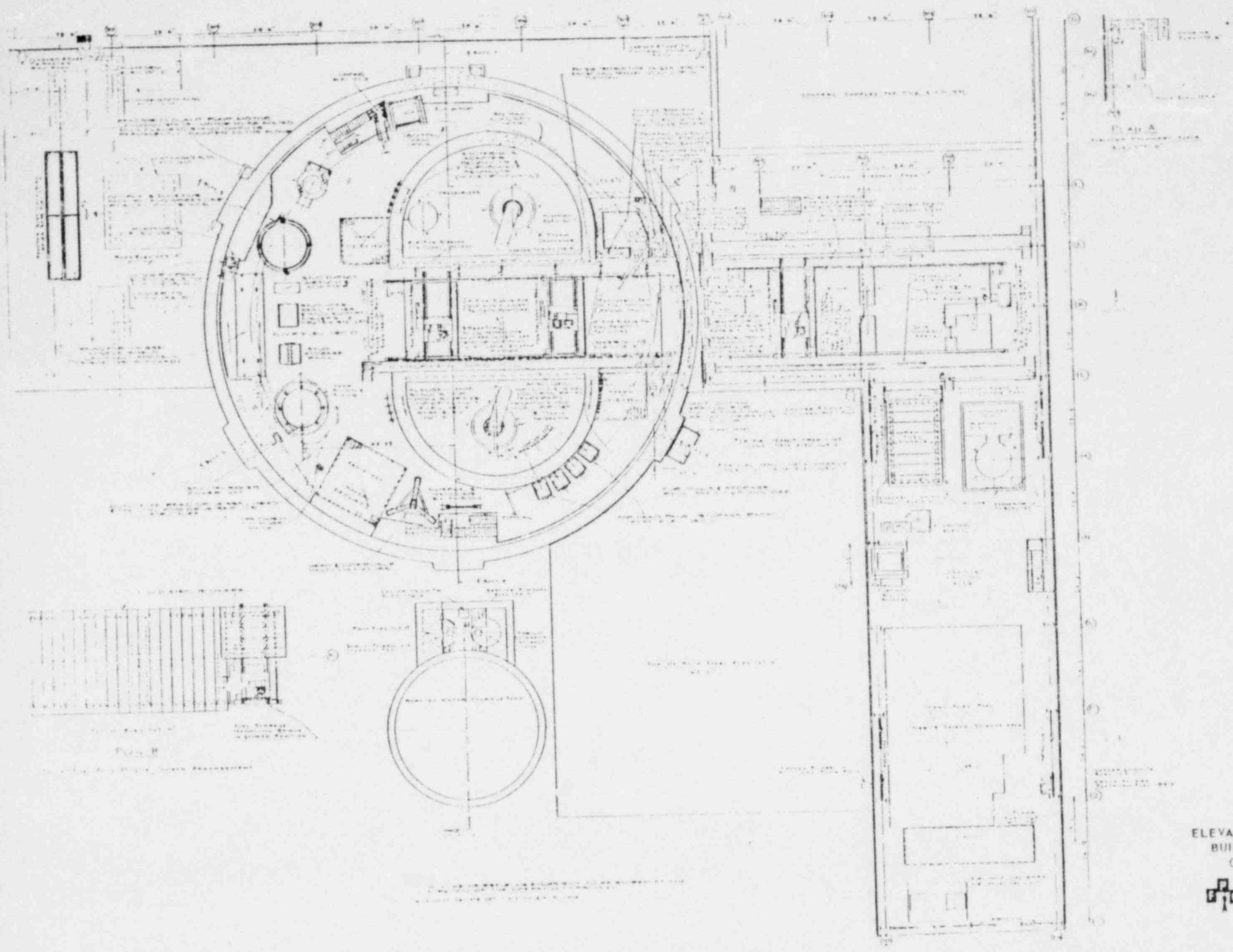
D. Regulatory Position #4 - The CR #3 spent fuel pools are enclosed within a controlled leakage building. The auxiliary building is equipped with an appropriate ventilation and filtration system to limit the potential release of radioactive materials. The CR #3 ventilation and filtration systems are described in Section 9.7 of the CR #3 FSAR.

E. Regulatory Position #5 - FPC utilizes interlocks and/or administrative controls to preclude moving heavy loads (including the refueling cask) not allowed by Technical Specifications, over spent fuel assemblies.

F. Regulatory Position #6 - The CR #3 spent fuel pool design meets this position statement as described in FSAR Section 9.3.

G. Regulatory Position #7 - CR #3 has monitoring equipment which will alarm if the water level fall below a predetermined level or if high radiation level are experienced. The water level alarm will annunciate in the control room and the radiation monitor will alarm locally and in the control room. This equipment is tested in accordance with the CR #3 Technical Specifications. The filtration system operates continuously.

H. Regulatory Position #8 - The CR #3 spent fuel cooling system meets this regulatory position as described in FSAR Section 9.3.



ELEVATION 160'-0" AND AUXIL
BUILDING ELEVATION 162'-
CRYSTAL RIVER UNIT 3

FIGURE 1-11
(AM. 48 1/76)
(DWG. NO. L-001-032)

TABLE I

LIST OF LOADS MOVED OVER REACTOR CORE

	OBJECT	WEIGHT (lbs)	SIZE	MOVEMENT PATH (1)	HEIGHT (ft)(2)	FREQUENCY OF MOVEMENT
)	Plenum Assembly	~98,500	Diameter - 13'11" Height - 10'8'	A to B	1	Refueling (moved twice)
)	Reactor Head & Studs	~300,000	Head Diameter - 16' Height - 30' Stud Diameter - 6.5" Height - 3'	A to C to D A to C to E	30	Refueling (moved twice)
)	Head & Internals Handling Fixture	~12,000	Tri-pod 14' between legs 10' high	F to C to A	30*	Refueling (used to remove head & internals)
)	Internals Handling Adapter, Pendants & Spreader Ring	Ring-~1359 Adapter-~850 Pendants-~791	Diameter 14' Height 6"-8" Thickness .25"	G to C to A H to G H to G	36	Refueling (used to remove internals only)
)	Internals Handling Extension	~3,400	Length 6' Width 12" Height 6"	I to F	40*	Refueling (used to remove head & internals)
)	Internals Indexing Fixture	~12,500	Diameter 14' Height 5'6" Thickness .25"	G to C to A	30	Refueling (moved twice)
)	Reactor Head Guide Studs	~600	Length 4' Diameter 6.5"	E to C to A	30	Refueling (moved twice)
8)	Camera & Associated Cabling	~60	Camera: Length 24" Diameter 2" Cable: Length 40' Diameter 3/4"	C to A	30	Used throughout refueling outage

TABLE I (Continued)

LIST OF LOADS MOVED OVER REACTOR CORE

OBJECT	WEIGHT (lbs)	SIZE	MOVEMENT PATH (1)	HEIG[illegible] (ft)(2)	FREQUENCY OF MOVEMENT
) Specimen Handling Tool	<100	Diameter - 2" Length - 40'	J to A	30	Per Tech. Spec. 4.4.9.1.2
) Surveillance Holder Tube Assembly	<100	Diameter - 2" Length - 12'	A to B	2	Per T[illegible]h. Spec. 4.4.9.1.2
) Surveillance Capsules	<20	Diameter - 2" Length - 18"	A to B	2	Per Tech. Spec. 4.4.9.[illegible] 2
) Long-handled Tool & Fittings	<100	Diameter - 2" Length - 40'	J to A and J to B	30	Used throughout refueling
3) Fuel Assemblies	~1550	Length - 14' Width - 8.5" Depth - 8.5"	A to B B to Pools	3	Refueling (1/3 of core to be replaced)
.) Control Rods	~125	Length - 14' Width - 6" Depth - 6"	A to B	3	Refueling (move all control rods)

The internals handling extension shown on Figure 1 is pinned and safety-wired to the hook of Polar Crane. The head and internals handling fixture is pinned and safety-wired to the extension piece. This lifting arrangement then becomes an intergal part of the polar crane and is used for lifting andmovemen [illegible]f the head and internals.

NOTES TO TABLE I

(1) The movement path locations designated in this table are shown on Figure 1 attached.

(2) The heights indicated are approximate heights above the R.V. flange. The top of the fuel core is approximately 11 feet below the top of the flange.

Figure 1

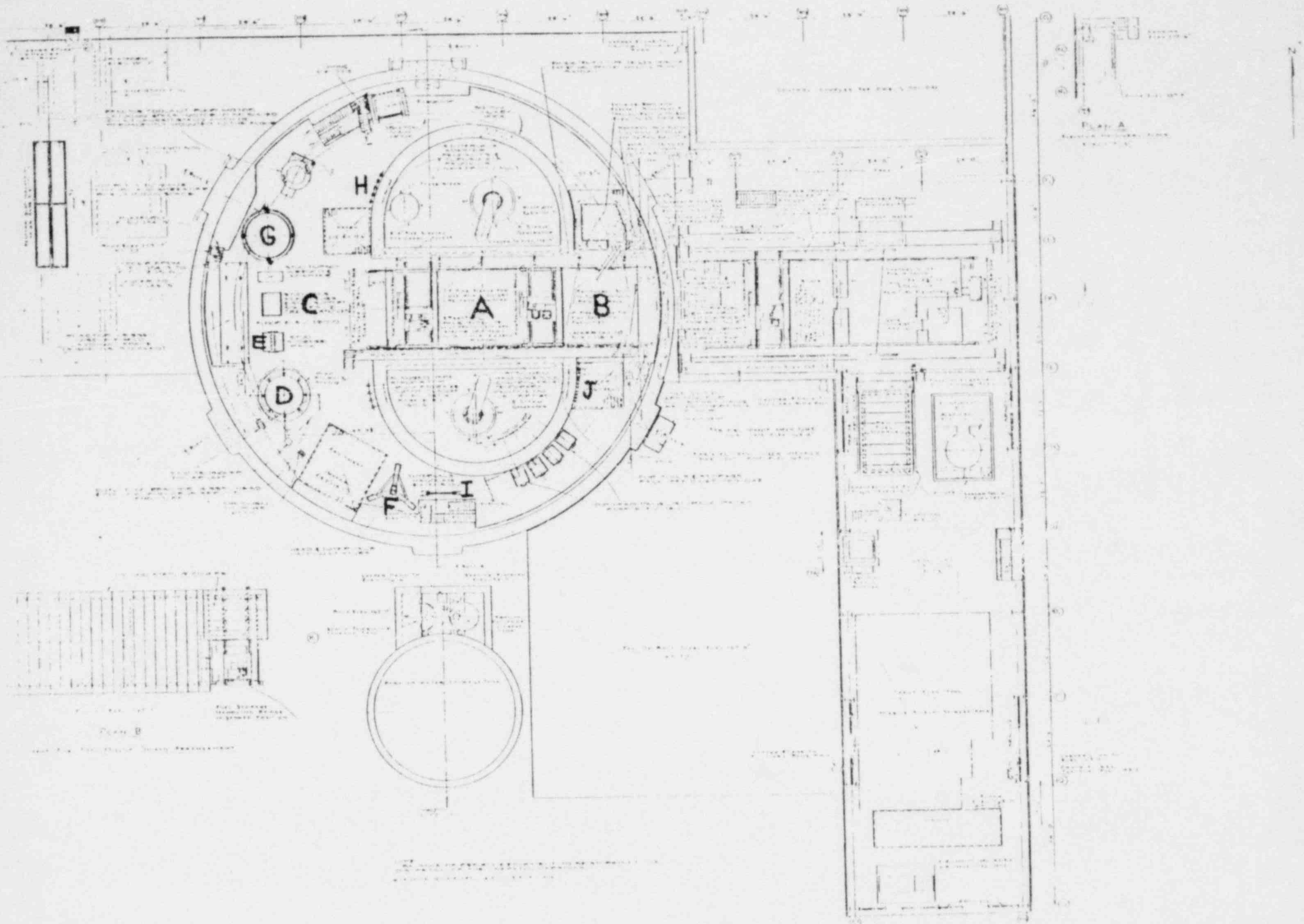


TABLE II

LIST OF LOADS MOVED OVER SPENT FUEL STORAGE POOLS

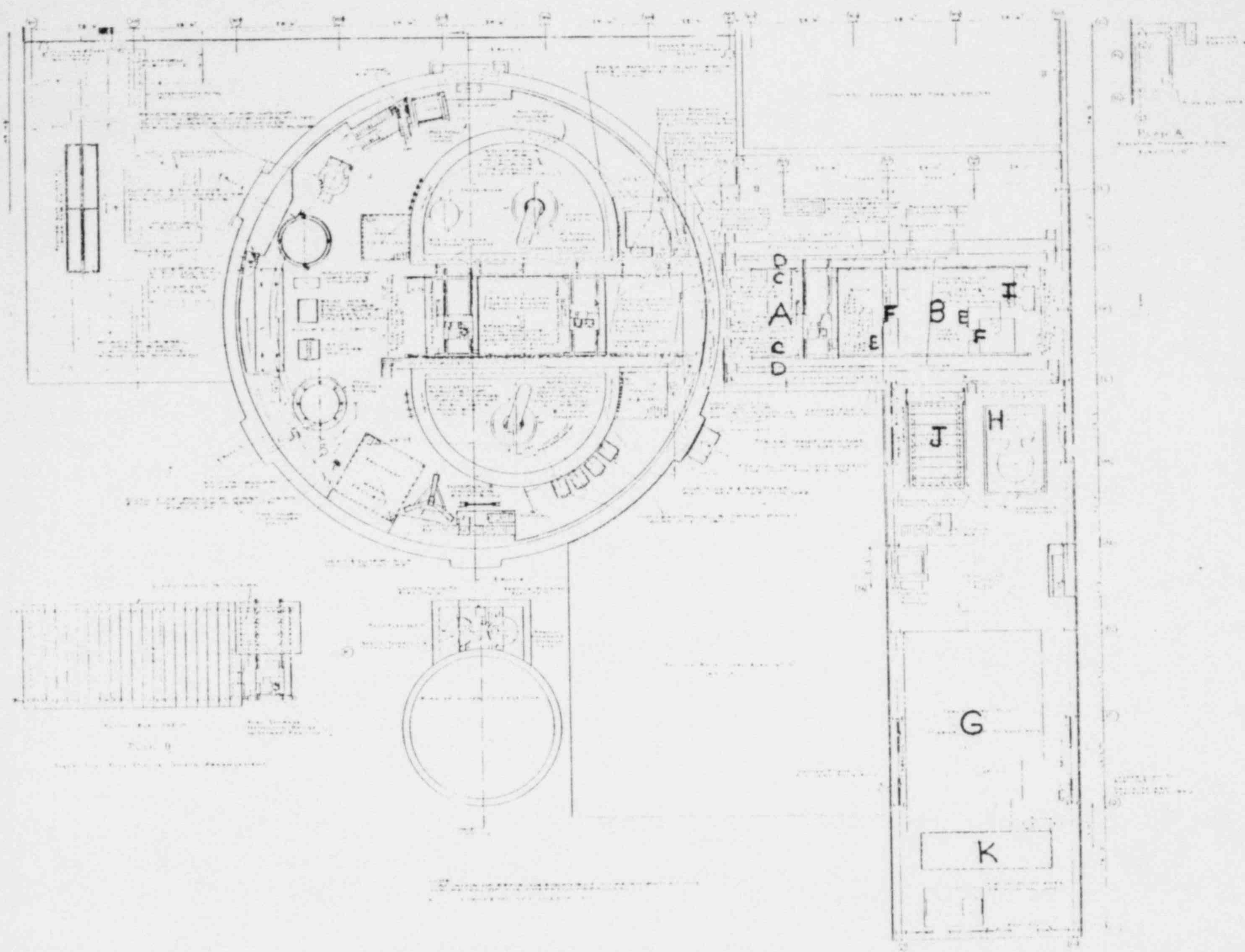
OBJECT	WEIGHT (lbs)	SIZE	MOVEMENT PATH (1)	HEIGHT (ft)(2)	FREQUENCY OF MOVEMENT
Fuel Assembly	~ 1550	Length - 14' Width - 8.5" Depth - 8.5"	A to B J to I to C to Reactor (New Fuel)	4	Refueling
Transfer Carriages	~ 2626	Length - 24' Width - 2'	C to D	30	Only for maintenance or repair
Lifting Beam for Carriages	~ 300	Length - 8' Width - 8"		33	Used for carriage removal
Spent Fuel Gates	~ 3900	Length - 28' Width - 35.5" Thickness - 1"	E to F	30	Refueling - moving fuel between pools
Missile Shields	~ 8200	Length - 26' Width - 30" Height - 30"	G to B to A	37	Refueling, maintenance
New Fuel Elevator Test Weight	~ 2080	Length - 16' Diameter- 8"	H to I	37	During new fuel receipt
Equipment/Personnel Lifting Basket	~ 250	Length - 4' Width - 4' Height - 3'	Throughout Fuel Pool Area	30	During maintenance on pools or equipment

NOTES TO TABLE II

(1) The movement path locations designated in this table are shown on Figure 2 attached.

(2) The heights indicated are approximate maximum heights above the top of the spent fuel storage racks.

Figure 2



C 08/25/78

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LTR 3 ENCL 40

SUBJECT:
RESPONSE TO NRC REQUEST OF 05/17/78... FORWARDING ADDL INFO CONCERNING MOVEMENT OF HEAVY LOADS NEAR SPENT FUEL AT SUBJECT FACILITY... W/ATT REV 2 "SURVEILLANCE PROCEDURE SP-434 FLORIDA PWR CORP CRYSTAL RIVER UNIT 3 - FUEL STORAGE POOL MISSILE SHIELDS" DTD

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SURVEILLANCE PROCEDURE

SP-601

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

PROCEDURE FOR LOAD TESTING SLINGS AND LIFTING FIXTURES

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 6/29/78

Meeting No. 78-36

APPROVED BY: Nuclear Plant Manager

Guy P. Beatty Jr.

Date 7/6/78

1.0 SURVEILLANCE REQUIREMENTS

1.1 REQUIREMENTS REFERENCE

Source	Surv. Req'd. During Modes	Mode Notes	Surv. Freq.	Freq. Notes
29 CFR 1910, Chapter XVII	1 thru 6	47	W	40

MODE NOTES: 47 - Sling in use.

SURVEILLANCE FREQUENCY: W - Weekly

FREQUENCY NOTES: 40 - Establish prior to ascent into applicable mode (prior to sling use).

1.2 Slings used in the handling of fuel will be load tested to 1.2 times the weight of the load to be lifted before each fuel receipt.

1.3 Slings complete with hook or other lifting rig fixtures to be used for lifting during safety-related activities other than in Step 1.2 above shall be load tested to 1.2 times the weight of the load to be lifted quarterly during use.

1.4 Tagging of the total lift rig assembly will be done at the time of load testing. The tag will denote date of test, weight lifted, and other lifting fixtures used to complete the lift rig assembly. Each component shall be tagged.

1.5 When it is impracticable to perform a load test in accordance with Step 1.3 above (because of extremely heavy lifts for example), slings rated at least 1.2 times the load to be lifted shall be used and a visual examination shall be performed and documented on Data Sheet I, noting "N/A" for load test. Ratings for non-standard configuration are based on normal sling calculations.

2.0 ACCEPTANCE CRITERIA

2.1 Load test completed with no slip in rigging.

2.2 Visual examination shows:

a. No broken strands.

b. No corrosion which when cleaned shows pitting.

c. No set kinks (deformations).

2.3 Successful completion of the attached Data Sheet I (Enclosure 1).

3.0 REFERENCES

3.1 29 CFR 1910, Chapter XVII

3.2 Data Sheet I (Enclosure 1), Procedure for Load Testing Slings

3.3 CSL Descriptions and Rated Load Capabilities (Enclosure 2)

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

4.1 Test load shall not exceed 110% of rating for any sling, hook, shackle, or other lifting fixture to be used.

4.2 Load test to be performed in area where potential for damage is minimized if test load is dropped.

5.0 EQUIPMENT REQUIRED

5.1 Test load equal in weight to at least 1.2 times the actual load to be lifted but in no event greater than 110% of rating for any lifting rig component. (See Enclosure 2.)

5.2 Sling, hook, shackle, and other lifting fixtures to be tested. Determine sling use and refer to Enclosure 2 for capabilities and load test requirements.

5.3 Crane with the capability to handle test load.

5.4 Rigging hardware such as shackles, eyebolts, etc., as required.

6.0 PROCEDURE

Determine load weight and ratings for sling, hook, and all lifting rig components.

6.1 Secure sling and complete lifting rig to crane hook.

6.2 Secure complete lifting rig to test load.

6.3 Raise test load to approximately 4 ft. from floor (4 ft. from bottom of load to floor).

6.4 Lower test load to approximately 2 ft. and hold for 30 sec.

6.5 Set test load on floor.

6.6 Repeat Steps 6.3, 6.4, and 6.5 above.

6.7 Release test load from lifting rig.

6.8 Record applicable data on Data Sheet 1 (Enclosure 1).

6.9 No restoration required.

6.10 Notify the Shift Supervisor of the completion and results of this Surveillance Procedure.

- DATA SHEET I -

PROCEDURE FOR LOAD TESTING SLINGS

Initials

Sling No. CSL-__________

Visual examination shows:

a. No broken strands. ________

b. No corrosion which when cleaned shows pitting. ________

*c. No set kinks (deformations). ________

Hook No. (or description) ____ ________

Shackle No. (or description) ____ ________

Other Lifting Fixtures ____ ________

Test Load Weight ____________ ________

Load test completed with no slip in rigging. ________

COMMENTS: ____

____

____

____

Describe lifting rig assembly (with sketch of how it was rigged).

____

____

____

Performed By ____________________ Date ____________

____

*"Set kinks" are defined as any strand or strands which are deformed in a manner irregular to the remaining strands which could result in cross-sectional, non-uniform loading.

CERTIFIED SLING DESCRIPTIONS AND RATED LOAD CAPABILITIES

CSL-6, Fuel Handling Fixture Sling (one 1/2" x 18" leg with two 3/8" x 14" legs)

Rated capacity is 2.2 tons based on the two 3/8" legs at no more than 30°.

NOTE: When attached to the fuel handling fixture, the two 3/8" legs are at an angle of approximately 16.6°. To meet the requirements of Section 4.1, the test load should be no greater than approximately 4840 lbs.

CSL-7, Fresh Fuel Shipping Container Four Legged Sling (four 1/2" x 204" legs)

CAPABILITIES: straight pull (each leg) - 10,560 lbs.

NOTE: A fresh fuel shipping container with two assemblies weighs approximately 7300 lbs., therefore, a load test of at least 10,950 lbs. is required. To load test CSL-7 prior to fuel receipt, lift either of the new fuel storage rack missile shields (weighing 14,125 lbs.) in accordance with Section 6.0 of this procedure.

CSL-8, New Fuel Assembly Lifting Sling

(single leg 1/2" x 180" with braided loop at both ends)

CAPABILITIES: Basket lift (looped over hook and shackled at loops) rated capacity is approximately 9,000 lbs.

CSL-9, New Fuel Assembly Lifting Sling

(single leg 1/2" x 180" with braided loop at both ends)

CAPABILITIES: See capabilities of CSL-8 above.

NOTE: CSL-8 and CSL-9 are used together on the auxiliary building main hook to move fuel assemblies. Since a fuel assembly with control rod weighs approximately 1660 lbs., a load test of at least 2490 lbs. is required. To load test CSL-8 and CSL-9, lift any one of the auxiliary building access hatches (weighing approximately 5500 lbs.) in accordance with Section 6.0 of this procedure.

Document Section
INFORMATION ONLY
C. R. Nuclear

SURVEILLANCE PROCEDURE

SP-530

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DEMONSTRATION OF AUXILIARY BUILDING OVERHEAD CRANE (FHCR-5)
INTERLOCK OPERABILITY

REVIEWED BY: Plant Review Committee

Paul J. McGee

Date 1/6/76

Meeting No. 76-1

APPROVED BY: Nuclear Plant Superintendent

Guy P. Beatty Jr

Date 1/22/76

1.0 SURVEILLANCE REQUIREMENTS

Interlocks which normally prevent the auxiliary building overhead crane (FHCR-5) from traveling over the fuel assembly storage portion of spent fuel pool "B" shall be demonstrated OPERABLE. This demonstration shall be performed during the modes and at the frequencies indicated below.

1.1 Technical Specification Reference

Technical Specification	Surv.. Req'd During Modes	Modes Notes	Surv. Freq.	Freq. Notes
4.9.7.1	1,2,3,4,5,6	41,42	W	40

Surveillance Frequency Designation:

W-Weekly

Modes Notes:

41-Fuel Assemblies in Spent Fuel Pool

42-Spent Fuel Overhead Crane (FHCR-5) in Use

Frequency Notes:

40-Establish Surveillance Prior to Ascending into Applicable Mode (Prior to placing crane in service with Fuel in Storage Pool)

2.0 ACCEPTANCE CRITERIA

2.1 The crane travel interlocks have successfully stopped any motion of the Auxiliary Building Spent Fuel Crane (FHCR-5) which would have caused its hoist hooks to be positioned over any part of spent fuel pool "B" (excluding the cask pit).

NOTE: If the above Acceptance Criteria cannot be met, refer to the "Action Statement" of 3.9.7 of the Technical Specifications.

3.0 REFERENCES NEEDED TO DO PROCEDURE

3.1 Enclosure 1, Crane Orientations and Directions

3.2 Data Sheet I (Enclosure 2)

3.3 FP-601, Fuel Handling Equipment Operations

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

4.1 This demonstration of interlock operation shall be performed with NO crane load.

4.2 If bridge or trolley is stopped by limit switch action, it will be necessary to reverse whatever motion was responsible by depressing the appropriate reversal push button.

4.3 The "NON-RESTRICTED" push button overrides limit switches and while depressed allows entry into the restricted area.

5.0 EQUIPMENT REQUIRED

None

6.0 PROCEDURE

6.1 Start up the overhead crane (FHCR-5) in accordance with FP-601, Fuel Handling Equipment Operations.

6.2 With the crane well away (south) of the southern wall of spent fuel pool "B", operate the bridge, trolley, and hoist controls to verify that they are operating normally.

6.3 Perform the following steps to demonstrate the operation of the crane's interlocks. Refer to Enclosure 1 for orientation and directions.

6.3.1 Run the trolley forward and position it approximately 2 ft. from the west end stops.

6.3.2 Depress the "BRIDGE FORWARD" push button and run the bridge north at fast speed until it is stopped by the actuation of a limit switch (LS-2). Verify that the main hoist hook centerline is not over the spent fuel pool storage racks and document this on Data Sheet I.

6.3.3 Depress the "TROLLEY FORWARD" push button. Verify the trolley does not move forward.

6.3.4 Depress the "TROLLEY REVERSE" push button. Verify that the trolley moves in reverse.

6.3.5 Continue moving the trolley in reverse and position it approximately 2 ft. from the trolley east end stops.

6.3.6 Depress the "BRIDGE REVERSE" push button and verify the bridge will move in reverse.

6.3.7 Depress the "BRIDGE FORWARD" push button and move the bridge forward until it is stopped by the actuation of a limit switch (LS-1); document this on Data Sheet I.

6.3.8 Depress the "TROLLEY FORWARD" push button and move the trolley forward until it is stopped by the actuation of a limit switch (LS-3). Lower the main hoist hook as necessary to verify that it is over the spent fuel cask storage pit; document this on Data Sheet I.

CAUTION: Care should be exercised to insure that the hook does not come in contact with the water in the cask storage pit.

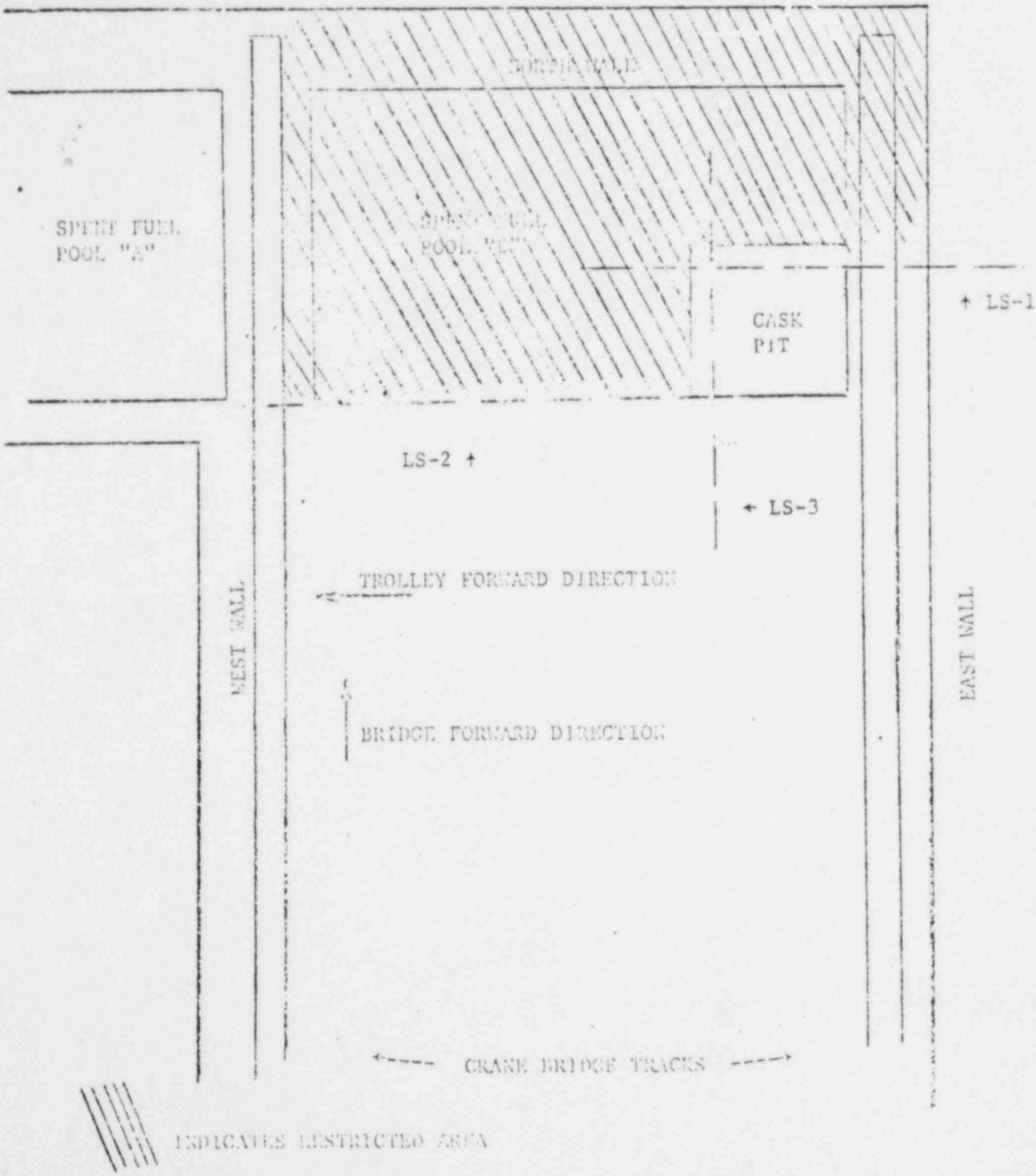
6.3.9 Return the hook to its storage position.

6.3.10 Depress and maintain depressed the "NON-RESTRICTED" push button. Move the bridge forward to approximately 2 ft. from the north end stops, then move the trolley forward until it has passed the west wall of the cask storage pit. Release the "NON-RESTRICTED" push button.

6.3.11 Return the trolley to the cab side of the bridge, then return the bridge to its normal storage area or the desired work area.

6.4 There is no restoration required.

6.5 Notify the Shift Supervisor of the completion and results of this Surveillance Procedure.



CRANE ORIENTATION AND DIRECTIONS

DATA SHEET I

AUXILIARY BUILDING OVERHEAD CRANE (FHCR-5) INTERLOCK DEMONSTRATION

TEST EQUIPMENT NO.

NONE

PROCEDURE STEP	ACTION	INITIALS/DATE
6.3.2	The crane is stopped (by LS-2) with its hooks not over the spent fuel pool storage racks.	/
6.3.7	The crane is stopped (by LS-1) with its hooks not over the spent fuel pool storage racks	/
6.3.8	The crane is stopped (by LS-3) with its hooks not over the spent fuel pool storage racks	/

COMMENTS: ______________________________

PERFORMED BY: ____________________ DATE: ____________________

SURVEILLANCE PROCEDURE

SP-434

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

FUEL STORAGE POOL MISSILE SHIELDS

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 5/4/78

Meeting No. 78-18

APPROVED BY: Nuclear Plant Manager

Gary P. Beatty, Jr.

Date 5/31/78

1.0 SURVEILLANCE REQUIREMENTS

1.1 All missile shields shall be installed over the storage pools whenever irradiated fuel assemblies are in the storage pools except during in-progress handling of fuel assemblies.

1.2 Immediately install all missile shields upon notification of a "tornado watch".

1.3 REQUIREMENTS REFERENCE

Reference	Surv. Req'd. During Modes	Mode Notes	Surv. Freq.
STS 4.09.11.01	1 thru 6	41	One Time
STS 4.09.11.01	1 thru 6	41,43	One Time
STS 4.09.07.01	1 thru 6	41	One Time

Surveillance Frequency: One Time - Each occurrence necessitating missile shield placement over storage pool.

Mode Notes: 41 - Irradiated fuel assemblies in storage pool.

43 - "Tornado watch" in effect.

2.0 ACCEPTANCE CRITERIA

Successful completion of this procedure.

3.0 REFERENCES NEEDED TO DO PROCEDURE

3.1 FP-601, Fuel Handling Equipment Operations

3.2 Enclosure 1, Fuel Storage Pool Missile Shield Installation Sequence

3.3 Enclosure 2, Missile Shield Panel SP-1

3.4 Enclosure 3, Missile Shield Panel SP-2

3.5 Enclosure 4, Missile Shield Panel SP-3

3.6 Enclosure 5, Missile Shield Panel SP-4

3.7 Enclosure 6, Missile Shield Panel SP-5

3.8 Enclosure 7, Shield Positioning Pin

3.9 Enclosure 8, Fuel Storage Pool Missile Shield Removal Sequence

3.10 Enclosure 9, Spent Fuel Pool Missile Shield Storage Positioning

3.11 Enclosure 10, Data Sheet I (Installation)

3.12 Enclosure 11, Data Sheet II (Removal)

3.13 Enclosure 12, Equipment List

3.14 Enclosure 13, Sling Lift Capabilities for CSL-7

3.15 Enclosure 14, Sling Lift Capabilities for CSL-8 and CSL-9

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

4.1 Determine that the water level in the storage pool is at least 23 ft. above fuel assemblies before beginning missile shield installation.

4.2 (deleted)

4.3 Sling CSL-7 certified in accordance with Step 1.4 of SP-601, Procedure for Load Testing Slings. (See Enclosure 13 for analysis.)

4.4 Slings CSL-8 and CSL-9 certified in accordance with Step 1.4 of SP-601, Procedure for Load Testing Slings. (See Enclosure 14 for analysis.)

5.0 EQUIPMENT REQUIRED

5.1 Auxiliary Building Overhead Crane

5.2 Auxiliary Building Missile Shield Crane

6.0 PROCEDURE

NOTE: Notify the Reactor Engineer before beginning missile shield placement.

6.1 STORAGE POOL MISSILE SHIELD INSTALLATION

6.1.1 Start up spent fuel (SF) handling bridge per FP-601, Fuel Handling Equipment Operations.

6.1.2 Move bridge and/or trolley to position fuel mast in cask loading area and move bridge to left travel limit.

6.1.3 Install panel positioning pins (Enclosure 7) in missile shield locations 1 and 2 (Enclosure 1) on both sides of SF pool "B".

6.1.4 Attach two (2) 1 in. eyebolts in tapped lifting holes and attach lifting slings to applicable missile shield panel. (Refer to Enclosures 1 through 6.)

6.1.5 Lift shield with the auxiliary building overhead crane.

6.1.6 Position shield across SF pool "B".

NOTE: Nylon safety ropes should be used to guide shield across pool.

6.1.7 Lower shield onto positioning pins until panel is seated firmly on anchor platform.

6.1.8 Remove positioning pins and replace with 1-½ in. anchor bolts. Remove rigging from shield. Install 1 in. bolts and flat washer in tapped lifting hole.

6.1.9 Install positioning pins to accommodate subsequent panels.

6.1.10 Repeat Sections 6.1.4 through 6.1.9 for panels 2 through 8.

NOTE: Shield positions 9 through 24 (Enclosure 1) require use of the missile shield crane.

6.1.11 Attach rigging of Enclosure 14 and position shield across SF pool "B" per Sections 6.1.4 through 6.1.6.

6.1.12 Move overhead crane trolley to position shield above shield location 8 (Enclosure 1).

6.1.13 Lower shield onto shield in location 8 and transfer rigging from overhead crane hook to missile shield crane hook.

6.1.14 Move missile shield crane to appropriate location (Enclosure 1) and lower and bolt shield per Sections 6.1.7 through 6.1.9.

6.1.15 Install panels 25 thru 32 with the overhead crane.

NOTE: Slight repositioning of the SF bridge may be required for placement of SP-2 panel in location 32.

6.1.16 Shut down SF handling bridge in accordance with FP-601, Fuel Handling Equipment Operations.

6.1.17 Upon completion of missile shield placement, complete Data Sheet I (Enclosure 10).

6.1.18 No restoration is required.

6.2 FUEL STORAGE POOL MISSILE SHIELD REMOVAL

6.2.1 Remove 1-1/4 in. anchor bolts from both ends of applicable missile shield. (Refer to Enclosure 8.)

6.2.2 Attach two (2) 1 in. eyebolts in tapped lifting holes, attach rigging, and lift with auxiliary building overhead crane.

6.2.3 Move crane bridge and trolley to position shield for storage in configuration of Enclosure 9.

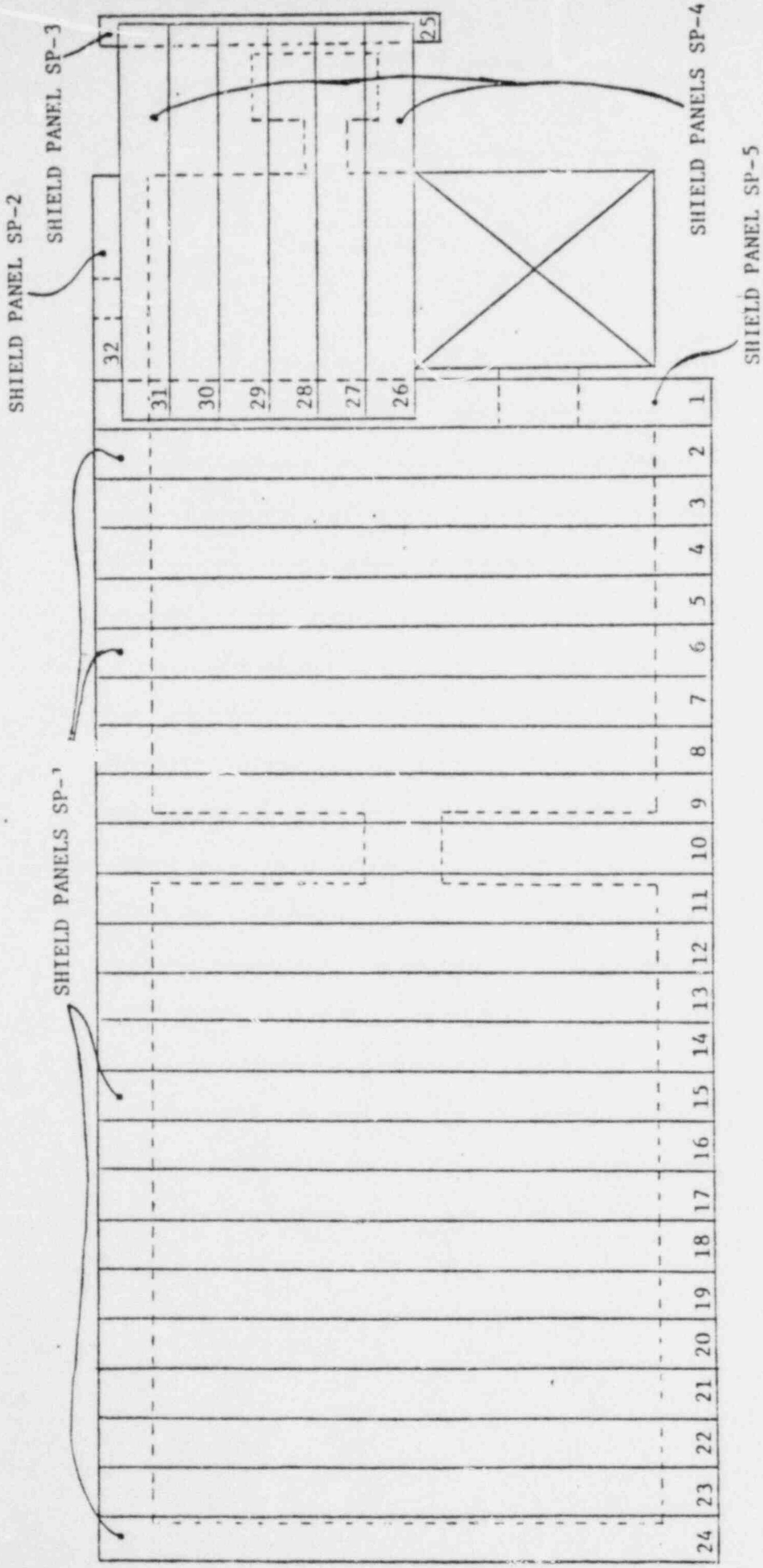
NOTE: Shields SP-1 and SP-4 shall be stacked no more than two (2) shields high.

6.2.4 Repeat Sections 6.2.1 thru 6.2.3 to complete missile shield removal.

NOTE: Removal of shield positions 1 thru 16 on Enclosure 8 require the use of the missile shield crane and transferral of rigging to the overhead crane for storage.

6.2.5 Upon completion of missile shield removal, complete Data Sheet II (Enclosure 11).

6.3 No restoration is required.

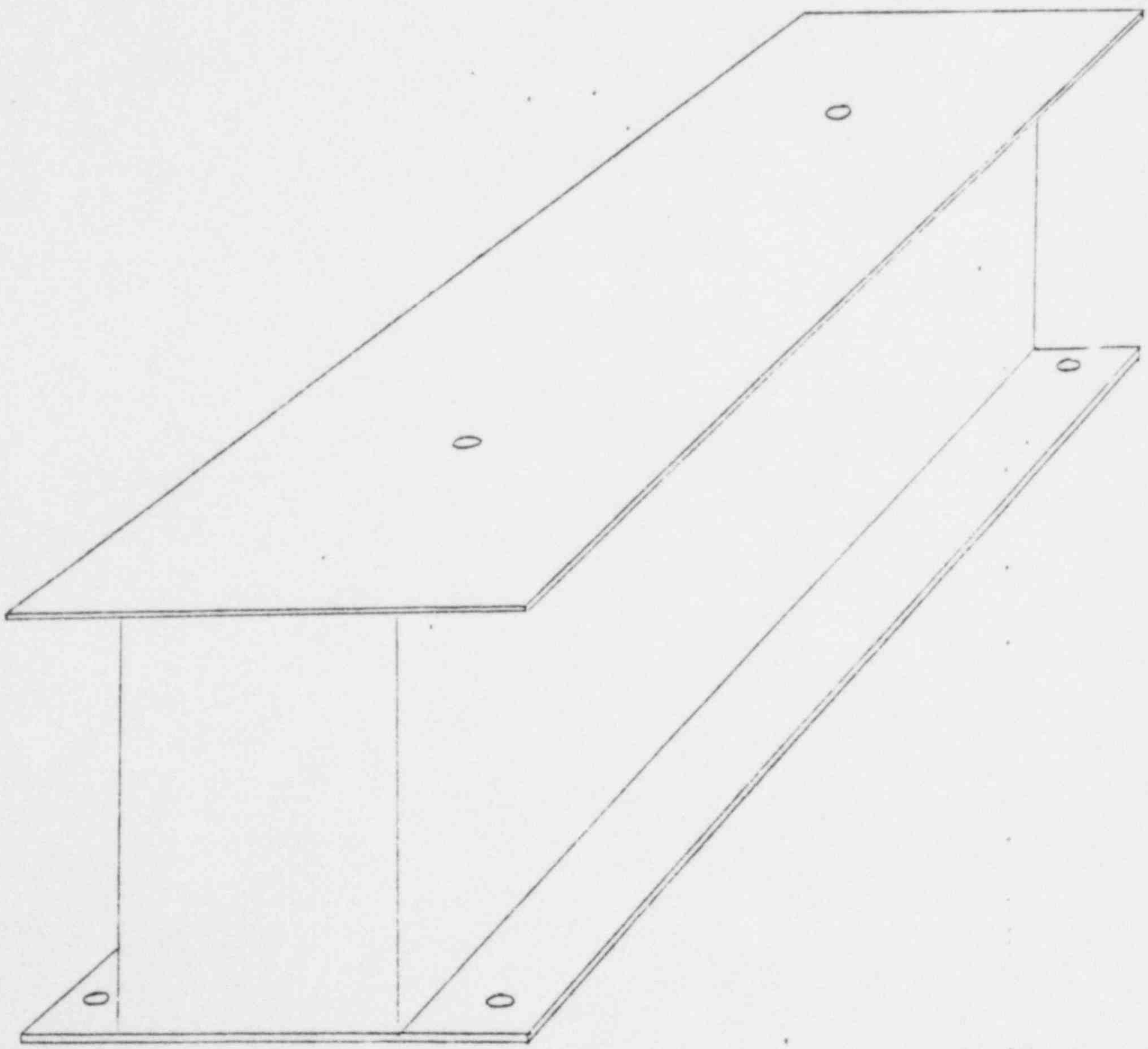


FUEL STORAGE POOL MISSILE SHIELD INSTALLATION SEQUENCE*

*NOTE: Sequence recommended but not mandatory.

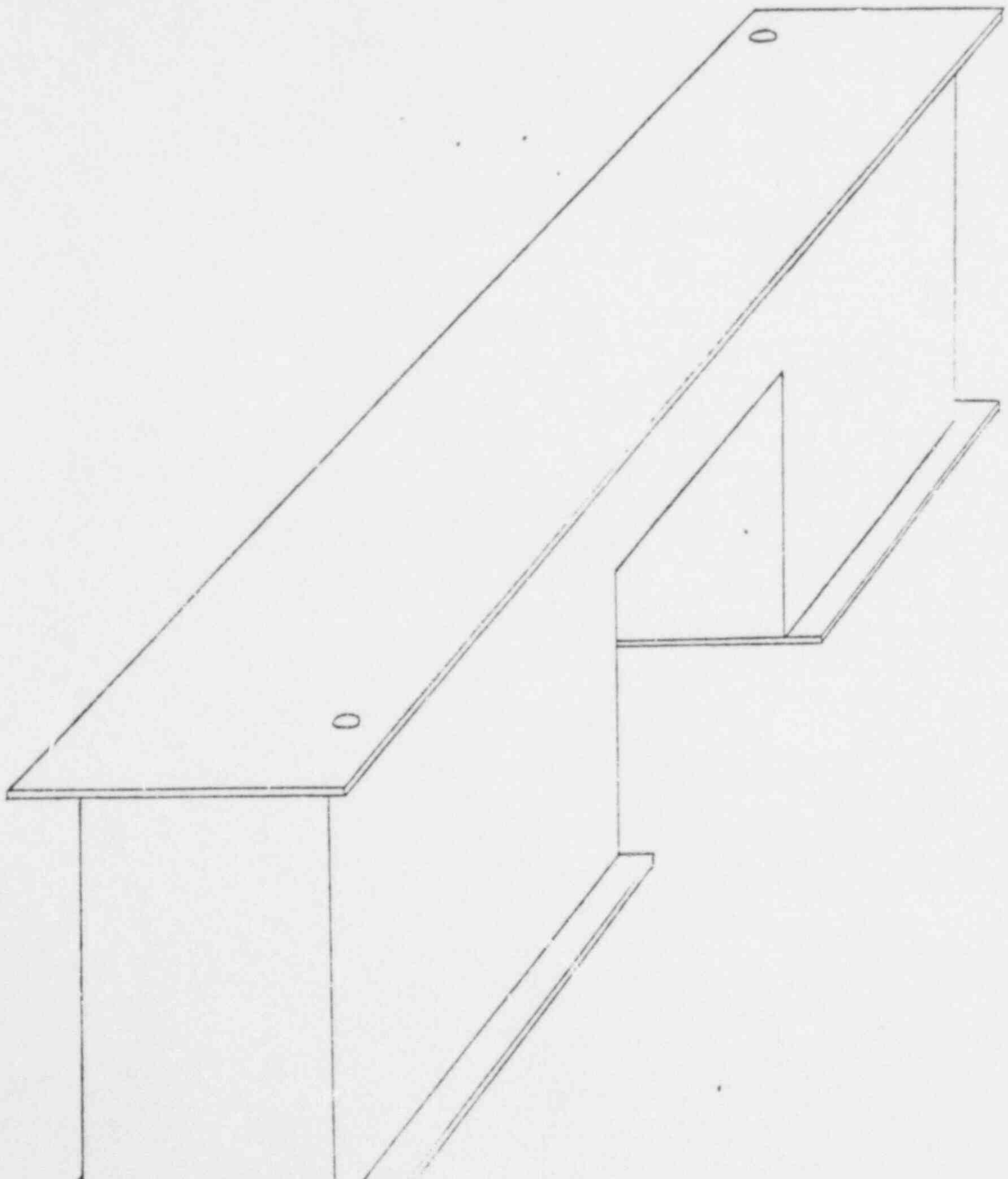
MISSILE SHIELD PANEL SP-1

(23 required)



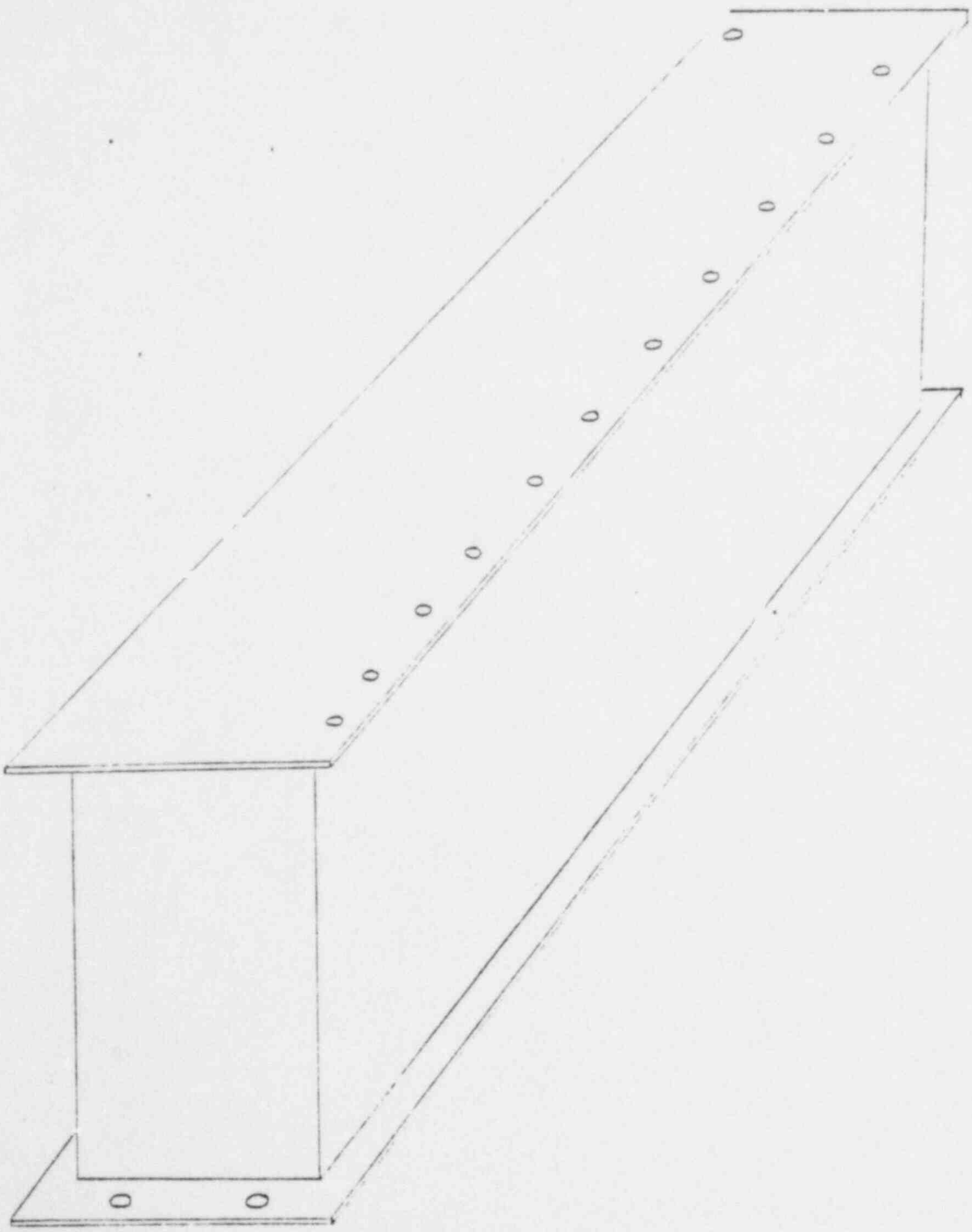
MISSILE SHIELD PANEL SP-2

(1 required)



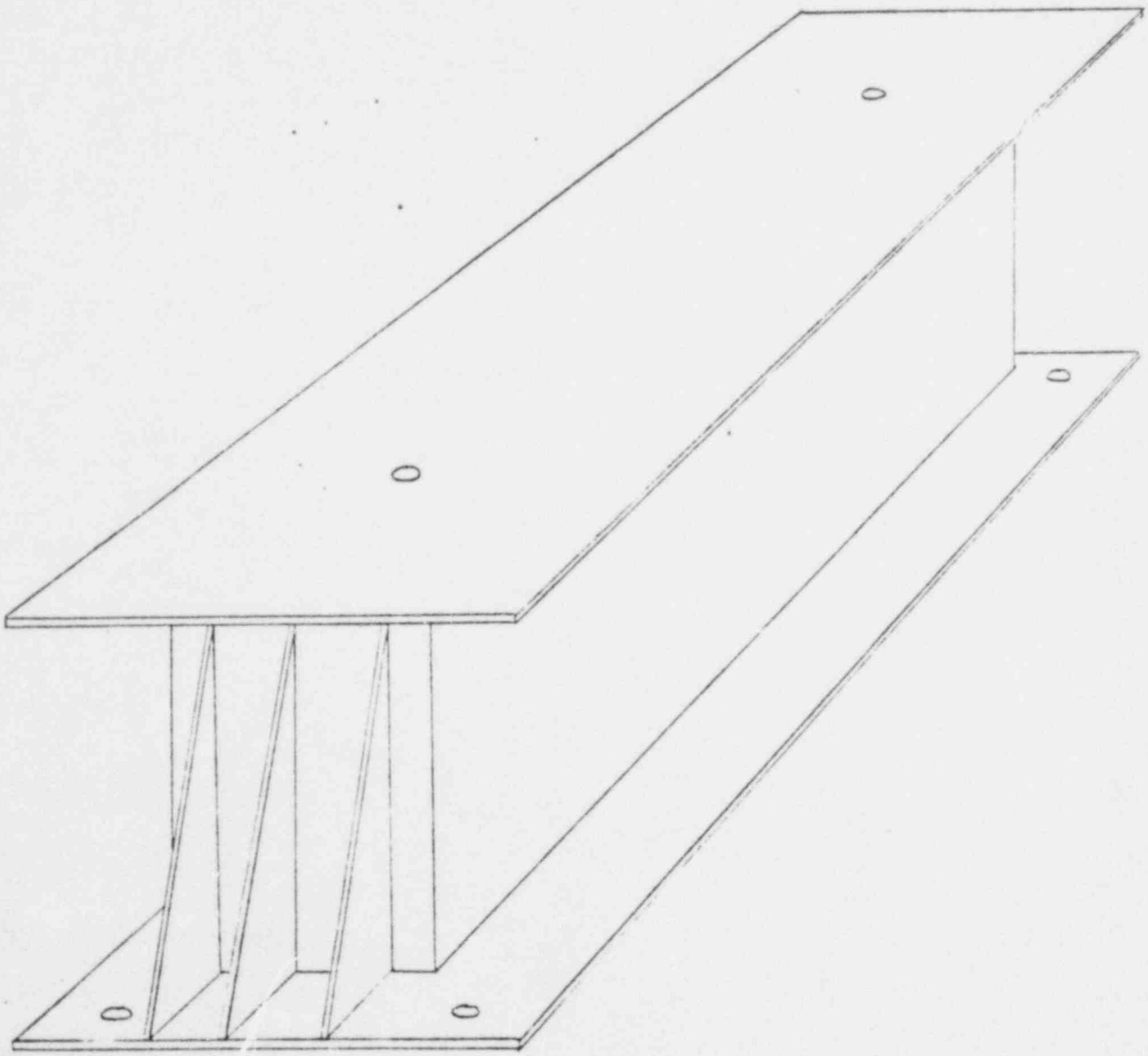
MISSILE SHIELD PANEL SP-3

(1 required)



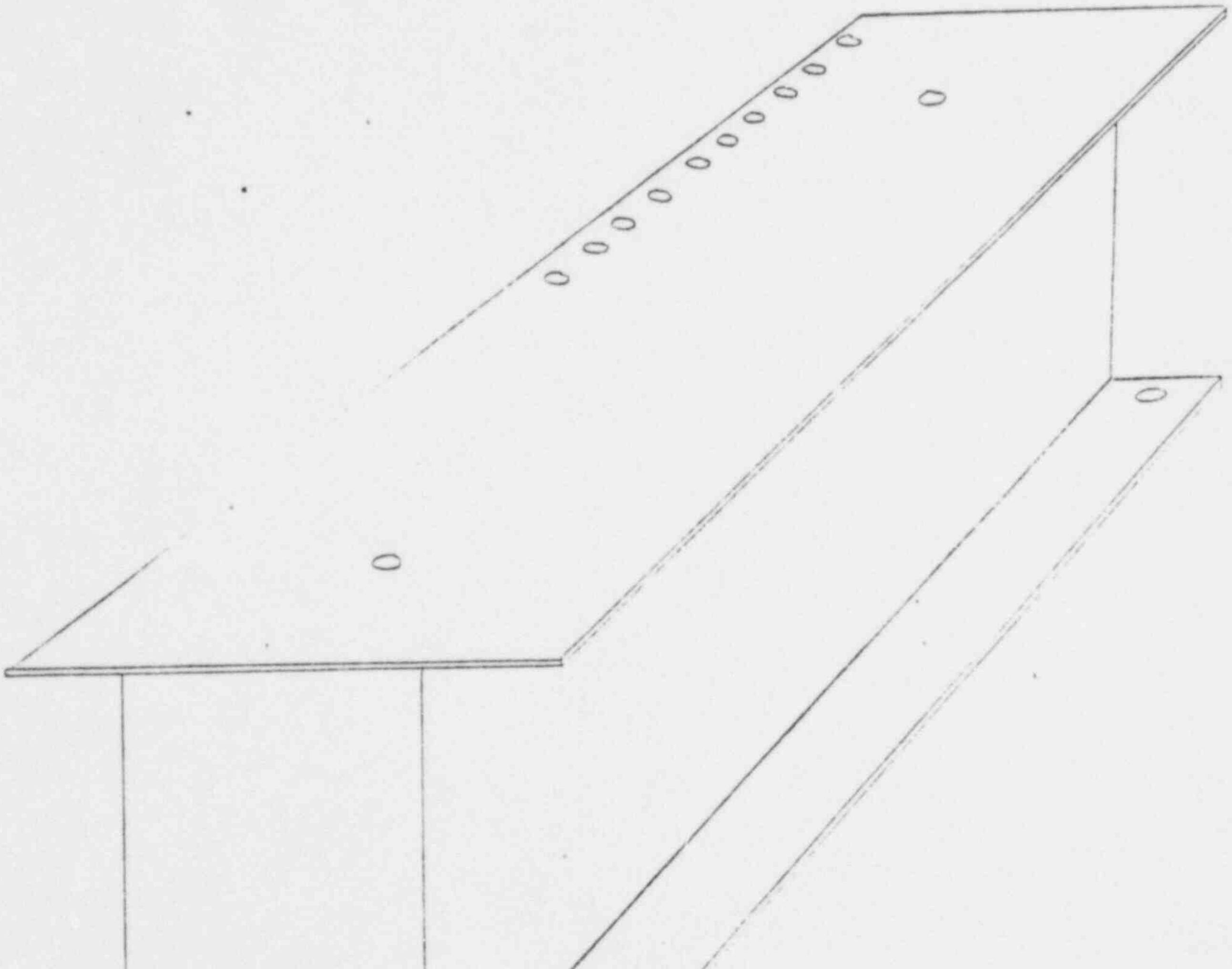
MISSILE SHIELD PANEL SP-4

(6 required)



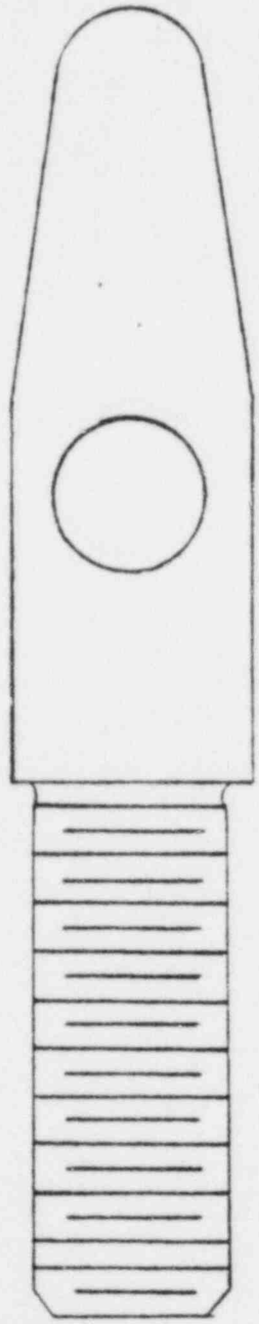
MISSILE SHIELD PANEL SP-5

(1 required)

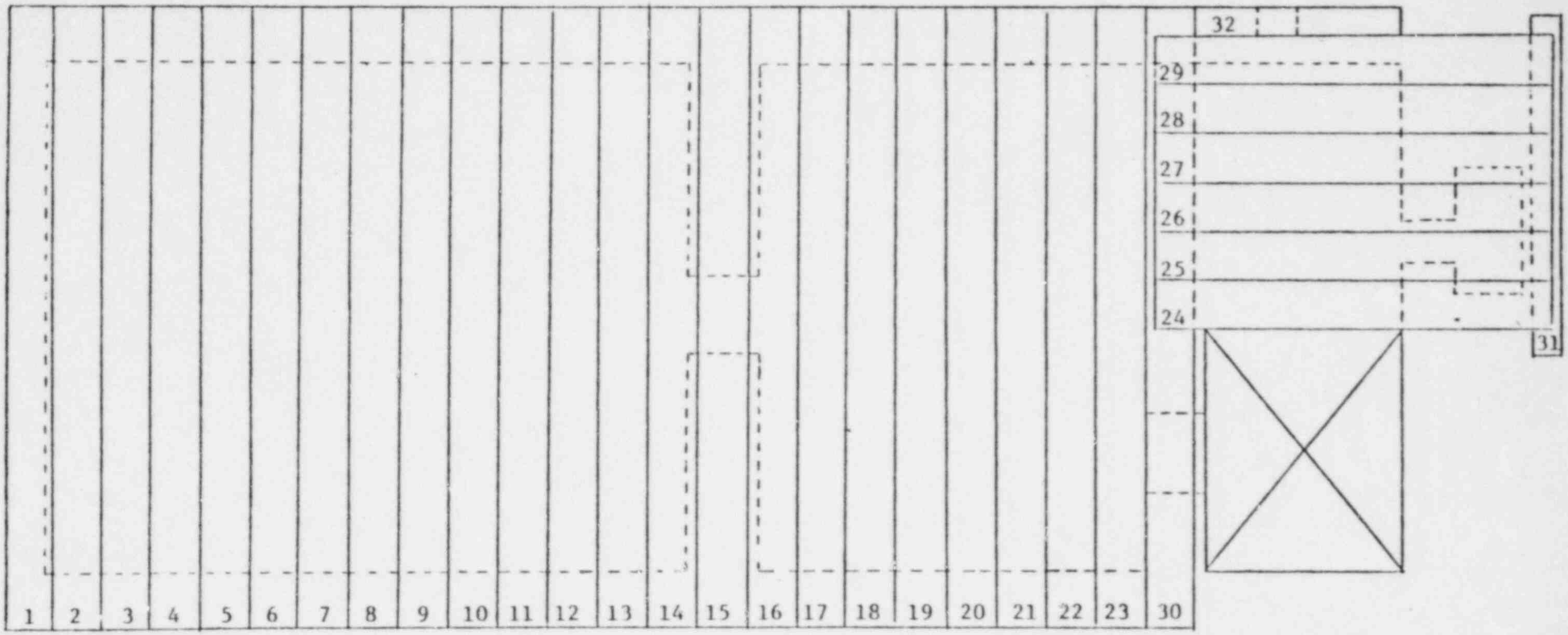


POSITIONING PIN

(8 required)

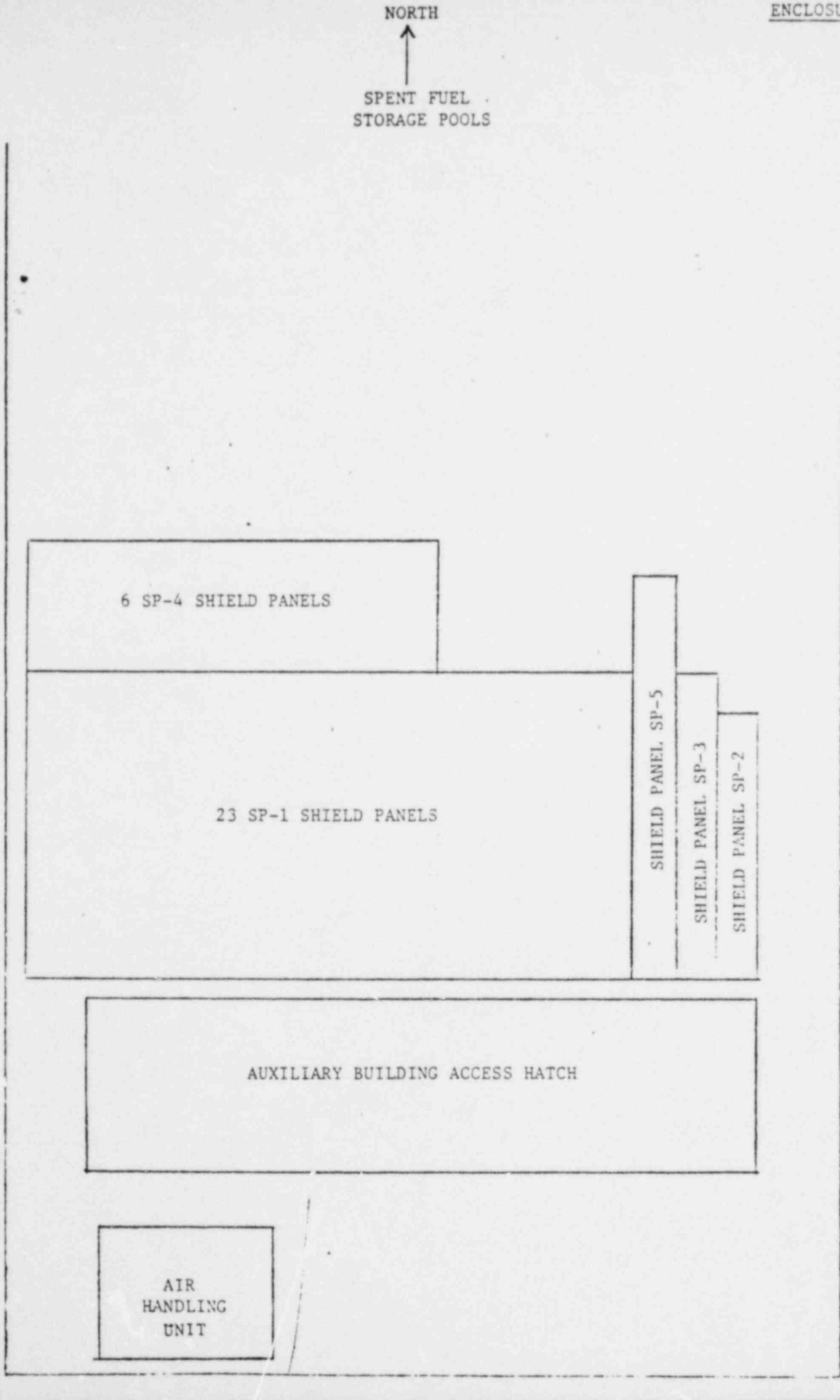


FOR USE WHEN INSTALLING PANELS



FUEL STORAGE POOL MISSILE SHIELD REMOVAL SEQUENCE*

*Note: Sequence recommended but not mandatory.



SPENT FUEL POOL MISSILE SHIELD STORAGE POSITIONING

DATA SHEET I

The following missile shield panels were installed in accordance with Section 6.1 of this procedure:

	Initials
23 SP-1 Shield Panels	________
6 SP-4 Shield Panels	________
1 SP-2 Shield Panel	________
1 SP-3 Shield Panel	________
1 SP-5 Shield Panel	________

COMMENTS: ____

____

____

____

Performed By ____________________ Date ____________

DATA SHEET II

The following missile shield panels were removed in accordance with Section 6.2 of this procedure:

	Initials
23 SP-1 Shield Panels	________
6 SP-4 Shield Panels	________
1 SP-2 Shield Panel	________
1 SP-3 Shield Panel	________
1 SP-5 Shield Panel	________

COMMENTS: ____

____

____

____

Performed By ____________________ Date ____________

EQUIPMENT LIST

1. 1" Eyebolts, 4
2. 4-Point Slings (CSL-5 and CSL-7), 2
3. Panel Positioning Pins, 8
4. 128 1-1/4" x 2-1/2" Anchor Bolts
5. 20" Adjustable Wrenches, 2

SLING LIFT CAPABILITIES FOR CSL-7

NOTE: A copy of this analysis must accompany the visual examination performed in Step 1.4 of SP-601, Procedure for Load Testing Slings.

CSL-7 - Straight pull capability - 10,560 lbs. (each leg) (four ½" x 204' legs)

1. Lifting a fuel storage pool missile shield with CSL-7 represents a lifting angle $\theta = 20.67^{\circ}$.
2. This reduces the lift capability to:

   $10,560 \times \cos\theta$

   $= 10,560 \times 0.936 = 9,880$ lbs.
3. The maximum storage pool missile shield weighs 8,200 lbs.
4. Two legs of CSL-7 will be used to lift shield so each leg will lift 4,100 lbs.
5. In accordance with Step 1.4 of SP-601, Procedure for Load Testing Slings, a sling must be rated at least 1.2 times the load to be lifted:

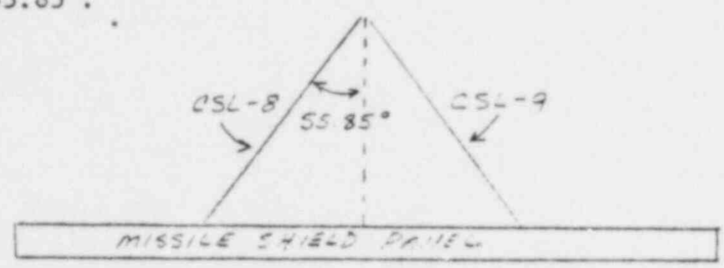
   4,100 lbs. x 1.2 = 4,920 lbs.
6. 4,920 lbs. less than 9,880 lbs. (Step 2)
7. Sling is usable in accordance with SP-601, Procedure for Load Testing Slings.

SLING LIFT CAPABILITIES FOR CSL-8 and CSL-9

NOTE: A copy of this analysis must accompany the visual inspection performed in Step 1.4 of SP-601, Procedure for Load Testing Slings.

CSL-8] Straight lift capability using Basket*
CSL-9] Lift = 9,000 lbs.

1. Lifting a pool missile shield with CSL-8 and CSL-9 represents a lifting angle of 55.85°.



2. This reduces the lift capability to:

   9,000 lbs. x cos θ

   = 9,000 lbs. x 0.5613 = 5052.0 lbs. (each cable)

3. The maximum missile shield weight is 8,200 lbs.
4. Each sling will lift 4,100 lbs.
5. In accordance with Step 1.4 of SP-601, Procedure for Load Testing Slings, a sling must be rated at least 1.2 times the load to be lifted:

   4,100 lbs. x 1.2 = 4,920 lbs.

6. 4,920 lbs. less than 5,052 lbs. (Step 2)
7. Sling is usable in accordance with SP-601. Procedure for Load Testing Slings.

*NOTE: Slings to be used in basket lift; i.e., loop ends shackled together to eye bolt and looped over crane hook.

SURVEILLANCE PROCEDURE

SP-531

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

SPENT FUEL HANDLING BRIDGE INTERLOCK SURVEILLANCE

REVIEWED BY: Plant Review Committee

Paul F. McKee

Date 5/21/76

Meeting No. 76-22

APPROVED BY: Nuclear Plant Superintendent

Gary P. Beatty Jr.

Date 7/1/76

1.0 SURVEILLANCE REQUIREMENTS

Spent fuel bridge and trolley interlocks and physical stops shall be demonstrated OPERABLE within seven days prior to fuel handling operation employing FHCR-3 and at least once per seven days during operation.

1.1 REQUIREMENTS REFERENCE

Reference	Surv. Req'd. During Modes	Mode Notes	Surv. Freq.	Freq. Notes
FPC Practice	1 thru 6	42	W	40

Surveillance Frequency: W - Weekly (seven days)

Mode Notes: 42 - Bridge in use.

Frequency Notes: 40 - Establish prior to ascension into applicable mode (prior to putting bridge in use).

2.0 ACCEPTANCE CRITERIA

Successful completion of this procedure.

3.0 REFERENCES NEEDED TO DO PROCEDURE

FP-601, Fuel Handling Equipment Operations

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

Refer to FP-601, Fuel Handling Equipment Operations. When verifying wall limit interlocks, attention should be given to very slow movement of bridge or trolley.

5.0 EQUIPMENT REQUIRED

Refer to FP-601, Fuel Handling Equipment Operations.

6.0 PROCEDURE

Refer to Enclosure 1.

6.1 Position bridge at SFA-DS.

6.1.1 Run bridge right until it stops (LS-5 bridge right end stop) and verify that:

6.1.1.1 Bridge will not run right.

6.1.1.2 Bridge will move left.

6.1.1.3 Trolley will run forward and reverse.

6.1.2 Run trolley forward until it stops (LS-19 transfer valve #2 protection) and verify that:

6.1.2.1 Bridge will not move left or right.

6.1.2.2 Trolley will move reverse.

6.1.3 Run trolley reverse until it stops (LS-19 transfer valve #1 protection) and verify that:

6.1.3.1 Bridge will not move left or right.

6.1.3.2 Trolley will move forward.

6.2 Position bridge at SFA-D8.

6.2.1 Run trolley reverse to transfer carriage #1 (scale index "X").

6.2.2 Run bridge right until it stops (LS-18) and verify that bridge will not move left or right and trolley will not move reverse.

6.2.3 Move trolley forward to scale index "A" and verify that bridge will move right and left and trolley will move forward and reverse.

6.3 Position bridge at SFA-D8.

6.3.1 Run trolley forward to transfer carriage #2 (scale index "Y").

6.3.2 Move bridge right until it stops (LS-18) and verify that bridge will not move right or left and trolley will not move forward.

6.3.3 Move trolley reverse to scale index "H" and verify that bridge will move right and left and trolley will move forward and reverse.

6.4 Move bridge left until it stops (LS-9 center wall left limit) and verify that:

6.4.1.1 Bridge will not move left.

6.4.1.2 Bridge will move right.

6.4.2 Trolley will forward and reverse.

6.5 Move trolley forward until it stops (LS-19) and verify that bridge will not move right or left.

6.5.1 Move trolley slightly reverse.

6.5.1.1 Move bridge right to row "14".

6.5.1.2 Move trolley forward to bumper stop.

6.5.1.3 Move trolley slightly reverse.

6.5.1.4 Move bridge left until it stops (LS-18) and verify that bridge will not move right or left and trolley will not move forward.

6.5.2 Move trolley reverse to scale index "H".

6.5.2.1 Move bridge right to row "14".

6.5.2.2 Move trolley reverse to bumper stop.

6.5.2.3 Move trolley slightly forward.

6.5.2.4 Move bridge left until it stops (LS-18) and verify that bridge will not move right or left and trolley will not move reverse.

6.5.3 Move trolley forward to scale index "A".

6.5.3.1 Move bridge left until it stops (LS-9).

6.5.3.2 Move trolley reverse until it stops (LS-19) and verify that bridge will not move right or left.

6.6 Move trolley forward until it stops (LS-10) and verify that:

6.6.1 Trolley will not move forward or reverse.

6.6.2 Bridge will move right or left.

6.7 Position trolley on centerline of center gate (scale index "Z").

NOTE: Bridge may have to be moved right to clear LS-9, then move the trolley forward to "Z".

6.7.1 Move bridge left until it stops (LS-12) and verify that bridge will not move left or right.

NOTE: The trolley can either move forward until it stops around "H" and no further movements can be made or move reverse until it stops around "F" and no further movements can be made.

6.7.2 Bypass bridge right interlock (TS-4).

6.7.3 Move bridge right to row "30".

6.7.4 Return bridge right bypass interlock (TS-4) to "OFF" position.

6.8 Move trolley forward to centerline of cask loading [illegible] index "W").

6.8.1 Move bridge left until mast is in the entrance of cask area (between LS-12 and LS-21) and verify that trolley will not move forward or reverse (LS-13).

6.8.2 Move bridge left until it stops (LS-6 bridge left end limit) and verify that:

6.8.2.1 Bridge will not move left.

6.8.2.2 Bridge will move right.

6.8.2.3 Trolley will move forward and reverse.

6.8.3 Move trolley forward to bumper stop.

6.8.4 Move trolley reverse until it stops (LS-20 trolley stop at cask inner wall). Trolley will not move forward or reverse.

6.8.5 Move bridge right until it stops (LS-21 cask area right wall limit). Bridge will not move right or left.

NOTE: Trolley interlock bypass required to move trolley forward to clear LS-20 interlock.

CAUTION: Do not move trolley in reverse!

6.8.6 Bypass trolley interlock (TS-5).

6.8.7 Move trolley forward to centerline of cask loading door (scale index "W").

6.8.8 Return trolley bypass interlock to "Off" position.

6.9 Move bridge right until it stops (LS-11 center wall right limit) and verify that :

6.9.1 Trolley will move forward and reverse.

6.9.2 Bridge will move left.

6.9.3 Bridge will not move right.

6.10 Move bridge left to clear LS-11 (SFB-W22).

6.10.1 Move trolley reverse to scale index "E" (LS-13 centerline of new fuel elevator).

6.10.2 Raise elevator to full "Up" position.

6.10.3 Move bridge left until it stops and verify that:

6.10.3.1 Trolley will not move forward or reverse.

6.10.3.2 Bridge will move right.

6.10.3.3 Bridge will not move left.

6.10.4 Lower the new fuel elevator to the full "Down" position.

6.10.5 Move bridge left to position directly over the new fuel elevator; bridge and bumper touching but not compressed. Verify that:

6.10.5.1 Trolley will not move forward or reverse.

6.10.5.2 New fuel elevator will not raise.

6.10.6 Move bridge right to SFB-E30 (LS-12 clears).

6.10.7 Move trolley reverse to SFB-C30.

6.10.8 Run bridge left until it stops (LS-9 bridge left wall limit).

6.10.8.1 Bridge will not move left.

6.10.8.2 Bridge will move right.

6.10.9 Run trolley forward until it stops (LS-20) and verify that trolley will not move forward or reverse.

6.11 Move bridge right until it stops (LS-11).

6.11.1 Move trolley forward until it stops (LS-10) and verify that:

6.11.1.1 Trolley will not move forward or reverse.

6.11.1.2 Bridge will move right or left.

6.12 Position trolley on centerline of center gate (scale index "[illegible]").

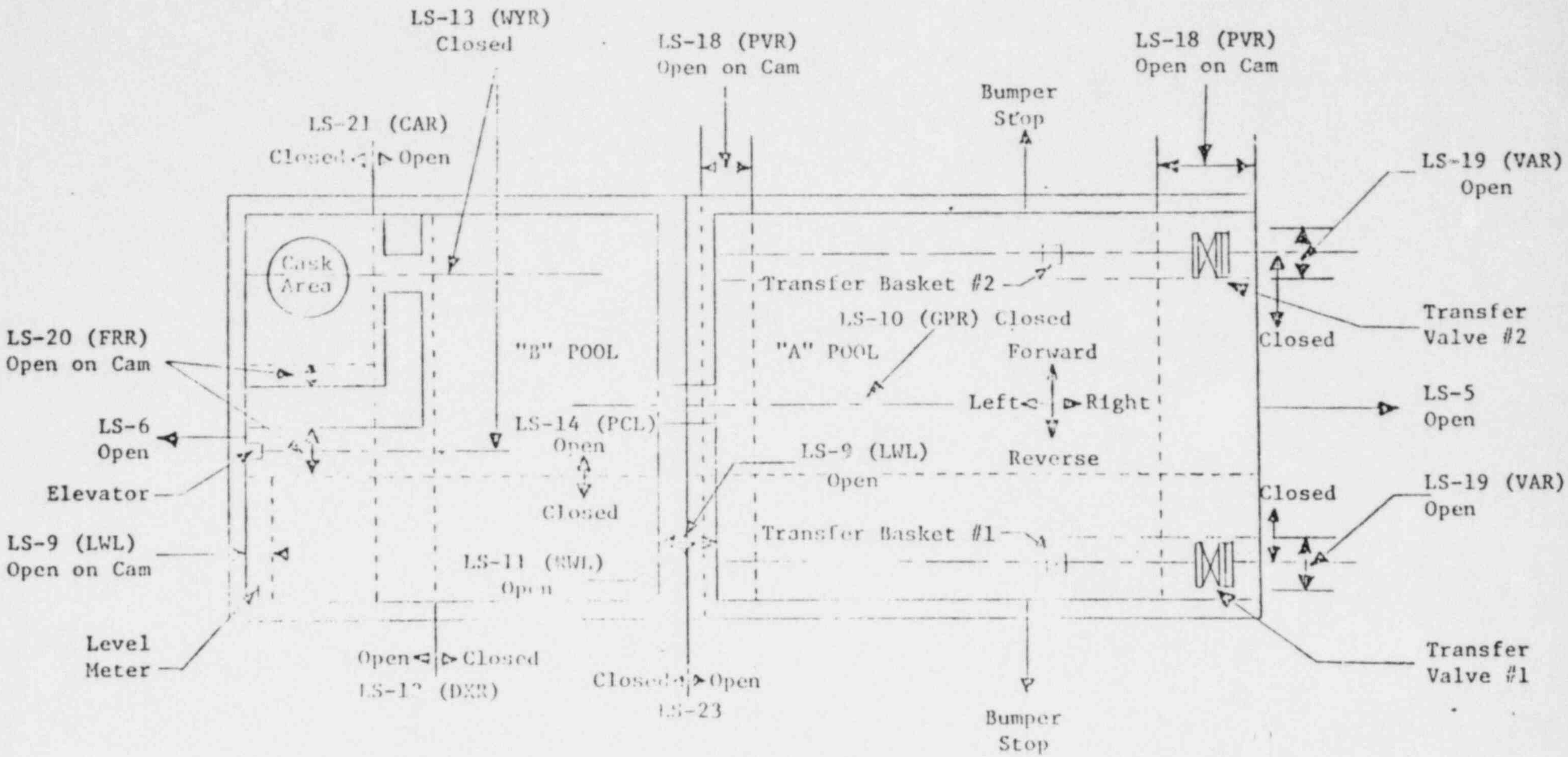
NOTE: Bridge may have to be moved left to clear LS-10, then move the trolley forward to "[illegible]".

6.13 Move bridge to SFA-D8.

6.14 No restoration is required.

6.15 Complete applicable section of the Spent Fuel Handling Bridge Log Sheet attached to bridge console.

6.16 Upon completion of this procedure, notify the Shift Supervisor and enter the results in the Control Center Log.



PLAN VIEW ELECTRICAL INTERLOCKS
SPENT FUEL POOL HANDLING BRIDGE
(FHCR-3)

ENCLOSURE 1
(Page 1 of 2)

LIMIT SWITCHES AND RELAY TITLES

LIMIT SWITCHES

LS-5 - BRIDGE AT RIGHT END LIMIT

LS-6 - BRIDGE AT LEFT END LIMIT

LS-9 - MIDDLE WALL LEFT LIMIT

LS-10 - MIDDLE GATE CENTERLINE

LS-11 - MIDDLE WALL RIGHT LIMIT

LS-12 - CASK LEFT TRAVEL WALL LIMIT

LS-13 - CASK DOOR CENTERLINE AND NEW FUEL ELEVATOR CENTERLINE

LS-14 - PERMISSIVE TO CASK LOADING AREA

LS-18 - BRIDGE PERMISSIVE AT VALVE AREA

LS-19 - TROLLEY STOP AT VALVE AREA

LS-20 - TROLLEY STOP AT CASK INNER WALL

LS-21 - BRIDGE/TROLLEY PERMISSIVE IN CASK AREA

RELAYS

RWL - MIDDLE WALL RIGHT LIMIT RELAY

LWL - MIDDLE WALL LEFT LIMIT RELAY

[illegible] - BRIDGE/TROLLEY PERMISSIVE IN CASK AREA

FRR - TROLLEY STOP AT CASK INNER WALL

DXR - CASK LEFT WALL LIMIT RELAY

WYR - CASK DOOR CENTERLINE RELAY

PCL - CASK LOADING PERMISSIVE

PVR - BRIDGE PERMISSIVE AT VALVE AREA

GPR - MIDDLE GATE PERMISSIVE RELAY

VAR - TROLLEY STOP IN VALVE AREA

- DATA SHEET I -

SPENT FUEL HANDLING BRIDGE INTERLOCK SURVEILLANCE

Procedure Step	Action	Date/Initials
6.1.1.1	Bridge will not move right (LS-5).	
6.1.2.1	Bridge will not move (LS-19).	
6.1.2.2	Trolley will only move reverse (LS-14).	
6.1.3.1	Bridge will not move (LS-19).	
6.1.3.2	Trolley will only move forward (LS-14).	
6.2.2	Bridge will not move (LS-18).	
6.3.2	Bridge will not move (LS-18).	
6.4.1.1	Bridge will not move left (LS-9).	
6.5	Bridge will not move (LS-19).	
6.5.1.2	Trolley will not move forward (bumper stop).	
6.5.1.4	Bridge will not move (LS-18).	
6.5.2.2	Trolley will not move reverse (bumper stop).	
6.5.2.4	Bridge will not move (LS-18).	
6.5.3.2	Bridge will not move (LS-19).	
6.6.1	Trolley will not move (LS-10).	
6.7.1	Bridge will not move (LS-12).	
6.8.1	Trolley will not move (LS-13).	
6.8.2.1	Bridge will not move left (LS-6).	
6.8.3	Trolley will not move forward (bumper stop).	
6.8.4	Trolley will not move (LS-20).	
6.8.5	Bridge will not move (LS-21).	
6.9.3	Bridge will not move right (LS-11).	

DATA SHEET 1 (Cont'd)
SPENT FUEL HANDLING BRIDGE INTERLOCK SURVEILLANCE

Procedure Step	Action	Date/Initials
6.10.3.1	Trolley will not move (LS-13).	
6.10.3.3	Bridge will not move left (fuel elevator permissive).	
6.10.5.1	Trolley will not move (LS-13).	
6.10.5.2	Elevator will not raise (LS-12 and LS-20).	
6.10.8.1	Bridge will not move left (LS-9).	
6.10.9	Trolley will not move (LS-20).	
6.11.1.1	Trolley will not move (LS-10).	

COMMENTS: ______________________________

Performed By ______________ Date ____________

REFUELING PROCEDURE

FP-501

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTOR INTERNALS REMOVAL AND REPLACEMENT

REVIEWED BY: Plant Review Committee

Paul J. McGee

Date 6/15/78

Meeting No. 78-24

APPROVED BY: Nuclear Plant Manager

[illegible]

Date 6/16/78

1.0 PURPOSE

To set forth the steps required for the removal and replacement of the reactor internals.

Procedure	Section
Preparation	8.0
Placing Indexing Fixture on Reactor Vessel Flange	9.0
Removing Indexing Fixture From Reactor Vessel Flange	10.0
Removal of the Plenum - Wet Method	11.0
Replacement of the Plenum - Wet Method	12.0
Removal of the Plenum/Core Support Assembly	13.0
Replacement of the Plenum/Core Support Assembly	14.0
Removal of the Plenum - Dry Method	15.0
Replacement of the Plenum - Dry Method	16.0
Removal of Core Support Assembly Without Plenum	17.0
Replacement of Core Support Assembly Without Plenum	18.0
Installation of Surveillance and Radiation Specimen Capsules	19.0

2.0 DESCRIPTION

2.1 The reactor internal components include the plenum assembly and the core support assembly.

2.2 The core support assembly consists of the core support shield, vent valves, core barrel, lower grid, flow distributor, in-core instrument guide tubes, thermal shield, and surveillance holder tubes. Enclosure 1 shows the reactor vessel (RV), reactor, and the vessel internals arrangement. The reactor internal components do not include fuel assemblies, control rod assemblies (CRA's), surveillance specimen assemblies, or in-core instrumentation. All internal components can be removed from the RV to allow inspection of the reactor internals and the RV internal surface. The core support assembly must be in place during refueling.

2.3 The plenum assembly is located directly above the reactor core and is removed as a single component before refueling. It consists of a plenum cover, upper grid, CRA guide tube assemblies, and a flanged plenum cylinder with openings for reactor coolant (RC) flow. Three lifting lugs are provided for handling the plenum assembly.

2.4 Surveillance specimen capsules may be removed after the plenum is removed.

2.5 Availability of only one storage stand requires that the core support assembly be removed with the plenum. The plenum/core support assembly are removed and replaced as a single unit with the plenum in place in the core support assembly.

NOTE: The plenum may be removed and placed in the shallow end of the refueling canal, which will allow removal of the core support assembly without the plenum.

2.6 The head and internals handling fixture assembly and the internals handling adapter, pendants, and spreader ring have been designed and manufactured to be used for the removal of the RV internals. This handling gear is used when removing the plenum (spreader ring optional with dry method). The same equipment with some modification is used to remove the plenum/core support assembly together as one lift. Replacement of internals is made using the same handling equipment.

2.7 The internals indexing fixture forms an extension of the four RV internals' keys to orient the internals for removal from and insertion into the vessel.

2.8 The internals storage stand is designed to receive either the plenum assembly alone or the core support assembly with the plenum in place.

2.9 The internals handling adapter latch boxes and the indexing fixture alignment stud locks are remotely-operated with the long-handled tools when the refueling canal is flooded.

2.10 The approximate weights of the internals and handling tools are as follows:

98,500 lbs. - Plenum Assembly

257,800 lbs. - Core Support Assembly

12,000 lbs. - Head and Internals Handling Fixture Assembly

3,000 lbs. - Internals Handling Adapter, Pendants, and Spreader Ring

12,500 lbs. - Internals Indexing Fixture

8,200 lbs. - Internals Storage Stand Assembly

(ea.) 850 lbs. - Internals Handling Adapter (Pendant) Assembly

(ea.) 79 lbs. - Internals Indexing Fixture Pendants

3,4[illegible]0 lbs. - Internals Handling Extension

2.11 When removing the plenum assembly, lift weights are as follows:

Plenum Assembly	98,500 lbs.
Head and Internals Handling Fixture	12,000 lbs.
Internals Handling Adapter, Pendants, and Spreader Ring	3,000 lbs.
Internals Handling Extension	3,400 lbs.
TOTAL	116,900 lbs.

2.12 The core support assembly and plenum may be removed as a single unit. The upper 11 ft. of the core support assembly and the entire plenum will be out of the water while the assembly is clearing the flange of the RV. The lift weights are as follows:

Plenum Assembly	98,500 lbs.
Head and Internals Handling Fixture	12,000 lbs.
Internals Handling Adapter, Pendants, and Spreader Ring	3,000 lbs.
Internals Handling Extension	3,400 lbs.
Internals Indexing Fixture	12,500 lbs.
Core Support Assembly	222,920 lbs.
TOTAL	352,320 lbs.
Less Buoyancy in Borated Water	28,000 lbs. (approx.)
ADJUSTED TOTAL	324,320 lbs.

2.13 The fuel transfer canal will be flooded to an elevation of 15- ft., 6 in. while the internals are being moved. The level of the RV flange is 135 ft. The maximum vertical length of the core support assembly (not including the top lifting lugs) is 30 ft. Allowing for a six inch clearance over the RV flange, the top of the core support shield (upper major component of the core support assembly) will be 11 ft. above the water when the bottom of the core support assembly (the projecting tubes) clears the RV flange. The plenum is fully recessed in the core support assembly but the plenum will be fully out of the water when the upper 11 ft. of the core support assembly is out of the water.

NOTE: The plenum may be removed and/or replaced while the refueling canal water level is between six inches below the RV flange and normal refueling level (154 ft., 6 in.), as needed to limit radiation levels.

3.0 REFERENCES

3.1 FP-401, Reactor Vessel Closure Head Removal and Replacement

3.2 FP-402, Reactor Vessel Closure Head Stud Removal and Replacement

3.3 FP-201, Refueling Operation Sequence of Events

3.4 FP-301, Preparation for Refueling

3.5 FP-304, Fill and Drain of the Fuel Transfer Canal

3.6 CP-115, In-Plant Equipment Clearance and Switching Orders

3.7 FP-701, In-Core Monitor Handling

3.8 B & W Dwg. No. 10006, Reactor Vessel Material Surveillance Program

3.9 B & W Dwg. No. 142913E, Plenum Assembly

3.10 B & W Dwg. No. 27065F, Core Support Assembly

3.11 B & W Dwg. No. 165259E, Head and Internals Handling Fixture Assembly

3.12 B & W Dwg. No. 165261E, Internals Handling Adapter, Pendants, and Spreader Ring Arrangement

3.13 B & W Dwg. No. 165262E, Internals Handling Adapter Assembly

3.14 B & W Dwg. No. 28262, Internals Indexing Fixture

3.15 B & W Dwg. No. 165266E, Internals Storage Stand Assembly

3.16 B & W Dwg. No. 105737D, Internals Handling Extension

3.17 B & W Dwg. No. 208574E, Specimen Handling Tool

3.18 B & W Dwg. No. 30757F, Surveillance Capsule Positioner Arrangement

3.19 B & W Dwg. No. 170401E, Surveillance Holder Tube Assembly and Details

3.20 B & W Dwg. No. 1739E, Surveillance Capsule [illegible]

3.21 B & W Dwg. No. 136168E, Long-Handled Tool

3.22 B & W Dwg. No. 136169E, Long-Handled Tool Fittings

3.23 B & W Dwg. No. 208558E, Push Rod Assembly and Details

3.24 B & W Dwg. No. 136368E, Spring Cartridge Assembly

3.25 B & W Dwg. No. 163558E, Surveillance Specimen Storage Rack

3.26 B & W Dwg. No. 51-00-007-03, Surveillance Capsule

3.27 B & W Dwg. No. 32918, Closure Head and Plenum Assembly Handling

3.28 FP-404, Canal Seal Plate Removal and Replacement

3.29 OP-303, Draining and Nitrogen Blanketing of the RC System

3.30 OP-209, Plant Cooldown

3.31 SP-441, Unit Shutdown Surveillance Plan

3.32 SP-443, Master Surveillance Plan

3.33 B & W Dwg. No. 1001435F, Closure Tool Assembly

3.34 B & W Dwg. No. 153809E, Closure and Holddown Assembly

3.35 B & W Dwg. No. 240667E, Surveillance Specimen Guide Tube

3.36 B & W Dwg. No. 1001440E, Pump and Hydraulic Assembly

3.37 B & W Dwg. No. 1001444E, Surveillance Specimen Handling Tool

3.38 B & W Dwg. No. 1001-67D, Torque Shaft Assembly

3.39 B & W Dwg. No. 1-6698D, Mandrel Assembly

4.0 ENCLOSURES

Enclosure 1	Reactor Vessel and Internals General Arrangement (sketch)
Enclosure 2	(deleted)
Enclosure 3	Required Initial Conditions and Plant Status
Enclsoure 4	Figure 1, Surveillance Specimen Holder Tube Locations and Surveillance Specimen Capsule/Closure Assembly Positioning
Enclosure 5	Figure 2, Specimen Capsule and Closure Assembly Storage Rack

5.0 LIMITS AND PRECAUTIONS

5.1 Work may be carried forth only when the temperature of the reactor vessel exceeds the Design Transition Temperature (DTT).

5.2 No welding, burning, chipping, grinding, arc strikes, inadvertent impacts, notches, grooves, or stress concentrations shall be performed on the reactor or reactor internals.

5.3 Prevent contamination of the reactor vessel internals from any source (rags, debris, part pieces, tool parts, or dirty tools, etc.). Secure tools with lanyards for use where they could drop into the reactor vessel. Arrange lights so that breakage would not contaminate. Weld, tape, or otherwise secure equipment parts to prevent accidental disassembly into the reactor vessel. Tape shut the pockets in the clothing of the workmen. Secure with tie lines the glasses worn by the workmen. Maintain required standards of cleanliness for all tools and handling equipment which will be immersed in the RC water. If any loose item is dropped into the reactor vessel or internals, report the circumstances to the Maintenance Supervisor.

5.4 Inspect the head and internals lifting fixture, crane cables, and fittings before lifting the plenum.

5.5 Notify the ChemRad Section before removing any component from the reactor vessel.

5.6 Safety-lock the connecting pins on the head and internals handling fixture prior to use.

5.7 Where use of special tools is directed in this procedure, do not use other tools without first obtaining permission from the Maintenance Supervisor.

5.8 Use a crane lowering speed of less than one foot per minute during the final six inches of travel.

5.9 Do not allow the crane hook to come in contact with RC.

5.10 The ChemRad Section shall be responsible for assuring that radiation levels are monitored to verify that working limits are not exceeded.

5.11 The rigging of the handling equipment has been adjusted to achieve level lifts of the plenum and core support assembly. In order to obtain this level lift, each element of the rigging equipment must be assembled as match-marked during adjustment. The spreader ring and pendant assemblies must be match-marked with respect to each other, to the head and internals handling fixture, and the axes of the RV internals to assure proper orientation and level during all handling operations.

5.12 Prior to removal of RV internals, withdraw the in-core monitoring instruments at least 21 ft. from the fully inserted position.

5.13 Do not load the polar crane in excess of its 180 ton capacity. The core support assembly shall not be hoisted except when the fuel transfer canal is flooded to 154 ft., 6 in.

5.14 Locate the storage rack for the surveillance specimens and dummy capsules so as to minimize radiation exposure.

5.15 Maintain direct communications between the Control Center and the Maintenance Supervisor at the RV when making changes in core equipment.

5.16 Do not use lubricants other than Neolube where contact will be made with RC.

5.17 Before swinging the plenum or the core support assembly over the flange of the reactor, verify that sufficient clearance exists. For the core support assembly, this clearance must be sufficient for the in-core instrument guide tubes which project below the flow distributor. Clearance should be about six inches. Excess clearance will have the undesirable effect of causing more exposure of the core support assembly above the water level.

5.18 Just prior to lifting the indexing fixture, ensure that the ball on the indexing lifting pendant is properly seated in the indexing fixture lifting pad.

5.19 For equipment to component latching/unlatching operations, the use of the long-handled tools, nylon ropes, or local operation is permitted, as appropriate, unless specifically stated otherwise in the procedure or radiation levels are limiting. Radiation levels may inhibit local operations.

5.20 As a minimum, the following instrumentation shall be OPERABLE:

a. Two source range neutron flux monitors, each with visual indication in the Control Room and one with audible indication in the Control Room, and

b. One auxiliary source range neutron flux monitor with audible indication in the containment or one source range neutron flux monitor with audible indication in the containment.

6.0 EQUIPMENT AND PERSONNEL REQUIREMENTS

6.1 Tie-lines for tools used over the reactor.

6.2 Radiation monitors as called out in the Radiation Work Permit (RWP).

6.3 One polar crane operator and five mechanics to work to this procedure, three mechanics of which must be able to perform the rigging operations called out by this procedure.

6.4 Material for cleaning up any spillage of contaminated water.

6.5 Head and Internals Handling Fixture

6.6 Internals Handling Extension

6.7 Indexing Fixture and Pendants

6.8 Spreader Ring

6.9 Internals Handling Adapter and Pendants

6.10 Internals Storage Stand Assembly

6.11 Long-Handled Tool and Fittings (B & W Dwg.'s 136168 and 136169)

6.12 Safety Wire

6.13 Six shim plates and locking pins for the plenum hoist pendants. (These are identified as 253 and 273 on B & W Dwg. 163261E.)

6.14 Power supply (110 volts AC) for lights and power tools.

6.15 Replacement specimen capsules and dummy capsules, as required.

6.16 One copy of this procedure with wooden pencil only.

6.17 Use of the polar crane in the Reactor Building (RB).

6.18 Neolube Lubricant

6.19 Emery cloth and small surface grinders for use on stainless steel.

6.20 Underwater Camera and Lights

6.21 Manually-Operated Hoist (2,000 lb. capacity)

6.22 Equipment for two-way radio communication between the television receiver and the polar crane cab during transfer of the plenum and plenum/core support assembly.

6.23 Nylon Ropes (approximately 60 ft. long and approximately 3/8 in. diameter)

7.0 REQUIRED INITIAL CONDITIONS AND PLANT STATUS

NOTE: Complete Enclosure 3 to show that each condition of Section 7.0 has been met.

7.1 The reactor building has been cleared for entry by the ChemRad Protection Engineer.

7.2 Clean the internals handling extension, the head and internals handling fixture, and the internals handling adapter, pendants, and spreader ring prior to use.

7.3 Missile shield slabs removed to storage location shown on GAI Dwg. No. L-001-032.

7.4 The RC system has been cooled and depressurized in accordance with OP-209, Plant Cooldown.

7.5 Head seal leak-off valve to reactor building normal sump closed.

7.6 The RC system has been drained and blanketed in accordance with OP-303, Draining and Nitrogen Blanketing of the RC System, to bring the coolant level in the reactor vessel between two and six inches below the flange.

7.7 Reactor vessel closure head removed in accordance with FP-401, Reactor Vessel Closure Head Removal and Replacement.

7.8 Canal seal plate in place in accordance with FP-404, Canal Seal Plate Removal and Replacement.

7.9 All in-core monitoring instruments have been withdrawn at least 21 feet from the fully inserted position in accordance with FP-701, In-Core Monitor Handling.

7.10 Clean the internals storage stand and store in the deep end of the fuel transfer canal with one of its guide block cut-outs aligned with the W, X, Y, and Z axis positions of the reactor. If any dirt or debris is present on the internals storage stand when the canal is flooded over the reactor vessel, the RC will be contaminated.

7.11 An approved RWP and Equipment Clearance Order.

7.12 Adequate lighting has been installed to make possible remote, visual verification that the plenum and core support assembly clear the RV flange during transfer.

7.13 The fuel transfer canal has been washed down in accordance with FP-304, Fill and Drain of the Fuel Transfer Canal.

7.14 Prior to and during any core alterations, the Shift Supervisor will verify that all Surveillance Procedures required per SP-441, Unit Shutdown Surveillance Plan, and SP-443, Master Surveillance Plan, are being completed within the prescribed time frames as stated within SP-441 and SP-443.

8.0 PREPARATION | Initials

NOTE:

a. Man in charge shall initial the blank to right of each section (Sections 8.0 through 17.0) after completion of that step.

b. Complete Enclosure 3 before starting work.

8.1 A Radiation Work Permit (from the ChemRad Section) and an Equipment Clearance Order (from the Operations Section per CP-115, In-Plant Equipment Clearance and Switching Orders) have been approved and issued. ________

8.2 The limits and precautions of Section 5.0 have been noted. ________

8.3 Equipment and personnel are available as listed in Section 6.0. ________

8.4 The initial conditions of Section 7.0 have been met. ________

8.5 The handling and indexing fixtures and special tools will be submerged in the pool water. Carefully clean these fixtures before submerging so as to avoid contaminating the RC. Remove any loose dirt and rust; wash down with demineralized water. While cleaning, inspect for any visually apparent evidence of cracking or yielding. Apply a light film of Neolube to bearing holes. The fixtures include the following: ________

a. Head and Internals Handling Fixture (B & W Dwg. No. 165259E)

b. Internals Handling Extension (B & W Dwg. No. 10573D)

c. Pendants (B & W Dwg. No. 165261E)

d. Indexing Fixture (B & W Dwg. PD 28262)

e. Spreader Ring (B & W Dwg. 165261E)

f. Internals Handling Adapter (B & W Dwg. 165261E)

g. Long-Handled Tool (B & W Dwg. 136168E)

h. Long-Handled Tool Fittings (B & W Dwg. 136169E)

i. Internals Storage Stand Assembly (B & W Dwg. 165268E)

8.6 Check all latches for freedom of action. Lubricate with Neolube, as necessary. ______

8.7 Do not adjust or loosen turnbuckles during assembly. Safety-lock pins and nuts wherever provision is made for safety locking. ______

8.8 Pin the internals handling extension to the polar crane and safety-lock pins and nuts. ______

8.9 Pin the head and internals handling fixture to the internals handling extension and safety-lock pins and nuts. ______

8.10 Check guide keys on the internals indexing fixture for evidence of galling. Dress surface lightly to restore finish if required. Do not remove base metal. ______

8.11 Open all latches and locking bars. ______

8.12 Install the canal seal plates in accordance with FP-404, Canal Seal Plate Removal and Replacement. ______

8.13 Assure lights are installed and operating satisfactorily. ______

8.14 Verify that radiation monitoring equipment as called out in the Radiation Work Permit is operating satisfactorily. ______

8.15 Verify that communication is satisfactory between the Test Supervisor and the polar crane operator. ______

9.0	PLACING INDEXING FIXTURE ON REACTOR VESSEL FLANGE	Initials
9.1	Remove the pendants from the indexing fixture and attach them to the outboard holes in the head and internals handling fixture. Match each pendant to the corresponding marked hole.	________
	NOTE: The internals indexing fixture may be installed prior to flooding the refueling canal, if radiation levels permit.	
9.2	Position handling fixture over indexing fixture. Rotate to proper orientation so as to match each pendant to the corresponding marked mating socket on the indexing fixture. Engage lifting pendants and close locking bars.	________
9.3	Lift indexing fixture. Clean bottom flange as necessary to remove loose rust and contamination. Open the guide stud locks.	________
9.4	Move the fuel handling bridges clear of the RV.	________
9.5	Orient the axis of the indexing fixture with the axis of the RV over the RV. Position the indexing fixture guide stud locks over the guide studs and lower the indexing fixture to rest on the RV flange.	________
9.6	Rotate the guide stud locks into locking position and latch. Move locking bars on indexing fixture pendants to the open position. Disengage the indexing fixture lifting pendants from their mating sockets. Work from a convenient location within safe radiation limits.	________

9.7 Hoist the head and internals handling fixture (with the indexing fixture lifting pendants) to a convenient location. ______

CAUTION: Guide indexing fixture lifting pendants to clear the lifting pads.

9.8 Remove the indexing fixture pendants from the head and internals handling fixture. ______

10.0	REMOVING INDEXING FIXTURE FROM REACTOR VESSEL FLANGE	Initials
10.1	Attach the indexing fixture pendants to the outboard holes in the lifting pads of the head and internals handling fixture. Match each pendant to the corresponding marked hole.	______
	NOTE: The internals indexing fixture may be removed prior to flooding the refueling canal, if radiation levels permit.	
10.2	Move the fuel handling bridge clear of the RV.	______
10.3	Position the Handling fixture over the indexing fixture. Rotate to same orientation as when the indexing fixture was placed on the RV. (See Step 9.2.)	______
10.4	Lower the handling fixture so as to engage each pendant to the corresponding mating socket and close the locking bars.	______
10.5	Rotate the guide stud locks to the unlocked position.	______
10.6	Hoist the indexing fixture clear of the guide studs and move to assigned storage. Rinse down with demineralized water as necessary to reduce radioactive contamination to an acceptable level.	______
10.7	Remove the indexing fixture pendants from the head and internals handling fixture. Move the pendants to assigned storage.	______

11.0	REMOVAL OF THE PLENUM - WET METHOD	Initials
11.1	Place the indexing fixture in accordance with Section 9.0.	______
11.2	Move fuel handling bridges to the opposite end of the refueling canal from which the plenum is to be placed (park clear of RV).	______
11.3	Attach the internals handling adapters, pendants, and spreader ring (See note of Step 15.3.) to inboard holes in the pads of the head and internals handling fixture. Match all elements as indicated by match-marks. Latches should be closed; they will open and close automatically during latching operations. Pendants must be in position for plenum lift.	______
	NOTE: Nylon ropes may be tied to the latches for ease of remote unlatching, if desired.	
11.4	Move the assembly into position over the reactor center with the auxiliary hook oriented to the east of the main hook. Orient the assembly so the axis coincides with the RV axis and alignment marks for bridge and trolley positions are correctly aligned. Lower so as to engage the latch of each pendant (See note, this section.) with the corresponding plenum lifting lug.	______

NOTE: The "A" pendant of the lifting assembly should engage the "Y" axis lifting lug of the plenum. The distances between the eyebolt shafts should be approximately: "A" leg - 2.828 in., "B" leg - 2.418 in., and "C" leg - 2.500 in.

WARNING: The plenum is highly radioactive. As the plenum is raised and the shielding layer of water is reduced in thickness, the radiation level will increase in the area above. Clear the area of all non-essential personnel. Insofar as possible, work from shielded or remote locations. It is anticipated that only the crane operator will be needed while the plenum is being moved.

11.5 Hoist the plenum clear of the indexing fixture. Verify clearance over RV flange. Keep the crane operator advised. Place the plenum in the internals storage stand assembly or the shallow end of the refueling canal, as desired. Disengage latches: hoist the lifting assembly clear. ______

11.6 Hoist the pendants to a storage area. ______

11.7 Remove the indexing fixture in accordance with Section 10.0. ______

12.0	REPLACEMENT OF THE PLENUM - WET METHOD	Initials
12.1	Place the indexing fixture in accordance with Section 9.0.	________
12.2	Move fuel handling bridges to the opposite end of the refueling canal from the plenum and park clear of the RV.	________
12.3	Attach the internals handling adapter, pendants, and spreader ring (See note of Step 15.3.) to inboard holes in the pads of the head and internals handling fixture. Match all elements as indicated by the match-marks. Latches should be closed; they will open and close automatically during latching operations. Pendants must be in position for plenum lift.	________
	NOTE: Nylon ropes may be tied to the latches for ease of remote unlatching, if desired.	
12.4	Hoist the lifting assembly over the plenum with the auxiliary hook oriented to the east of the main hook. Match the pendants to the corresponding lifting lugs. (See "Note" of Step 11.4.) Lower the lifting assembly so as to engage the latch of each pendant to the corresponding plenum lifting lug.	________
	NOTE: Use crane speed of less than six inches per minute while within one foot of metal-to-metal contact.	
12.5	Hoist the plenum over the RV and align the bridge and trolley with their respective alignment marks for plenum replacement. Verify clearance over the RV flange. Keep the crane operator advised. Orient	

the assembly so the assembly axis lines up with the RV axis with the "W" of the plenum assembly towards the west side of the RB and the keyways are aligned with the keys of the indexing fixture. Lower the plenum to engage the keys in the indexing fixture. Continue lowering to rest. ______

12.6 Working from the handling bridge or other convenient location within safe radiation limits, disengage the latch of each pendant. ______

12.7 Hoist the internals handling adapter and pendants to a storage area; remove these fixtures and leave them in the storage area. ______

12.8 Remove the indexing fixture in accordance with Section 10.0. ______

13.0	REMOVAL OF THE PLENUM/CORE SUPPORT ASSEMBLY	Initials
13.1	Remove the plenum in accordance with Section 11.0 or 15.0.	______
13.2	Verify that the RV has been defueled and that this procedure is in its correct position in FP-201, Refueling Operation Sequence of Events.	______
	NOTE: Steps 13.3 thru 13.15 may be performed with the refueling canal level two to six inches below the RV flange, if radiation levels will permit.	
13.3	Replace the plenum in accordance with Section 12.0 or 16.0 but leave the indexing fixture in place on the RV flange.	______
13.4	Park both fuel handling bridges clear of the RV at the shallow end of the refueling canal.	______
13.5	Place the internals storage stand in a clear space in the deep end of the canal.	______
13.6	Attach the internals handling extension to the main hook of the polar crane.	______
13.7	Attach the head and internals handling fixture to the internals handling extension.	______
13.8	Attach the internals handling adapter, pendants, and spreader assembly (See note of Step 13.3.) to inboard holes in pads of the head and internals handling fixture. Match all elements as indicated by match-marks for lift	

of the core support assembly. Position the pendants on the spreader ring for the core support assembly lift. (See note of Step 15.3.) ____________

13.9 Attach the indexing fixture pendants to the outboard holes in the lifting pads of the head and internals handling fixture. Match each pendant to the corresponding marked hole. ____________

NOTE: The "A" pendant leg should be positioned on "W" lifting lug on core support assembly. The distances between eyebolt shafts should be "A" - 2.856 in.; "B" - 2.070 in.; and "C" - 2.658 in.

13.10 Open pendant locking bars on the indexing fixture. ____________

13.11 Hoist the lifting assembly and position it over the RV with the auxiliary hook oriented east of the main hook. Rotate to proper orientation so as to match each indexing fixture pendant to its corresponding marked socket on the indexing fixture and alignment marks for the bridge and trolley positions are correctly aligned.

NOTE: A fuel handling bridge may be brought up temporarily for use as a working platform (for Steps 13.12 thru 13.18). Work from an area which is being monitored for radiation safety. Maintain monitoring during transfer of the internals.

13.12 Lower the assembly to engage the four keyways of the spreader ring with the four keys of the indexing fixture. (See note of Step 15.3.) The indexing fixture pendants will ride over the lifting pendant pads while lowering. Guide the rod section of each indexing fixture pendant into its slot in the indexing fixture lifting pad. Guide the pendants on the spreader ring as necessary. (If used, see note of Step 15.3.) ______

13.13 Continue lowering until lifting assembly comes to rest. ______

13.14 Engage the internals handling adapter latches. ______

13.15 Close the locking bars on the internals indexing fixture. ______

13.16 Flood the refueling canal to an elevation of 154 ft., 6 in. if not already at this level. ______

CAUTION: This next hoist is near maximum for the polar crane.

13.17 Hoist the core support assembly until the upper ends of the control rod guide tubes are approximately flush with the top of the indexing fixture. Stop the hoist. ______

13.18 Using the long-handled tool (35 ft. with hook attachment), rotate the locking bars to release the alignment stud lock on the indexing fixture. Upon completion, move the bridge to the shallow end of the fuel transfer canal. ______

WARNING: a. Approximately 11 ft. of the plenum/core support assembly will be exposed during transfer to the internals storage stand. Radiation levels will be high.

b. Clear the area of all personnel except the crane operator.

13.19 Raise the assembly until the in-core instrument guide tubes will clear the reactor flange. Keep the crane operator advised. ______

13.20 Move the assembly across the reactor flange, avoiding impact with the alignment studs. ______

13.21 Move the assembly into position over the internals storage stand. Lower until the core support assembly comes to rest on the stand. Radially orient the core support assembly to position the shock pads over the stand cutouts. ______

13.22 Release the internals handling adapter latches. Personnel must re-enter the area for this and succeeding operations. Monitor the radiation level. If convenient, move one of the fuel handling cranes into position as a working platform. ______

13.23 Hoist the internals handling adapter, pendants, spreader ring, the indexing fixture and its pendants to a convenient storage area. ______

NOTE: The fuel transfer canal water level may be lowered, as necessary, to permit access to the RV interior. Minimize lowering; the water serves as a radiation shield against the radiation sources in the core support assembly and the RV.

14.0 REPLACEMENT OF THE PLENUM/CORE SUPPORT ASSEMBLY — Initials

14.1 Attach the internals handling adapter, pendants, and spreader assembly (See note of Step 15.3.) to the inboard holes in the pads of the head and internals handling fixture. Match all elements as indicated by the match-marks. Latches should be closed; they will open and close automatically during latching operations. Pendants must be in position for the core support assembly lift. (See note of Step 13.9.) ________

14.2 Attach the indexing fixture pendants to the outboard holes in the lifting pads of the head and internals handling fixture. Match each pendant to the corresponding marked hole. Attach the indexing fixture and close locking bars. Open the guide stud latches. ________

14.3 Verify that the water level in the fuel transfer canal is at elevation 154 ft., 6 in. ________

14.4 Move the fuel handling bridges to the shallow end of the refueling canal and clear of the plenum/core support assembly. ________

14.5 Position the lifting assembly over the plenum/core support assembly. Rotate the lifting assembly to match up the lifting lugs and pendants (same as Step 13.11 or 17.10). ________

19.2 INSTALLATION OF SPECIMEN CAPSULES AND/OR DUMMY CAPSULES

19.2.1 Initial Conditions

19.2.1.1 Fuel transfer canal water level between six inches below RV flange and normal refueling depth according to the level of radiation. ______

19.2.1.2 RV head and plenum assembly removed from the RV. ______

19.2.1.3 The storage container located in the deep end of the refueling canal. ______

19.2.1.4 New and/or dummy specimen capsules located in a storage container. ______

19.2.2 Install the surveillance specimen guide tube (guide tube) by performing the following steps:

19.2.2.1 Lower an underwater television camera through a vent valve exercise port adjacent to the desired surveillance holder tube. This will provide remote viewing capability to ensure that the guide tube enters the surveillance holder tube. ______

19.2.2.2 Attach a chain fall and 0 to 1,000 lb. load cell to a suitable lifting hoist. With the mandrel inserted into the guide tube, attach both the mandrel and guide tube cables to the load cell, position the guide tube over the desired surveillance holder tube, and lower the guide tube through the port in the core support assembly (CSA) flange. ______

19.2.2.3 Observe the load cell for an indication of when the guide tube is fully bottomed in the surveillance holder tube. ______

19.2.2.4 Lower the bail of the guide tube away from the reactor core. Disconnect the guide tube cable from the load cell and tie off to a convenient point. ______

19.2.2.5 Remove the mandrel from the guide tube and store. ______

19.2.3 Attach the specimen handling tool (handling tool) to a speciman capsule as follows:

19.2.3.1 Attach the handling tool to the load cell. ______

19.2.3.2 Record the weight of the handling tool. ______

19.2.3.3 Ensure that the push tube is in the retracted position by raising the grip to the upper position and inserting the bal-lok pin through the grip and the outer tube. ______

19.2.3.4 Lower the handling tool onto the specimen capsule, insuring proper axial position. ______

NOTE: With the bal-lok pins on the handling tool positioned nearest the operator, the pointed or longer side of the end cap wedge will be on the operator's left.

19.2.3.5 With the handling tool properly positioned, remove the bal-lok pin, lower the grip to the lower position, and install the bal-lok pin through the grip and the outer tube. ______

19.2.3.6 Raise the handling tool and observe an increase of 30 to 50 lbs. greater than that noted in Step 19.2.3.2. Record the weight of the handling tool and specimen capsule. ______

14.6 Align keys in indexing fixture with keyways in core support assembly and lower the lifting assembly until the internals handling adapters come to rest on the lifting lugs. ______________

14.7 Ensure the internals handling adapter latches are engaged.

CAUTION: The lift of the core support assembly/plenum is near maximum for the polar crane.

WARNING: a. Approximately 11 ft. of the plenum/core support assembly will be exposed during transfer to the internals storage stand. Radiation levels will be high.

b. Clear the area of all personnel except the crane operator.

14.8 Hoist the assembly over the RV with the same orientation as when removed. (See Step 13.11.) Verify clearance over the RV flange. Keep the crane operator advised. Avoid impact with the alignment studs. Monitor clearance over the RV flange. ______________

14.9 Orient the axis of the indexing fixture with the axis of the [illegible] over the RV with "[illegible]" of the plenum/core support assembly directed towards the west side of the RB. Position the indexing fixture guide stud locks over the guide studs and lower the indexing fixture to rest on the RV flange, then cease lowering. ______ ______

14.10 Using the long-handled tool (35 ft. with hook attachment), rotate the guide stud locks into locking position and latch. ______

NOTE: It is not necessary to lock the guide studs to the indexing fixture when lowering the plenum/core support assembly.

14.11 Continue lowering the plenum/core support assembly until the assembly comes to rest in place. ______

14.12 Disengage the latches on the internals handling adapters. Rotate the locking bars at the top of the indexing fixture to the open position (if previously locked). ______

14.13 Hoist lifting equipment clear of the RV. ______

CAUTION: The indexing fixture lifting pendants must be guided clear of the lifting pads (using long-handled tool).

14.14 Rerig the lifting assembly (for the plenum lift) and remove the plenum in accordance with Section 11.0 or 15.0, when required (i.e., for fuel loading). ______

14.15 Replace the plenum in accordance with Section 12.0 or 16.0, if not already in place. ______

14.16 Remove the indexing fixture in accordance with Section 10.0. ______

15.0 REMOVAL OF THE PLENUM - DRY METHOD — Initials

NOTE: The dry method is used when radiation levels permit and the refueling canal water level is two to six inches below the RV flange.

15.1 Place indexing fixture in accordance with Section 9.0. __________

NOTE: This step is optional.

15.2 Move fuel handling bridges to the opposite end of the refueling canal from which the plenum is to be placed (park clear of RV). __________

15.3 Attach the internals handling adapters and pendants to the inboard holes in the ads of the head and internals handling fixture. Match all elements as indicated by match-marks. Latches should be closed; they will open and close automatically during latching operations. Shims should be in place and safety wired. __________

NOTE: If desired, the spreader ring may be used for this method, but it is not necessary.

15.4 Move the assembly into position over the reactor center with the auxiliary hook of the polar crane oriented to the east of the main hook. Orient the assembly so the axis coincides with the RV axis and alignment marks for the bridge and trolley positions are correctly aligned. Lower the assembly so as to engage the latch of each pendant (see "Note" below) with the corresponding plenum lifting lug. __________

NOTE: The "X" pendant of the lifting assembly should engage the "Y" axis lifting lug of the plenum. The distances between the eyebolt shafts should be: "A" leg - 2.828 in., "B" leg - 2.418 in., and "C" leg - 2.500 in.

WARNING: The plenum is highly radioactive. As the plenum is raised and the shielding layer of water is reduced in thickness, the radiation level will increase in the area above. Clear the area of all non-essential personnel. Insofar as possible, work from shielded or remote locations. It is anticipated that only the crane operator will be needed while the plenum is being moved.

15.5 Hoist the plenum clear of the indexing fixture. Verify clearance over RV flange. Keep the crane operator advised. Place the plenum in the internals storage stand assembly or the shallow end of the refueling canal, as desired. Disengage latches; hoist the lifting assembly clear. ________

15.6 Hoist the pendants to a storage area. ________

15.7 Remove the indexing fixture in accordance with Section 10.0, if required. ________

16.0	REPLACEMENT OF THE PLENUM - DRY METHOD	Initials
	NOTE: The dry method is used when radiation levels permit and the refueling canal water level is two to six inches below the RV flange.	
16.1	Place the indexing fixture in accordance with Section 9.0.	______
16.2	Move the fuel handling bridges to the opposite end of the refueling canal from the plenum and park clear of the RV.	______
16.3	Attach the internals handling adapter and pendants to the inboard holes in the pads of the head and internals handling fixture. Match all elements as indicated by the match-marks. Latches should be closed; they will open and close automatically during latching operations. Shims and safety wires should be in place.	______
	NOTE: If desired, the spreader ring may be used for this method, but it is not necessary.	
16.4	Hoist the lifting assembly over the plenum with the auxiliary hook of the polar crane oriented to the east of the main hook. Match the pendants to the corresponding lifting lugs. (See "Note" of Step [illegible].) Lower the lifting assembly so as to engage the latch of each pendant to the corresponding plenum lifting lug.	______
	NOTE: Use crane speed of less than six inches per minute while within one foot of metal-to-metal contact.	

16.5 Hoist the plenum over the RV and align the bridge and trolley with their respective alignment marks for plenum replacement. Verify clearance over the RV flange. Keep the crane operator advised. Orient the assembly so the assembly axis lines up with the RV axis with the "W" of the plenum assembly towards the west side of the RB and the keyways are aligned with the keys of the indexing fixture. Lower the plenum to engage the keys in the indexing fixture. Continue lowering to rest. ____________

16.6 Disengage the latch of each pendant. ____________

16.7 Hoist the internals handling adapter and pendants to a storage area; remove these fixtures and leave them in the storage area. ____________

16.8 Remove the indexing fixture in accordance with Section 10.0. ____________

17.0	REMOVAL OF CORE SUPPORT ASSEMBLY WITHOUT PLENUM	Initials
17.1	Remove the plenum in accordance with Section 11.0 or 15.0. The plenum must be placed in the shallow end of the refueling canal and the indexing fixture may be in place on the RV flange, if desired.	______
	NOTE: This assumes that defueling is complete.	
17.2	Verify that the RV has been defueled and that this procedure is in its correct position in FP-201, Refueling Operation Sequence of Events.	______
	NOTE: Steps 17.3 thru 17.14 may be performed with the refueling canal level two to six inches below the RV flange, if radiation levels will permit.	
17.3	Park both fuel handling bridges clear of the RV at the shallow end of the refueling canal.	______
17.4	Place the internals storage stand in a clear space in the deep end of the canal.	______
17.5	Attach the internals handling extension to the main hook of the polar crane.	______
17.6	Attach the head and internals handling fixture to the internals handling extension.	______
17.7	Attach the internals handling adapter, pendants, and spreader assembly to the inboard holes in the pads of the head (See note of Step 15.3.) and internals handling fixture. Match all elements as indicated by match-marks for lift of the core support assembly. Position the	

pendants on the spreader ring (See note of Step 15.3.) for the core support assembly lift. __________

NOTE: Steps 17.8 thru 17.14 and Step 17.17 are optional.

17.8 Attach the indexing fixture pendants to the outboard holes in the lifting pads of the head and internals handling fixture. Match each pendant to the corresponding marked hole. __________

NOTE: The "A" pendant leg should be positioned on the "[illegible]" lifting lug on the core support assembly. The distances between eyebolt shafts should be the same as in Step 13.9.

17.9 Open pendant locking bars on the indexing fixture. __________

17.10 Hoist the lifting assembly and position it over the RV. Rotate to proper orientation so as to match each indexing fixture pendant to its corresponding marked socket on the indexing fixture. __________

NOTE: A fuel handling bridge may be brought up temporarily for use as a working platform (for Steps 17.11 thru 17.17). Work from an area which is being monitored for radiation safety. Maintain monitoring during transfer of the internals.

17.11 Lower the assembly to engage the four keyways of the spreader ring with the four keys of the indexing fixture. The indexing fixture pendants will ride over the lifting pendant pads while lowering. Guide the rod section of each indexing fixture pendant into its slot in the indexing fixture lifting pad. Guide the pendants on the spreader ring as necessary. ______

17.12 Continue lowering until the lifting assembly comes to rest. ______

17.13 Engage the internals handling adapter latches. ______

17.14 Close the locking bars on the internals indexing fixture. ______

17.15 Flood the refueling canal to an elevation of 154 ft., 6 in. if not already at this level. ______

CAUTION: This next hoist is near maximum for the polar crane.

17.16 Hoist the core support assembly until the upper ends of the control rod guide tubes are two feet above vessel flange if indexing fixture is not used. Stop the hoist. ______

17.17 Using the long-handled tool (35 ft. with hook attachment), rotate the locking bars to release the alignment stud lock on the indexing fixture. Upon completion, move the bridge to the shallow end of the fuel transfer canal. ______

17.18 Raise the assembly until the in-core instrument guide tubes will clear the reactor flange. Keep the crane operator advised. ______

WARNING: a. Approximately 11 ft. of the core support assembly will be exposed during transfer to the internals storage stand. Radiation levels will be high.

b. Clear the area of all personnel except the crane operator.

17.19 Move the assembly across the reactor flange, avoiding impact with the alignment studs. ______

17.20 Move the assembly into position over the internals storage stand. Lower until the core support assembly comes to rest on the stand. Radially orient the core support assembly to position the shock pads over the stand cutouts. ______

17.21 Release the internals handling adapter latches. Personnel must re-enter the area for this and succeeding operations. Monitor the radiation level. If convenient, move one of the fuel handling cranes into position as a working platform. ______

17.22 Hoist the internals handling adapter and pendants to a convenient storage area. ______

NOTE: The fuel transfer canal water level may be lowered, as necessary, to permit access to the RV interior. Minimize lowering; the water serves as a radiation shield against the radiation sources in the core support assembly and the RV.

18.0	REPLACEMENT OF CORE SUPPORT ASSEMBLY WITHOUT PLENUM	Initials
18.1	Attach the internals handling adapter, pendants, and spreader assembly (See note of Step 15.3.) to inboard holes in pads of head and internals handling fixture. Match all elements as indicated by match-marks. Latches should be closed; they will open and close automatically during latching operations. Shims must be removed from latch boxes. Pendants must be in position on the spreader ring for the core support assembly lift.	______
18.2	Attach the indexing fixture pendants to the outboard holes in the lifting pads of the head and internals handling fixture. Match each pendant to the corresponding marked hole. Attach the indexing fixture and close locking bars. Open the guide stud latches.	______
18.3	Verify that the water level in the fuel transfer canal is at elevation 134 ft., 6 in.	______
18.4	Move the fuel handling bridges to the shallow end of the refueling canal and clear of the RV.	______
18.5	Position the lifting assembly over the plenum/core support assembly. Rotate the lifting assembly to match up the lifting lugs and pendants (same as Step 13.11 or 17.10).	______
18.6	Align keys in indexing fixture with keyways in core support assembly and lower the lifting assembly until the internals handling adapters come to rest on the lifting lugs.	______

18.7 Ensure the internals handling adapter latches are engaged. ________

WARNING: a. Approximately 11 ft. of the core support assembly will be exposed during transfer to the internals storage stand. Radiation levels will be high.

b. Clear the area of all personnel except the crane operator.

18.8 Hoist the assembly over the RV with the same orientation as when removed. Verify clearance over the RV flange. Keep the crane operator advised. Avoid impact with the alignment studs. Monitor clearance over the RV flange. ________

18.9 Orient the axis of the indexing fixture with the axis of the RV, over the RV. Position the indexing fixture guide stud locks over the guide studs and lower the indexing fixture to rest on the RV flange, then cease lowering. ________

18.10 Using the long-handled tool (35 ft. with hook attachment), rotate the guide stud locks into locking position and latch. ________

NOTE: It is not necessary to lock the guide studs to the indexing fixture when lowering the core support assembly.

18.11 Continue lowering the plenum/core support assembly until the assembly comes to rest in place. ________

18.12 Disengage the latches on the internals handling adapters. Rotate the locking bars at the top of the indexing fixture to the open position (if previously locked). ______

18.13 Hoist lifting equipment clear of the RV. ______

CAUTION: The indexing fixture lifting pendants must be guided clear of the lifting pads (using long-handled tool).

18.14 Replace the plenum in accordance with Section 12.0 or 16.0. ______

18.15 Remove the indexing fixture in accordance with Section 10.0. ______

19.0 INSTALLATION OF SURVEILLANCE AND RADIATION SPECIMEN CAPSULES

19.1 SPECIAL PRECAUTIONS

Initials

19.1.1 Locate a suitable storage container such that the required operation may be performed with minimal radiation exposure to personnel. ______

19.1.2 The closure tool assembly (closure tool) and specimen handling tool should be stored in a suspended manner. This will prevent damage to the lower ends of these tools. ______

19.1.3 Extreme caution must be exercised when installing the specimen capsules and closure assemblies to assure proper azimuthal orientation. When installing the lower specimen capsule or the closure assembly, the pointed (longer) side of the end cap wedge must be on the operator's right while viewing the surveillance holder tube from the center of the RV. When installing the upper specimen capsule, the pointed (longer) side of the end cap wedge must be on the operator's left while viewing the surveillance holder tube from the center of the RV. Refer to Figure 1. ______

19.1.4 To permit small vertical movements of the specimen capsules and closure assembly, a chain hoist shall be located between the hoist hook and load cell. ______

19.1.5 During all operations in which the closure assembly is attached to the closure tool, the balancer should be adjusted to minimize axial loading of the closure locking screw by the closure tool torque shaft. ______

19.2.4 Raise the handling tool and specimen capsule sufficiently to clear the storage container. Verify and record the specimen capsule serial number per Step 19.2.12. ______

19.2.5 Position the specimen capsule directly over the guide tube. Assure proper azimuthal orientation of the specimen capsule per Step 19.1.3 as follows:

19.2.5.1 For the LOWER specimen capsule, the bal-lok pins on the handling tool should be on the side of the tool nearest the center of the reactor core. ______

19.2.5.2 For the UPPER specimen capsule, the bal-lok pins on the handling tool should be on the side of the tool away from the center of the reactor core. ______

19.2.6 Lower the specimen capsule into the surveillance holder tube. Maintain proper azimuthal orientation of the specimen capsule per Step 19.2.5 above. ______

19.2.7 Unlatch the handling tool from the specimen capsule as follows:

19.2.7.1 Remove the bal-lok pin and raise the grip to the upper position; insert the bal-lok pin through the grip and outer tube. ______

19.2.7.2 Raise the handling tool six to 10 in. Observe the load cell reading equals that obtained in Step 19.2.3.2. ______

19.2.7.3 Remove the handling tool from the guide tube. ______

19.2.8 Repeat Steps 19.2.3 thru 19.2.7 for the specimen capsule that is to be installed in the upper position in the surveillance holder tube. ______

19.2.9 Remove the handling tool from the load cell and store. ______

NOTE: To prevent damage to the latching fingers of the handling tool, the tool must be stored in a suspended position.

19.2.10 Install the closure assembly per Section 19.4 of this procedure. ______

19.2.11 Install the mandrel in the guide tube. Remove and store the guide tube and mandrel as an assembly. ______

19.2.12 Record the following:

a. Specimen Capsule and Closure Assembly Serial Numbers ______

b. Azimuthal location of specimen capsules and closure assembly in RV. ______

c. Vertical location of specimen capsules in surveillance holder tube. ______

19.2.13 Repeat Steps 19.2.2 thru 19.2.12 for the remaining surveillance holder tubes. ______

19.3 <u>REMOVAL OF SPECIMEN CAPSULES AND/OR DUMMY CAPSULES</u>

19.3.1 <u>Initial Conditions</u>

19.3.1.1 Fuel transfer canal water level between six inches below RV flange and normal refueling depth according to the level of radiation. ______

19.3.1.2 RV head and plenum assembly removed from the RV. ______

19.3.1.3 The storage container located in the deep end of the refueling canal. ______

19.3.2 Install the guide tube per Step 19.2.2 of this procedure. ______

19.3.3 Remove the closure assembly per Section 19.5 of this procedure. ______

19.3.4 Attach the handling tool to a suitable hoist with a load cell located between the tool and hoist hook. Record the tool weight. ______

19.3.5 Insure that the push tube is in the retracted position by raising the grip to the upper position and inserting the bal-lok pin through the grip and the outer tube. ______

19.3.6 Position the handling tool over the surveillance holder tube. Assure proper axial orientation per Step 19.2.5. Lower the tool and attach it to the upper specimen capsule by performing Step 19.2.3.5 of this procedure. ______

19.3.7 Raise the handling tool six to 10 in. Observe an increase of 30 to 50 lbs. greater than that noted in Step 19.3.4. ______

19.3.8 Remove the specimen capsule from the surveillance holder tube, place it in a suitable container, and disconnect the handling tool from the specimen capsule per Step 19.2.7 of this procedure. Verify specimen capsule serial number per Step 19.3.10. ______

19.3.9 Repeat Steps 19.3.6 thru 19.3.8 for the lower specimen capsule. ____________

19.3.10 Record the following:

a. Specimen Capsule Serial Number ____________

b. Axial location in reactor from which removed. ____________

c. Vertical location in surveillance holder tube from which removed. ____________

d. Position in storage container (if applicable). ____________

e. Disposition if permanently removed from RV. ____________

19.3.11 <u>Final Conditions</u>

19.3.11.1 The required specimen capsules and/or dummy capsules have been removed from the surveillance holder tube. ____________

19.3.11.2 The specimen capsules are stored in a suitable storage or transfer container. ____________

19.4 INSTALLATION OF CLOSURE ASSEMBLY

NOTE: Have Quality Control Inspector observe and sign off steps of Section 19.4.

19.4.1 Initial Conditions

19.4.1.1 The closure tool is suspended from a suitable hoist in the following manner: ____________

Hoist hook, a 1-ton chain hoist, a 0 to 1,000 lb. load measuring device, and closure tool. In addition, the balancer will be suspended from the hoist hook and connected to the torque shaft of the closure tool.

19.4.1.2 The hydraulic pump assembly is located on the fuel handling bridge or near the RV flange with the hydraulic hoses connected to the hydraulic cylinder on the closure tool. ____________

19.4.1.3 The closure assembly is located in the storage container in the deep end of the refueling canal or coupled to the closure tool.

19.4.1.4 The guide tube is inserted in the surveillance holder tube and the mandrel has been removed. ______

19.4.1.5 Two specimen capsules or specimen and dummy capsule combinations have been installed in the surveillance holder tube. ______

19.4.1.6 The underwater television camera is lowered through a vent valve exercise port to view the oval inspection port located near the top of the surveillance holder tube. ______

19.4.2 Couple the closure tool to the closure assembly by performing the following steps:

NOTE: If the closure assembly is already attached to the closure tool, proceed to Step 19.4.3.

19.4.2.1 Verify that the inner capsule latch assembly is rotated to the "Unlock" position. ______

19.4.2.2 Raise the inner capsule latch assembly to the elevated position by turning the selector valve to the "Collapse Fingers" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

19.4.2.3 Position the closure tool over the closure assembly. ______

19.4.2.4 Observe and record the weight of the closure tool. ______

19.4.2.5 Slowly lower the closure tool onto the closure assembly. Observe the springscale for tool contact. ______

19.4.2.6 With the chain fall, raise the closure tool until it is clear of the closure assembly. The springscale reading should be the same as that recorded in Step 19.4.2.4. ______

19.4.2.7 With the chain fall, slowly lower the closure tool until a springscale reading of 50 to 75 lbs. less than that recorded in Step 19.4.2.4 is achieved. ____________

19.4.2.8 Rotate the entire closure tool clockwise until it drops approximately five-eighths of an inch into the slots of the closure assembly finger latch assembly. Observe an increase in the closure tool weight. ____________

NOTE: If the closure tool cannot be rotated clockwise, it is an indication that it is properly aligned with the closure assembly finger latch assembly.

19.4.2.9 Verify that the closure tool weight is the same as that achieved in Step 19.4.2.7. ____________

19.4.2.10 Rotate the entire closure tool counterclockwise 90°. This will engage the shroud assembly with the closure assembly finger latch assembly. ____________

19.4.2.11 Lower the inner capsule latch assembly by turning the selector valve to the "Compress Springs" position and actuating the hydraulic pump until the tool weight is 150 lbs. less than that recorded in Step 19.4.2.4. ____________

19.4.2.12 Engage the inner capsule latch assembly with the closure assembly actuator by rotating the inner capsule latch assembly counterclockwise 90° until the match-marks on the inner capsule latch assembly and the outer tube are properly aligned to "lock". ____________

19.4.2.13 Collapse the fingers of the closure assembly finger latch assembly by rotating the selection valve to the "Collapse Fingers" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge. ______ ____

19.4.2.14 With the chain fall, raise the closure tool with closure assembly attached approximately 12 in. Observe a closure tool plus closure assembly weight of approximately 16 lbs. greater than that noted in Step 19.4.2.4. ______

NOTE: If no increase in weight is observed, the closure assembly is not attached and it is necessary to repeat Steps 19.4.2.1 thru 19.4.2.14.

19.4.3 Raise the closure tool and closure assembly and position them directly over the guide tube. Rotate the closure tool and closure assembly to obtain proper azimuthal orientation of the closure assembly per Step 19.1.3. ______

19.4.4 Slowly lower the closure tool and closure assembly through the guide tube and onto the specimen capsule. Maintain the azimuthal orientation obtained in Step 19.4.3. Observe the springscale for indication of the closure assembly bottoming on the specimen capsule. Continue lowering the hoist until the springscale reading is approximately 100 lbs. less than the combined weight of the closure tool and closure assembly. This operation will assure the closure assembly is fully seated on the specimen capsule. ______

19.4.5 Additional confirmation that the closure assembly and specimen capsules are properly positioned may be made by viewing the oval inspection port of the surveillance holder tube. The belleville spring stack should be visible through the inspection port. If the springs are not visible, the specimen capsules or closure assembly are misoriented 180°. ______

19.4.6 Apply the preload to the closure assembly belleville springs by performing the following steps:

19.4.6.1 Rotate the selector valve to the "Compress Springs" position and actuate the hydraulic pump until 400 psi is maintained on the pressure gauge. ______

NOTE: The outer tube will translate upward approximately one inch.

19.4.6.2 Lower the torque shaft onto the locking screw of the closure assembly. Rotating the torque shaft clockwise will assist in proper engagement of the torque shaft and locking screw hex. ______

19.4.6.3 Rotate the torque shaft and locking screw counterclockwise until the tapered shoulder of the locking screw contacts the emergency escape device. ______

NOTE: Ten to 17 revolutions of the torque shaft will be required and should be accomplished by hand without the aid of a wrench. Maximum free running torque should not exceed 5 ft-lbs.

19.4.6.4 Verify that 400 psi is maintained on the pressure gauge and torque the torque shaft and locking screw to 10 ft-lbs. counterclockwise. ______

19.4.7 Uncouple the closure tool from the closure assembly by performing the following steps:

19.4.7.1 Relieve the pressure on the hydraulic system. Observe by viewing with the television camera that no relaxation of the belleville springs occurs. ______

19.4.7.2 Rotate the selector valve to the "Collapse Fingers" position and actuate the hydraulic pump two or three strokes. ______

19.4.7.3 Rotate the entire closure tool 90° clockwise against the hardstop. ______

19.4.7.4 With the chain fall, raise the closure tool approximately 12 in. Observe that the closure tool weight approximately equals that obtained in Step 19.4.2.4. ______

19.4.8 Raise the closure tool from the guide tube. Observe the springscale reading for possible mechanical interference. ______

19.4.9 Confirm that the closure assembly is properly latched by viewing with the television camera the upper end of the surveillance holder tube from a near horizontal position. The closure assembly is properly latched and seated if the uppermost part of the surveillance holder tube is approximately centered in the 3/8-in. groove of the finger latch assembly. ______

19.4.10 <u>Final Conditions</u>

19.4.10.1 The closure assembly is installed in the surveillance holder tube. ______

19.5 REMOVAL OF CLOSURE ASSEMBLY

19.5.1 Initial Conditions

19.5.1.1 The closure tool is suspended from a suitable hoist in the following manner: ______

Hoist hook, a 1-ton chain hoist, a 0 to 1,000-lb. load measuring device, and closure tool. In addition, the balancer will be suspended from the hoist hook and connected to the torque shaft of the closure tool.

19.5.1.2 The hydraulic pump assembly is located on the fuel handling bridge or near the RV flange with the hydraulic hoses connected to the hydraulic cylinder on the closure tool. ______

19.5.1.3 The guide tube is inserted in the surveillance holder tube and the mandrel has been removed. ______

19.5.1.4 The underwater television camera is lowered through a vent valve exercise port to view the oval inspection port located near the top of the surveillance holder tube. ______

19.5.2 Couple the closure tool to the closure assembly by performing the following steps:

19.5.2.1 Verify that the inner capsule latch assembly is rotated to the "Unlock" position. ______

19.5.2.2 Raise the inner capsule latch assembly to the elevated position by turning the selector valve to the "Collapse Fingers" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

19.5.2.3 Position the closure tool over the guide tube. ______

19.5.2.4 Observe and record the weight of the closure tool. ______

19.5.2.5 Slowly lower the closure tool through the guide tube and onto the closure assembly. Observe the springscale for closure tool contact. ______

19.5.2.6 With the chain fall, raise the closure tool until it is clear of the closure assembly. The springscale reading should be the same as that recorded in Step 19.5.2.4. ______

19.5.2.7 With the chain fall, slowly lower the closure tool until a springscale reading of 50 to 75 lbs. less than that recorded in Step 19.5.2.4 is achieved. ______

19.5.2.8 Rotate the entire closure tool clockwise until it drops approximately five-eighths of an inch and into the slots of the closure assembly finger latch assembly. Observe an increase in the closure tool weight. ______

NOTE: If the closure tool cannot be rotated clockwise, it is an indication that it is properly aligned with the closure assembly finger latch assembly.

19.5.2.9 Verify that the closure tool weight is the same as that achieved in Step 19.5.2.7. ______

19.5.2.10 Rotate the entire closure tool counterclockwise 90°. This will engage the shroud assembly with the closure assembly finger latch assembly. ______

19.5.2.11 Lower the inner capsule latch assembly by turning the selector valve to the "Compress Springs" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

19.5.2.12 Engage the inner capsule latch assembly with the closure assembly actuator by relieving the pressure on the hydraulic system and rotating the inner capsule latch assembly counterclockwise 90°. The matchmarks on the inner capsule latch assembly and the outer tube should be aligned. ______

19.5.3 Relieve the preload to the belleville springs by performing the following steps:

19.5.3.1 Actuate the hydraulic pump until 450 psi is maintained on the pressure gauge. ______

19.5.3.2 Lower the torque shaft onto the locking screw of the closure assembly. Rotating the torque shaft counterclockwise will assist in proper engagement of the torque shaft and locking screw hex. ______

19.5.3.3 Verify that 450 psi is maintained on the pressure gauge and rotate the torque shaft clockwise. Record the breakaway torque. ______

NOTE: Do not exceed 50 ft-lbs. of torque.

19.5.3.4 Continue to rotate the torque shaft clockwise until it bottoms on the threaded insert. Record the maximum free-running torque. ______

NOTE: Ten to 17 revolutions of the torque shaft will be required.

19.5.3.5 Relieve the pressure on the hydraulic system.

19.5.4 Remove the closure assembly from the surveillance holder tube by performing the following steps:

19.5.4.1 Rotate the selector valve to the "Collapse Fingers" position and actuate the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

NOTE: The inner capsule latch assembly will translate upward approximately one inch with respect to the outer tube.

CAUTION: Observe the springscale for possible increase in indicated weight which may result from sticking of the closure assembly wedge within the surveillance holder tube. Do not exceed 1,000 lbs. on the springscale. Rotation of the closure tool will assist in separating the closure assembly from the specimen capsule.

19.5.4.2 With the chain fall, raise the closure tool and closure assembly approximately 12 in. Observe that the springscale reading has increased approximately 16 lbs., indicating that the closure assembly has been coupled to the closure tool. Continue to observe the springscale for indication of mechanical interference. If mechanical interference is noted, rotate the closure tool in a back and forth manner in an attempt to free the tool train. ______

19.5.4.3 Slowly remove the closure tool and closure assembly from the surveillance holder tube. Observe the springscale reading for any gross increase which would be indicative of mechanical interference. ______

19.5.4.4 If the closure assembly is to be reinstalled following specimen capsule shuffle, the closure assembly may remain attached on the closure tool. The hydraulic hoses may be disconnected from the hydraulic cylinder and the closure tool stored from a suitable suspension point. ______

19.5.5 If the closure assembly is not to be reinstalled in the surveillance holder tube, or it is desired not to leave the closure assembly attached to the closure tool, perform the following steps:

19.5.5.1 Position the closure assembly and closure tool over the designated tube of the specimen capsule storage rack (Figure 2). ______

19.5.5.2 Lower the closure assembly into the storage rack, maintaining proper orientation of the end cap wedge (Figure 2). ______

19.5.5.3 Apply the preload to the closure assembly belleville springs by performing Steps 19.4.6.1 thru 19.4.6.4. ______

19.5.5.4 Uncouple the closure tool from the closure assembly by performing Steps 19.4.7.1 thru 19.4.7.4. ______

19.5.5.5 Raise the closure tool from the storage rack. Observe the springscale for possible mechanical interference. ______

19.5.5.6 The closure tool may now be stored as required, dependent upon operational requirements. ______

19.5.6 Final Conditions

19.5.6.1 The closure assembly has been removed from the surveillance holder tube and stored, as desired. ______

19.6 ALTERNATE REMOVAL OF CLOSURE ASSEMBLY

19.6.1 Initial Conditions

19.6.1.1 The locking screw of the closure assembly cannot be rotated clockwise as described in Step 19.5.3.3. ____________

19.6.1.2 The socket on the end of the torque shaft assembly of the closure tool has been replaced with the alternate spanner attachment. ____________

19.6.2 The closure tool is suspended from a suitable hoist in the following manner:

> Hoist hook, a 1-ton chain hoist, a 0 to 1,000 lb. load measuring device, and closure tool. In addition, the balancer will be suspended from the hoist hook and connected to the torque shaft of the closure tool.

19.6.2.1 The hydraulic pump assembly is located on the fuel handling bridge or near the RV flange with the hydraulic hoses connected to the hydraulic cylinder on the closure tool. ____________

19.6.2.2 The guide tube is inserted in the surveillance holder tube and the mandrel has been removed. ____________

19.6.2.3 The underwater television camera is lowered through a vent valve exercise port to view the oval inspection port located near the top of the surveillance holder tube. ____________

19.6.3 Couple the closure tool to the closure assembly by performing the following steps:

19.6.3.1 Verify that the inner capsule latch assembly is rotated to the "Unlock" position. ____________

19.6.3.2 Raise the inner capsule latch assembly to the elevated position by turning the selector valve to the "Collapse Fingers" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

19.6.3.3 Position the closure tool over the guide tube. ______

19.6.3.4 Observe and record the weight of the closure tool. ______

19.6.3.5 Slowly lower the closure tool through the guide tube and onto the closure assembly. Observe the springscale for closure tool contact. ______

19.6.3.6 With the chain fall, raise the closure tool until it is clear of the closure assembly. The springscale reading should be the same as that recorded in Step 19.6.3.1. ______

19.6.3.7 With the chain fall, slowly lower the closure tool until a springscale reading of 50 to 75 lbs. less than that recorded in Step 19.6.3.4 is achieved. ______

19.6.3.8 Rotate the entire closure tool clockwise until it drops approximately five-eighths of an inch and into the slots of the closure assembly finger latch assembly. Observe an increase in the closure tool weight. ______

NOTE: If the closure tool cannot be rotated clockwise, it is an indication that it is properly aligned with the closure assembly finger latch assembly.

19.6.3.9 Verify that the closure tool weight is the same as that achieved in Step 19.6.3.7. ______

19.6.3.10 Rotate the entire closure tool counterclockwise 90°. This will engage the shroud assembly with the closure assembly finger latch assembly.

19.6.3.11 Lower the inner capsule latch assembly by turning the selector valve to the "Compress Springs" position and actuating the hydraulic pump until 100 psi is maintained on the pressure gauge.

19.6.3.12 Engage the inner capsule latch assembly with the closure assembly actuator by relieving the pressure on the hydraulic system and rotating the inner capsule latch assembly counterclockwise 90°. The matchmarks on the inner capsule latch assembly and the outer tube should be aligned.

19.6.4 Relieve the preload to the belleville springs by performing the following steps:

19.6.4.1 Actuate the hydraulic pump until 450 psi is maintained on the pressure gauge.

19.6.4.2 Lower the torque shaft into the slots of the emergency escape device of the closure assembly. Rotating the torque shaft will assist in proper engagement of the torque shaft and emergency escape device slots.

19.6.4.3 Verify that 450 psi is maintained on the pressure gauge and rotate the torque shaft clockwise 90°, releasing the emergency escape device from the finger latch by shearing the two shear pins through the finger latch and the emergency escape device.

NOTE: Do not exceed 400 ft-lbs. of torque.

19.6.4.4 Relieve the pressure on the hydraulic system. ______

19.6.5 Remove the closure assembly from the surveillance holder tube by performing the following steps:

19.6.5.1 Rotate the selector valve to the "Collapse Fingers" position and actuate the hydraulic pump until 100 psi is maintained on the pressure gauge. ______

NOTE: The inner capsule latch assembly will translate upward approximately one inch with respect to the outer tube.

CAUTION: Observe the springscale for possible increase in indicated weight which may result from sticking of the closure assembly wedge within the surveillance holder tube. Do not exceed 1,000 lbs. on the springscale. Rotation of the closure tool will assist in separating the closure assembly from the specimen capsule.

19.6.5.2 With the chain fall, raise the closure tool and closure assembly approximately 12 in. Observe that the springscale reading has increased approximately 16 lbs., indicating that the closure assembly has been coupled to the closure tool. Continue to observe the springscale for indication of mechanical interference. If mechanical interference is noted, rotate the closure tool in a back and forth manner in an attempt to free the tool train. ______

19.6.5.3 Slowly remove the closure tool and closure assembly from the surveillance holder tube. Observe the springscale reading for any gross increase which would be indicative of mechanical interference. ______

19.6.5.4 Lower the closure assembly into a suitable disposal container. ______

19.6.6 Uncouple the closure tool from the closure assembly by performing the following steps:

19.6.6.1 Relieve the pressure on the hydraulic system. ______

19.6.6.2 Rotate the selector valve to the "Collapse Fingers" position and actuate the hydraulic pump two or three strokes. ______

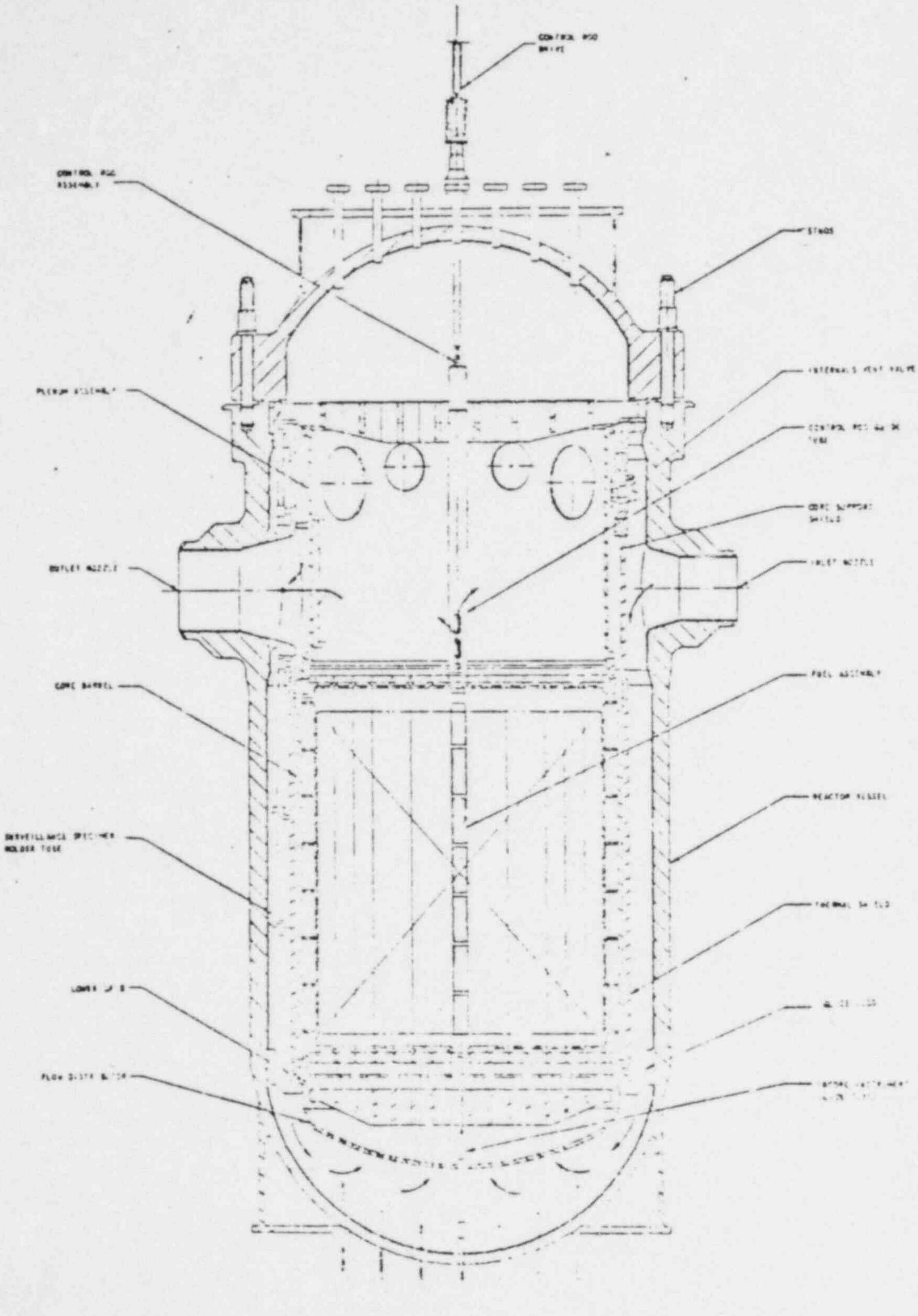
19.6.6.3 Rotate the entire closure tool 90° clockwise against the hardstop while preventing the closure assembly from rotating. ______

19.6.6.4 Raise the closure tool from the disposal container. Observe the springscale for possible mechanical interference. ______

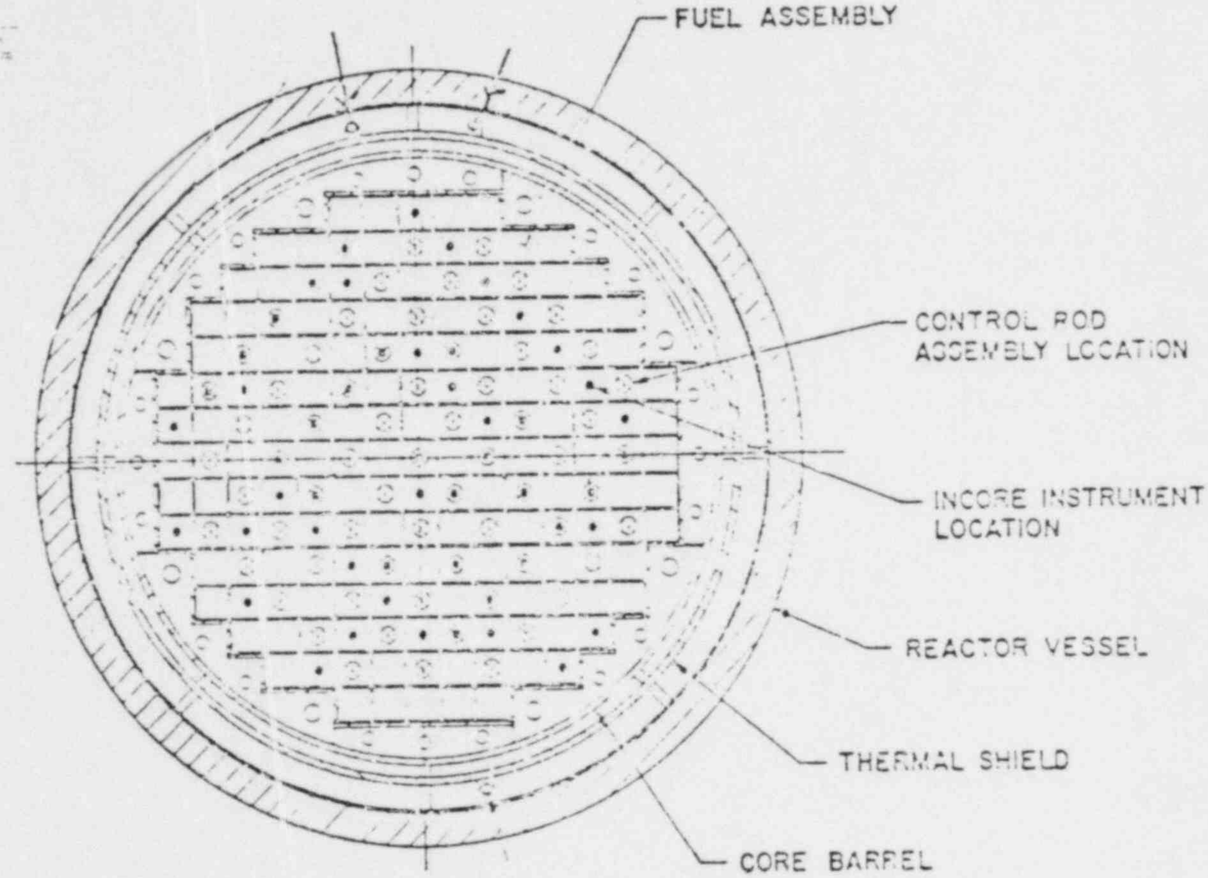
19.6.6.5 The closure tool may now be stored as required, dependent upon operational requirements. ______

19.6.7 <u>Final Conditions</u>

19.6.7.1 The closure assembly has been removed from the surveillance holder tube and placed in a disposal container. ______



REACTOR VESSEL INTERNALS GENERAL ARRANGEMENT
ELEVATION VIEW



REACTOR VESSEL INTERNALS GENERAL ARRANGEMENT
PLAN VIEW

(deleted)

REQUIRED INITIAL CONDITIONS AND PLANT STATUS

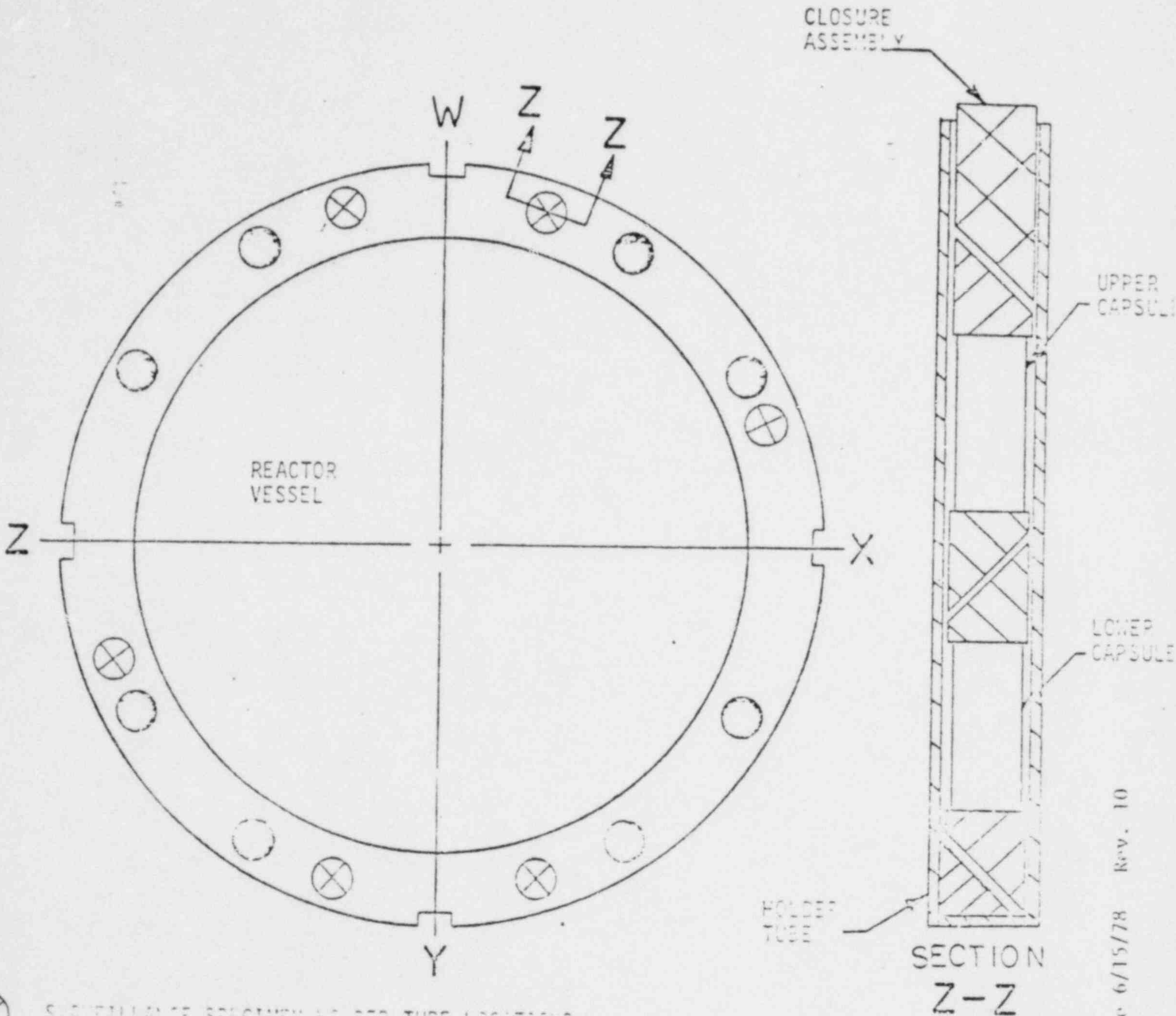
NOTES: 1. All items listed here shall have been checked off and found to be satisfactorily completed before any work is started in connection with this procedure.

2. See Section 7.0 of this procedure for more information.

	ITEM TO BE CHECKED OFF	DATE/TIME CHECKED	INITIALS
1.	RB cleared for entry.		
2.	Missile shield slabs removed to storage location.		
3.	RC system cooled and depressurized.		
4.	Head seal leak-off valve to RB normal sump closed.		
5.	Electrical disconnects complete per FP-401, Reactor Vessel Closure Head Removal and Replacement.		
6.	RV closure head removed per FP-401, Reactor Vessel Closure Head Removal and Replacement.		
7.	Canal seal plate in place per FP-40-, Canal Seal Plate Removal and Replacement		
8.	In-core monitoring instruments withdrawn per FP-701, In-Core Monitor Handling.		
9.	RC system drained and blanketed per CP-303, Draining and Nitrogen Blanketing of the RC System, to bring level two to six inches below RV flange.		
10.	Internals handling extension, head and internals handling fixture, pendants, spreader ring, and indexing fixture have all been cleaned and are ready for use.		
11.	Internals storage stand has been cleaned and is ready for use.		
12.	Request for RWP has been initiated.		
13.	Request for an Equipment Clearance Order has been initiated.		
14.	Television camera/lights installed.		
15.	Fuel transfer canal washed down.		
16.	Required Surveillance Procedures (per SP-441 and SP-443) are being completed within required time spans.		

ENCLOSURE 4

FIGURE 1



SURVEILLANCE SPECIMEN HOLDER TUBE LOCATIONS

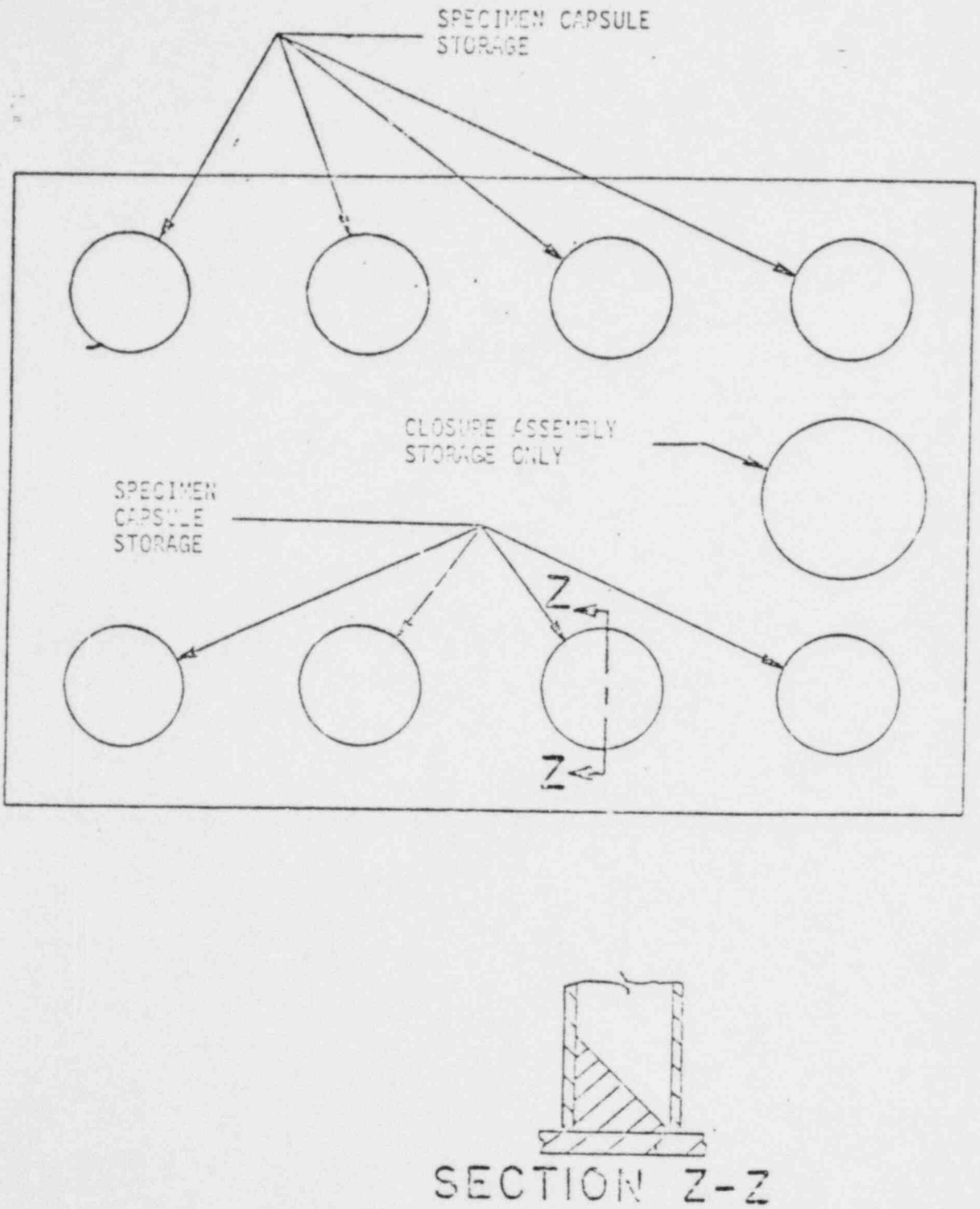
VENT VALVE EXERCISE PORT

SURVEILLANCE SPECIMEN HOLDER TUBE LOCATIONS
AND
SURVEILLANCE SPECIMEN CAPSULE/CLOSURE ASSEMBLY POSITIONING

DATE:

SERIAL:

FIGURE 2



SPECIMEN CAPSULE AND CLOSURE ASSEMBLY STORAGE RACK

SURVEILLANCE PROCEDURE

SP-532

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTOR BUILDING MAIN AND AUXILIARY (FHCR-1 AND FHCR-2) FUEL HANDLING BRIDGES ELECTRICAL INTERLOCK SURVEILLANCE

REVIEWED BY: Plant Review Committee

[signature]

Date 3/23/78

Meeting No. 78-12

APPROVED BY: Nuclear Plant Manager

Paul F. McKee for GPB

Date 4/18/78

1.0 SURVEILLANCE REQUIREMENTS

1.1 Main and auxiliary fuel handling bridge and trolley electrical interlocks shall be demonstrated operable within seven days prior to fuel handling operations employing FHCR-1 and/or FHCR-2 and at least once per seven days during operation.

1.2 REQUIREMENTS REFERENCE

Source	Surv. Req.'d During Modes	Mode Notes	Surv. Freq.	Freq. Notes
FPC Practice	6	29	W	40

Surveillance Frequency: W - Weekly

Mode Notes: 29 - Movement of control rods or fuel assemblies within the reactor pressure vessel or other irradiated fuel movement in progress.

Frequency Notes: 40 - Establish prior to ascent into applicable mode (prior to beginning core alterations).

2.0 ACCEPTANCE CRITERIA

Successful completion of Data Sheet I (Enclosure 1) and Data Sheet II (Enclosure 3).

3.0 REFERENCES NEEDED TO DO PROCEDURE

3.1 FP-601, Fuel Handling Equipment Operations

3.2 Plan View Electrical Interlocks Reactor Main Bridge (FHCR-1), Enclosure 2

3.3 Plan View Electrical Interlocks Reactor Auxiliary Bridge (FHCR-2), Enclosure 4

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

Refer to FP-601, Fuel Handling Equipment Operations. When verifying wall limit interlocks, attention should be given to extremely slow movement of bridge or trolley.

4.1 Extreme caution should be exercised in the following areas:

4.1.1 Bumper stop on south wall inoperative.

4.1.2 Bumper stops on east and west walls will not operate if temporary grating is in place.

5.0 EQUIPMENT REQUIRED

Refer to FP-601, Fuel Handling Equipment Operations.

6.0 PROCEDURE

NOTE: Refer to Data Sheet I (Enclosure 1) and Enclosure 2.

6.1 Position main bridge over reactor at position RTR-H8.

6.1.1 Run trolley forward until it stops (LS-13 trolley forward stud limit) and verify that:

a. Bridge will NOT move left or right.

b. Trolley will move reverse.

6.1.2 Run trolley reverse until it stops (LS-12 trolley reverse stud limit) and verify that:

a. Bridge will NOT move left or right.

b. Trolley will move forward.

6.1.3 Position bridge over reactor at RTR-H8.

6.1.4 Run bridge left enough to actuate LS-11 closed; white "Hoist Slow Zone" light comes on.

6.1.5 Verify that trolley will move forward and reverse to stud limits.

6.1.6 Run trolley to position "H"; run bridge left to position fuel mast on centerline of transfer basket using Selsyn index marks.

6.1.7 Position transfer basket #2 in full "Down" position.

6.1.8 Run trolley forward to LS-10 (trolley just past transfer #2 centerline).

6.1.9 Verify that fuel hoist <u>cannot</u> be lowered.

6.1.9.1 Move trolley reverse to rack position "G".

6.1.10 Raise transfer basket #2 to the full "Up" position.

6.1.10.1 Move trolley forward to LS-10.

6.1.11 Verify that fuel hoist <u>cannot</u> be lowered using fuel hoist control handle.

6.1.12 Verify that fuel hoist will lower using "Jog" button.

6.1.13 Raise fuel hoist until "Grapple Up Disengage" light illuminates using "Jog" pushbutton.

6.1.14 Move bridge left until it stops (LS-16 trolley permissive relay) and verify that:

a. Trolley will <u>NOT</u> move forward.

b. Trolley will move reverse.

c. Bridge will <u>NOT</u> move right.

6.1.15 Turn bridge "Right Bypass" to "On" position.

6.1.16 Move bridge right approximately one to two inches to actuate LS-16.

6.1.17 Turn bridge "Right Bypass" to "Off" position and verify that:

a. Bridge will move left and right.

NOTE: LS-16 allows approximately two inches of travel over transfer basket centerline.

b. Trolley will move forward and reverse.

6.1.18 Run trolley reverse to rack position "G".

6.1.19 Lower transfer basket #2 to full "Down" position.

6.1.20 Run trolley forward to LS-10 (trolley just past transfer basket #2 centerline).

6.1.21 Place bridge "Left Bypass" switch to "On" position and run bridge left to Selsyn index for rod mast on centerline of transfer basket #2.

6.1.22 Place bridge "Left Bypass" switch to "Off" position and verify that rod hoist cannot be lowered.

6.1.22.1 Move trolley reverse to rack position "G".

6.1.23 Raise transfer basket #2 to the full "Up" position.

6.1.23.1 Move trolley forward to LS-10.

6.1.24 Verify that rod hoist cannot be lowered using rod hoist control handle.

6.1.25 Verify that rod hoist will lower using rod "Jog" button. (Lower until "Control Rod Tube Up" light just goes out.)

6.1.26 Raise rod hoist until "Control Rod Tube Up" light illuminates using "Jog" pushbutton.

6.1.27 Move bridge left until it stops (LS-16 trolley permissive relay) and verify that:

a. Trolley will NOT move forward.

b. Trolley will move reverse.

c. Bridge will NOT move right.

6.1.28 Turn bridge "Right Bypass" to "On" position.

6.1.29 Move bridge right approximately one to two inches to actuate LS-16.

6.1.30 Turn bridge "Right Bypass" to "Off" position and verify that:

a. Bridge will move left and right.

NOTE: LS-16 allows approximately two inches of travel over transfer basket centerline.

b. Trolley will move reverse and forward.

6.1.31 Move trolley reverse to rack position "D".

6.1.32 Lower transfer baskets #1 and #2 to full "Down" position.

6.1.33 Move trolley reverse to LS-9 (trolley just past transfer basket #1 centerline).

6.1.34 Verify that the rod hoist cannot be lowered.

6.1.34.1 Move trolley forward to rack position "B".

6.1.35 Raise transfer basket #1 to full "Up" position.

6.1.35.1 Move trolley reverse to LS-9.

6.1.36 Verify that the rod hoist will NOT lower using the rod hoist control handle.

6.1.37 Verify that rod hoist will lower using rod "Jog" pushbutton. (Lower until "Control Rod Tube Up" light just goes out.)

6.1.38 Raise rod hoist until "Control Rod Tube Up" light illuminates using rod "Jog" pushbutton.

6.1.39 Move bridge left until it stops (LS-16 trolley permissive relay) and verify that:

a. Trolley will NOT move reverse.

b. Bridge will NOT move right.

c. Trolley will move forward.

6.1.40 Turn bridge "Right Bypass" on.

6.1.41 Move bridge right approximately one to two inches to actuate LS-16.

6.1.42 Turn bridge "Right Bypass" off and verify that:

a. Bridge will move left and right.

NOTE: LS-16 allows approximately two inches of travel over transfer basket centerline.

b. Trolley will move forward and reverse.

6.1.43 Move trolley forward to rack position "B".

6.1.44 Lower transfer basket #1 to full "Down" position.

6.1.45 Move trolley reverse to LS-9 (trolley just past transfer basket #1 centerline).

6.1.46 Turn bridge "Right Bypass" on.

6.1.47 Move bridge right to Selsyn index for fuel mast on centerline of transfer basket #1.

6.1.48 Turn bridge "Right Bypass" of .

6.1.49 Verify that fuel hoist <u>cannot</u> be lowered.

6.1.49.1 Move trolley forward to rack position "B".

6.1.50 Raise transfer basket #1 to full "Up" position.

6.1.50.1 Move trolley reverse to LS-9.

6.1.51 Verify that the fuel hoist will <u>NOT</u> lower using the fuel hoist control handle.

6.1.52 Verify that the fuel hoist will lower using the fuel "Jog" button; lower until "Grapple Up Disengage" light just goes out.

6.1.53 Raise fuel hoist until "Grapple Up Disengaged" light illuminates using fuel "Jog" pushbutton.

6.1.54 Move bridge left until it stops (LS-16 trolley permissive relay) and verify that:

a. Trolley will NOT move reverse.

b. Bridge will NOT move right.

c. Trolley will move forward.

6.1.55 Turn bridge "Right Bypass" to "On".

6.1.56 Move bridge "Right Bypass" approximately one to two inches to actuate LS-16.

6.1.57 Turn bridge "Right Bypass' off and verify that:

a. Bridge will move left and right.

NOTE: LS-16 allows approximately two inches of travel over transfer basket centerline.

b. Trolley will move forward and reverse.

6.1.58 Turn bridge "Left Bypass" on.

6.1.59 Move bridge left to position rod mast over transfer basket #1 centerline.

6.1.60 Turn bridge "Left Bypass" off.

6.1.61 Move trolley forward to center of travel and lower transfer basket #1 to full "Down" position.

6.1.62 No restoration required.

6.1.63 Complete applicable section of Bridge Log Sheet.

NOTE: Refer to Data Sheet II (Enclosure 3) and Encl. ure 4.

6.2 Position auxiliary bridge over reactor at position RTR-H8.

6.2.1 Run trolley forward until it stops (LS-12 trolley forward stud limit) and verify that:

a. Bridge will NOT move left.

b. Bridge will move right.

c. Trolley will move reverse.

6.2.2 Run trolley reverse until it stops (LS-13 trolley reverse stud limit) and verify that:

a. Bridge will NOT move left.

b. Bridge will move right.

c. Trolley will move forward.

6.2.3 Position bridge at RTR-H8.

6.2.4 Run bridge right until it stops (LS-10 bridge right, trolley reverse stop) and verify that:

a. Trolley will NOT move reverse.

b. Trolley will move forward.

6.2.5 Run trolley forward until it stops (LS-11 trolley on parking cam).

6.2.6 Move bridge right to "Park" position (right travel limit controlled by bumper stop).

6.2.7 Run bridge left until it stops (LS-10).

6.2.8 Run trolley reverse to center of travel.

6.2.9 Run bridge left until it stops (LS-5 bridge at left reactor limit) and verify that:

a. Trolley will move forward.

b. Trolley will move reverse.

6.2.10 Move auxiliary bridge to parking position indicated on Enclosure 4 (Sections 6.2.4 thru 6.2.6).

6.3 No restoration required.

6.4 Complete applicable section of Bridge Log Sheet.

6.5 Notify the Shift Supervisor of the completion and results of this Surveillance Procedure.

- DATA SHEET I -

MAIN FUEL HANDLING BRIDGE INTERLOCK SURVEILLANCE

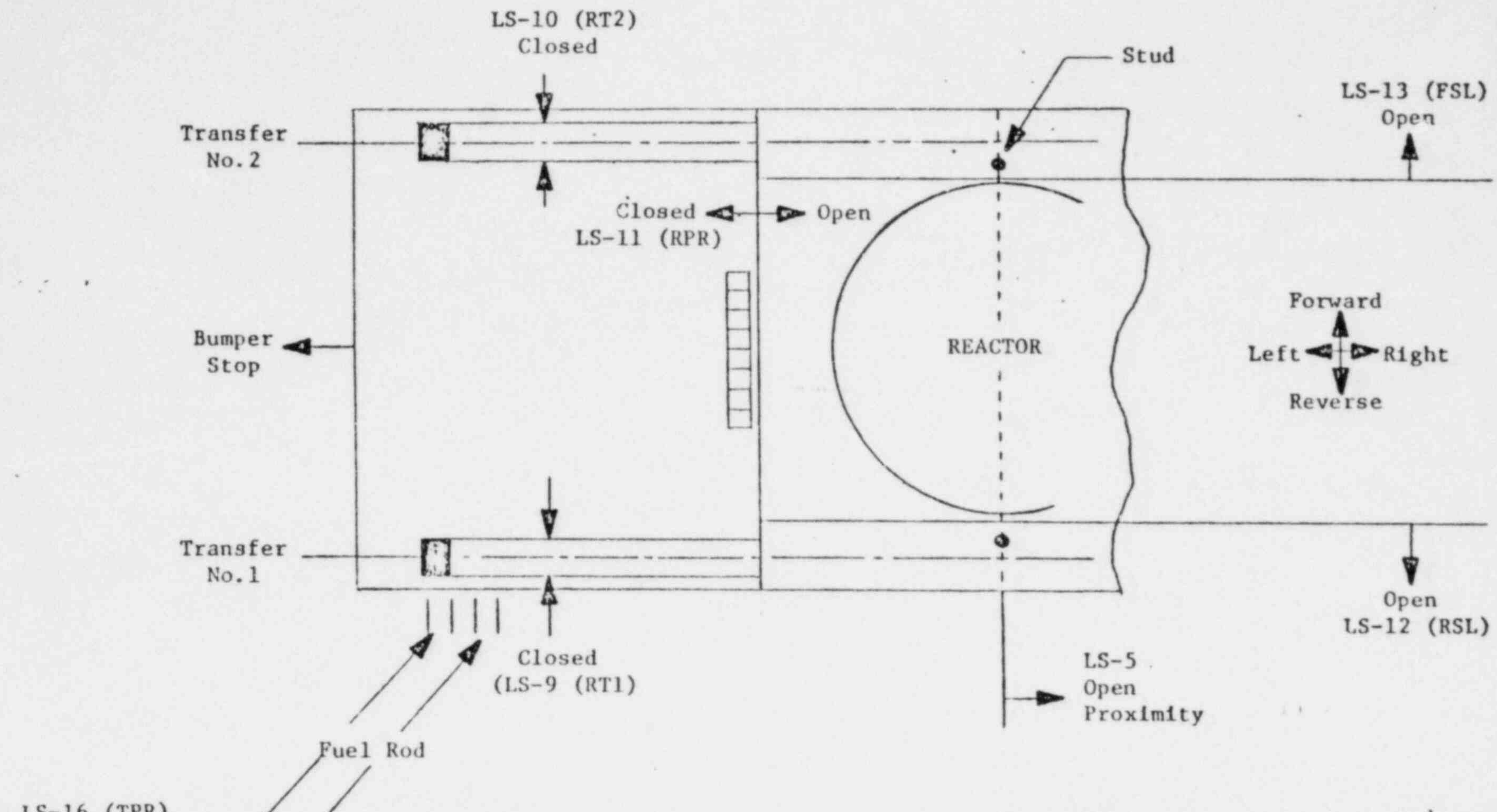
	Procedure Step	Action	Initials
	6.1.1	Trolley is stopped (LS-13).	______
	6.1.2	Trolley is stopped (LS-12).	______
(Fuel)	6.1.9	Hoist cannot be lowered.	______
(Fuel)	6.1.11	Hoist cannot be lowered with hoist control handle.	______
(Fuel)	6.1.12	Hoist can be lowered with "Jog" button.	______
	6.1.14	Bridge is stopped (LS-16).	______
(Rod)	6.1.22	Hoist cannot be lowered.	______
(Rod)	6.1.24	Hoist cannot be lowered with hoist control handle.	______
(Rod)	6.1.25	Hoist can be lowered with "Jog" button.	______
	6.1.27	Bridge is stopped (LS-16).	______
(Rod)	6.1.34	Hoist cannot be lowered.	______
(Rod)	6.1.36	Hoist cannot be lowered with hoist control handle.	______
(Rod)	6.1.37	Hoist can be lowered with "Jog" button.	______
	6.1.39	Bridge is stopped (LS-16).	______
(Fuel)	6.1.49	Hoist cannot be lowered.	______
(Fuel)	6.1.51	Hoist cannot be lowered with hoist control handle.	______
(Fuel)	6.1.52	Hoist can be lowered with "Jog" button.	______
	6.1.54	Bridge is stopped (LS-16).	______

COMMENTS: ____

____

____

Performed By ____________________ Date ____________



PLAN VIEW ELECTRICAL INTERLOCKS
REACTOR MAIN BRIDGE
(FHCR-1)

- DATA SHEET II -

AUXILIARY FUEL HANDLING BRIDGE INTERLOCK SURVEILLANCE

Procedure Step	Action	Initials
6.2.1	Trolley is stopped (LS-12).	______
6.2.2	Trolley is stopped (LS-13).	______
6.2.4	Bridge is stopped (LS-10).	______
6.2.5	Trolley is stopped (LS-11).	______
6.2.7	Bridge is stopped (LS-10).	______
6.2.9	Bridge is stopped (LS-5).	______

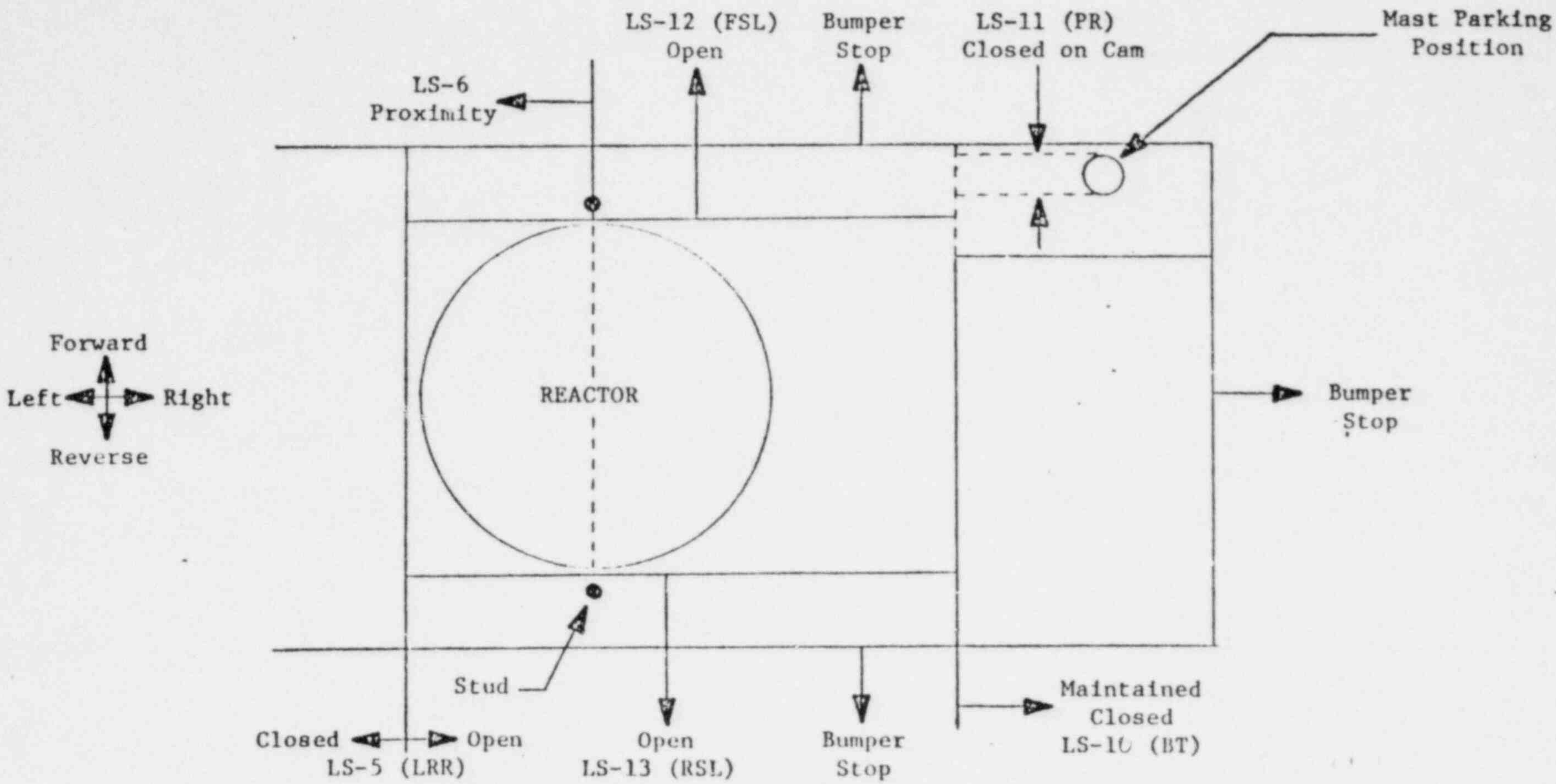
COMMENTS: ____

____

____

____

Performed By ________________ Date ____________



PLAN VIEW ELECTRICAL INTERLOCKS
REACTOR AUXILIARY BRIDGE
(FHCR-2)

SURVEILLANCE PROCEDURE

SP-670

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTOR BUILDING FUEL HANDLING BRIDGES (FHCR-1 & 2) LOAD TEST

REVIEWED BY: Plant Review Committee

A Nichols

Date 3/23/78

Meeting No. 78-12

APPROVED BY: Nuclear Plant Manager

Paul F. McKee/4-6?

Date 4/18/78

1.0 SURVEILLANCE REQUIREMENTS

The reactor building (RB) fuel handling bridges shall be demonstrated OPERABLE by performing load capacity and load interlock tests. The demonstrations shall be performed during the modes and at the frequencies indicated below.

1.1 TECHNICAL SPECIFICATIONS REFERENCE

Technical Specification	Surv. Req'd. During Modes	Mode Notes	Surv. Freq.	Freq. Notes
4.9.6	6		R	18

MODE NOTES: None

SURVEILLANCE FREQUENCY:

R - Refueling (18 months)

FREQUENCY NOTES:

18 - Within 100 hrs. prior to movement of control rods or fuel assemblies within the reactor pressure vessel.

2.0 ACCEPTANCE CRITERIA

2.1 Each RB fuel handling bridge shall be OPERABLE with:

2.1.1 A hoist minimum capacity of 3,000 lbs., including weight of grapple tube, and

2.1.2 An automatic hoist overload cut-off limit of 2750 lbs. (wet) or 2880 lbs. (dry), including weight of grapple tube.

NOTE: If the above acceptance criteria cannot be met, refer immediately to the "Action Statement" of Technical Specification (TS) 3.9.6.

3.0 REFERENCES NEEDED TO DO PROCEDURE

3.1 Data Sheet I (Enclosure 1)

3.2 FP-601, Fuel Handling Equipment Operations

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

4.1 During lifts to minimum loads or overload settings, do not exceed the expected load values by more than approximately 100 lbs; if automatic overload actuations do not occur do not proceed with Surveillance Procedure. Notify the Shift Supervisor.

5.0 EQUIPMENT REQUIRED

None

6.0 PROCEDURE

6.1 Demonstrate the OPERABILITY of the Main Fuel Handling Bridge (FHCR-1) by performing the following steps:

6.1.1 Startup FHCR-1 in accordance with the startup procedure in FP-601, Fuel Handling Equipment Operation.

6.1.2 Place the main fuel hoist Dillon load cell range switch in position "A" (0 to 3000 lbs.).

6.1.3 Position the main fuel handling grapple over the load testing fixture. To position the auxiliary fuel handling grapple over the test fixture, the bridge left and trolly interlock bypass must be actuated.

6.1.4 Lower the main fuel handling grapple and engage the mating fitting on the test fixture. Visually check for proper engagement of grapple with test fixture.

6.1.5 Slowly raise the main fuel handling grapple, using the "Jog" button, until the hoist stops and the red "Overload" indicator light comes on. Record the fuel Dillon readout on Data Sheet I.

CAUTION: The overload cut-off should actuate at or before reaching 2750 lbs. Do not exceed 2800 lbs.

6.1.6 Slowly lower the main fuel handling grapple until the fuel Dillon readout indicated approximately 2000 lbs.

6.1.7 Place the main fuel hoist Dillon load cell range switch in position "B" (3,000 to 6,000 lbs.).

6.1.8 Place the main fuel hoist overload bypass switch in the "On" position.

6.1.9 Slowly raise the main fuel handling grapple, using the "JOG" button or manual handwheel, until the fuel Dillon readout indicates a load of 3050 to 3100 lbs. Record the reading on Data Sheet I.

6.1.10 Lower the main fuel handling grapple to less than 3000 lbs. using the manual handwheel (grapple will not lower with jog button due to low load interlock being actuated by range switch in "B" position) then use jog button and disengage the test fixture visually verifying the disengagement.

6.1.11 Raise the main fuel handling grapple. Return the fuel hoist overload bypass switch to the "Off" position. Return the fuel hoist Dillon load cell range switch to the "A" (0 to 3,000 lbs.) position.

6.1.12 Complete the applicable section of the reactor building bridges log sheet attached to the bridge consoles.

6.2 Demonstrate the OPERABILITY of the Auxiliary Fuel Handling Bridge FHCR-2 by performing the following steps:

6.2.1 Startup FHCR-2 in accordance with the startup procedure in FP-601, Fuel Handling Equipment Operation.

6.2.2 Repeat Steps 6.1.2 through 6.1.11 except for the auxiliary fuel handling hoist, recording appropriate data on Data Sheet I.

6.2.3 Complete the applicable section of the reactor building bridges log sheet attached to the bridge consoles.

6.3 Return both FHCR-1 and FHCR-2 bridges to their normal park locations and then, if applicable, shut down both bridges in accordance with FP-601, Fuel Handling Equipment Operation.

6.4 No restoration is required.

6.5 Notify the Shift Supervisor of the completion and results of this Surveillance Procedure.

DATA SHEET I

REACTOR BUILDING FUEL HANDLING BRIDGES (FCHR-1 & 2)
LOAD TEST

TEST EQUIPMENT NO.

NONE

ITEM	REQUIRED	ACTUAL	
		FHCR-1	FHCR-2
Dillon Fuel load cell range switch placed in position	"A"		
Fuel load cell reading at overload actuation, lbs.	$\leq$ 2750*		
Dillon Fuel load cell range switch placed in position	"B"		
Fuel hoist overload bypass switch placed in position.	"On"		
Fuel load cell reading at minimum lift capacity, lbs.	$\geq$ 3000		
Fuel hoist overload bypass switch placed in position	"Off"		
Dillon Fuel load cell range switch placed in position	"A"		
Rod load cell reading with dummy rod lifted clear	X		X

COMMENTS: ____

PERFORMED BY: ____________________ DATE: ______________

*When handling control rods or fuel assemblies with $\geq$ 23 feet of water over the top of fuel assemblies seated in the reactor core; otherwise the hoist overload cutoff shall be set at 2880 lbs, including the weight of grapple tube.

SURVEILLANCE PROCEDURE

SP-671

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

SPENT FUEL HANDLING BRIDGE LOAD SURVEILLANCE

REVIEWED BY: Plant Review Committee

Paul F. McKee

Date 5/21/76

Meeting No. 76-22

APPROVED BY: Nuclear Plant Superintendent

Guy P. Beatty Jr.

Date 7/1/76

1.0 SURVEILLANCE REQUIREMENTS

1.1 The spent fuel handling bridge shall be demonstrated operable within seven days prior to handling fuel assemblies and at least once per seven days during operation by performing a hoist load test demonstrating the automatic load cutoff when hoist load exceeds approximately 2900 lbs., and a hoist load test of at least 3,000 lbs.

1.2 REQUIREMENTS REFERENCE

Reference	Surv. Req.'d During Modes	Mode Notes	Surv. Freq.	Freq. Notes
FPC Practice	1 thru 6	42	W	40

Surveillance Frequency: W - Weekly (seven days)

Mode Notes: 42 - Bridge in use.

Frequency Notes: 40 - Establish prior to ascension into applicable mode (prior to putting bridge in use).

2.0 ACCEPTANCE CRITERIA

Successful completion of this procedure.

3.0 REFERENCES NEEDED TO DO PROCEDURE

FP-601, Fuel Handling Equipment Operations

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

Refer to FP-601, Fuel Handling Equipment Operations.

5.0 EQUIPMENT REQUIRED

Refer to FP-601, Fuel Handling Equipment Operations.

6.0 SPENT FUEL HANDLING BRIDGE LOAD TEST

6.1 Position the spent fuel handling grapple over the fuel handling bridge load test fixture in spent fuel pool "A" (SFA).

NOTE: "Bridge Left Interlock Bypass" is required to position grapple over test fixture.

6.2 Verify "Grapple Up Disengaged" indicator light is illuminated.

6.3 Lower the grapple onto test fixture. Lower the grapple with the "Jog" push button until the Dillon readout indicates approximately 600 lbs. and the "Low Load" indicator light illuminates. Record the low load Dillon reading on Enclosure 1. Record "Z-Z" axis tape reading on Enclosure 1. (Reading should agree within ± 1/8" of 9'3-1/8".)

6.4 Engage grapple; verify that the "Grapple Engaged" indicator light (green) illuminates.

6.5 Slowly raise the grapple until the Dillon readout indicates approximately 1200 lbs. Turn the selector switch to "Disengaged" and verify that grapple fingers remain engaged. Return selector switch to "Engaged".

6.6 Slowly lift the grapple until the Dillon readout indicates approximately 2100 lbs. Record the Dillon readout on Enclosure 1.

6.7 Raise the grapple until the Dillon readout indicates approximately 2900 lbs. Verify that the hoist stops and the "Overload" indicator light (red) illuminates. Record the Dillon readout on Enclosure 1. Verify that the hoist will not lift beyond the overload cutoff.

6.8 Place hoist "Overload Bypass" interlock in the "On" position and raise the grapple until the Dillon readout indicates approximately 3,000 lbs. Record Dillon readout on Enclosure 1.

6.9 Lower the grapple until the "Low Load" indicator light illuminates.

6.10 Place hoist "Overload Bypass" interlock in the "Off" position.

6.11 Place the "Engaged/Disengaged" selector switch to "Disengaged" and verify that grapple fingers disengage and "Grapple Disengaged" light illuminates.

6.12 Raise grapple until "Grapple Up Disengaged" light illuminates.

6.13 Move bridge right to SFA-A15. Position all "Bypass" switches in the "Off" position.

6.14 No restoration is required.

6.15 Complete applicable section of the Spent Fuel Handling Bridge Log Sheet attached to bridge console.

6.16 Upon completion of this procedure, notify the Shift Supervisor and enter the results in the Control Center Log.

- DATA SHEET I -

SPENT FUEL HANDLING BRIDGE LOAD SURVEILLANCE

Procedure Step	"Z-Z" Tape Reading	Dillon Reading (lbs.)	Initials/Date
6.3	________	________	________
6.6		________	________
6.7		________	________
6.8		________	________

COMMENTS: ____

____

____

____

____

Performed By ____________________ Date ____________

Rev. 2 5/21/76

SURVEILLANCE PROCEDURE

SP-672

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

PROCEDURE FOR LOAD TESTING NEW FUEL ELEVATOR

REVIEWED BY: Plant Review Committee

Paul J. McGee

Date 5-21-76

Meeting No. 76-22

APPROVED BY: Nuclear Plant Superintendent

Gary P. Beatty Jr.

Date 7/13/76

1.0 SURVEILLANCE REQUIREMENTS

1.1 The new fuel elevator will be demonstrated operable within seven days prior to the start of moving fuel assemblies by a load test.

1.2 The new fuel elevator will be load tested to 2,075 lbs. ± 25 lbs. (dry weight).

1.3 Requirements Reference

Reference	Surv. Req'd During Modes	Modes Notes	Surv. Freq.	Freq. Notes
FPC Practice	1 thru 6	42	W	40

Surveillance Frequency:

W-Weekly (7 days)

Mode Notes:

42-Elevator in use

Frequency Notes:

40-Establish prior to ascension into applicable mode (prior to putting elevator in use)

2.0 ACCEPTANCE CRITERIA

2.1 Load test complete with no slip in elevator cable.

2.2 Visual examination shows the following:

a. No broken strands in cable.

b. No abnormal stretch of strand in cable.

c. No deformations or failures of the new fuel elevator equipment.

NOTE: If yes to any of the above, list on data sheet (Enclosure 1).

3.0 REFERENCES

FP-601, Fuel Handling Equipment Operations

4.0 SPECIAL CONDITIONS OR REQUIREMENTS

Refer to FP-601, Fuel Handling Equipment Operations.

5.0 EQUIPMENT REQUIRED

5.1 New Fuel Elevator Test Load Assembly (weight approximately 2100 lbs.)

5.2 Auxiliary Building Overhead Crane (FHCR-5)

5.3 Rigging hardware such as shackles, eyebolts, etc., as required.

6.0 PROCEDURE

6.1 Raise the new fuel elevator to the "Up" position.

6.2 Connect appropriate shackles and eyebolts to the hoisting loop of the test load assembly.

6.3 Raise the test load assembly with the auxiliary building overhead crane (FHCR-5).

6.4 Position the test load assembly over the opening of the new fuel elevator. Guide and lower the test load assembly into the new fuel elevator until it bottoms.

6.5 Detach the auxiliary building overhead crane hook from the test load assembly. (Disconnect at shackle so rigging remains attached to crane hook.)

6.6 Lower and raise the new fuel elevator to its respective "Up" and "Down" positions two times. The fuel elevator is in the "Up" position after completion of this section. [Fill out data sheet (Enclosure 1).]

6.7 If the spent fuel pool is wet and the test load assembly has been contaminated by spent fuel, notify the ChemRad Section. According to ChemRad instructions, store the assembly on the fuel handling floor or in the decontamination pit.

6.8 If the spent fuel pool is dry, move the test load assembly from the new fuel elevator by using the auxiliary building overhead crane and store it on the fuel handling floor or in the decontamination pit.

6.9 Inspect the elevator against acceptance criteria (Section 2.0). Elevator shall not be used if not met.

6.10 Elevator is useable in accordance with Section 6.9.

6.11 Restoration is complete.

- DATA SHEET I -

PROCEDURE FOR LOAD TESTING NEW FUEL ELEVATOR

Initials

Sling No. CSL-_________ (sling used to lift test load)

Elevator successfully completed two cycles up and down with no visible stress or damage with load of 2075 lbs. (dry). ________

Visual examination of elevator hoist cable shows:

a. No broken strands. ________

b. No corrosion which when cleaned shows pitting. ________

*c. No set kinks (deformations). ________

Load test completed with no slip in rigging. ________

COMMENTS: ____

____

____

____

Performed By ______________________ Date ______________

*"Set kinks" are defined as any strand or strands which are deformed in a manner irregular to the remaining strands which could result in cross-sectional, nonuniform loading.

REFUELING PROCEDURE

FP-203

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DEFUELING AND REFUELING OPERATIONS

REVIEWED BY: Plant Review Committee

Paul F. McKee

Date 5/4/78

Meeting No. 78-18

APPROVED BY: Nuclear Plant Manager

Gary P. Beatty Jr.

Date 5/9/78

1.0 PURPOSE

1.1 To describe the procedure to be followed during the defueling and subsequent refueling of the CR-3 reactor.

Procedure	Section
Fuel Movement in Reactor Building for Defueling	8.0
Fuel Movement in Auxiliary Building for Defueling	9.0
Fuel Movement in Auxiliary Building for Refueling	10.0
Fuel Movement in Reactor Building for Refueling	11.0
Auxiliary Neutron Detector Movement	12.0
Inverse Count Rate Plotting	13.0
Verification of Loaded Fuel Assemblies	14.0
Restoration of Activities and Systems	15.0

2.0 DESCRIPTION

2.1 This procedure is to be used for all defueling and refueling evolutions subsequent to CR-3 initial fuel loading.

2.2 The loading and accompanying reactivity changes for each assembly are monitored by two or more source range neutron monitors. Plots of the subcritical multiplication versus the number of fuel assemblies will be made during major increases of reactivity during refueling.

2.3 The only nuclear instrumentation (NI) that is required to be operable during the defueling evolution is the two source range detectors, NI-1 and NI-2.

2.4 REFUELING SUPERVISOR

The Refueling Supervisor is responsible for supervising fuel movement. He is responsible for all decisions to stop and resume fuel loading. He must hold a Senior Operator (SOP) License.

2.5 REFUELING CONSULTANT

The Refueling Consultant is the individual who supplies technical advice and expertise in the area of defueling and refueling operations to the Refueling Supervisor. He is also responsible for maintaining the Refueling Log which will contain a list of all problems and major events occurring during defueling and refueling operations.

2.6 CCOP

CCOP refers to the personnel in the Control Center who are licensed operators and who are assigned to defueling and refueling operations only. These activities will include tag board control, communication with other refueling stations, and NI monitoring.

3.0 REFERENCES

3.1 CP-116, Standard Cleanliness Specifications

3.2 FP-601, Fuel Handling Equipment Operations

3.3 RP-106, Radiation Work Permit Procedure

3.4 SP-112, Calibration of the Reactor Protection System

3.5 SP-220, Instrumentation Functional Tests During Refueling Operations

3.6 OP-404, Decay Heat Removal System

3.7 OP-408, Nuclear Services Cooling System

3.8 OP-704, Communications System

3.9 OP-403, Chemical Addition System

3.10 OP-405, Reactor Building Spray System

3.11 OP-412, Waste Gas Disposal System

3.12 OP-207, Fire Protection Systems

3.13 OP-411, Instrument and House Service Air Systems

3.14 OP-410, Secondary Services Closed Cycle Cooling System

3.15 OP-414, Nitrogen and Hydrogen Systems

3.16 OP-416, Domestic Water Supply System

3.17 OP-418, Demineralized Water System

3.18 OP-419, Liquid Sampling System-Initial Valve Lineup

3.19 OP-407, Liquid Waste Disposal System

3.20 OP-604, Circulating Water System

3.21 OP-606, Auxiliary Steam System

3.22 OP-703, Plant Distribution System

3.23 OP-705, Emergency Power-DC System

3.24 EM-203, Classification of Emergencies and Criteria for Evacuation

3.25 Special Nuclear Materials Handling and Accountability Manual

3.26 AI-400, Plant Operating Quality Assurance Manual Control Document, Section 8.0

3.27 SP-156, Calibration and Equipment Setup For the Auxiliary Neutron Detector System

4.0 ENCLOSURES

Enclosure 1	Water Chemistry Log
Enclosure 2	Fuel/Control Component Move Sheet (sample)
Enclosure 3	(deleted)
Enclosure 4	(deleted)
Enclosure 5	(deleted)
Enclosure 6	CR-3 Cycle 1 Core Load Map
Enclosure 7	CR-3 Core Map Check Form
Enclosure 8	Background Determination
Enclosure 9	Random Distribution Verification and Base Count Rate Determination
Enclosure 10	Inverse Count Rate Calculations
Enclosure 11	Inverse Count Rate Plot

5.0 LIMITS AND PRECAUTIONS

5.1 If any of the conditions of Section 5.0 are not met, fuel handling shall cease. Action shall be initiated to correct the situation so the conditions are met. No operation which may increase the reactivity of the core shall be made until the conditions of Section 5.0 are met.

5.1.1 During defueling, two source range NI monitors, each with visual indication in the Control Center and one with audible indication in the Control Center, shall be operable.

5.1.2 During refueling at least two source range NI monitors (NI-1 and NI-2), each with visual indication in the Control Center and one with audible indication in both the Control Center and containment, shall be operable. If Step 13.4 of this procedure cannot be met, i.e., if average counts are less than 30 cpm and a random distribution of counts cannot be verified, an auxiliary neutron monitor must be used. The auxiliary neutron monitor must have both visual and audible indication in the containment.

5.1.3 The reactor shall be subcritical for at least 72 hrs. prior to movement of irradiated fuel in the reactor pressure vessel.

5.1.4 The containment penetrations shall be in the following status:

a. The equipment door closed and held in place by a minimum of four bolts, and

b. A minimum of one door in each air lock closed, and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:

   1. Closed by isolation valves, blind flanges, or manual valves, or

   2. Be capable of being closed by an OPERABLE automatic containment purge and exhaust isolation valve.

5.1.5 Direct communications shall be maintained between the Control Center and personnel at the defueling or refueling station.

5.1.6 All fuel handling equipment operations will be done per FP-601, Fuel Handling Equipment Operations. The fuel handling bridges shall be used for movement of control rods or fuel assemblies and shall be OPERABLE with:

a. A hoist minimum capacity of 3,000 lbs., and

b. A hoist overload cut-off limit of 2750* lbs.

5.1.7 [redacted]

5.1.8 At least one decay heat removal loop shall be in operation.

5.1.9 The containment purge and exhaust isolation system shall be OPERABLE.

5.1.10 The water level in the refueling canal shall be maintained at the 157 ft. elevation, or higher.

5.1.11 The water level in the spent fuel (SF) pools shall be maintained at the 157 ft. elevation, or higher.

5.1.12 The Auxiliary Building ventilation exhaust system servicing the storage pool area shall be OPERABLE when irradiated fuel is stored in the SF pools.

5.2 Access to the RB and fuel handling floor area in the Auxiliary Building will be controlled per the Radiation Work Permit (RWP).

5.3 All personnel must be logged in and out of the RB at the Control Point. The Control Point will be at the RB personnel hatch. This is to ensure personnel accountability in the RB.

5.4 The reactor, transfer canal, and SF pools will be Class "B" clean (CP-116, Standard Cleanliness Specifications) prior to filling.

---

*When handling control rods or fuel assemblies with $\geq$ 23 ft. of water over the top of fuel assemblies seated in the reactor core; otherwise, the hoist overload cut-off shall be set at 2880 lbs.

5.5 All accessible areas and equipment in the RB and on the fuel handling floor in the Auxiliary Building will be Class "D" clean (CP-116, Standard Cleanliness Specifications).

5.6 Reactor coolant (RC) chemistry shall be maintained as follows:

a. Fluorides $\leq$ 0.15 ppm

b. Chlorides $\leq$ 0.15 ppm

c. Boron $\geq$ 1950 ppm

5.7 Personnel involved with fuel handling shall be limited to working a maximum of 12 hours out of any 24 hr. period.

5.8 [redacted]

5.9 All movements of fuel assemblies and rod assemblies shall be made in accordance with the Special Nuclear Materials (SNM) Handling and Accountability Manual. A Control Center Operator shall follow the movement of each fuel assembly and auxiliary neutron detector on the fuel movement board in the Control Center.

5.10 The RB evacuation alarm shall have been tested and verified operable per SP-323, Evacuation and Fire Alarm Demonstration, within one week prior to the defueling and refueling evolutions. The alarm shall also be tested after any maintenance work on the alarm equipment during these evolutions.

5.11 Any system which might decrease the boron concentration by inserting non-borated water will be isolated from the RC system-refueling canal.

5.12 An entry shall be made in the Water Chemistry Log (Enclosure 1) prior to, and once each shift during, the defueling and refueling evolutions.

5.13 In the event of a damaged fuel assembly or a reportable occurrence involving a fuel assembly, it will be removed and reinspected and approved for use by the Nuclear Plant Manager prior to insertion in the core.

5.14 In the event of an accident involving nuclear fuel or the sounding of a radiation monitor alarm, personnel shall evacuate the affected area. The area gamma monitoring subsystem which will monitor the fuel loading operations are listed below:

a. RM-G13, Decontamination Pit Area
b. RM-G14, Fuel Storage Pool Area
c. RM-G15, Auxiliary Building Fuel Handling Bridge
d. RM-G16, RB Fuel Handling Bridge
e. RM-G17, RB Near Personnel Access Hatch
f. RM-G18, RB In-Core Instrument Arae
g. RM-G19, RB - Building Dome

EM-203, Classification of Emergencies and Criteria for Evacuation, will be used to evaluate the situation and plan a course of action.

5.15 If any disagreement occurs between persons responsible for defueling and refueling (including B & W and FPC personnel) which cannot be resolved by mutual agreement of all parties involved, the Nuclear Plant Manager shall resolve the disagreement.

5.16 During movement of auxiliary neutron holders, the associated fuel handling bridge will require its low load limit bypassed. This bypass must be removed when fuel moves are going to be initiated.

5.17 If refueling operations are delayed for eight hours or more, all neutron monitors being used must be response checked within eight hours prior to resuming fuel loading. To accomplish this, pull one source-fuel assembly approximately three-fourths of the way out and observe the response on all operable monitors. Reinsert the source-fuel assembly and again observe the responses on all operable monitors. If a response is not observed on all operable monitors, repeat the above steps with the other source-fuel assembly. After a response has been observed on all operable monitors, defueling or refueling may be resumed. A new base count rate should be established for each monitor and recorded on Enclosures 9 and 10. An explanation of the occurrence, including the count rate with the source three-fourths withdrawn and reinserted plus the new "ZZ" tape reading of source-fuel assembly reinserted, shall be recorded on the back of Enclosure 9. This movement of the source should also be indicated by a symbol or identifying number on the SNM Move Sheets and referenced in the explanation on Enclosure 9.

5.18 Cease core alterations immediately if the neutron count rate from two neutron monitors unexpectedly doubles during any single fueling or defueling step. Withdraw the fuel assembly in question, perform a boron analysis of the RC, and record on Enclosure 1. Core alterations shall not resume until the Refueling Consultant has evaluated the occurrence and the Refueling Supervisor has given permission to resume core alterations.

5.19 If the count rate on two or more neutron monitors increases by a factor of two or more while no geometry changes are being made, immediately begin boration of the RC system until the count rate stops increasing. The Refueling Consultant and Refueling Supervisor shall investigate the cause of the count rate increase. Core alterations shall not resume until the cause is determined and rectified.

5.20 If the count rate on two or more neutron monitors decreases by a factor of two or more while no core geometry changes are being made, investigate to determine the cause of the count rate decrease. Core alterations shall not resume until the cause is determined and rectified.

5.21 All fuel assemblies should be oriented with the identification plate in the west direction. All control rod assemblies should have been inserted with their serial numbers in the same direction as the fuel assembly identification number.

5.22 During defueling and refueling, the sequence of fuel assemblies to be moved, the detectors, or the source-fuel assemblies may be modified. This change in sequence shall be handled in accordance with Section 8.0 of AI-400, Plant Operating Quality Assurance Manual Control Document.

5.23 If the Co/Ci plots from two neutron monitors indicate that criticality will be reached with the addition of three or less fuel assemblies, refueling will be suspended until a thorough evaluation is made by the Refueling Consultant and the Refueling Supervisor gives permission to continue refueling.

NOTE: When a fuel assembly is loaded directly adjacent to a neutron monitor, the count rate on this monitor is expected to rise sharply and may cause the Co/Ci projection of criticality to predict that the next fuel assembly will be one-third or more of the additional fuel for criticality. This is to be expected and does not require further evaluation unless one other monitor's Co/Ci projection predicts a similar situation or exhibits an unexpectedly high count rate.

5.24 If the refueling increment is reduced to less than one fuel assembly (loading by incremental insertions of a fuel assembly) because of excessive subcritical multiplications, the refueling increment shall not be increased again.

5.25 Inverse count rate (Co/Ci) plots will be made in the Control Center from NI-1 and NI-2 counts and the RB if an auxiliary neutron monitor is in use during the refueling evolution.

5.26 SET POINTS

5.26.1 The RC water temperature will be maintained between 75°F and 140°F.

5.26.2 The RC system and decay heat removal system boron concentration shall be maintained within Standard Technical Specification (STS) limits and greater than 1950 ppmB.

5.26.3 Water chemistry shall be maintained by SP-710, RC, Decay Heat Removal, and RC Makeup Systems' Chemistry Surveillance Program; and SP-713, RC Support Systems' Chemistry Surveillance Program.

I have read and understand the aforementioned limits and precautions and have discussed them with my shift.

Refueling Consultants ____________________

____

____

____

Refueling Supervisors ____________________

____

____

____

Duty Shift Supervisors ____________________

____

____

____

6.0 EQUIPMENT AND PERSONNEL REQUIREMENTS

6.1 COMMUNICATIONS

6.1.1 Plant Communications System

6.2 SPECIAL VISUAL AIDS

6.2.1 Underwater Lights

6.2.2 Underwater Television Camera

6.2.3 Binoculars

6.2.4 Underwater Viewing Boxes

6.3 COMPUTATIONAL AIDS

6.3.1 IBM 5100

6.3.2 Calculator

6.3.3 Straight-Edge Rulers

6.3.4 Linear Graph Paper

6.3.5 Pencils

6.4 INSTRUMENTATION

6.4.1 Trend recorders for source range neutron detectors.

6.4.2 Scaler Timers (2)

6.4.3 Auxiliary Source Range Neutron Detectors (2) (FOR REFUELING ONLY)

6.5 CALIBRATION SOURCE

6.5.1 Portable 5-Curie PuBe Source

6.6 PERSONNEL

6.6.1 Plant Operations Staff

6.6.2 Defueling and Refueling Shift:

a. Refueling Supervisor

b. Refueling Consultant

c. Fuel Handling Bridge Operators

d. Fuel Transfer Carriage Operators

e. Data Takers

f. ChemRad Technicians

7.0 REQUIRED INITIAL CONDITIONS AND PLANT STATUS

7.1 DEFUELING AND REFUELING

Initials/Date

7.1.1 The reactor vessel (RV) closure head has been removed and stored per FP-401, Reactor Vessel Closure Head Removal and Replacement. ____________

7.1.2 The seal plate has been lowered and installed per FP-404, Canal Seal Plate Removal and Replacement. ____________

7.1.3 The plenum has been removed and stored in the deep end of the fuel transfer canal per FP-501, Reactor Internals Removal and Replacement. ____________

7.1.4 All Surveillance Procedures required prior to Mode 6 operation have been performed. ____________

7.1.5 (deleted) ____________

7.1.6 (deleted) ____________

7.1.7 Connect outputs from the two source range out-of-core monitors to trend recorders. ______ ______

7.1.8 Connect the output from each source range out-of-core monitor to a scaler timer. ____________

7.1.9 For defueling and refueling the last fuel assembly, audible indication of neutron flux will have to originate from a source range NI. Any of the following methods are acceptable:

a. Have the Control Center PAX phone on live circuit with the RB Operations Floor PAX phone. Place the Control Center PAX phone next to the speaker of the audible source range NI and have an RB Data Taker monitor the circuit during removal of the first fuel assembly.

b. Place the Control Center PAX phone to the "PA" position and move it next to the source range NI speaker. This will provide audible indication in the containment during removal of the first fuel assembly.

c. Place either of the auxiliary detectors with audible indication in the RV atop the irradiated fuel with a fuel handling bridge. This can only be done if the low load limit on the fuel handling bridge has been jumpered out. The jumper is to be installed across relay contact LL-1 (terminal points 226 and 251). The jumper is to be removed before any fuel is moved by this bridge.

d. Any other method which satisfies Technical Specification 3.9.2.

7.1.10 All neutron monitors have been response checked within eight hours prior to refueling or defueling.

7.1.11 Current/Fuel Control Component Move Sheets are available.

8.0 FUEL MOVEMENT IN REACTOR BUILDING FOR DEFUELING

8.1 (deleted)

8.2 The Main Fuel Handling Bridge Operator will move to a position above the reactor core location designated on the Fuel/Control Component Move Sheet. He will lower the fuel grapple until he engages the fuel assembly, but shall not raise the assembly until the "ZZ" tape reading has been read to verify proper location of the fuel assembly. After ensuring that a stable count rate has been established on at least two neutron monitors and permission has been obtained from the Refueling Supervisor, the Main Fuel Handling Bridge Operator may raise the fuel assembly into the mast and move it to the upender designated on the Fuel/Control Component Move Sheet.

8.3 Lower the fuel assembly into the fuel transfer carriage, release the assembly, and transfer it into the Auxiliary Building per FP-601, Fuel Handling Equipment Operations, while calling the move into the Control Center.

8.4 Move the main fuel handling bridge to the next location described on the Fuel/Control Component Move Sheet and repeat Steps 8.1 thru 8.4 for the remaining fuel assemblies that are to be moved into the Auxiliary Building.

9.0 FUEL MOVEMENT IN AUXILIARY BUILDING FOR DEFUELING

9.1 The SF Handling Bridge Operator will position the SF bridge over the proper fuel transfer carriage as determined by the Fuel/Control Component Move Sheet.

9.2 Lower the grapple tube over the fuel, engage the fuel assembly, and move it to its location in the SF pool per the Fuel/Control Component Move Sheet.

9.3 Lower the fuel assembly into its receptacle, confirm the "ZZ" tape reading and "low-load limit", and release the assembly.

9.4 Move the SF handling bridge to the proper fuel transfer carriage as indicated by the Fuel/Control Component Move Sheet.

9.5 Sign off the move as complete on the Fuel/Control Component Move Sheet.

NOTE: There may be considerable delay in returning a fuel transfer carriage to the Auxiliary Building for the next fuel assembly. This may be caused by detector relocation, establishing new base count rates, removing a fuel assembly, etc.

9.6 Repeat procedural Steps 9.1 thru 9.5 until all fuel assemblies are seated in their proper locations established by the Fuel/Control Component Move Sheet.

10.0 FUEL MOVEMENT IN AUXILIARY BUILDING FOR REFUELING

Obtain permission from the Refueling Supervisor and contact the Control Center to start fuel movement.

10.1 The SF Handling Bridge Operator shall move the bridge to the location described by the Fuel/Control Component Move Sheet.

10.2 The operator will move the fuel assembly from this location to the fuel transfer carriage designated on the approved Fuel/Control Component Move Sheet.

10.3 The Fuel/Control Component Move Sheet shall be signed off as moves are made. Enclosure 2 provides a sample of this sheet. Approved sheets will be provided at the time of actual fuel loading.

10.4 The fuel assembly will be transferred to the RB.

10.5 The move will be called into the Control Center.

10.6 If the next fuel transfer carriage is ready for transferring fuel, the Fuel Handling Bridge Operator in the Auxiliary Building may proceed to the location of the next fuel assembly listed on the Fuel/Control Component Move Sheet.

NOTE 1: Omit all steps that do not involve fuel movement from the SF pools.

NOTE 2: There may be considerable delay in returning a fuel transfer carriage to the Auxiliary Building for the next fuel assembly. This may be caused by detector relocation, establishing new base count rates, seating a fuel assembly, etc.

10.7 Repeat procedural Steps 10.2 thru 10.6 until all of the fuel assemblies have been removed from the SF pools.

11.0 FUEL MOVEMENT IN REACTOR BUILDING FOR REFUELING

11.1 The fuel assembly identification number shall be read and called in to the Control Center before the main fuel handling bridge moves the fuel to the core.

NOTE: The use of underwater television cameras, binoculars, and portable lights may be used to help read the numbers at the fuel transfer carriage.

11.2 The Fuel Handling Bridge Operator in the RB will pick up the fuel assembly and move it to a position above the reactor core location designated on the Fuel/Control Component Move Sheet.

11.3 The Fuel Handling Bridge Operator in the RB may lower the assembly into the reactor but shall not disengage the fuel grapple until the "ZZ" tape reading has been read to verify the proper seating of the fuel assembly, a stable count rate is established on at least two neutron monitors, and permission to release the assembly is obtained from the Fueling Supervisor or his licensed designee.

NOTE: If there is any difficulty seating the assembly, refer to FP-601, Fuel Handling Equipment Operations, Step 8.2.8.

11.4 The Fuel/Control Component Move Sheet will be initialed as completed and the "ZZ" tape reading recorded.

NOTE: Omit all steps that do not involve fuel or detector movement in the reactor.

11.5 Repeat procedural Steps 11.1 thru 11.4 for each fuel assembly to be moved from the fuel transfer carriages listed on the Fuel/Control Component Move Sheet.

NOTE: Move sequence steps 347 and 350 do not require moving fuel from the fuel transfer tubes, therefore, follow the instructions below for these steps.

11.6 (deleted)

11.7 Move sequence steps 347 and 350 involve moving the source-fuel assembly. The Fuel Handling Bridge Operator in the RB will move the main fuel bridge to the proper location, then he will perform procedural Steps 11.1 thru 11.4.

11.8 (deleted)

11.9 (deleted)

12.0 AUXILIARY NEUTRON DETECTOR MOVEMENT

12.1 An auxiliary neutron detector is to be moved by hand using a rope.

12.2 The detector holder is to be moved by a fuel handling bridge. [The low load limit switch will have to have a jumper installed (write-up) since the holder weighs less than the low load limit.]

12.3 The detector torpedo suspended from the nylon line will be lowered into the holder. During the last two to three inches of insertion of the detector torpedo, the nylon line should be slowly moved in a circular motion and the detector seating verified using binoculars.

NOTE: The seating of the detector torpedo is to avoid a large unexpected count rate increase (a factor of 0.5 to 1.5) [illegible]en it does seat. This is apparently due to a plane of fuel assembly grid spacers in close alignment with the active center line of the auxiliary detectors and the source.

12.4 Make sure the detector cable is made stationary and placed so that it will not interfere with subsequent loading of fuel assemblies.

NOTE: When an auxiliary neutron detector is relocated, a new base count rate must be established for that detector.

12.5 The Fuel/Control Component Move Sheet will be initialed as completed at each refueling station.

12.6 When permission is given by the Refueling Supervisor or his licensed designee to load the next fuel assembly listed on the S.M Move Sheets, repeat Steps 11.1 thru 11.4.

12.7 In order to provide the required audible signal until the final fuel assembly is loaded, use one of the choices provided by Step 7.1.9.

12.8 Remove the jumper from the low load limit switch on the auxiliary fuel handling bridge after detector holder "A" is removed from the reactor.

12.9 Dispose/decontaminate the auxiliary detectors per ChemRad instructions.

13.0 INVERSE COUNT RATE PLOTTING

13.1 Determine background for each of the neutron monitors within eight hours prior to the start of defueling/refueling evolutions. The monitors shall have been in operation at least 30 min. prior to background determination.

13.2 The background count rate for each monitor will be taken for five intervals of five minutes and recorded on Enclosure 8.

NOTE: Background count rates are to be established for each detector in order to verify that the background will have an insignificant addition to the measured count rates for Co/Ci plots.

13.3 A base count rate (Co) for each monitor will be established after the second fuel assembly (C20) is loaded in the core. The base count rate is determined from averaging five equal counting intervals. The data is to be recorded for each monitor on a Base Count Rate Determination Form (Enclosure 9).

13.4 If the average count rate is less than 30 cpm or the counts are not randomly distributed as determined in Enclosure 9, notify the Refueling Supervisor. An auxiliary neutron monitor will have to be used if the problem is not resolved.

13.5 Each time an auxiliary neutron detector is moved, a new base count rate (Co) will be determined for that neutron monitor system. A base count rate does not have to be determined if detector "A" is suspended over the core during Step 12.7.

13.6 Each time a source is moved, a new base count rate (Co) will be determined for all neutron monitors.

13.7 After each fuel assembly is inserted into the core, observe the trend recorders for the two source range neutron detectors.

13.8 When a stable count rate is reached (trace from trend recorders approximates a straight line), determine if the count rate has increased by 50% over the base count rate (Co/Ci = 0.67). If not, the next fuel assembly can be removed; return to Step 13.7.

13.9 If the count rate increases by 50% over the base count rate, then Co/Ci plots shall be performed per Steps 13.10 thru 13.12.

13.10 Record three successive counts, the average count rate, and Co/Ci value on Enclosure 10 and plot the Co/Ci value on Enclosure 11.

13.11 A very conservative method of criticality prediction is to use the last Co/Ci point and the previous Co/Ci point which gives the steepest slope and extrapolate to Co/Ci = 0.

13.12 If the Co/Ci plot shows no change in multiplication (10 or more points do not vary from the average Co/Ci value by more than $\pm$ 0.1), then a new base count can be established; return to Step 13.7.

13.13 If the Co/Ci plot for a neutron monitor value falls below 0.25 when a fuel assembly is moved next to a monitor or a source, the situation should be evaluated. If it is determined that spatial effects caused the value of Co/Ci to be less than 0.25, then a new base count rate should be established for that monitor.

13.14 If more than three fuel assemblies are predicted to go critical, inform the Refueling Supervisor or his licensed designee. After two Co/Ci plots predict that it is safe to load the next fuel assembly, the Refueling Supervisor can inform the refueling personnel that the next fuel assembly can be loaded.

13.15 If less than three fuel assemblies are predicted to go critical, try to determine the cause of this prediction. (The K_{eff} of one of the assemblies enriched to about 2.8% at cold, clean conditions with 1800 ppm boron is about 0.6 and the K_{eff} of the new clean core for the same conditions is about 0.87.) Consult with the Refueling Consultant about your analysis and seek his advice. If the prediction is due to spatial loading effects and not due to excessive subcritical multiplication, determine if the reading should be ignored for that monitor. The Refueling Consultant should then use the data from the other monitors and determine the effect that the last fuel assembly loaded had on the subcritical multiplication. If it can now be shown that more than three fuel assemblies are needed to go critical, inform the refueling personnel that the next fuel assembly may be loaded. If less than three fuel assemblies are still indicated, further analysis should be done with the assistance of B & W.

NOTE: When a fuel assembly is loaded directly adjacent to a neutron monitor, the count rate on this monitor is expected to rise sharply and may cause the Co/Ci projection of criticality to predict that the next fuel assembly will be one-third or more of the additional fuel for criticality. This is to be expected and does not require further evaluation unless one other monitor's Co/Ci projection predicts a similar situation or exhibits an unexpectedly high count rate.

When a fuel assembly is loaded directly adjacent to a neutron source, the count rates on all the neutron monitors are expected to rise sharply. The Co/Ci projections of criticality from two or more neutron monitors are not expected to predict that the next fuel assembly will be one-third or more of the additional fuel for criticality. If they do, the situation should be carefully analyzed.

13.16 If the Co/Ci plot for a neutron monitor value falls below 0.25 when a fuel assembly is moved next to a monitor or a source, the situation should be evaluated. If it is determined that spatial effects caused the value of Co/Ci to be less than 0.25, then a new base count rate should be established for that monitor.

14.0 VERIFICATION OF LOADED FUEL ASSEMBLIES

14.1 Two individuals will separately record the fuel assembly identification number and orientation for each core lo ation after core loading on Enclosure 5. All fuel elements must be facing west.

15.0 RESTORATION OF ACTIVITIES AND SYSTEMS

15.1 Continue decay heat flow.

15.2 Accumulate all data and submit it to the Reactor Engineer.

15.3 Replace reactor internals according to FP-501, Reactor Internals Removal and Replacement.

15.4 Reinstall the reactor vessel closure head according to FP-401, Reactor Vessel Closure Head Removal and Replacement.

15.5 Being cleanup of fuel transfer canal per ChemRad instructions.

WATER CHEMISTRY LOG

READINGS TAKEN PRIOR TO AND ONCE EACH DAY DURING DEFUELING/REFUELING EVOLUTIONS

Initials	Date/Time	RCS - Boron Concentration $\geq$ 1950 ppm (ppm)	RCS Temperature 75^{o} To $100^{o}F$ (^{o}F)	RV Wtr. Lv. Above Cold Leg Centerline (ft)	Fuel Transfer Canal Wtr.Lvl. Over Xfer Tube (ft)	RCS - CL Concentration $\leq$ 0.15 ppm (ppm)	RCS - FL Concentration $\leq$ 0.15 ppm (ppm)	Comments

SHEET NUMBER 76- 47

STEP	FUEL ASSEMBLY	CONTROL COMPONENT	FROM	LOCATION	TO	LOCATION	OPERATOR INITIALS	ZZ (FT)	TAPE (IN)
1	C04	D110	SFA	B01	FTC	X 0			
2	C04	D110	FTC	X 0	RTR	N14			
3	C20	D111	SFA	G01	FTC	Y 0			
4	C20	D111	FTC	Y 0	RTR	D02			
5	C55		SFB	L22	FTC	X 0			
6	C55		FTC	X 0	RTR	D13			
7	C37	B047	SFB	G26	FTC	Y 0			
8	C37	B047	FTC	Y 0	RTR	N13			
9	C35	B052	SFB	G27	FTC	X 0			
10	C35	B052	FTC	X 0	RTR	D12			
11	C48		SFB	A22	FTC	Y 0			
12	C48		FTC	Y 0	RTR	M14			
13	A04	C054	SFA	D08	FTC	X 0			
14	A04	C054	FTC	X 0	RTR	N12			
15	A27	C051	SFA	C08	FTC	Y 0			
16	A27	C051	FTC	Y 0	RTR	M13			
17	B05	B066	SFB	H28	FTC	X 0			
18	B05	B066	FTC	X 0	RTR	M12			
19	B39	B042	SFB	H26	FTC	Y 0			
20	B39	B042	FTC	Y 0	RTR	L13			
21	B28	B068	SFB	H24	FTC	X 0			
22	B28	B068	FTC	X 0	RTR	N11			
23	A42	A006	SFA	B08	FTC	Y 0			
24	A42	A006	FTC	Y 0	RTR	L12			
25	A21	C050	SFA	A08	FTC	X 0			
26	A21	C050	FTC	X 0	RTR	M11			
27	B50	B062	SFB	G25	FTC	Y 0			

SAMPLE

FUEL / CONTROL COMPONENT MOVE SHEET - CONTROL ROOM COPY PAGE 1

SHEET NUMBER 76- 47

STEP	FUEL ASSEMBLY	CONTROL COMPONENT	FROM	LOCATION	TO	LOCATION	OPERATOR INITIALS	DATE	TIME	ZZ (FT)	TAPE (IN)
1	C04	0110	SFA	B01	FTC	X 0					
2	C04	0110	FTC	X 0	RTR	N14					
3	C20	0111	SFA	G01	FTC	Y 0					
4	C20	0111	FTC	Y 0	RTR	D02					
5	C55		SFB	E22	FTC	X 0					
6	C55		FTC	X 0	RTR	O13					
7	C37	B047	SFB	C26	FTC	Y 0					
8	C37	B047	FTC	Y 0	RTR	N13					
9	C35	B052	SFB	G27	FTC	X 0					
10	C35	B052	FTC	X 0	RTR	O12					
11	C48		SFB	A22	FTC	Y 0					
12	C48		FTC	Y 0	RTR	M14					
13	A04	C054	SFA	D08	FTC	X 0					
14	A04	C054	FTC	X 0	RTR	N12					
15	A27	C051	SFA	C08	FTC	Y 0					
16	A27	C051	FTC	Y 0	RTR	M13					
17	B05	B066	SFB	H28	FTC	Y 0					
18	B05	B066	FTC	X 0	RTR	M12					
19	B39	B042	SFB	H26	FTC	Y 0					
20	B39	B042	FTC	Y 0	RTR	L13					
21	B28	B068	SFB	H24	FTC	X 0					
22	B28	B068	FTC	X 0	RTR	N11					
23	A42	A006	SFA	B08	FTC	Y 0					
24	A42	A006	FTC	Y 0	RTR	L12					
25	A21	C050	SFA	A08	FTC	X 0					
26	A21	C050	FTC	X 0	RTR	M11					
27	B50	B062	SFB	G25	FTC	Y 0					

SAMPLE

PREPARED BY DATE TIME

SHEET NUMBER 76- 47

STEP	FUEL ASSEMBLY	CONTROL COMPONENT	FROM	LOCATION	TO	LOCATION	OPERATOR INITIALS	ZZ (FT)	TAPE (IN)
1	C04	0110	SFA	B01	FTC	X 0			
2	C04	0110	FTC	X 0	RTR	N14			
3	C20	0111	SFA	G01	FTC	Y 0			
4	C20	0111	FTC	Y 0	RTR	D02			
5	C55		SFB	E22	FTC	X 0			
6	C55		FTC	X 0	RTR	O13			
7	C37	B047	SFB	C26	FTC	Y 0			
8	C37	B047	FTC	Y 0	RTR	N13			
9	C35	B052	SFB	G27	FTC	X 0			
10	C35	B052	FTC	X 0	RTR	O12			
11	C48		SFB	A22	FTC	Y 0			
12	C48		FTC	Y 0	RTR	M14			
13	A04	C054	SFA	D08	FTC	X 0			
14	A04	C054	FTC	X 0	RTR	N12			
15	A27	C051	SFA	C08	FTC	Y 0			
16	A27	C051	FTC	Y 0	RTR	M13			
17	B05	B066	SFB	H28	FTC	X 0			
18	B05	B066	FTC	X 0	RTR	M12			
19	B39	B042	SFB	H26	FTC	Y 0			
20	B39	B042	FTC	Y 0	RTR	L13			
21	B28	B068	SFB	H24	FTC	X 0			
22	B28	B068	FTC	X 0	RTR	N11			
23	A42	A006	SFA	B08	FTC	Y 0			
24	A42	A006	FTC	Y 0	RTR	L12			
25	A21	C050	SFA	A08	FTC	X 0			
26	A21	C050	FTC	X 0	RTR	M11			
27	B50	B062	SFB	G25	FTC	Y 0			

SAMPLE

(deleted)

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CR-3 CYCLE 1 CORE LOAD MAP

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
R						0190 C54	0192 C21	0193 C07	0196 C27	0200 C56					
P				0112 C29	0171 C33	C061 C05	B020 B27	C060 C18	B019 B45	C059 C02	0201 C26	0110 C04			
O			0168 C55	B052 C35	C058 A34	B051 B21	C057 A51	B050 B34	C056 A02	B049 B47	C055 A31	B048 C22	0203 C59		
N		0231 C30	B047 C37	C054 A04	B068 B28	A008 A48	B046 B23	C053 A40	B045 B46	A007 A10	B067 B09	C052 A05	B044 C09	0206 C51	
M		0170 C48	C051 A27	B066 B05	C050 A21	B065 B15	C049 A01	B043 B61	C048 A17	B064 B08	C047 A18	B063 B29	C046 A55	0204 C03	
L	0207 C57	C045 C32	B042 B39	A006 A42	B062 B50	C044 A44	B018 B33	C043 A47	B017 B32	C042 A50	B061 B43	A005 A07	B041 B42	C041 C15	0233 C58
K	0209 C13	B016 B56	C038 A46	B040 B41	C039 A20	B015 B25	C040 A33	B014 B59	C037 A45	B013 B48	C036 A41	B039 B36	C035 A08	B012 B54	0189 C10
H	0213 C06	C034 C45	B038 B31	C033 A36	B037 B02	C032 A54	B011 B55	C031 B37	B010 B58	C030 A56	B036 B01	C029 A03	B035 B24	C028 C43	0188 C19
G	0214 C12	B009 B38	C027 A35	B034 B19	C026 A13	B008 B51	C025 A39	B007 B57	C024 A26	B006 B10	C023 A16	B033 B07	C022 A25	B005 B60	0183 C08
F	0234 C53	C021 C31	B032 B44	A004 A49	B060 B14	C020 A29	B004 B20	C019 A30	B003 B18	C018 A38	B059 B13	A003 A09	B031 B11	C017 C16	0177 C41
E		0229 C47	C016 A43	B058 B06	C015 A14	B057 B16	C014 A24	B030 B52	C013 A12	B056 B49	C012 A23	B055 B30	C011 A11	0173 C14	
D		0230 C39	B029 C50	C010 A32	B054 B12	A002 A37	B028 B22	C009 A19	B027 B53	A001 A06	B053 B03	C008 A53	B026 C28	0232 C34	
C			0227 C60	B025 C49	C007 A22	B024 B17	C006 A52	B023 B35	C005 A15	B022 B26	C004 A28	B021 C11	0175 C52		
B				0111 C20	0225 C23	C003 C25	B002 B40	C002 C17	B001 B04	C001 C24	0176 C46	0109 C40			
A						0224 C38	0222 C36	0221 C01	0220 C44	0217 C42					

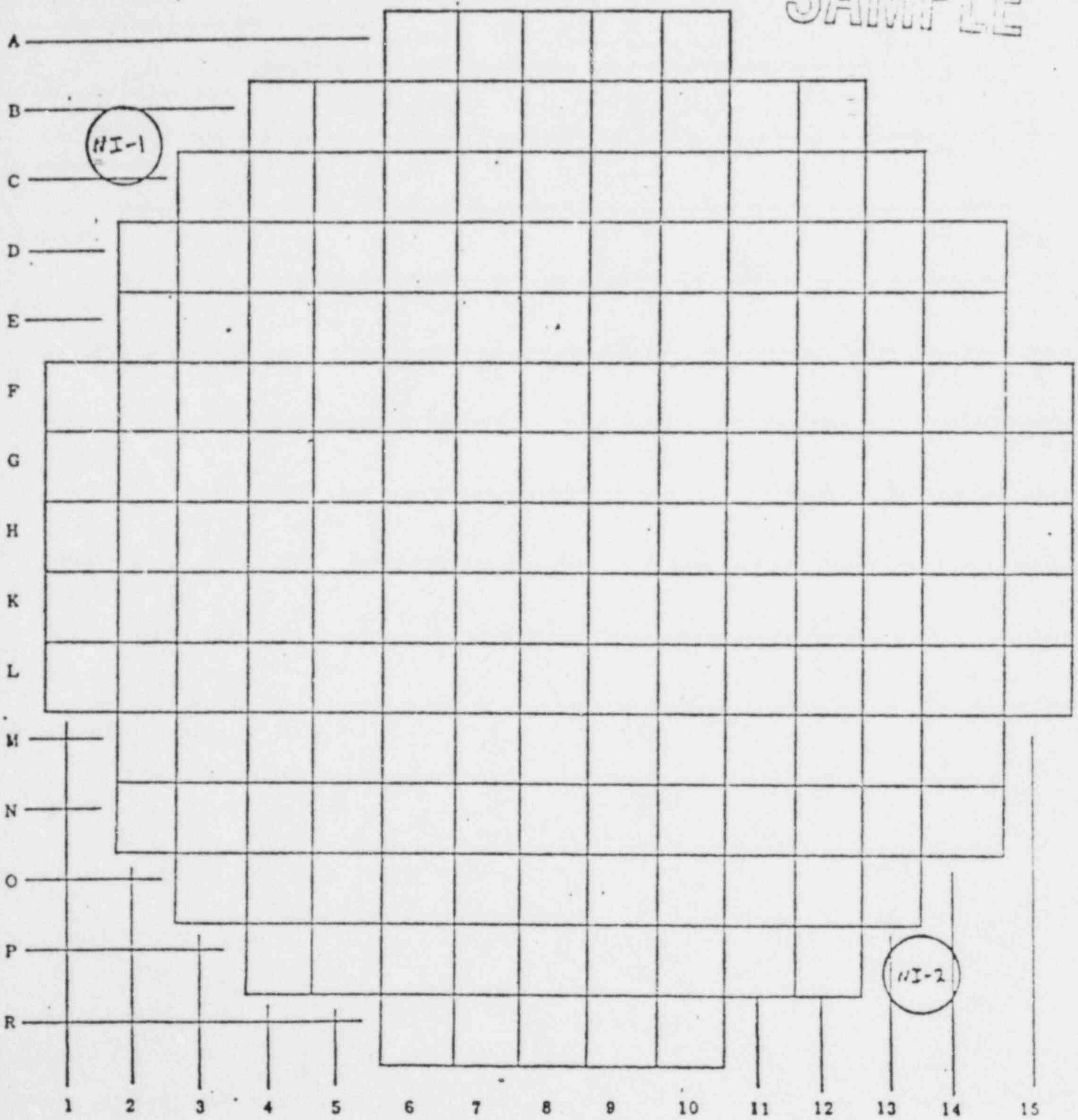
FP-203

Date 3/27/78

ENCLOSURE 6

CR-3 CORE MAP
CHECK FORM
CALLED NORTH

SAMPLE



DATE______________

BACKGROUND DETERMINATION

Detector ____________ Time ____________

Initials ____________ Date ____________

Record counts for five counting intervals for five minutes each before loading fuel.

1. ____________ counts per 5 min. = ____________ cpm
2. ____________ counts per 5 min. = ____________ cpm
3. ____________ counts per 5 min. = ____________ cpm
4. ____________ counts per 5 min. = ____________ cpm
5. ____________ counts per 5 min. = ____________ cpm

Sum of Counts = ____________ cpm

Average Background (BG) = $\frac{\text{Sum}}{5}$ cpm

BG = ____________ cpm

RANDOM DISTRIBUTION VERIFICATION AND BASE COUNT RATE DETERMINATION

Detector ______________ Initials ________

Background (BG) ________ cpm (from Enc. 8) Time/Date ________ / ________

NOTE: Count to a minimum of 200 counts or to a counting time of five minutes. (A minimum count time of 10 sec. is required.)

Take data for five equal counting intervals.

Ni (counts)		$\lvert Ca - Ni \rvert$	$(Ca - Ni)^2$
N1 = ________	counts	________	________
N2 = ________	counts	________	________
N3 = ________	counts	________	________
N4 = ________	counts	________	________
N5 = ________	counts	________	________
Sum = S1 = ________	counts		Sum = S2 = ________

Average Count Rate = Ca = $\frac{S1}{5 \times \text{Counting Interval in Min.}} = \frac{\_\_\_\_\_\_\_\_}{5 \times \_\_\_\_\_\_\_\_}$ = cpm

Random Distribution Verification[1]

$P^1 = \frac{S2}{Ca} = \_\_\_\_\_\_ =$

Is "P" > .75 but < 13.40? _____ / _____ (Yes or No/Initials)

IF YES: Two source range NI's are required for refueling. (Ca must also be greater than 30 cpm.)

IF NO : Two source range NI's and one auxiliary neutron monitor are required for refueling.

Base Count Rate Determination

1. Ni successive counts are $Ca \pm 2\sqrt{Ca}$. $\pm 2\sqrt{2Ca}$ = ________
2. Ca is greater than 30 cpm.
3. Ca is greater than 5 x BG. 5 x BG = ________

If all three conditions are met, then:

Base Count Rate (Co) = Ca

Co = ________ cpm

---

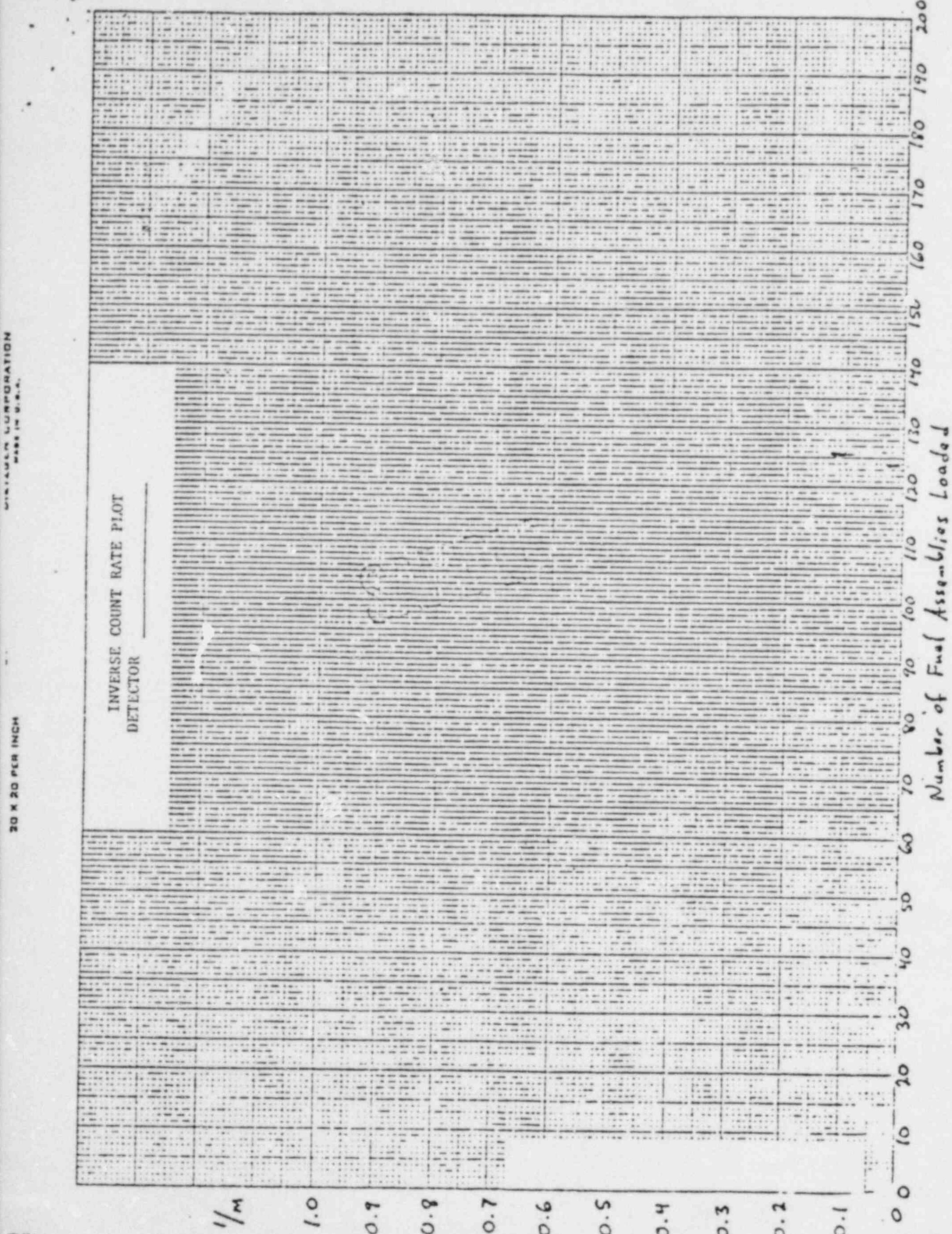
[1] This is known as a Chi square test which is used to determine how well data fits a Poisson Distribution of Probability. Limits .75 < P < 13.40 represents a good fit.

INVERSE COUNT RATE CALCULATIONS

Detector ____________ Base Count Rate (Co) ____________ cps

STEP NO.	FUEL ASSEMBLY NO.	C_1 (cps)	C_2 (cps)	C_3 (cps)	C_{ave} (cps)	C_o/C_{ave}	ESTIMATED CRITICALITY*	INITIALS/DATE

*Number of fuel assemblies that 1/M plot indicates criticality might occur.


INVERSE COUNT RATE PLOT
DETECTOR
1/M
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Number of Fuel Assemblies Loaded
20 X 20 PER INCH

Rev. 4 4/20/78

Document Section
INFORMATION ONLY
C. R. Nuclear

REFUELING PROCEDURE

FP-401

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTOR VESSEL CLOSURE HEAD REMOVAL AND REPLACEMENT

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 4/20/78

Meeting No. 78-16

APPROVED BY: Nuclear Plant Manager

Gary P. Beatty Jr.

Date 5/15/78

1.0 PURPOSE

To set forth the steps required to remove, store, check the flange surfaces, install two new flange O-rings, and reinstall the reactor vessel closure head.

Procedure	Section
Head Removal	8.0
Gasket and Head Replacement	9.0

2.0 DESCRIPTION

2.1 The reactor vessel consists of a domed closure head, shell, and domed bottom head. The closure head bolts to a ring flange on the upper shell and carries the control rod mechanism housings, three lifting lugs, and service structure support which supports the control rod drive (CRD) equipment.

2.2 When ready for removal, the combined weight of the closure head, studs (which are stored on the closure head), and associated parts is about 300,000 lbs. The outside diameter of the closure head is about 200 in.

2.3 An arrow, pointing to the space between stud #1 and stud #60, is welded to the top of the closure head. Studs are numbered from 1 to 60 increasing in the clockwise direction as seen from above the closure head.

2.4 To mate the head to the vessel, three mechanical systems assure proper alignment and effective closure: alignment studs, alignment keys, and the closure stud assemblies.

2.5 Two metallic O-rings are used to seal the vessel at the closure head joint. System pressure is admitted to the inner O-ring. Pressure may be placed between the O-rings to test for leaks without bringing the vessel up to pressure. The O-rings are replaced before each closure.

2.6 A missile shield is installed above the reactor vessel service structure. This shield is made up of three pieces, all of which must be removed to provide crane access to the closure head.

3.0 REFERENCES

3.1 Instruction Book No. 172, B & W Reactor Vessel Instruction Manual

3.2 FP-402, Reactor Vessel Closure Head Stud Removal and Replacement

3.3 FP-403, Head Seal Leak Test

3.4 FP-404, Canal Seal Plate Removal and Replacement

3.5 MP-108, Control Rod Drive Handling

3.6 OP-301, Filling and Venting the RC System

3.7 OP-303, Draining and Nitrogen Blanketing of the RC System

3.8 OP-209, Plant Shutdown

3.9 B & W Dwg. No. 135561E; Arrangement and Details, Gaskets and Fasteners

3.10 B & W Dwg. No. 141000E, Arrangment Head Storage Stand

3.11 B & W Dwg. No. 140970E, Head and Internals Handling Fixture Assembly

3.12 B & W Dwg. No. 135563E, Service Structure Support and Flange

3.13 B & W Dwg. No. 135553E, Control Rod Drive Mechanism Housing

3.14 B & W Dwg. No. 135550E, Miscellaneous Closure Head Details

3.15 B & W Dwg. No. 99563C, Stud Support Spacer

3.16 B & W Dwg. No. 99564C, Stud Handling Adapter

3.17 B & W Dwg. No. 101988D, Castellated Nut Wrench

3.18 B & W Dwg. No. 165257E, Closure Head Service Structure

3.19 SP-358, Refueling System Interlocks

3.20 TG-000-20, Clean Areas and Clean Rooms

3.21 GAI Dwg. No. L-001-032, Plan Above Reactor Bldg. Operating Floor-Elev. 160' 0"

3.22 GAI Dwg. No. L-001-042, Plan Above Reactor Bldg.-Elev. 180' 0"

3.23 B & W Pressurized Water Reactor Technology, Volume 3, Section 12 (This reference contains useful information and sketches.)

3.24 CP-115, In-Plant Equipment Clearance and Switching Orders

4.0 ENCLOSURES

Enclosure 1 Record of Small Items Monitored Near Open Reactor Vessel

5.0 LIMITS AND PRECAUTIONS

5.1 Work may be carried forth only when the temperature of the closure head and flange exceeds the Design Transition Temperature (DTT).

5.2 No welding, burning, chipping, grinding, arc strikes, inadvertent impacts, notches, grooves, or stress concentrations shall be imposed on the reactor head equipment.

5.3 Prevent contamination of the reactor vessel internals from any source (rags, debris, part pieces, tools, etc.). Secure tools with lanyards for use where they could drop into the reactor vessel. Arrange lights so that the breakage cannot contaminate. Weld, tape, or otherwise secure equipment parts to prevent accidental disassembly into the vessel. Maintain accountability of tools and small items. (See Enclosure 1.)

5.4 Do not allow crane hook to come in contact with reactor coolant.

5.5 Follow the general precautions set forth in FP-501, Reactor Internals Removal and Replacement.

5.6 Inspect the head and internals lifting fixtures, including crane, cables, and fittings before lifting the closure head.

5.7 Do not remove any component from the fuel transfer canal (including the two seal O-rings) which has been exposed to the reactor coolant (RC) until approval is received from the ChemRad Section.

5.8 When handling the reactor vessel closure joint seal O-rings, do not deform them to an extent greater than the deformation allowed during shipping.

5.9 Safety-lock the connecting pins on the head and internals handling fixture.

5.10 Only Neolube may be used as a lubricant where exposed to RC.

6.0 EQUIPMENT AND PERSONNEL REQUIREMENTS

6.1 Verify operability of the following reactor building services and equipment after entry is authorized by an approved Radiation Work Permit.

a. All lighting and electrical services, including canal underwater lights.

b. Pneumatic Service (100 psi available)

c. Elevator

d. Phones and Intercom System

e. Safety Alarms and Monitors

f. Circulating Fans

g. Hoists (including polar crane)

h. Cooling and Ventilating Units

i. Emergency Hatch Air Locks

6.2 Check out the following equipment (after entry is authorized if the equipment is in the reactor building):

a. Fuel Handling Bridge Cranes-
Move out of the way from above the reactor.

b. Canal Seal Assembly

c. Control Rod Grapple

d. Long-handled hook and guide and wrench tools.

e. CRD Handling Tools

f. Head Storage Stand

g. In-core instrumentation handling equipment, including cask and replacement instruments.

h. Head and Internals Handling Fixture

i. Closure Head O-Rings (At least two sets placed on the head storage stand and checked out.)

j. Service structure hoists with associated rigging equipment.

6.3 Chloride-free detergent such as Turco's DECON 4501-A or DECON 4512-A.

6.4 Adhesive tape suitable for use on stainless steel.

6.5 Plastic Sheeting, 6-mils thick, approximately 3 ft. wide (Approximately 100 square feet will be adequate.)

6.6 Materials and tools for repair of head insulation, if necessary.

6.7 Miscellaneous tools for disconnection and connection of electrical and fluid lines, removal of head insulation, removal and replacement of the head O-ring gaskets, installation of canal seal gaskets, etc.

6.8 Tie-lines for tools used over the reactor.

6.9 Two or more radiation monitors.

6.10 One or more inside calipers which open to one foot and one or more one foot rulers (to measure the head level).

6.11 Tags for identifying disconnected lines.

6.12 One polar crane operator, nine mechanics, and one electrician to work to this procedure. Three of the mechanics shall be capable of rigging the closure head for hoisting.

6.13 One copy of this procedure with a wooden pencil only.

6.14 Molykote-G Lubricant (manufactured by Dow Corning Corporation)

6.15 Tools for cleaning and smoothing the flange surfaces and O-rings.

6.16 Material for cleaning up any spillage of contaminated water.

6.17 Three-quarter inch rubber gasket stock and cement to form the seal plate gaskets.

6.18 Leadscrew Installation Tool (Diamond Power Specialty Corporation)

6.19 Service power (110 volts AC) at the closure head and the head storage stand for working lights and power tools.

6.20 Vacuum Lifter Tool

7.0 REQUIRED INITIAL CONDITIONS AND PLANT STATUS

7.1 An approved Radiation Work Permit (RWP) and an Equipment Clearance Order.

7.2 Missile shield slabs removed to storage location shown on GAI Dwg. No. L-001-032.

7.3 The RC system has been cooled, depressurized, and drained.

7.4 Verify that all electrical, mechanical, and instrumentation disconnects are completed.

7.5 Reactor vessel metal temperature above the Design Transition Temperature (DTT).

7.6 Head seal leak-off valve to reactor building normal sump open.

PROCEDURE

8.0	HEAD REMOVAL	Initials
	NOTE: Man in charge shall initial in blank to right of each section upon completion of the step.	
8.1	An RWP and Equipment Clearance Order have been approved and issued.	______
8.2	The limits and precautions of Section 5.0 have been noted.	______
8.3	Equipment and personnel are available as listed in Section 6.0 and checked out.	______
8.4	The initial conditions of Section 7.0 have been met.	______
8.5	Verify that the fuel transfer cover plates are removed per FP-304, Fill and Drain of the Fuel Transfer Canal.	______
8.6	Bring equipment into the RB. Handling equipment normally stored outside the RB is moved into the building through the personnel air locks. Although opening the equipment hatch is not usually required, it may be opened when the RC system has been cooled and depressurized to refueling shutdown conditions and the RB atmosphere has been checked for allowable radiation levels.	______
8.7	Disconnect electric and fluid lines from the CRD service structure in accordance with MP-108, Control Rod Drive Handling.	______
	NOTE: If APSR's are to be uncoupled using the Group Power Supply, the electrical and fluid lines should remain connected until after APSR's are uncoupled.	

8.8 Verify that after RC system pressure reaches 75 to 100 psi, all of the 69 CRD pressure housings have been vented per MP-108, Control Rod Drive Handling, Section 17.0. ____________

8.9 Drain inlet and outlet headers on service structure as well as the connecting spool pieces to the canal. Disconnect CRD mechanism cooling water inlet and outlet headers. Store each header spool piece on the shielding floor. Attach temporary covers to the exposed flanges using 6-mil polyethylene sheeting and adhesive tape. ____________

NOTE: If APSR's are to be uncoupled using the Group Power Supply, the electrical and fluid lines should remain connected until after APSR's are uncoupled.

8.10 Disconnect and tag each of the 69 CRD junctions along the side of the canal in accordance with MP-108, Control Rod Drive Handling. Store the harness on the service structure platform. ____________

NOTE: If APSR's are to be uncoupled using the Group Power Supply, the electrical and fluid lines should remain connected until after APSR's are uncoupled.

8.11 Remove clamps holding segments of thermal insulation. Lower the insulation racks (four) to the canal floor for loading. With the use of a service structure hoist, lift each insulation segment high enough to clear adjacent segments, then transfer the segment to a rack. Using the polar crane, transfer the racks back to the operating floor when full (four segments to each rack). ____________

8.12 Lower the water level in the RC system until it reaches a level approximately two to six inches below the level of the closure flange. Reduce RC pressure to ambient. ____________

8.13 Verify that the seal gasket and seal plate have been installed between the reactor vessel flange and the fuel transfer canal per FP-404, Canal Seal Plate Removal and Replacement. ____________

8.14 Verify that each of the 69 control rod housing pressure caps have been removed per MP-108, Control Rod Drive Handling. ____________

8.15 Transfer the stud tensioners to the service structure as follows: ____________

8.15.1 Pick the tensioner up with a sling attached to the polar crane.

8.15.2 Hoist the tensioner up over the canal and lower it down to the area around the service structure.

8.15.3 Attach the service structure hoist sling to the second ring on the sling and assume the load.

8.15.4 Detach the polar crane hook from the first sling ring.

8.16 Verify that each of the CRD's from the control rod assemblies has been uncoupled per MP-108, Control Rod Drive Handling. ____________

NOTE: Steps 8.16, 8.17, and 8.18 may be performed in parallel.

8.17 Verify that the 52 in-core instrument assemblies have been withdrawn from the core and store in refueling positions per FP-701, In-Core Monitor Handling. ____________

8.18 Detension and remove studs and install alignment studs. Complete the steps set forth in Sections 8.0 and 9.0 of FP-402, Reactor Vessel Closure Head Stud Removal and Replacement. ____________

8.19 Clean the flange area. Remove all loose parts and tools from the area. From this point forward until the closure head has been replaced, monitor all small tools, parts, and other items brought to the vicinity of the reactor. Keep a written record using the format shown in Enclosure 1. Safety-tie all tools which will be used in the area over the reactor. ________

8.20 Remove all tools and equipment from the fuel canal area in preparation for flooding. ________

8.21 Attach a cover plate to the cavity flooding line flange. ________

8.22 Verify that the valves in the drain line from the transfer canal to the RB sump have been opened. ________

8.23 Hose down the canal walls and floor with demineralized water. ________

8.24 Verify that the valves in the drain line from the transfer canal to the building sump have been closed. ________

8.25 Verify that the valves in the drain line of the fuel transfer tubes have been closed. ________

8.26 Prepare and inspect the head and internals handling fixture and the head lifting pendants. Pin the assembly to the polar crane hook and hoist the entire assembly over the service structure. ________

NOTE: As an alternate method, the lifting pendants may each be separately attached to the lifting lugs on the closure head by following the intent of Steps 8.27, 8.28, and 8.29 for each pendant and then pinning the tripod to the pendants.

Supports for the pendants are needed on the service structure if this method is to be used. Ensure proper matching of lifting equipment to components is accomplished.

8.27 Match the numbered reactor vessel head lifting pendants to the corresponding lugs on the closure head. ____________

NOTE: The pendant turnbuckles have been set for a level lift of the reactor vessel head, locked in place with locking nuts, and scribed upon initial installation. Subsequent operations will be simplified by carefully assuring that components of the lifting gear are lined up the same way as upon initial installation.

8.28 Open the pendant access doors on the walkway at the top of the service structure. Assure that each pendant is suspended over its matching head lifting lugs. Lower the fixture and pendants. Manually guide each pendant through the walkway access doors. Match the pendant eyes with the head lifting lugs. ____________

8.29 Pin each pendant to its head lifting lug and remove the slack from the rigging. Inspect each pendant and fitting to assure that all are secure and locked. Verify that the alignment studs are installed as specified in FP-402, Reactor Vessel Closure Head Stud Removal and Replacement, and are secure. ____________

8.30 Inspect the entire head and service structure to verify that all connections between the head and building have been broken and cleared. Assure that there are no obstructions to the required path from the reactor vessel to the closure head storage stand. Assure that no loose gear, tools, equipment, parts, or debris are present on the closure head. ______

8.31 Verify that two or more survey instruments have been placed on the canal floor at either side of the closure head by the ChemRad Section. ______

8.32 Notify all personnel in the RB that the closure head is being removed and temporarily evacuate all personnel not involved in this activity. Assure that the lift path to the head storage stand is clear. ______

CAUTION:
a. Lift the closure head by the lifting lugs only.
b. Carefully avoid damage to the sensitive sealing surfaces of the closure head and vessel flanges.
c. While lifting, keep the closure head level within 0.02 in. per foot, 5/16 of an inch across the entire diameter.
d. Assure that the lifting rig does not ride or bind against the service support structure or other attachments of the closure head.
e. Safety-lock all connecting pins.

8.33 Hoist enough to place a heavy load on the hoist equipment without moving the closure head. Recheck the hoist assemblies. ______

8.34 Hoist the head from the vessel, keeping the head level within 5/16 of an inch across its entire diameter. While lifting the head off, maintain contact with the Control Center for monitoring of nuclear instruments. Visually verify that control rods have been disconnected. When the head has been lifted about one to two inches, check the head level by measuring at four locations on the flange (approximately 90° separation). ____________

8.35 If not within level limits, lower the head. Readjust the hoist equipment so the head will be level when rehoisted. ____________

WARNING: Keep all personnel clear of the area under the head while lifting.

8.36 Assure adequate measures have been taken to prevent contamination of floor or structures. ____________

8.37 Move the head to the head storage stand. Make sure the stand is clear of all loose material and debris. Move the head over the head storage stand. Visually verify that the head and stand are concentric, that there is one inch of diametrical clearance between the inside vertical surface of the head and the storage stand gussets, and that there are two inches of lead-in on the gussets. Lower the head to rest on the stand. Carefully avoid damaging the flange sealing surface. ____________

NOTE: As an alternate method, the lifting pendants may be left attached to the closure head lifting lugs and uncoupled from the tripod. The tripod is then hoisted away from the head. Supports for the lifting pendants are needed on the service structure if this method is to be used.

8.38 Slack the hoist, unpin the pendants from the lifting head lugs, and hoist the fixture and the pendants away from the head. ______________

8.39 With the approval of the ChemRad Section, use a 5X magnifying glass and carefully inspect the O-ring seating and sealing surfaces of the reactor vessel. Hand-dress any minor scratches to a smooth finish by lapping or using Scotch-Brite. The most minute scratch or blemish on either sealing surface may cause a leak. Clean the sealing surface as necessary using a chloride-free detergent. ______________

9.0 GASKET AND HEAD REPLACEMENT — Initials

NOTE: The man in charge shall initial in the blank to the right of the section after completion of the step.

9.1 After a survey and approval is given by the ChemRad Section, loosen the O-ring retaining clips on the underside of the closure head flange. Slide the clips toward the center of the head and free the O-ring. Cut into pieces and remove both of the old seal O-rings. B & W Dwg. #135561E and the B & W Reactor Vessel Instruction Manual apply. ______

9.2 With the use of a 5X magnifying glass, carefully inspect the O-ring seating and sealing surfaces of the closure head. Hand-dress any minor scratches to a smooth finish by lapping or using a fine emery cloth. The most minute scratch or blemish on the sealing surface may cause a leak. Clean the sealing surface, as necessary, using a chloride-free detergent. ______

9.3 Lift the inner O-ring and hold it against the sealing surface while sliding the clips into the perforations in the O-ring. Tighten the retaining screws. ______

NOTE: Soft surface clamps may be used to hold the O-ring in place.

9.4 Lift the outer O-ring and hold it against the sealing surface while sliding the clips into the perforations in the O-ring. Tighten the retaining screws. ______

9.5 Inspect and service the CRD's.

9.6 As necessary, depending on disposition of the hoist equipment, prepare and inspect the head and internals handling fixture and the head lifting pendants. Pin the assembly to the polar crane hook and hoist the entire assembly over the service structure.

9.7 Match the numbered reactor vessel head lifting pendants to the corresponding lugs on the closure head. See "Notes" of Steps 8.26 and 8.37 for alternate method.

9.8 Open the pendant access doors on the walkway at the top of the service structure. Assure that each pendant is suspended over its matching head lifting lugs. Lower the fixture and pendants. Manually guide each pendant through the walkway access doors. Match the pendant eyes with the head lifting lugs.

9.9 Pin each pendant to its head lifting lug and remove the slack from the rigging. Inspect each pendant and fitting to assure that all are secure and locked.

9.10 Assure that there are no obstructions to the required path from the closure head storage stand to the reactor vessel.

9.11 Assure that no loose gear, tools, equipment, parts, or debris are present on the closure head.

9.12 Assure that the reactor vessel is free of loose gear, tools, equipment, parts, or debris, and the reactor is ready to receive the closure head. Assure that the alignment studs are properly installed and secure. Drain the canal (per FP-304, Fill and Drain of the Fuel Transfer Canal) to the level specified by the ChemRad Section.

9.13 Hoist enough to place a heavy load on the hoist equipment without moving the closure head. Recheck the hoist assemblies.

9.14 Inform all personnel in the RB that the reactor vessel closure head is being moved and hoist the head from the stand. Keep all personnel clear of area under the head.

9.15 Move the head to a point approximately one foot above the alignment studs. Align holes "15" and "45" with the alignment studs.

9.16 Inch the head down until the alignment studs are within the stud holes. Continue lowering to where the flange surfaces are separated by about six inches.

9.17 Check the head level by measuring flange separation approximately every 90° around the flange. If out of level by more than 5/16 of an inch, raise the head above the alignment studs and readjust the head level. Lower the head to rest on the stand. Readjust the hoist equipment so the head will be level when rehoisted. ______

9.18 After head is found to be level within 5/16 of an inch, inch the head down until the head lifting pendants are slack. Remove the pendants and handling fixtures. ______

9.19 Install and load studs in accordance with FP-402, Reactor Vessel Closure Head Stud Removal and Replacement. ______

9.20 Hose down the walls and floor of the transfer canal and bridge masts and grapples. ______

9.21 Remove the blind flange from the cavity flooding line flange. ______

9.22 Reinstall the transfer tube cover plates. ______

9.23 Couple the 69 CRD's to the control rods using the rod coupling tool following the procedure outlined for uncoupling in reverse. (See Step 8.16.) ______

9.24 Install the closure head thermal insulation as follows: ______

9.24.1 Lower each segment down into the canal and position it near the reactor closure head with the building crane, then connect all segments with clamping devices. Transfer the load to one of the stud hoists.

9.24.2 Lower the segment with the stud hoist and lock the segments together after all have been replaced.

9.25 Replace the CRD cooling water lines as follows: _______

9.25.1 Remove the protective covers from the exposed flanges.

9.25.2 Hoist the manifold sections up and lower them into place after replacing gaskets for each flange.

9.25.3 Bolt up each flange and remove the lifting slings.

9.26 Install the 69 control rod housing pressure caps per Section 17.0 of MP-108, Control Rod Drive Handling. _______

9.26.1 (deleted)

9.26.2 (deleted)

9.26.3 (deleted)

9.27 Verify that the RC system has been filled as per OP-301, Filling and Venting of the RC System. _______

9.28 Close all vent valves. _______

9.29 Connect all electrical service leads between the junction boxes and the 69 CRD's. _______

9.30 Leak-check the CRD mechanisms, system vents, head O-ring gaskets, and in-core instrument lines. _______

9.31 Remove all tools, fixtures, ladders, supplies, identification tags, and like items from the canal area. _______

9.32 Replace the missile shield slabs above the reactor vessel using the building crane. _______

9.33 (deleted)

9.34 Inspect service and clean all tools, fixtures, and equipment. Return these items to normal storage. Wrap in plastic film if necessary. ________

9.35 Notify the Operations Section that the reactor is ready for return to normal operation. ________

9.36 Verify that the blanks on one copy of this procedure, Sections 8.0 and 9.0, have all been initialed by the individuals responsible for completing the steps noted at the left. Verify that Enclosure 1 has been completed and is attached. Note any problems or recommendations on the blank sheet opposite the problem step. Send the initialed copy (with the completed Enclosure 1) to the Maintenance Superintendent. ________

RECORD OF SMALL ITEMS MONITORED NEAR OPEN REACTOR VESSEL

Description of Item(s)	Quantity	Time/Date/Initials	
		When Item Arrived	When Removed

REFUELING PROCEDURE

FP-402

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

REACTOR VESSEL CLOSURE HEAD STUD REMOVAL AND REPLACEMENT

REVIEWED BY: Plant Review Committee

Paul J. McKee

Date 4/20/78

Meeting No. 78-16

APPROVED BY: Nuclear Plant Manager

Gary P. Beatty Jr.

Date 5/15/78

1.0 PURPOSE

1.1 To set forth the steps required for removal, replacement, and storage of reactor vessel closure head studs.

1.2 To set forth the inspection requirements for studs upon removal and reinstallation.

1.3 To set forth other operations requiring stud handling.

1.4 To provide a record of elongation of tensioned studs.

1.5 To set forth steps for stud hole seal plug removal and replacement.

1.6 To set forth steps for use of the stud impact wrench, if required.

Procedure	Section
Stud Detensioning	8.0
Stud Removal	9.0
Stud Installation	10.0
Stud Hole Seal Plug Installation	11.0
Stud Hole Seal Plug Removal	12.0
Stud Loading	13.0
Stud Impact Wrench Operation	14.0

2.0 DESCRIPTION

2.1 The reactor vessel consists of a domed closure head, shell, and domed bottom head. The closure head bolts to a ring flange on the upper shell with sixty five-foot studs, each six and a half inches in diameter. The bottom head is welded to the shell. Each item in the stud assembly (sixty assemblies) weighs as follows:

Stud	509 lbs.
Nut	83 lbs.
Spherical Washer Set	38 lbs.
Measuring Rods	10 lbs.

2.2 Each stud has a one inch diameter center hole through the longitudinal axis. This hole is used for the stud elongation measuring rod. The hole will also accommodate an electrical stud heater. The bottom insert is used to close the bottom of the stud and seat the stud elongation measuring rod. Each stud has a threaded length sufficient to accommodate a hydraulic stud tensioner.

2.3 Studs and nuts are die-stamped with the stud number. The spherical washers are die-stamped in matched sets.

2.4 The head is guided into position by two alignment studs in holes "15" and "45" in the reactor vessel flange.

2.5 Studs are removed and installed using pneumatic-powered tools. An impact wrench of 4,000 foot-pounds torque is available in the event a stud cannot be removed with normal stud handling tools.

2.6 Hydraulically-operated stud tensioners are used to load and unload the closure head studs.

2.7 Studs are numbered clockwise (looking down at the closure head) from "1" to "60" with an arrow welded to the closure head points to the space between studs "1" and "60".

3.0 REFERENCES

3.1 B & W Reactor Vessel Instruction Manual

3.2 Instruction Manual for Diamond Stud Tensioner, IM-502698-N

3.3 Stud Impact Wrench Instruction Manual

3.4 Stud Handling Tool Instruction Manual

3.5 GAI Dwg. L-001-032, Plan Above Reactor Building Operating Floor-Elevation 160'0"

3.6 FP-401, Reactor Vessel Closure Head Removal and Replacement

3.7 B & W Pressurized Water Reactor Technology, Volume 3, Section 12 (Contains useful sketches and other background information.)

4.0 ENCLOSURES

Enclosure 1	Closure Stud Unloading Data Sheets - Operation Only
Enclosure 2	Stud Locations for Replacement
Enclosure 3	Closure Stud Tensioning Data Sheets
Enclosure 4	Closure Stud Elongation Data Sheets

5.0 LIMITS AND PRECAUTIONS

5.1 Studs may be detensioned and tensioned only when the closure head and flange metal temperatures reach or exceed 60°F. Also, whenever studs are loaded (tensioned), the closure head and vessel flange temperatures must be maintained at 60°F or higher at all times.

5.2 If a stud is incorrectly unloaded or omitted from the unloading sequential pass, it will be severely overloaded. Subsequent application of the tensioner load can damage the stud, vessel, and flange threads.

5.3 Do not tension a stud unless the engaging nut is threaded into the stud in accordance with the Diamond Stud Tensioner Instruction Manual (IM-502698-N).

5.4 Do not continue operating a stud tensioner which is leaking excessive oil. Immediately wipe up any spilled oil.

5.5 Operate stud tensioners diametrically opposite each other.

5.6 Do not thread a stud in or out of the stud hole unless it is properly suspended from the stud handling tool (for threading in) and the lubricant has been properly applied.

5.7 Protect elongation rods from dirt. Assure that elongation rods are at temperature of the surrounding metal before taking measurements. (Two hours are usually satisfactory for obtaining equal temperatures.)

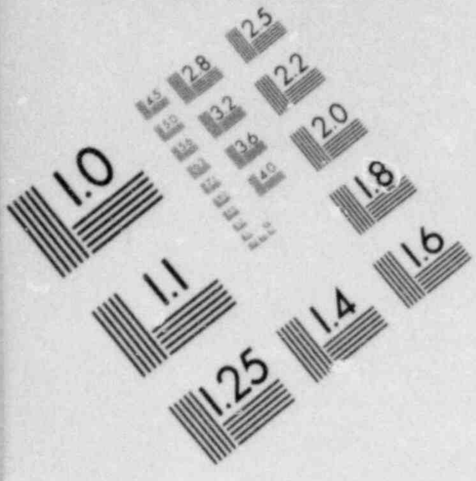
5.8 Mark stud and nuts to check for movement during tensioning or detensioning.

5.9 Do not use wire brushes on stud threads.

IMAGE EVALUATION
TEST TARGET (MT-3)

6"

MICROCOPY RESOLUTION TEST CHART



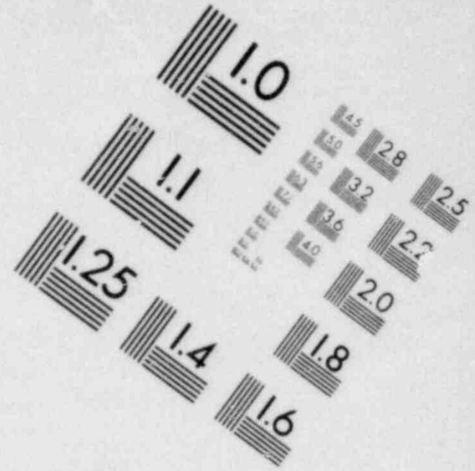
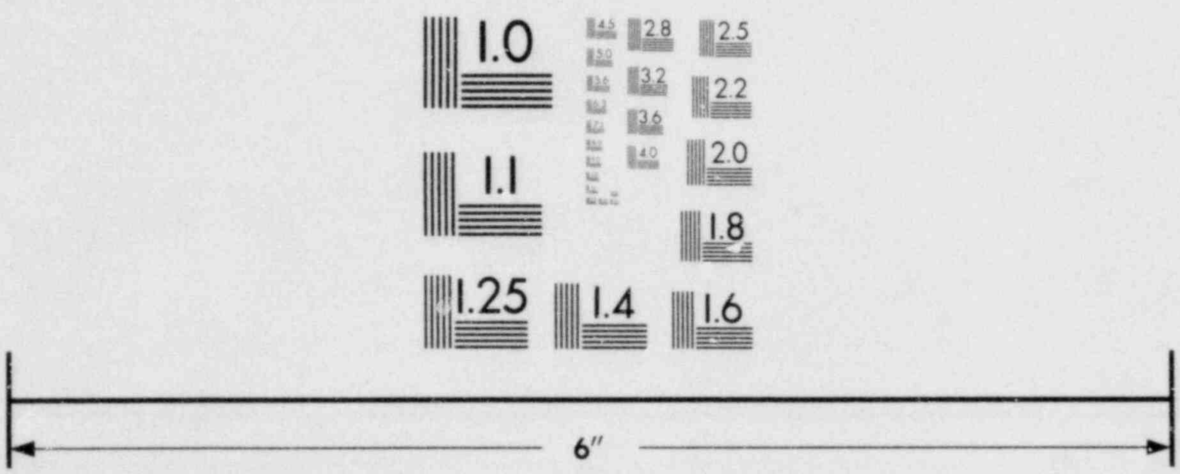
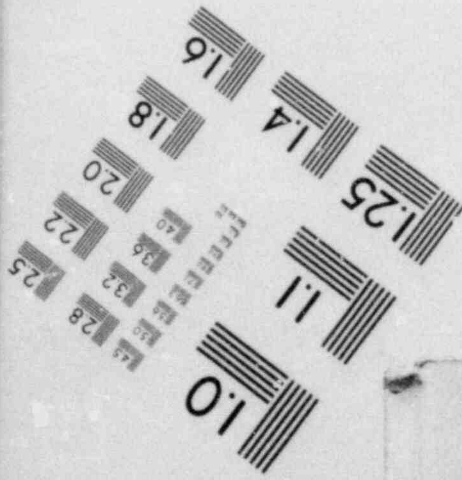
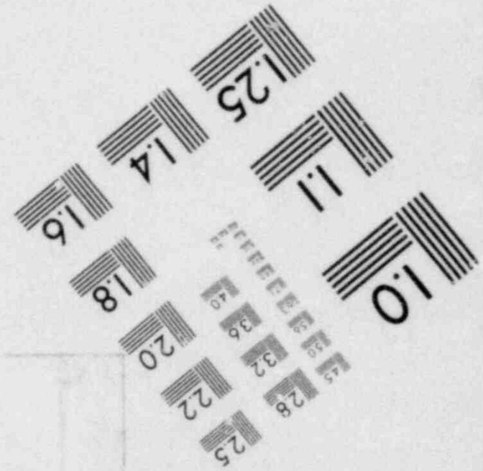


IMAGE EVALUATION TEST TARGET (MT-3)



MICROCOPY RESOLUTION TEST CHART





5.10 Do not use a hydraulic pump pressure greater than 20,000 psi on the tensioner.

5.11 No welding, burning, chipping, grinding, arc strikes, inadvertent impacts, notches, grooves, or stress concentrations shall be performed on the reactor head equipment.

5.12 Prevent contamination of the reactor vessel internals from any source (rags, debris, part pieces, tools, etc.). Secure tools with lanyards for use where they could drop into the reactor vessel. Arrange lights so that breakage cannot contaminate. Weld, tape, or otherwise secure equipment parts to prevent accidental disassembly into the vessel.

5.13 Do not overtension studs. If a stud elongation of 0.080 in. is exceeded, call for an evaluation by the B & W Service Representative.

5.14 Acetone is highly volatile. It is flammable and toxic in concentrations over 1,000 ppm. Provide ample ventilation for any space in which acetone is used. Forbid open flames, electric arcs, or sparks in spaces where acetone is being used. Post "DANGER-NO SMOKING" signs in these spaces. Acetone can cause serious effects if ingested (drank or eaten), inhaled, or absorbed through the skin. Treat acetone with the same care as gasoline with regard to its flammability and explosive hazards. Acetone vapors are lighter than air.

5.15 When taking the initial and final elongation readings of Enclosures 4 and 6, two independent sets of readings will be taken on the forms provided. The readings will be taken at the same time 180° apart by two individual mechanics so the readings of one mechanic will not affect the other.

6.0 EQUIPMENT AND PERSONNEL REQUIREMENTS

6.1 Check out the special tools and parts listed below:

Nomenclature	Drawing or Part No.	Quantity
Measuring Rod	MK-85	60
Depth Gage, Starrett	MK-41	2
Castellated Nut Wrench for 6-1/2" Stud	101988D-2 Part No. 903	2
Seal Plug Handling Tool	MK-127	2
Guide Stud Assembly	MK-75	2
Closure Studs	MK-25	5
Bottom Insert	MK-72	5
Measuring Rod	MK-85	5
Closure Nuts	MK-26	5
Convex Washer	MK-14	5
Concave Washer	MK-27	5
Stud Tensioner System (includes two tensioners, one power unit, handling slings, two elongation gauges, and related equipment)	MK-150	1
Stud Hole Seal Plug	MK-74	58
O-Ring Gasket	MK-69	58
Stud Hole Chase Tool	17655 Dwg. THD-22098	1
Contact Pyrometer		1

6.2 Check out the reactor building services as listed in Section 6.1 of FP-401, Reactor Vessel Closure Head Removal and Replacement.

6.3 Check out the following equipment (after entry is authorized in the reactor building):

a. Stud Support Spacers (58)

b. Head Storage Stand

c. Stud Storage Stand

d. Stud and Nut Handling Equipment (two sets)

e. Stud Impact Wrench and Adapter (stored as shown on GAI Dwg. No. L-001-032, Plan Above Reactor Building Operating Floor-Elevation 160'0")

6.4 Molykote-G and LUBRA-SEAL Lubricants (manufactured by Dow Corning Corporation)

6.5 Chloride-free detergent such as Turco's DECON 4501-A or DECON 4512-A.

6.6 One copy of this procedure with pencil or pen.

6.7 Nylon brushes and acetone for cleaning the studs.

6.8 Personnel needed includes one qualified polar crane operator and six mechanics, two of whom ar. qualified to rig the studs, stud handling equipment, and stud tensioners for hoisting.

6.9 Service power (110 volts AC) at the closure head and the head storage stand for working lights.

6.10 Neolube Lubricant

6.11 Pressure-Sensitive Tape

7.0 REQUIRED INITIAL CONDITIONS AND PLANT STATUS

7.1 Plant is in the condition arrived at after meeting all requirements of FP-401, Reactor Vessel Closure Head Removal and Replacement, up to and including Step 8.17.

7.2 Reactor vessel metal temperatures above 60°F. RC temperature below 120°F and RC system depressurized to 0 psi.

8.0	STUD DETENSIONING	Initials/Time/Date
8.1	A Radiation Work Permit (RWP) has been issued.	________
8.2	The limits and precautions of Section 5.0 have been noted.	________
8.3	Equipment and personnel are available as listed in Section 6.0.	________
8.4	The initial conditions of Section 7.0 have been met.	________
8.5	Clean the reactor vessel flange of all foreign matter. Clean accessible areas of the studs, nuts, washers, and stud center holes. Clean thread areas with Spotcheck cleaner and nylon brushes. Do not use wire brushes on threads. Relubricate exposed threads of studs with Molylcote-G.	________
8.6	Use the polar crane to transfer the two stud tensioners to two of the hoists on the service structure monorail as directed in FP-401, Reactor Vessel Closure Head Removal and Replacement. Prepare the stud tensioners for operation in accordance with the Diamond Stud Tensioner Instruction Manual, IM-502698-N. Connect the air supply to the tensioners. Calibrate both tensioner pressure gauges.	________

8.7 Colc. code the two stud tensioners so one is red and the other is yellow. Use the red tensioner on studs 1-30 only; use the yellow tensioner on studs 31-60 only. ____________________

8.8 Detension studs in two passes in the sequences shown on Enclosure 1. Note that Enclosure 1 requires that the studs be detensioned in pairs, two studs diametrically opposite each other. All 60 studs are detensioned (partially) in the first unloading pass. Detensioning is completed with the second unloading pass. Extreme (possibly damaging) tension will be placed on any stud which is not detensioned in proper sequence. Begin with Sequence 1 of the first unloading pass, verifying with a contact pyrometer that the reactor vessel and closure head metal temperatures are above the DTT. Use the stud hole numbers for sequencing of all stud operations. Perform Steps 8.8.1 thru 8.8.9 to unload the 60 individual studs in the sequences listed on Enclosure 1 and initial here when complete. ____________

8.8.1 Using the stud tensioner hoists, lower the stud tensioners over the studs (180^{o} apart) until the pedestals come to rest on the closure head flange. Insure each tensioner has been centered over the stud.

8.8.2 Thread the stud tensioner on the stud. Thread the engaging nut on the stud by turning the engaging nut drive counterclockwise by hand until the engaging nut begins to thread onto the stud. Note location of the white band on the engaging nut relative to the indicator lines on the pedestal. Continue turning the engaging nut drive until assured that engaging nut is properly threaded on the stud. Remove hand crank and attach pneumatic nut runner and continue turning the engaging nut drive until the upper white band on the engaging nut reaches the original location of the lower band (at initial thread contact)

NOTE: Engagement must be made by this visual check. Do not allow the engaging nut drive to be turned to a hard stop.

8.8.3 Increase the hydraulic pump pressure to the reading shown in column four of Enclosure 1 for the pass/sequence. This pressure may be exceeded if necessary, however, do not exceed 20,000 psi.

8.8.4 Turn the transmission crankhandles on both stud tensioners counterclockwise by the number of degrees ($\pm$ 5°) shown in column five of Enclosure 1 for the pass/sequence. Initial in column five immediately upon completion of this step.

8.8.5 Release the tensioner hydraulic pressure. Remove the engaging nut from the stud by rotating the engaging nut drive using the penumatic nut runner counterclockwise until the nut is clear of the threaded portion of the stud.

8.8.6 Raise the tensioner clear using the stud tensioner hoists.

8.8.7 Repeat Sections 8.8.1 through 8.8.6 for the first unloading pass of each pair of studs in Sequences 2-30 as shown on Enclosure 1. This completes the first unloading pass.

NOTE: If difficulty in unseating a stud nut occurs in the first unloading pass, the following procedure is required:

a. Retension an adjoining stud which has been relaxed to 15,000 psi and seat the stud nut.

b. Tension the problem stud to a pressure sufficient to unseat the nut (not to exceed 20,000) and back off the stud nut 1-1/4 counterclockwise crankhandle turns.

c. Retension the stud of (a) above to a pressure sufficient to unseat the nut (not to exceed 20,000 psi) and back off the stud nut one counterclockwise crankhandle turn.

d. Resume normal unloading sequence.

8.8.8 Repeat Steps 8.8.1 thru 8.8.6 for the second unloading pass of each pair of studs in Sequences 1-30 as shown on Enclosure 1. At the beginning of the second unloading pass, again verify with a contact pyrometer that the reactor vessel and closure head metal temperatures are greater than the DTT. This completes the second unloading pass.

NOTE: If difficulty in unseating a stud nut occurs in the second unloading pass, the following procedure is required:

a. Retension an adjoining stud which has undergone the second unloading pass to 10,000 psi and seat the stud nut

b. Tension the problem stud to a pressure sufficient to unseat the nut (not to exceed 20,000 psi) and back off the stud nut six counterclockwise crankhandle turns.

c. Retension the stud of (a) to a pressure sufficient to unseat the nut (not to exceed 20,000 psi) and back off the stud nut six counterclockwise crank-handle turns.

d. Resume normal unloading sequence.

8.8.9 Initial opposite Section 8.8 when all steps are completed.

8.10 Move the stud tensioners to the operating floor, remove the tensioner guide handles, and install the shipping brackets on the tensioner pedestal. Wipe up any spilled oil. Recalibrate both tensioner pressure gauges. ____________

NOTE: The stud tensioners may be left hanging in place on the service structure if the following conditions are met:

a. The head and service structure lifting equipment is capable of lifting the extra weight.

b. The tensioners are located diametrically opposite each other on the service structure and tied securely to prevent swinging prior to reactor vessel head removal or replacement.

Completed By ________________ Date ____________

Approved By ________________ Date ____________

9.0 STUD REMOVAL

Initials/Time/Date

9.1 Use the polar crane to bring the two stud handling tools into position for suspension from the hoists on the service structure monorail. __________

9.2 Attach a stud handling adapter to the tops of studs "15" and "45". Line up the holes in the adapter and stud and insert the one inch ball-lock pin through to lock. __________

9.3 Check that the stud handling tool hook is in the lowered position. Move the stud hoists with the stud handling tools into position over studs "15" and "45". Lower the tools until the stud transfer yokes are at the same level as the eye of the stud handling adapter. Line up the holes in the eye and the yoke and insert the transfer yoke ball-lock pin through to lock. Check that the stud hook retaining pin is also in place. __________

9.4 Using the stud hoist, raise the tool to pre-load the balance springs until the bottom of the guide plate is in the mid position in the indicator slots. __________

9.5 Move the direction control valve to "Reverse" (up position). Slowly jog the tool counterclockwise to take up slack, then hold the on-off valve and drive the stud out of the stud hole. As the last threads disengage, the balance springs will lift the stud away from the vessel approximately three-fourths of an inch to prevent damage to the threads. Nuts and washers will lift out with the studs.

9.6 If the stud cannot be turned out of the stud hole using the stud handling tool, refer to Section 14.0 of this procedure.

9.7 Using a service sling attached to the polar crane, attach a hook to the second bail of the transfer yoke on the stud handling adapter. Raise the tool with the hand hoist until the stud is clear of the closure head flange. Transfer the load to the service sling until the full weight of the stud is removed from the stud handling tool. Remove the ball-lock pin from the stud hook and detach the stud handling tool from the yoke.

9.8 Hoist studs "15" and "45" (with nuts and washers) in this manner to the stud storage rack (shown on GAI Dwg. L-001-032). Seat the studs in the rubber-lined cups and secure the studs to the rack with the lanyards.

9.9 As each stud is transferred to the stud storage rack, remove the stud handling adapter from the stud and attach the adapter to an alignment stud in the stud storage rack. Release the retaining lanyard, hoist the alignment stud out of the rack, and lower the stud to the reactor vessel flange area.

9.10 Apply lubricant (LUBRA-SEAL) to a seal O-ring and slip the ring over the threads and into the groove above the threads. Attach the stud handling tool hook to the transfer yoke and swing the stud directly over hole "15" or "45". Transfer the load to the stud hoist and detach the polar crane hook.

9.11 Lower the alignment stud with the hoist to within one-half to one inch of the first thread. Manually depress the stud handling tool to bring the threads into contact. Set control to "Insert" and jog the hand valve to engage the first threads. Drive stud down until motor load indicates stud has bottomed. Install the other alignment stud in the same manner. The hole in the top of the stud should point in a radial direction to facilitate insertion/removal of the stud handling adapter pin without interference with the adjacent studs.

9.12 Detach the adapters from the alignment studs and attach the adapters to studs "16" and "46". __________

9.13 Remove the studs with the stud handling tool as in Steps 9.3, 9.4, and 9.5 of this procedure. __________

9.14 Using the hoists, raise the studs high enough to install one stud support spacer between each stud nut and washers. Lower the studs until the load is on the spacers. Detach the stud handling adapters from the studs and attach to the next pair of studs (using the sequence "17" and "47", "18" and "48", etc.). __________

9.15 Repeat Steps 9.13 and 9.14 until all 60 studs have been set in the storage position. __________

9.16 When convenient, visually examine and dye penetrant inspect one-third of the studs upon each refueling. Begin with studs "1, 4, 7, 10", etc., upon the first refueling. Replace any rejected studs. __________

9.17 Detach stud handling adapters from the studs and hoist tools clear of studs. Detach air service lines. Attach service sling to the stud handling tool lifting eye. Remove the stud handling tool from the stud hoist hook and transfer the tools to the storage racks. __________

9.18 After the reactor vessel head and plenum have been removed and the indexing fixture is in place on the reactor vessel, install the stud hole seal plugs per Section 10.0 of this procedure. __________

NOTE: Inspect the surfaces of the studs, nuts, and washers. Dirt or rough metal surfaces must not contact these parts. The studs are to be cleaned by using an approved solvent and brushing with nylon brushes. Cleaning must be performed without damaging the stud threads. The studs and threads are to be dried with clean, dry, compressed air. The root area of the threads must be absolutely free of foreign particles. THE IMPORTANCE OF THREAD CLEANLINESS CANNOT BE OVEREMPHASIZED, HOWEVER, THE MANGANESE PHOSPHATE COATING ON THE THREADS MUST NOT BE REMOVED.

Completed By ________________ Date ____________

Approved By ________________ Date ____________

10.0	STUD HOLE SEAL PLUG INSTALLATION	Initials/Time/Date
10.1	Verify the following:	
10.1.1	Reactor vessel closure head removed.	
10.1.2	Reactor vessel plenum removed.	
10.1.3	Indexing fixture installed on reactor vessel.	
10.1.4	RC system water level two to six inches below the reactor vessel flange.	
10.1.5	Requirements through Step 9.18 of this procedure completed as applicable.	________
10.2	Inspect each stud hole and note the condition of any hole which will require reconditioning prior to closure head installation.	________
10.3	Fill the stud holes to within two inches of the top with the rust inhibitor solution.	________
10.4	Lubricate a seal plug O-ring with Molykote-G and place the O-ring into the groove below the seal plug shoulder.	________
10.5	Place the seal plug into the stud hole and thread the seal plug until the O-ring is compressed.	________
10.6	Install all seal plugs by repeating Steps 10.4 and 10.5.	________

NOTE: Ensure that any rust inhibitor solution spilled is immediately removed to prevent entry into the RC system.

11.0 STUD HOLE SEAL PLUG REMOVAL

		Initials/Time/Date
11.1	Verify the following:	
11.1.1	Reactor vessel closure head removed.	
11.1.2	Reactor vessel plenum removed.	
11.1.3	Indexing fixture installed on reactor vessel.	
11.1.4	RC system water level two to six inches below the reactor vessel flange.	
11.1.5	Requirements through Step 10.6 of this procedure completed as applicable.	
11.2	Remove the seal plugs and discard the seal plug O-rings.	
11.3	Remove the rust inhibitor solution from the stud holes by pumping to a suitable container.	
11.4	Thoroughly dry the stud holes and clean by wire brushing.	
11.5	Inspect the stud hole threads and chase any stud holes with the stud hole chasing tool if any nicks, burrs, etc. exist on the threads or if the stud was sticking when it was withdrawn.	
	NOTE: Use chase tool <u>only</u> when necessary.	
11.6	Vacuum the stud holes to remove debris.	
11.7	Lubricate the stud hole threads with Molykote-G.	

12.0 STUD INSTALLATION — Initials/Time/Date

12.1 Verify that all requirements through Step 9.18 of FP-401, Reactor Vessel Closure Head Removal and Replacement, have been met. Also, verify that the 58 studs are stored on the reactor vessel closure head with spacers, nuts, and washers. Verify that the stud, nuts, and washers all bear the same number for each assembly and that they are placed in accordance with Enclosure 2. ______________

NOTE: Prior to reactor vessel head and plenum installation and with the indexing fixture in place on the reactor vessel, the stud hole seal plugs should be removed and the stud holes cleaned per Section 11.0 of this procedure.

12.2 Transfer the stud handling assemblies to the service structure hoists. Connect the compressed air supply to both units. ______________

12.3 Coat the stud threads and the seating surfaces of the stud nuts and washers (both sides of the convex and concave spherical washers) with Dow-Corning Molykote-G lubricant. ______________

12.4 Remove each alignment stud in turn, return studs "15" and "45" to the reactor vessel, and install the studs as follows: ______________

12.4.1 Attach a stud handling adapter to the top of an alignment stud, line up the holes in the adapter and stud, and insert the one inch ball-lock pin through to lock.

12.4.2 Check that the stud handling tool hook is in the lowered position. Move the stud hoists with the stud handling tools into position over the alignment stud. Lower the tools until the stud transfer yokes are at the same level as the eye of the stud handling adapter. Line up the holes in the eye and the yoke and insert the transfer yoke ball-lock pin through to lock. Check that the stud hook retaining pin is also in place.

12.4.3 Using the stud hoist, raise the tool to preload the balance springs until the bottom of the guide plate is in the mid-position in the indicator slots.

12.4.4 Move the direction control valve to "Reverse". Slowly jog the tool counterclockwise to take up slack, then hold the on-off valve and drive the stud out of the stud hole. As the last threads disengage, the balance springs will lift the stud away from the vessel approximately three-fourths of an inch to prevent damage to the threads. Nuts and washers will lift out with the studs.

12.4.5 If the stud cannot be turned out of the stud hole using the stud handling tool, refer to Section 14.0 of this procedure.

12.4.6 Using a service sling attached to the polar crane, attach a hook to the second bail of the transfer yoke on the stud handling adapter. Raise the tool with the hand hoist until the stud is clear of the closure head flange. Transfer the load to the service sling until the full weight of the stud is removed from the stud handling tool. Remove the ball-lock pin from the stud hook and detach the stud handling tool from the yoke.

12.4.7 Hoist each alignment stud to the stud storage rack (shown on GAI Dwg. L-001-032). Seat the stud to the rack with the lanyards. Remove the stud handling adapter from the stud and attach the adapter to stud "15" or "45".

12.4.8 Transfer the stud ("15" or "45") back to the reactor vessel head in the area of its original hole. Transfer the load to the stud handling tool and move the hoist along the monorail to center the stud over its original hole.

12.4.9 Perform Steps 12.8, 12.9, and 12.10 to install studs "15" and "45".

12.5 Attach the stud handling adapters to the next pair of studs using the sequence "14" and "44", "13" and "43", etc. (as set forth on Enclosure 2). ____________

12.6 Pin the stud handling adapters to the stud handling tools. ____________

12.7 Using the stud hoists, raise the studs out of their storage positions until they clear the reactor vessel flange by approximately one inch. Remove the stud support spacers.

NOTE: Move the hoists as necessary to verify stud hole cleanliness, then center the studs over their assigned holes.

12.8 Assure that the stud handling tool drive shaft is in the raised position. Lower the hoists to insert the studs into their holes until the lowest threads are between one-half and one inch of first thread engagement. Manually depress the tool to bring the first threads into contact. Set control valves to "Insert" and jog the hand valve to engage the first threads. Drive the stud down until the motor load indicates that the stud has bottomed. Reverse the direction control valve and back the stud out two turns to provide a 1/4-in. clearance between the stud shoulder and the chamber on the reactor vessel flange. The hole in the top of the stud should point in a radial direction to facilitate insertion/removal of the stud handling adapter pin without interference with the adjacent studs. __________

12.9 Remove the stud handling tool and mark, with aligned lines, the closure head flange and the stud assembly. __________

12.10 While preventing studs from rotating, hand-tighten the stud nuts against the top of the convex spherical washer. __________

12.11 Repeat Steps 12.5 thru 12.10 for each of the studs, following the order set forth on Enclosure 2, and initially positioning the stud handling tool over each stud in turn. __________

12.12 Detach stud handling adapter from stud and hoist tool clear of stud. Detach air service lines. Attach service sling to the stud handling tool lifting eye. Remove the stud handling tool from the stud hoist hook and transfer the tools to the storage racks. ________________

12.13 Remove the pressure sensitive tape covering the stud center holes. Remove tape residue, if necessary, using acetone. Clean the center hole as necessary. ________________

12.14 Wipe off the top of each measuring rod. ______________

NOTE: If necessary to clean or remove a measuring rod, attach a line to the hole in the top of the rod. Carefully lower (do not drop) a rod into the stud center hole until the rod rests on the bottom insert of the closure stud.

12.15 Cover the stud center hole area with pressure sensitive tape, if necessary, to preserve stud center hole cleanliness. ______________

Completed By ________________ Date ____________

Approved By ________________ Date ____________

13.0 STUD LOADING

Initials/Time/Date

13.1 Determine and record the preload elongation for each of the 60 studs by performing the following: ________________

13.1.1 Remove the pressure sensitive tape covering the stud center hole and, if necessary, remove the tape residue using acetone.

13.1.2 Zero the handheld depth gauge. Take care not to disturb the gauge dial once the dial has been zeroed.

13.1.3 Insert the depth gauge pin in the stud center hole so as to contact the measuring rod. Set the depth gauge anvil on top of the stud. Gently rock the depth gauge and rotate it until the greatest depth is determined. Remove the gauge.

NOTE: Ensure the studs and measuring rods have reached approximate equilibrium temperature prior to taking depth gauge readings.

NOTE: Two independent sets of readings will be taken on forms provided in Enclosure 4. The readings will be taken at the same time by two mechanics positioned 180° apart on the reactor vessel head.

13.1.4 Record the greatest depth reading in column three of Enclosure 4.

13.1.5 If necessary to preserve stud center hole cleanliness, recover the stud center hole with pressure sensitive tape.

13.2 If not already in place, use the polar crane to bring the two stud tensioners to the service structure for suspension from the service structure monorail hoists.

13.3 Attach air pressure supply and verify tensioner pressure gauge calibration for both tensioners.

13.4 Tension studs in two seating passes followed by two loading passes in the sequences shown on Enclosure 3. Note that Enclosure 3 requires that the studs be tensioned simultaneously in pairs, two studs diametrically opposite each other. Assure that tensioning is performed in proper sequence. Only studs "1, 11, 21, 31, 41, and 51" are tensioned for the seating passes. Perform the following steps for each tensioning sequence, verifying at the beginning of each tensioning sequence with a contact pyrometer that the reactor vessel and closure head metal temperatures are greater than 60°F.

13.4.1 Locate the stud tensioners over the two studs to be tensioned. Follow color codes of Step 8.7.

13.4.2 Using the stud tensioner hoists, lower stud tensioners over the studs until the pedestals come to rest on the closure head flange.

13.4.3 For engagement reference, note the location of the top thread of the stud by visual observation through the pedestal viewing port. Turn the engaging nut drive counterclockwise until the engaging nut contacts the thread of the stud. Note the location of the white band on the engagement nut relative to the indicator lines on the pedestal. Start engagement and continue turning the engaging nut drive until the upper white band on the engaging nut reaches the original location of the lower band (at initial thread contact).

13.4.4 Increase the hydraulic pump pressure to the reading shown in column five of Enclosure 3 for the pass/sequence. Do not exceed 20,000 psi.

13.4.5 Maintain the specified hydraulic pump pressure for a period of 5-10 sec. Turn the transmission crankhandles clockwise until the stud nuts are seated. Back off the crankhandle about 45° counterclockwise. Seat the stud nut with a sharp clockwise rap of the crankhandle.

13.4.6 Release the hydraulic pump pressure.

13.5 Complete the first seating pass in accordance with Step 13.4. ____________

13.6 Complete the second seating pass in accordance with Step 13.4. ____________

13.7 Complete the first loading pass in accordance with Step 13.4. ____________

13.8 Complete the second loading pass in accordance with Step 13.4. ____________

13.9 If necessary, remove the pressure sensitive tape and tape residue. Use the handheld depth gauge to determine the elongation for each of the 60 studs. Record these readings in column four of Enclosure 4. If necessary to preserve stud center hole cleanliness, recover the stud center holes with pressure sensitive tape. ______ ______

13.10 Calculate the elongation of each stud by subtracting the initial depth gauge reading (column three of Enclosure 4) from the second pass depth gauge reading (column four of Enclosure 4) and enter that difference in column five of Enclosure 4.

NOTE: If any of the individual studs do not conform to the final target elongation of 0.0471 in. ± 0.004 in., those studs must be retensioned to conform to this requirement of 0.0471 in. ± 0.004 in.

NOTE: The following procedure applies to studs that are greater than the final target elongation of 0.0471 in. ± 0.004 in.

a. Increase the hydraulic pump pressure to 19,500 psi or until the transmission crankhandle can be turned (counterclockwise). DO NOT EXCEED 20,000 psi.

b. Loosen the stud nut by turning the crankhandle counterclockwise 360°.

c. Reduce the hydraulic pump pressure to 12,600 psi and seat the stud nut with a sharp clockwise rap of the crankhandle.

d. Remove the tensioner load.

NOTE: The following procedure applies to studs that are less than the final target elongation of 0.0471 in. - 0.004 in.

a. Increase the hydraulic pump pressure to 12,600 psi.

b. Seat the stud nut with a sharp clockwise rap of the transmission crankhandle.

c. Remove the tensioner load.

13.11 Calculate the average for each group of three readings in column five of Enclosure 4 and record that average in column six. The average group elongation must meet the group target elongation of 0.0471 + 0.004/-0.002 in. Comply with the following notes if an out-of-tolerance condition exists. ______________

NOTE: If the average stud elongation for any group of studs does not conform to the elongation tolerance range of 0.0471 + 0.004/-0.002 in., the studs within that group must be retensioned to conform with the tolerance range.

NOTE: If the average stud elongation (column six of Enclosure 4) for any group of studs is greater than the group target elongation of 0.0471 + 0.004 in., the following unloading procedure is required.

a. Increase the hydraulic pump pressure to 19,500 psi or until the transmission crankhandle can be turned (counterclockwise). DO NOT EXCEED 20,000 psi.

b. Loosen the stud nut by turning the crankhandle counterclockwise 360°.

c. Reduce the hydraulic pump pressure to 12,600 psi and seat the stud nut with a sharp clockwise rap of the crankhandle.

d. Remove the tensioner load.

NOTE: If the average stud elongation (column six of Enclosure 4) for any group of studs is less [illegible] group target elongation of 0.0471 - 0.002 in., the following loading procedure is required.

a. Increase the hydraulic pump pressure to 12,600 psi.

b. Seat the stud nut with a sharp clockwise rap of the transmission crankhandle.

c. Remove the tensioner load.

13.12 After all corrections have been completed, obtain the elongation gauge reading of each of the 60 studs using the dial depth gauge on the stud reference surface as in Step 13.9. Record the individual stud elongation readings in column seven of Enclosure 4. ______________

13.13 Perform head seal leak test, if required. ______________

NOTE: All stud handling and tensioning equipment shall remain in a standby condition until the head seal leak test has been successfully completed.

13.14 Following successful completion of the head seal leak test (if performed), recalibrate both tensioner pressure gauges and remove all stud handling and tensioning equipment to normal storage. Continue with Step 9.20 of FP-401, Reactor Vessel Closure Head Removal and Replacement. ______________

13.15 Verify that the blanks on one copy of this procedure (Sections 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, and, if applicable, 14.0) have all been initialed and time/dated by the individuals responsible for completing the steps noted at left. Note any problems or recommendations on the blank sheet opposite the problem step. Send the initialed copy (with the completed enclosures) to the Maintenance Supervisor. ______________

Completed By ________________ Date ____________

Approved By ________________ Date ____________

14.0 STUD IMPACT WRENCH OPERATION

Initials/Time/Date

14.1 Use the stud impact wrench only when the stud cannot be backed out with the stud handling assembly and the following conditions have been met. ________

14.1.1 Stud detensioned and nut backed off.

14.1.2 Impact wrench and wrench adapter slung from the hoist.

14.1.3 Air supply available as called out by Section 14.2 or 14.9.

NOTE: A stuck stud has potentially serious consequences for thread, stud, and reactor vessel flange integrity. No impact tools or forces in excess of those described in this section shall be used. If necessary, call for a B & W Service Representative.

14.2 Lower the 4,000 foot-pound impact wrench and the impact wrench adapter to the reactor vessel flange area. Connect air supply (130 scfm at 100 psig through three-fourths inch hose connection) to wrench handle fitting. ________

14.3 Attach and pin impact wrench adapter to the stuck stud. Insert a snap impact wrench into the adapter socket. Turn wrench to convenient angle for safe operation. Set and lock direction control in "Reverse". ________

14.4 Roll control handle to increase speed and torque of wrench. Back the stud out of the hole not more than two turns. ________

14.5 Remove wrench and adapter. ______________

14.6 Attach stud handling adapter and stud handling tool and remove as directed in Section 9.0. If stud handling tool still cannot turn the stud, repeat the steps set forth in Sections 14.2, 14.3, and 14.4 but do not back the stud all the way out using the impact wrench. ______________

NOTE: When the top surface of the stud is 32 inches above the top surface of the reactor vessel flange, there is approximately one inch of stud still threaded into the flange. Use the stud handling tool to back out this last inch (as a minimum).

14.7 Chase the stud hole threads with the stud hole chasing tools. Thoroughly clean the stud holes. (Wire brushes may be used.) Dry the stud hole. Install stud support spacer and install stud in storage position designated on Enclosure 2. Enter the serial number (1 to 60) on the following blank:

__________. ______________

14.8 If the stud impact wrench does not torque the stud out of the stud hole, bypass that stud and continue the removal sequence. Meanwhile, immediately notify the B & W Service or Engineering Representative that a larger impact wrench may be required. ______________

14.9 If the 16,000 foot-pound wrench is used, follow the same procedure as for the 4,000 foot-pound wrench, subject to the following changes: ______________

a. Air supply of 155 scfm at 100 psig to one inch hose connection.

b. Hook attached to one service structure hoist to fit 1-1/2 inch eyebolt for approximately 250 pound lift.

14.10 Upon completion of loosening studs, as required, return the impact tools to normal storage. ______________

Completed By ______________ Date __________

Approved By ______________ Date __________

CLOSURE STUD UNLOADING DATA - OPERATION ONLY

FIRST UNLOADING PASS
REACTOR VESSEL AND CLOSURE HEAD TEMPERATURE _____ °F

1	2	3	4	5
SEQ. NO.	STUD HOLE NUMBERS	TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE*	CRANKHANDLE TURNS
1	1 / 31	Red / Yellow	15,000	270° - 3/4 turn
2	11 / 41	Red / Yellow	15,000	270° - 3/4 turn
3	21 / 51	Red / Yellow	15,000	270° - 3/4 turn
4	6 / 36	Red / Yellow	15,000	270° - 3/4 turn
5	16 / 46	Red / Yellow	15,000	270° - 3/4 turn
6	26 / 56	Red / Yellow	15,000	270° - 3/4 turn
7	3 / 33	Red / Yellow	15,000	270° - 3/4 turn
8	18 / 48	Red / Yellow	15,000	270° - 3/4 turn
9	8 / 38	Red / Yellow	15,000	270° - 3/4 turn
10	23 / 53	Red / Yellow	15,000	270° - 3/4 turn
11	13 / 43	Red / Yellow	15,000	270° - 3/4 turn
12	28 / 58	Red / Yellow	15,000	270° - 3/4 turn
13	10 / 40	Red / Yellow	15,000	270° - 3/4 turn
14	24 / 54	Red / Yellow	15,000	270° - 3/4 turn
15	30 / 60	Red / Yellow	15,000	270° - 3/4 turn
16	15 / 45	Red / Yellow	15,000	270° - 3/4 turn
17	4 / 34	Red / Yellow	15,000	270° - 3/4 turn
18	20 / 50	Red / Yellow	15,000	270° - 3/4 turn
19	7 / 37	Red / Yellow	15,000	270° - 3/4 turn
20	22 / 52	Red / Yellow	15,000	270° - 3/4 turn
21	29 / 59	Red / Yellow	15,000	270° - 3/4 turn

*PSI read at master gage on pump unit.

CLOSURE STUD UNLOADING DATA - OPERATION ONLY
(Continued)

FIRST UNLOADING PASS
REACTOR VESSEL AND CLOSURE HEAD TEMPERATURE _____ °F

1	2	3	4	5
SEQ. NO.	STUD HOLE NUMBERS	TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE*	CRANKHANDLE TURNS
22	12 / 42	Red / Yellow	15,000	270° - 3/4 turn
23	17 / 47	Red / Yellow	15,000	270° - 3/4 turn
24	5 / 35	Red / Yellow	15,000	270° - 3/4 turn
25	19 / 49	Red / Yellow	15,000	270° - 3/4 turn
26	9 / 39	Red / Yellow	15,000	315° - 7/8 turn
27	27 / 57	Red / Yellow	15,000	360° - 1 turn
28	14 / 44	Red / Yellow	15,000	360° - 1 turn
29	2 / 32	Red / Yellow	15,000	2160° - 6 turns
30	25 / 55	Red / Yellow	15,000	2160° - 6 turns

*PSI read at master gage on pump unit.

CLOSURE STUD UNLOADING DATA - OPERATION ONLY
(Continued)

SECOND UNLOADING PASS
REACTOR VESSEL AND CLOSURE HEAD TEMPERATURE _____ °F

1	2	3	4	5
SEQ. NO.	STUD HOLE NUMBERS	TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE*	CRANKHANDLE TURNS
1	1 31	Red Yellow	10,000	2160° - 6 turns
2	11 41	Red Yellow	10,000	2160° - 6 turns
3	21 51	Red Yellow	10,000	2160° - 6 turns
4	6 36	Red Yellow	10,000	2160° - 6 turns
5	16 46	Red Yellow	10,000	2160° - 6 turns
6	26 56	Red Yellow	10,000	2160° - 6 turns
7	3 33	Red Yellow	10,000	2160° - 6 turns
8	18 48	Red Yellow	10,000	2160° - 6 turns
9	8 38	Red Yellow	10,000	2160° - 6 turns
10	23 53	Red Yellow	10,000	2160° - 6 turns
11	13 43	Red Yellow	10,000	2160° - 6 turns
12	28 58	Red Yellow	10,000	2160° - 6 turns
13	10 40	Red Yellow	10,000	2160° - 6 turns
14	24 54	Red Yellow	10,000	2160° - 6 turns
15	30 60	Red Yellow	10,000	2160° - 6 turns
16	15 45	Red Yellow	10,000	2160° - 6 turns
17	4 34	Red Yellow	10,000	2160° - 6 turns
18	20 50	Red Yellow	10,000	2160° - 6 turns
19	7 37	Red Yellow	10,000	2160° - 6 turns
20	22 52	Red Yellow	10,000	2160° - 6 turns
21	29 59	Red Yellow	10,000	2160° - 6 turns

*PSI read at master gage on pump unit.

CLOSURE STUD UNLOADING DATA - OPERATION ONLY
(Continued)

SECOND UNLOADING PASS
REACTOR VESSEL AND CLOSURE HEAD TEMPERATURE _____ °F

1	2	3	4	5
SEQ. NO.	STUD HOLE NUMBERS	TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE*	CRANKHANDLE TURNS
22	12 42	Red Yellow	10,000	2160° - 6 turns
23	17 47	Red Yellow	10,000	2160° - 6 turns
24	5 35	Red Yellow	10,000	2160° - 6 turns
25	19 49	Red Yellow	10,000	2160° - 6 turns
26	9 39	Red Yellow	10,000	2160° - 6 turns
27	27 57	Red Yellow	10,000	2160° - 6 turns
28	14 44	Red Yellow	10,000	2160° - 6 turns
29	2 32	Red Yellow	ALREADY UNLOADED	
30	25 55	Red Yellow	ALREADY UNLOADED	

*PSI read at master gage on pump unit.

Completed By _______________ Date _______

Approved By _______________ Date _______

STUD LOCATIONS FOR REPLACEMENT

Alignment	Stud Storage Rack	Alignment	Stud Storage Rack
15	Hole 15	45	Hole 45
14	" 14	44	" 44
13	" 13	43	" 43
12	" 12	42	" 42
11	" 11	41	" 41
10	" 10	40	" 40
9	" 9	39	" 39
8	" 8	38	" 38
7	" 7	37	" 37
6	" 6	36	" 36
5	" 5	35	" 35
4	" 4	34	" 34
3	" 3	33	" 33
2	" 2	32	" 32
1	" 1	31	" 31
60	" 60	30	" 30
59	" 59	29	" 29
58	" 58	28	" 28
57	" 57	27	" 27
56	" 56	26	" 26
55	" 55	25	" 25
54	" 54	24	" 24
53	" 53	23	" 23
52	" 52	22	" 22
51	" 51	21	" 21
50	" 50	20	" 20
49	" 49	19	" 19
48	" 48	18	" 18
47	" 47	17	" 17
46	" 46	16	" 16

CLOSURE STUD TENSIONING DATA

1	2	3	4
SEQ. NO.	STUD HOLE NO.'S	STUD TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE (PSI)

FIRST SEATING PASS
REACTOR VESSEL AND CLOSURE HEAD METAL TEMPERATURE _____ °F

1	1 31	Red Yellow	5,000
2	11 41	Red Yellow	5,000
3	21 51	Red Yellow	5,000

SECOND SEATING PASS
REACTOR VESSEL AND CLOSURE HEAD METAL TEMPERATURE _____ °F

1	1 31	Red Yellow	10,000
2	11 41	Red Yellow	10,000
3	21 51	Red Yellow	10,000

FIRST LOADING PASS
REACTOR VESSEL AND CLOSURE HEAD METAL TEMPERATURE _____ °F

1	1 31	Red Yellow	19,100
2	11 41	Red Yellow	18,700
3	21 51	Red Yellow	18,100

CLOSURE STUD TENSIONING DATA
(Continued)

1 SEQ. NO.	2 STUD HOLE NO.'S	3 STUD TENSIONER COLOR CODE	4 HYDRAULIC PUMP PRESSURE (PSI)

FIRST LOADING PASS
(CONT'D)

4	6 36	Red Yellow	17,700
5	16 46	Red Yellow	17,200
6	26 56	Red Yellow	16,900
7	3 33	Red Yellow	16,500
8	18 48	Red Yellow	16,200
9	8 38	Red Yellow	15,900
10	23 53	Red Yellow	15,700
11	13 43	Red Yellow	15,400
12	28 58	Red Yellow	15,200
13	10 40	Red Yellow	15,000
14	24 54	Red Yellow	14,800
15	30 60	Red Yellow	14,600

CLOSURE STUD TENSIONING DATA
(Continued)

1 SEQ. NO.	2 STUD HOLE NO.'S	3 STUD TENSIONER COLOR CODE	4 HYDRAULIC PUMP PRESSURE (PSI)

FIRST LOADING PASS
(CONT'D)

16	15 45	Red Yellow	14,500
17	4 34	Red Yellow	14,300
18	20 50	Red Yellow	14,200
19	7 37	Red Yellow	14,100
20	22 52	Red Yellow	13,900
21	29 59	Red Yellow	13,800
22	12 42	Red Yellow	13,700
23	17 47	Red Yellow	13,600
24	5 35	Red Yellow	13,500
25	19 49	Red Yellow	13,400
26	9 39	Red Yellow	13,300
27	27 57	Red Yellow	13,200

CLOSURE STUD TENSIONING DATA
(Continued)

1 SEQ. NO.	2 STUD HOLE NO.'S	3 STUD TENSIONER COLOR CODE	4 HYDRAULIC PUMP PRESSURE (PSI)
	FIRST LOADING PASS (CONT'D)		
28	14 44	Red Yellow	13,100
29	2 32	Red Yellow	13,000
30	25 55	Red Yellow	12,900

CLOSURE STUD TENSIONING DATA
(Continued)

1	2	3	4
SEQ. NO.	STUD HOLE NO.'S	STUD TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE (PSI)

SECOND LOADING PASS
REACTOR VESSEL AND CLOSURE HEAD METAL TEMPERATURE _____ °F

1	1 31	Red Yellow	12,600
2	11 41	Red Yellow	12,600
3	21 51	Red Yellow	12,600
4	6 36	Red Yellow	12,600
5	16 46	Red Yellow	12,600
6	26 56	Red Yellow	12,600
7	3 33	Red Yellow	12,600
8	18 48	Red Yellow	12,600
9	8 38	Red Yellow	12,600
10	23 53	Red Yellow	12,600
11	13 43	Red Yellow	12,600
12	28 58	Red Yellow	12,600

CLOSURE STUD TENSIONING DATA
(Continued)

1	2	3	4
SEQ. NO.	STUD HOLE NO.'S	STUD TENSIONER COLOR CODE	HYDRAULIC PUMP PRESSURE (PSI)

SECOND LOADING PASS
(CONT'D)

13	10 40	Red Yellow	12,600
14	24 54	Red Yellow	12,600
15	30 60	Red Yellow	12,600
16	15 45	Red Yellow	12,600
17	4 34	Red Yellow	12,600
18	20 50	Red Yellow	12,600
19	7 37	Red Yellow	12,600
20	22 52	Red Yellow	12,600
21	29 59	Red Yellow	12,600
22	12 42	Red Yellow	12,600
23	17 47	Red Yellow	12,600
24	5 35	Red Yellow	12,600

CLOSURE STUD TENSIONING DATA
(Continued)

1 SEQ. NO.	2 STUD HOLE NO.'S	3 STUD TENSIONER COLOR CODE	4 HYDRAULIC PUMP PRESSURE (PSI)
SECOND LOADING PASS (CONT'D)			
25	19 49	Red Yellow	12,600
26	9 39	Red Yellow	12,600
27	27 57	Red Yellow	12,600
28	14 44	Red Yellow	12,600
29	2 32	Red Yellow	12,600
30	25 55	Red Yellow	12,600

Completed By ____________________ Date ___________

Approved By ____________________ Date ___________

DATA SHEET I

CLOSURE STUD ELONGATION DATA

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION*
1	1							
	2							
	3							
2	4							
	5							
	6							
3	7							
	8							
	9							
4	10							
	11							
	12							
5	13							
	14							
	15							
6	16							
	17							
	18							
7	19							
	20							
	21							
8	22							
	23							
	24							
9	25							
	26							
	27							

NOTES:
1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. The target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

DATA SHEET I
CLOSURE STUD ELONGATION DATA (Cont'd)

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION*
10	28							
	29							
	30							
11	31							
	32							
	33							
12	34							
	35							
	36							
13	37							
	38							
	39							
14	40							
	41							
	42							
15	43							
	44							
	45							
16	46							
	47							
	48							
17	49							
	50							
	51							
18	52							
	53							
	54							

NOTES:
1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. The target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

DATA SHEET I
CLOSURE STUD ELONGATION DATA (Cont'd)

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION*
19	55							
	56							
	57							
20	58							
	59							
	60							

NOTES: 1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. The target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

Completed By ________________ Date ________

Approved By ________________ Date ________

DATA SHEET II
CLOSURE STUD ELONGATION DATA

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION*
1	1							
	2							
	3							
2	4							
	5							
	6							
3	7							
	8							
	9							
4	10							
	11							
	12							
5	13							
	14							
	15							
6	16							
	17							
	18							
7	19							
	20							
	21							
8	22							
	23							
	24							
9	25							
	26							
	27							

1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. The target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

DATA SHEET II
CLOSURE STUD ELONGATION DATA (Cont'd)

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION
10	28							
	29							
	30							
11	31							
	32							
	33							
12	34							
	35							
	36							
13	37							
	38							
	39							
14	40							
	41							
	42							
15	43							
	44							
	45							
16	46							
	47							
	48							
17	49							
	50							
	51							
18	52							
	53							
	54							

NOTES:
1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. Target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

DATA SHEET II
CLOSURE STUD ELONGATION DATA (Cont'd)

1	2	3	4	5	6	7	8	9
			SECOND PASS			CORRECTED (IF REQUIRED)		
GROUP	STUD HOLE NO.'S	PRE-LOAD READING	ELONGATION READING	ELONGATION (Col. 4 minus Col. 3)	AVERAGE CALCULATED ELONGATION	ELONGATION GAGE READING*	ELONGATION (Col. 7 minus Col. 3)	AVERAGE CALCULATED ELONGATION*
19	55							
	56							
	57							
20	58							
	59							
	60							

NOTES:
1. All dimensions are in inches.
2. All measurements are made from the stud reference surface with a handheld depth gage.
3. The target elongation is 0.047 inches.
4. Individual stud elongation (column 5 or 8) must meet the +0.004/-0.004 inch tolerance range requirement.
5. Group stud elongation (column 6 or 9) must meet the +0.004/-0.002 inch tolerance range requirement.

Completed By ____________________ Date __________

Approved By ____________________ Date __________

Rev. 5 6/20/78

Document Section
INFORMATION ONLY
C. R. Nuclear

REFUELING PROCEDURE

FP-601

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

FUEL HANDLING EQUIPMENT OPERATIONS

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 6/20/78

Meeting No. 78-25

APPROVED BY: Nuclear Plant Manager

Gary P. Beatty Jr.

Date 7/7/78

1.0 PURPOSE

This procedure defines the operation of the following:

Equipment	Section
New Fuel Elevator (FHCR-6)	6.0
Fuel Transfer Carriages and Upenders (FHCR 4A and 4B)	7.0
Main Fuel Handling Bridge (FHCR-1)	8.0
Spent Fuel Handling Bridge (FHCR-3)	9.0
Auxiliary Fuel Handling Bridge (FHCR-2)	10.0
Miscellaneous Fuel Handling Tools	11.0
Auxiliary Building Overhead Crane (FHCR-5)	12.0
Auxiliary Building Missile Shield Crane (FHCR-7)	13.0

2.0 DESCRIPTION

The operation of equipment supplied by Stearns-Roger Corporation is detailed in Stearns-Roger technical manuals. Instructions for each operation described in this procedure should be written following these manuals and with due regard to the applicability of the other references listed. Handling precautions and methods described herein apply as well to equivalent operations performed with equipment furnished by other than B & W. Fuel storage design is capable of storing the following:

a. Sixty-six fuel assemblies in dry storage.

b. Two hundred forty fuel assemblies in the spent fuel storage pools and 16 failed fuel canisters.

c. Seven fuel assemblies in the fuel transfer canal, including one failed fuel detection container.

2.1 The new fuel elevator, located at the east end of the spent fuel pool, is utilized for receiving new fuel elements and positioning the fuel elements for transfer by the spent fuel bridge.

2.2 The transfer carriages and upenders transfer fuel assemblies to and from the fuel transfer canal and spent fuel pool "A". These units consist of transfer carriage, carriage actuating system, fuel basket, basket rotating system, and control panels. Refer to Enclosure 1.

2.3 The main fuel handling bridge which transfers fuel assemblies between the reactor vessel and the fuel transfer station is equipped with two trolley-mounted hoist mechanisms. One (fuel handling mechanism) has a fuel grapple and the second (for control rods) houses the control rod grapple. Mandatory slow zones are provided for the hoisting mechanisms as the grapples approach the core and fuel baskets, and during insertion of fuel, control rod, and orifice rod assemblies.

2.4 The spent fuel handling bridge is utilized for transferring new and spent fuel within the spent fuel pools.

2.5 The auxiliary fuel handling bridge in the reactor building has only one trolley-mounted hoist mechanism equipped with a fuel grapple; it is used primarily for shuffling or rearranging partially spent fuel assemblies from one position to another in the core.

2.6 The auxiliary building overhead crane is utilized for handling new fuel during receipt of shipping and handling of fuel elements during inspection and placement into storage.

2.7 The auxiliary building missile shield crane is used , in conjunction with the auxiliary building overhead crane, for the placement and removal of the spent fuel pool missile shield panels. The missile shield crane is also used for movement of miscellaneous equipment for maintenance or testing.

3.0 REFERENCES

3.1 Stearns-Roger Technical Manuals

3.2 FSAR Section 9.6

3.3 FP-302, Fresh Fuel Receipt, Inspection, Inventory, Documentation and Storage

3.4 FP-300 Series (Preparation for Refueling) Refueling Procedures of Volume VII of the Plant Operating Qaulity Assurance Manual

3.5 Technical Sepcification 3/4.9 (Refueling Operations)

3.6 SP-434, Fuel Storage Pool Missile Shields

4.0 LIMITS AND PRECAUTIONS

4.1 NEW FUEL ELEVATOR

4.1.1 The fuel elevator shall be closely observed during all elevator operations.

4.1.2 Do not move overhead crane (bridge or trolley) when a fuel assembly is attached and suspended inside the new fuel elevator.

4.1.3 The fuel elevator shall be stored in the full "Down" position when not in use.

4.1.4 There are interlocks to prevent the spent fuel bridge from hitting the fuel elevator in the "Up" position.

4.2 FUEL TRANSFER CARRIAGES AND UPENDERS

4.2.1 Delay movement of the transfer carriage for at least 30 seconds after the "Upender Down" signal, in order to assure the carriage is completely down.

4.2.2 Operators shall establish communications between the spent fuel area and reactor building (RB) and be in complete agreement before transferring the carriages between the two control points.

4.2.3 Communications shall be established between the fuel handling operators and the Nuclear Operator in the Control Center during all fuel movement.

4.3 FUEL HANDLING BRIDGES AND HOISTS

4.3.1 Fuel handling controls are interlocked so that:

a. With the fuel grapple mechanism "Engaged", movement of the bridge or trolley is permitted only with the mechanism in the full "Up" position.

b. With the fuel grapple mechanism "Disengaged", movement of the bridge or trolley is permitted without raising the disengaged grapple entirely up into the mast.

c. No simultaneous movement of the bridge trolley and hoist is permitted.

d. Hard stops are provided to prevent raising the fuel assembly above minimum shielding depth (9 ft. minimum in the fuel transfer canal).

e. The grapple mechanism cannot be disengaged by operator error or electric or hydraulic failure when the grapple is loaded.

4.3.2 Only qualified bridge operators, as determined by the Operations Superintendent, shall operate the fuel handling bridges.

(TS) 4.3.3 When two irradiated fuel assemblies are being handled within the fuel transfer canal, a minimum separation of 10 ft. shall be maintained between the assemblies at all times. Irradiated fuel assemblies may be handled with the auxiliary bridge hoist provided that no other irradiated fuel assembly is being handled in the core.

4.3.4 The bridges shall not be left unattended unless the grapple is disengaged and in the full "Up" position, and the equipment is de-energized.

4.3.5 Do not operate the fuel handling equipment while any interlock is bypassed or inoperative unless done under close supervision. Manual operation is preferred to bypassing the interlocks.

4.3.6 Trolleys shall be clear of the transfer tube axis whenever the transfer baskets (upenders) are operated.

4.3.7 Cover the control rod mast index scale when not in use to prevent reading the wrong index scale when moving fuel assemblies.

4.4 AUXILIARY BUILDING OVERHEAD CRANE (FHCR-5)

4.4.1 The operator(s) should give rigid adherence to proven safety rules and practices per the Florida Power Corporation Accident Prevention Manual.

4.4.2 That area north and west of the cask loading area is protected by limit switches to prevent the operation of the overhead crane. When it is necessary to operate within this area, the limit switches may be bypassed with a "Restricted" push button incorporated on the push button control station.

4.5 Auxiliary Building Missile Shield Crane (FHCR-7)

4.5.1 Loads in excess of 2750 lbs., except for movement of the missile shields as necessary for access to the fuel assemblies, shall be prohibited from travel over fuel assemblies in the storage pool.

4.6 Radiation Work Permit (RWP) secured, if necessary, prior to the movement of any fuel or rod assemblies.

5.0 SET POINTS

5.1 Overload on fuel Dillon (switch #4) is 2880 lbs. dry, A lbs. wet. (See Note 1 below for calculation of wet weight.)

5.2 Low load on fuel Dillon (switch #1) is 600 lbs.

5.3 Dillon switch #3 is B lbs. (See Note 2 below for calculation of pounds.)

5.4 Overload on rod Dillon (switch #2) is 2650 lbs.

5.5 Low load on rod Dillon (switch #1) is 1800 lbs.

NOTE 1: Measure weight of fuel assembly with mast moving up without control component (orifice rod weight in water = 12 lbs.); add 250 lbs.

A = weight of fuel assembly ↑ + 250 lbs.

NOTE 2: Measure weight of fuel assembly with mast moving down without control component and subtract 130 lbs.

B = weight of fuel assembly ↓ - 130 lbs.

Weight moving up is more than weight moving down.

PROCEDURE

6.0 NEW FUEL ELEVATOR (FHCR-6)

6.1 STARTUP OF THE NEW FUEL ELEVATOR

6.1.1 Close breaker (3AL) at 480V reactor MCC-3B-1.

6.1.2 Operator is in position to observe all elevator movement.

6.1.3 Spent fuel bridge is away and clear of the new fuel elevator.

6.2 LOWERING A FUEL ASSEMBLY

6.2.1 Depress "Raise" button. (Elevator will stop when it reaches its upper end limit.)

6.2.2 Position the fuel assembly over the elevator with fuel assembly ID number facing west.

6.2.3 Slowly lower the fuel assembly into the elevator per Section 12.2.

6.2.4 OPTIONS: Control rod assemblies (CRA's), orifice rod assemblies (ORA's), burnable poison rod assemblies (BPRA's), and axial power shaping rod assemblies (APSRA's) should be inserted into the fuel assembly while the fuel assembly and elevator are in the "Up" position.

6.2.5 Depress "Down" button. (Elevator will stop when it reaches its down limit.)

6.2.6 The fuel assembly is ready for transport by the spent fuel bridge.

6.3 RAISING A FUEL ASSEMBLY

6.3.1 Depress "Down" button. (Elevator will stop when it reaches its down limit.)

6.3.2 Put the fuel assembly into the elevator per Section 9.3 or 9.7.

6.3.3 Depress "Raise" button. (Elevator will stop when it reaches its up limit.)

6.3.4 OPTIONS: CRA's, ORA's, BPRA's, and APSRA's may be-removed from the fuel assembly while the fuel assembly and elevator are in the "Up" position.

6.3.5 The fuel assembly is ready for lifting by the auxiliary building overhead crane.

6.4 SHUTDOWN OF THE NEW FUEL ELEVATOR

6.4.1 Determine the elevator is in the full "Down" position.

6.4.2 Open breaker (3AL) reactor MCC-3B-1.

7.0 FUEL TRANSFER CARRIAGES AND UPENDERS (FHCR-4A and 4B)

7.1 STARTUP OF THE FUEL TRANSFER SYSTEM

NOTE: If any applicable step cannot be successfully completed, the operator shall notify his immediate supervisor. The supervisor will assume responsibility for evaluation of the difficulty and initiation of action to rectify the problem.

7.1.1 Transfer tube cover plates should be off and the transfer canal at least partially filled with water.

7.1.2 Transfer tube valves should be open with an "Open" indication on the panels in the spent fuel pool.

7.1.3 Check water level in each hydraulic reservoir; assure 95% filled (estimate).

7.1.4 Close the main feeder breakers:

a. Panel 3A (North) Reactor MCC-3A-1 (4AL)

b. Panel 3B (South) Reactor MCC-3B-1 (4AL)

7.1.5 At the control panel, auxiliary building:

a. Turn on air valve at bottom of panel.

b. Turn on the local breakers.

c. Turn off heaters inside cabinet using toggle switch on outside of cabinet.

7.1.6 The following lights on the panel should be illuminated: (See Enclosure 1.)

a. "Power On" (opal)

b. "Frame Down" (green)

c. "Carriage at Pool" (green)

.. "Transfer Tube Valve Open" (red) SFV-119 and/or SFV-120

e. "Low Hydraulic Pressure" (red)

f. The remaining lights (PUSH-TO-TEST) are off and have been tested to verify operation.

7.1.7 The "Hydraulic Pump Start" push buttons should not be illuminated and the pump selector switch is in the "Off" position.

7.1.8 The key-operated "Carriage Interlock" is in the "Run" position and the key removed.

7.1.9 The carriage selector switch is in "Pool" position.

7.1.10 Place the hydraulic pump selector switch to "Auto"; the pump will start on the pool side. Verify that the push buttons are illuminated and that pressure is between 180-200 psig.

7.1.11 At the control panel in the RB, turn on the local feeder breakers.

a. Panel 4A (North), ACDP-3 Breaker #3

b. Panel 4B (South), ACDP-3 Breaker #4

7.1.12 The following lights on the control panel should be illuminated: (See Enclosure 1.)

a. "Power On" (opal)

b. "Frame Down" (green)

c. "Low Hydraulic Pressure" (red)

d. The remaining lights (PUSH-TO-TEST) should be off.

7.1.13 The "Hydraulic Pump Start" push buttons should not be illuminated and the pump selector switches should be in the "Off" position.

7.1.14 The "Carriage Control" switches are in the "Off" position.

7.1.15 The key-operated "Carriage Interlocks" are in the "Run" position and the keys removed.

7.1.16 Place the hydraulic pump selector switch to "Hand", push the pump "Start" buttons, and verify that the "Start" push buttons are illuminated and that pressure is between 180-200 psig.

7.1.17 Place the hydraulic pump selector switches to "Auto".

7.1.18 Place the "Carriage Control" switch to the "On" position and verify that the "Carriage Control" light is illuminated on the panel in the spent fuel pool.

7.1.19 Verify startup in accordance with the above steps by completion of Enclosure 12A.

7.2 <u>SPENT FUEL POOL TO FUEL TRANSFER CANAL</u>

7.2.1 Spent fuel bridge is away and clear of upender.

7.2.2 Push "Frame Up" push button (yellow). Basket will start up. "Frame Down" light (green) will go out. Basket will attain vertical position. "Frame Up" light (red) will be lit.

7.2.3 Deposit fuel assembly in the upender and move bridge away from and clear of transfer station.

7.2.4 Push "Frame Stop" push button (to relieve piston pressure).

7.2.5 Push "Frame Down" push button (blue). Basket will start down.

7.2.6 Determine "Frame Down" light (green) is on.

7.2.7 Operator (S), spent fuel area, establishes communications with operator (R), RB control panel operator.

7.2.8 Operator (R)

7.2.8.1 Determine fuel transfer station area is clear.

7.2.8.2 "Frame Down" light (green) is on.

7.2.8.3 Hydraulic pump selector is on "Auto".

7.2.8.4 "Carriage Control" is in "On" position. ["Carriage Control" light (green) on spent fuel panel will be illuminated.]

7.2.8.5 Inform operator (S) of transfer permission.

7.2.9 Operator (S)

7.2.9.1 Determine hydraulic pump in "Auto" mode.

7.2.9.2 Place "Carriage Control" to "Reactor".

7.2.9.3 Depress "Carriage Start" push button (green).

7.2.9.4 Determine "Carriage at Pool" lamp goes out; carriage is moving towards reactor; and "Carriage at Reactor" light (red) is on.

7.2.10 Operator (R)

7.2.10.1 Determine hydraulic pump starts automatically, carriage is at its station, and "Carriage at Reactor" light (green) is on.

7.2.10.2 Place "Carriage Control" to "Off" position.

7.2.10.3 Push "Frame Up" push button (yellow).

7.2.10.4 When upender is up (vertical position), "Frame Up" light (red) is on and "Frame Down" light (green) is off.

NOTE: Operator (R) can stop carriage at any time by placing "Carriage Control" to "Off" position.

7.3 FUEL TRANSFER CANAL TO SPENT FUEL POOL

NOTE: Assumption made, spent fuel assembly is in the upender and main fuel handling bridge is away and clear of transfer station.

7.3.1 Push "Frame Stop" push button (red) to relieve piston pressure.

7.3.2 Push "Frame Down" push button (blue). Determine that basket starts down, "Frame Up" light goes out, upender attains horizontal position, and "Frame Down" light (green) is on.

7.3.3 Operator (R)

7.3.3.1 Establish communications with spent fuel area operator (S) and inform of readiness to transfer.

7.3.3.2 Place "Carriage Control" switch to "On".

7.3.4 Operator (S)

7.3.4.1 Determine the following:

a. Spent fuel bridge is away and clear of transfer station.

b. "Frame Down" light is on.

c. "Carriage Control" switch to "Pool".

d. "Carriage Control" light (green) is on.

e. "Carriage at Reactor" light (red) is on.

7.3.4.2 Depress "Carriage Start" push button (green).

7.3.4.3 Determine the following:

a. "Carriage at Reactor" light (red) goes out.

b. Carriage is moving towards pool.

c. "Carriage at Pool" light (green) is on.

d. Hydraulic pump automatic start.

7.4 REMOVAL OF UPENDER INNER BASKET

7.4.1 Position the fuel transfer carriage at the fuel transfer station in the fuel storage pool.

7.4.2 Actuate the upender and raise to the vertical position.

7.4.3 Using the long-handled tool with the straight hook attached, release the inner fuel transfer basket lock. (Lock is attached to the upper end of the fixed outer fuel transfer basket.)

7.4.4 Engage hook in lock actuating chain and pull chain upward. (This disengages chain from its lower locking bar.)

7.4.5 When lock actuating chain is at its maximum "Up" position, engage chain in the upper locking bar. This holds the inner basket lock in its disengaged position.

7.4.6 Attach handling sling to the inner basket removal tool by use of stainless steel shackle and sling to dynamometer which is attached to missile shield crane hook.

7.4.7 Check inner basket grapple to ensure that it is in the unlocked position by verifying:

a. Forked locking bar is disengaged from lifting shaft.

b. Lifting shaft is rotated 90° clockwise to the unlocked position.

c. Lifting shaft is free to move vertically up and down through the bushings.

7.4.8 Lower inner basket grapple tool into position on top of the inner fuel transfer basket using the missile shield crane. (The long-handled tool with its straight hook is used to position the grapple on top of the inner basket and ensure that the grapple locating lug engages with the locating notch in the fixed outer basket.)

7.4.9 Engage the straight hook in the lifting lug eye.

7.4.10 Rotate lifting lug 90° counterclockwise until the shaft stop pin comes in contact with its fixed stop. This operation positions the lifting shaft locking cams in their locked position.

7.4.11 Engage the straight hook in the forked locking bar positioning eye.

7.4.12 Lift the tool upward until the forked locking bar is engaged with the flats on the grapple lifting shaft.

7.4.13 Start hoist and raise the inner fuel transfer basket out of the canal. Load on dynamometer will be approximately 750 lbs.

NOTE: Basket and grapple shall be washed down prior to their removal from the pool.

7.5 INSERTION OF UPENDER INNER BASKET

7.5.1 Attach inner basket grapple to the inner fuel transfer basket as noted in Section 7.4. (Inner basket locking notch must be positioned to engage with the desired inner fuel transfer basket lock.)

7.5.2 Attach lifting sling to grapple and sling to dynamometer placed on missile crane hook. Lower the transfer basket down into the pool directly over the empty fixed outer basket.

NOTE: The long-handled tool with its straight hook is used to guide and position the inner basket into the fixed outer basket.

7.5.3 Continue to lower basket until the load sensing device indicates zero load and slack is in the cable.

7.5.4 Using the long-handled tool with its straight hook, engage the hook with the forked locking bar positioning eye.

7.5.5 Pull upward and disengage the forked locking bar from the flats on the lifting shaft.

7.5.6 Engage the straight hook in the lifting lug eye.

7.5.7 Rotate lifting lug 90° clockwise against its stop. (This will position the lifting shaft locking cams in their unlocked position.)

7.5.8 Start hoist and take up slack in cable.

7.5.9 Continue raising until grapple is disengaged from basket.

NOTE: Load on dynamometer should read approximately 75 lbs. during grapple removal.

7.5.10 Raise grapple out of pool, wash and remove handling sling, and store.

7.5.11 Release the inner basker lock from its unlocked to its locked position. This is accomplished by using the long-handled tool with its straight hook.

7.5.12 Engage hook in lock actuating chain and pull upward. (This disengages chain from its upper locking bar.)

7.5.13 After chain is disengaged from the upper locking bar, hold chain away from basket and lower it until it can be engaged with the lower chain locking bar.

7.5.14 Remove hook from chain.

7.5.15 Raise long-handled tool up out of pool, decontaminate per ChemRad Section, and store.

7.6 SHUTDOWN OF THE FUEL TRANSFER SYSTEM

7.6.1 When the transfer system is to be secured, transfer the carriage to the pool, close the transfer tube valve, and determine that the "Valve Open" light is off.

7.6.2 Place the hydraulic pump selector switch to "Off".

7.6.3 Place the "Carriage Control" switch to "Off".

7.6.4 Open the main breaker on the control panel.

7.6.5 Close the air supply valve at the bottom of the control panel.

7.6.6 Energize heater strips (inside cabinet) with toggle switch on right side of panel.

7.6.7 Turn off feeder breakers.

8.0 MAIN FUEL HANDLING BRIDGE (FHCR-1)

8.1 STARTUP OF THE MAIN FUEL HANDLING BRIDGE

See Enclosures 2A, 2B, and 2C1.

NOTE: Bridge shutdown mode can be obtained from the Main Fuel Handling Bridge Log Sheet attached to the Bridge Console.

8.1.1 If the main fuel handling bridge is currently in the long-term shutdown condition, startup will be accomplished using the long-term startup procedure (Enclosure 8).

8.1.2 If the main fuel handling bridge is currently in the short-term shutdown condition, startup will be accomplished using the short-term startup procedure (Enclosure 7).

8.2 FUEL TRANSFER CARRIAGE TO CORE

8.2.1 On a panel in the RB, push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving. The "Frame Up" light is illuminated when the frame reaches a vertical position.

8.2.2 On the main fuel bridge, determine that the "Grapple Up Disengage" light and the "Control Rod Tube Up" light are illuminated.

8.2.3 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket.

8.2.4 Push "Jog Down" button on pendant control; the "Grapple Up Disengage" light will go off when the hoist starts moving. The hoist will continue down [and will not stop when it reaches the "Unloaded Slow Zone" (yellow indicating light)] until the load cell reads approximately 600 lbs., then the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the grapple is fully down.

NOTE: If grapple cannot be seated on fuel assembly, perform the following as necessary to seat grapple:

a. Recheck indexed position of bridge and trolley. Manually rotate mast back and forth and attempt to seat grapple.

b. Using manual override (handwheel), adjust bridge and trolley. Position as necessary to seat grapple.

c. If above operations are successful, make note of bridge and trolley positions if out of indexed position. Evaluate and determine cause of misalignment before attempting to hoist fuel assembly.

8.2.5 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.2.6 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load should read approximately 2,575 lbs. (2,450 without CRA) when the full weight of the assembly is lifted. Raise the element until the "Grapple Tube Up" light is illuminated.

8.2.7 Move trolley Forward or Reverse and bridge Right as required to position the bridge and trolley on the index marks for the desired core position.

8.2.8 Rotate the hoist control handle to the "Down" position and the "Grapple Tube Up" light will go off when the hoist starts moving. The hoist will continue down until the grapple reaches the grapple loaded core slow zone (bottom of assembly approximately 11 in. above core). When the grapple stops, push the "Jog Down" button on the pendant control. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated.

NOTE: Seating of assemblies has been a generic problem. If the assembly does not seat properly, try the following:

1. If fuel assembly hang-up is experienced at the spacer grid elevation, <u>do not rotate the mast or fuel assembly</u>. Try the following action:

   a. Reverse the motion of the fuel assembly until the underload or overload is relieved, then shake the cable supporting the assembly, then proceed with raising or lowering the assembly.

   b. If the fuel assembly hangs up at the same location after trying Step 1(a) above a couple of times, reposition fuel assembly in "full up" or "full down" position, then reindex the bridge or trolley or both and attempt to proceed with fuel movement. <u>DO</u> <u>NOT</u> bypass interlock, preventing simultaneous horizontal and vertical motion. The magnitude and direction of the reindexing will have to be determined on an individual case basis, but should generally be less than one-half inch.

2. If fuel assembly hang-up is experienced at the spacer grid elevation and the methods defined above do not permit fuel assembly insertion/withdrawal, try the following action:

   a. For Insertion of Fuel

      1. Place the fuel assembly in a temporary storage rack in the transfer canal.

      2. Insert the proper fuel assemblies adjacent to the location experiencing difficulty; see Enclosure 14. At least two rows should be installed as indicated on Enclosure 14.

      3. Bring the fuel assembly experiencing the difficulty back into the core and attempt reinsertion.

   b. For Withdrawal of Fuel

      1. If the assembly to be withdrawn has two or three adjacent locations empty, attempt to remove the adjacent fuel assembly(ies). With three or four adjacent locations empty, attempt to withdraw the problem assembly. If the assembly to be withdrawn has one or two adjacent locations empty, establish the "boxed-in" configuration by replacing the one or two adjacent fuel assemblies, then try to withdraw the problem assembly.

2. Repeat Step 1(a) above, then attempt withdrawal.

3. If the fuel assembly still cannot be withdrawn, repeat Step 1(b) above.

c. Recommendations

1. If continuous underload set point tripping occurs when a fuel assembly is within one (1) inch of its seating position, the hoist interlock bypass may be used.

2. Record the maximum Dillon gauge and "Z-Z" tape readings at the time of any overload/underload trip.

3. A precaution which deserves added emphasis is the proper indexing of the bridge system. Visual checking on the tracks is recommended.

4. Have an underwater TV camera and gear available in the RB for inspection, if needed.

8.2.9 Check the "Z-Z" axis tape to verify that the assembly is seated. Place the grapple control to the "Disengaged" position. The

"Engaged" light will go off and the "Disengaged" light will be illuminated.

8.2.10 Push the "Jog Up" button on the pendant control; the "Low Load" and "Tube Down" lights will go off when the hoist starts moving. The load cell should read approximately 900 lbs. when the weight of the grapple tube is lifted. Approximately 11 inches above the core the hoist will leave the slow zone and the hoist control handle may be used to raise the grapple. Raise the grapple until the hoist stops and the "Grapple Up Disengage" light is illuminated.

8.3 CORE TO FUEL TRANSFER CARRIAGE

8.3.1 On the main fuel bridge, determine that the "Grapple Up Disengage" light and the "Control Rod Tube Up" light are illuminated.

8.3.2 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired core position.

8.3.3 Rotate the hoist control handle to the "Down" position; the "Grapple Up Disengage" light will go off when the hoist starts moving. The hoist control handle can be used to lower the hoist until the hoist enters the grapple unloaded core slow zone approximately 11 inches above the core and stops. Push the "Jog Down" button on the pendant control and lower the grapple. When the load cell reads approximately 600 lbs., the hoist will stop, the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the grapple is fully down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

8.3.4 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.3.5 Push the "Jog Up" button on the pendant control; the "Low Load" and "Tube Down" lights will go off when the hoist starts to move. The load cell reading will increase to approximately 2,575 lbs. when the full weight of the assembly is lifted. After leaving the grapple loaded core slow zone (bottom of assembly approximately 11 inches above core), use the hoist control handle to raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

8.3.6 Move the bridge Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket. Determine that the "Carriage at Reactor" and "Frame Down" lights are illuminated.

8.3.7 Push the "Frame Up" button; verify that the "Frame Down" light goes off when the frame starts moving and the "Frame Up" light is illuminated when the frame reaches a vertical position.

8.3.8 Push the "Jog Down" button on the pendant control; the "Tube Up" light will go off when tube starts moving. Monitor the Dillon indicator. When the load cell reads approximately 600 lbs., the hoist movement will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

8.3.9 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated. Push "Jog Up" button on pendant control; the

"Low Load" light will go off when the tube starts moving. Raise the tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

8.3.10 Move the trolley Forward or Reverse and the bridge Right as required to move the bridge and trolley away from basket.

8.3.11 Push the "Frame Stop" button to release the hydraulic pressure on the piston. Wait approximately 15 seconds to allow the pressure to decay, then push the "Frame Down" button. The "Frame Up" light will go off when the frame starts moving and the "Frame Down" light will be illuminated when the frame reaches a horizontal position.

8.4 <u>FUEL TRANSFER CARRIAGE TO FUEL TRANSFER STORAGE RACK</u>

8.4.1 On the panel in the RB, push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

8.4.2 On the main fuel bridge, determine that the "Grapple Up Disengage" light and the "Control Rod Tube Up" light are illuminated.

8.4.3 Move the bridge Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket(s).

8.4.4 Push the "Jog Down" button on the pendant control; the "Grapple Up Disengage" light will go off when the hoist starts moving. Monitor the Dillon indicator. When load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to verify that the grapple is fully down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

8.4.5 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.4.6 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off and the Dillon indicator reading will increase when the hoist starts to move. The load cell should read approximately 2,575 pounds when the full weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

8.4.7 Move the trolley Forward or Reverse and the bridge Right as required to position the trolley and bridge on the index marks for the desired rack position.

8.4.8 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the hoist starts moving. When the load cell reads approximately 600 pounds, the hoist will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

8.4.9 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.4.10 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts to move. The load cell should read approximately 900 pounds when the weight of the grapple tube is lifted. Raise the tube until the "Grapple Up Disengage" light is illuminated.

8.4.11 Push the "Frame Down" button. The "Frame Up" light will go off when the frame starts moving and the "Frame Down" light will be illuminated when the frame reaches a horizontal position.

8.5 FUEL TRANSFER STORAGE RACK TO CORE

NOTE: If the main bridge is not available to transfer fuel from the fuel transfer storage rack to the core, the auxiliary bridge may be used provided the main bridge is moved to the east end of the transfer canal.

8.5.1 On the auxiliary fuel bridge, determine that the "Grapple Up Disengage" light, the "Control Rod Tube Up" light, and if the TV is installed, the "TV Cylinder Up" light are illuminated.

8.5.2 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired rack.

8.5.3 Rotate the hoist control handle to the "Down" position; the "Grapple Up Disengage" light will go off when the hoist starts moving. The hoist control handle can be used to lower the hoist until the hoist enters the grapple unloaded core slow zone approximately 11 inches above the core and stops. Push the "Jog Down" button on the pendant control and lower the grapple. When the load cell reads approximately 600 lbs., the hoist will stop, the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the grapple is fully down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

8.5.4 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.5.5 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off and the Dillon reading will increase when the hoist starts moving. The load cell should read approximately

2,575 lbs. when the full weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

8.5.6 Move the bridge Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks of the desired core position.

8.5.7 Rotate the hoist control handle to the "Down" position and the "Tube Up" light will go off when the hoist starts moving. The hoist will continue down until the grapple reaches the grapple loaded core slow zone (bottom of assembly approximately 11 inches above core). When the grapple stops, push the "Jog Down" button on the pendant control. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

8.5.8 Place the grapple control to the "Disengaged" position. The "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.5.9 Push the "Jog Up" button on the pendant control; the "Low Load" and "Tube Down" lights will go off when the hoist starts moving. The load cell should read approximately 900 lbs. when the weight of the grapple tube is lifted. Approximately 11 inches above the core, the hoist will leave the grapple unloaded core slow zone and the hoist control handle may be used to raise the grapple. Raise the tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

8.6 CORE TO TRANSFER STORAGE RACK

NOTE: If the main bridge is not available to transfer fuel from the core to the transfer rack, the auxiliary bridge may be used provided the main bridge is moved to the east of the transfer canal.

8.6.1 On the auxiliary fuel bridge, confirm that the "Grapple Up Disengage" light, the "Control Rod Tube Up" light, and if the TV is installed, the "TV Cylinder Up" light are illuminated.

8.6.2 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired core position.

8.6.3 Rotate the hoist control handle to the "Down" position; the "Grapple Up Disengage" light will go off when the hoist starts moving. The hoist control handle can be used to lower the hoist until the hoist enters the grapple unloaded core slow zone approximately 11 inches above the core and stops. Push the "Jog Down" button on the pendant control and lower the grapple. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to determine that the grapple is fully down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

8.6.4 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.6.5 Push the "Jog Up" button on the pendant control. The "Low Load" and "Grapple Tube Down" lights will go off when the hoist starts moving. The reading on the load cell will increase to approximately 2,575 lbs. when the full weight of the assembly is lifted. After leaving the grapple loaded core slow zone (bottom of assembly approximately 11 inches above core), use the hoist control handle to raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

8.6.6 Move the bridge Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired rack.

8.6.7 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the hoist starts moving. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

8.6.8 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.6.9 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the tube starts moving. Raise the tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

8.7 <u>FUEL TRANSFER STORAGE RACK TO FUEL TRANSFER CARRIAGE</u>

8.7.1 On the main fuel bridge, determine that the "Grapple Up Disengage" light and the "Control Rod Tube Up" light are illuminated.

8.7.2 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired rack.

8.7.3 Push the "Jog Down" button on the pendant control; the "Grapple Up Disengage" light will go off when the hoist starts moving. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to determine that the grapple is properly seated on the fuel assembly end fitting.

NOTE: See note in Section 8.2.4 if grapple does not seat.

8.7.4 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.7.5 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off and the Dillon reading will increase when the hoist starts moving. The load cell should read approximately 2,575 pounds when the full weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

8.7.6 Push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

8.7.7 Move the bridge Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket.

8.7.8 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the hoist starts moving. When the load cell reads approximately 600 pounds, the hoist will stop and the "Low Load" light will be illuminated. Check the "Z-Z" axis tape to determine that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

8.7.9 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.7.10 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load cell should read approximately 900 lbs. when the weight of the grapple tube is lifted. Raise the tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

8.7.11 Move the trolley Forward or Reverse and the bridge Right to move from over the basket.

8.7.12 Push "Frame Stop" button to relieve piston pressure.

8.7.13 Push the "Frame Down" button. The "Frame Up" light will go off when the frame starts moving and the "Frame Down" light will be illuminated when the frame reaches a horizontal position.

8.8 CONTROL ROD TRANSFER WITHIN THE FUEL TRANSFER CANAL

8.8.1 On the main fuel bridge, determine that the "Control Rod Tube Up" light, the "Control Rod Disengaged" light, the "Telescopic Cylinder Up First Stage" light and the "Grapple Up Disengage" light are illuminated.

NOTE: If either the "Engage", "Disengage", or "Test" indicator lights are not illuminated, depress the "Control Rod Grapple Reset" push button.

NOTE: Sections 8.8.2 thru 8.8.8 must be completed if telescopic cylinder has not been operated since hydraulic pump was started or if it has been greater than two hours since telescopic cylinder was last operated. If it has been operated, proceed to Section 8.8.9.

8.8.2 Position the trolley on the "H" core index position. Position the bridge such that the control rod mast is over the canal floor midway between the core and deep end of the canal.

8.8.3 Using the pendant control, lower the control rod tube. When the Dillon reads approximately 1800 pounds, the tube will have bottomed on the canal floor and the "Low Load" light will be illuminated.

8.8.4 Place the rod selector switch to the "Orifice Rod" position.

8.8.5 Push the "Telescopic Cylinder Down" push button. The "Telescopic Cylinder Up First Stage" light will go off and the "Telescopic Cylinder Down" light will come on when the cylinder reaches the full "down" position.

8.8.6 Push the "Telescopic Cylinder Up" push button. The "Telescopic Cylinder Down" light will go off. The "Telescopic Cylinder Up First Stage" light will come on when the cylinder stops moving.

8.8.7 Repeat Steps 8.8.5 and 8.8.6 again or until the telescopic cylinder lowers down slowly to the full "down" position.

8.8.8 Using the pendant control, raise the control rod tube until it stops. The "Low Load" light will go off and the "Control Rod Tube Up" light will be illuminated.

8.8.9 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired assembly. Confirm the assembly number and the control rod number.

NOTE: If the assembly is in the basket, push the "Frame Up" button, The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

8.8.10 Push the "Jog Down" button on the pendant control; the "Tube Up" light will go off when the hoist starts moving. The load cell reading will decrease to approximately 1800 pounds, the hoist will stop, and the "Low Load" light will be illuminated.

8.8.11 Push the "Telescopic Cylinder Down" button; the "Cylinder Up First Stage" light will go off when the cylinder starts to move. When the telescopic cylinder is extended, the "Cylinder Down" light will be illuminated. Compare the "Z-Z" axis tape readings for the tube and the cylinder. If the grapple has engaged the rod, the readings will have a difference of ______(later)______. (Storage Rack)

8.8.12 Place the rod selector switch to "Control Rod".

8.8.13 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.8.14 Push the "Telescopic Cylinder Up" button; the "Cylinder Down" light will go off when the cylinder starts moving. When the cylinder has been retracted, the "Cylinder Up" light will be illuminated.

8.8.15 Push the "Jog Up" button on the pendant control; the load cell reading will increase as the weight of the tube is lifted. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.8.16 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the ind[illegible] marks for the desired assembly. Confirm the assembly [illegible]

NOTE: If the assembly is in the basket, push the "Frame Up" button. The "Frame Down" light will go off as the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

8.8.17 Push the "Jog Down" button on the pendant control; the "Tube Up" light will go off when the hoist starts moving. The load cell reading will decrease to approximately 1800 pounds, the hoist will stop, and the "Low Load" light will be illuminated when the tube bottoms on the assembly.

8.8.18 Push the "Telescopic Cylinder Down" button; the "Cylinder Up" light will go off when the cylinder starts to move. The "Telescopic Cylinder Down" light will be illuminated when the cylinder is extended. Check the "Z-Z" axis tapes on the tube and cylinder. If the control rod is completely down, the readings will have a difference of ____(later)____. (Storage Rack)

8.8.19 Place the grapple control to "Disengaged"; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.8.20 Push the "Telescopic Cylinder Up" button; the "Cylinder Down" light will go off when the cylinder starts moving. When the cylinder is fully retracted, the "Cylinder Up First Stage light will be illuminated.

8.8.21 Push the "Jog Up" button on the pendant control; the load cell reading will increase as the weight of the tube is lifted. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.9 CONTROL ROD TRANSFER WITHIN THE CORE

8.9.1 On the main fuel bridge, determine that the "Control Rod Tube Up" light, the "Control Rod Disengaged" light, the "Telescopic Cylinder Up First Stage" light and the "Grapple Tube Up" light are illuminated.

NOTE: If either the "Engage", "Disengage", or "Test" indicator lights are not illuminated, depress the "Control Rod Grapple Reset" push button.

NOTE: Sections 8.9.2 thru 8.9.8 must be completed if telescopic cylinder has not been operated since hydraulic pump was started or if it has been greater than two hours since telescopic cylinder was last operated. If it has been operated, proceed to Section 8.9.9.

8.9.2 Position the trolley on the "H" core index position. Position the bridge such that the control rod mast is over the canal floor midway between the core and deep end of the canal.

8.9.3 Using the pendant control, lower the control rod tube. When the Dillon reads approximately 1800 lbs., the tube will have bottomed on the canal floor and the "Low Load" light will be illuminated.

8.9.4 Place the rod selector switch to the "Control Rod" position.

8.9.5 Push the "Telescopic Cylinder Down" push button. The "Telescopic Cylinder Up First Stage" light will go off and the "Telescopic Cylinder Down" light will come on when the cylinder reaches the full "Down" position.

8.9.6 Push the "Telescopic Cylinder Up" push button. The "Telescopic Cylinder Down" light will go off. The "Telescopic Cylinder Up First Stage" light will come on when the cylinder stops moving.

8.9.7 Repeat Sections 8.9.5 and 8.9.6 again or until the telescopic cylinder lowers slowly to the full "Down" position.

8.9.8 Using the pendant control, raise the control rod tube until it stops. The "Low Load" light will go off and the "Control Rod Tube Up" light will be illuminated.

8.9.9 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired assembly. Check the assembly number and the control rod number.

8.9.10 Rotate the hoist control handle in the "Down" direction and the "Tube Up" light will go off when the hoist starts moving. The hoist control handle may be used to lower the tube until the tube is approximately 11 inches over the core where the hoist enters a slow zone and stops. Push the "Jog Down" button on the pendant control and lower the tube. When the load cell reads approximately 1800 lbs., the hoist will stop and the "Low Load" and "Tube Down" lights will be illuminated.

8.9.11 Push the "Telescopic Cylinder Down" button; the "Cylinder Up First Stage" light will go off when the cylinder starts to move. When the telescopic cylinder is extended, the "Cylinder Down" light will be illuminated.

8.9.12 Compare the "Z-Z" axis tape readings for the tube and the cylinder. If the grapple has engaged the rod, the readings will have a difference of ______(later)______.

8.9.13 Confirm rod selector switch is in "Control Rod" position.

8.9.14 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.9.15 Push the "Telescopic Cylinder Up" button. The "Cylinder Down" light will go off when the cylinder starts moving. When the cylinder has been retracted, the "Cylinder Up" light will be illuminated.

8.9.16 Push the "Jog Up" button on the pendant control; the "Tube Down" and "Low Load" lights will go off when the hoist starts moving. The load cell reading will increase as the weight of the tube is lifted. When the tube is approximately 11 inches above the core, the hoist will leave the slow zone and the hoist control handle may be used to raise the tube. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.9.17 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the birdge and trolley on the index marks for the desired assembly. Confirm the assembly number and location.

8.9.18 Rotate the hoist control handle in the "Down" direction; the "Tube Up" light will go off when the hoist starts moving. Approximately 11 inches above the core, the hoist will enter a slow zone and stop. Push the "Jog Down" button on the pendant control and lower the tube. The load cell reading will decrease to approximately 1800 lbs., the hoist will stop, and the "Low Load" and "Tube Down" lights will be illuminated.

8.9.19 Push the "Telescopic Cylinder Down" button. The "Cylinder Up" light will go off when the cylinder starts moving. The "Telescopic Cylinder Down" light will be illuminated when cylinder is extended.

Check the "Z-Z" axis tapes on the tube and cylinder. If the control rod is completely down, the readings will have a difference of ______(later)___.

8.9.20 Place the grapple control to "Disengaged"; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

8.9.21 Push the "Telescopic Cylinder Up" button; the "Cylinder Down" light will go off when the cylinder starts to move. When the cylinder is fully retracted, the "Cylinder Up First Stage" light will be illuminated.

8.9.22 Push the "Jog Up" button on the pendant control; the "Tube Down" and "Low Load" lights will go off when the hoist starts moving. The load cell reading will increase as the weight of the tube is lifted. When the tube is approximately 11 inches above the core, the hoist will leave the slow zone and the hoist control handle may be used to raise the tube. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.10 <u>ORIFICE ROD TRANSFER WITHIN THE CORE</u>

8.10.1 On the main fuel bridge, confirm that the "Control Rod Tube Up" light, the "Control Rod Disengaged" light, the "Telescopic Cylinder Up" light and the "Grapple Tube Up" light are illuminated.

NOTE: Sections 8.10.2 thru 8.10.8 must be completed if telescopic cylinder has not been operated since hydraulic pump was started or if it has been greater than two hours since telescopic cylinder was last operated. If it has been operated, proceed to Section 8.10.9.

8.10.2 Position the trolley on the "H" core index position. Position the bridge such that the control rod mast is over the canal floor midway between the core and deep end of canal.

8.10.3 Using the pendant control, lower the control rod tube. When the Dillon reads approximately 1800 pounds, the tube will have bottomed on the canal floor and the "Low Load" light will be illuminated.

8.10.4 Place the rod selector switch to the "Orifice Rod" position.

8.10.5 Push the "Telescopic Cylinder Down" push button. The "Telescopic Cylinder Up First Stage" light will go off and the "Telescopic Cylinder Down" light will come on when the cylinder reaches the full "down" position.

8.10.6 Push the "Telescopic Cylinder Up" push button. The "Telescopic Cylinder Down" light will go off. The "Telescopic Cylinder Up First Stage" light will come on when the cylinder stops moving.

8.10.7 Repeat Steps 8.10.5 and 8.10.6 again or until the telescopic cylinder lowers down slowly to the full "down" position.

8.10.8 Using the pendant control, raise the control rod tube until it stops. The "Low Load" light will go off and the "Control Rod Tube Up" light will be illuminated.

8.10.9 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired assembly. Confirm the assembly number and the orifice rod number.

8.10.10 Rotate the hoist control handle in the "down" direction and the "Tube Up" light will go off when the hoist starts moving. The hoist control handle may be used to lower the tube until the tube is approximately 11 inches above the core, where the hoist enters a slow zone and will stop. Push the "Jog Down" button on the pendant control and lower the tube. When the load cell reads approximately 1800 pounds, the hoist will stop and the "Low Load" and "Tube Down" lights will be illuminated.

8.10.11 Push the "Telescopic Cylinder Down" button; the "Cylinder Up First Stage" light will go off when the cylinder starts moving. When the telescopic cylinder is extended, the "Cylinder Down" light will be illuminated.

8.10.12 Compare the "Z-Z" axis tape readings for the tube and the cylinder. If the grapple has engaged the rod, the readings will have a difference of __(later)__.

8.10.13 Confirm rod selector switch is in "Orifice Rod" position.

8.10.14 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

8.10.15 Push the "Telescopic Cylinder Up" button; the "Cylinder Down" light will go off when the cylinder starts moving. When the orifice rod has been fully retracted inside the mast, the hoist will stop and the "Cylinder Up First Stage" light will be illuminated.

8.10.16 Push the "Jog Up" button on the pendant control; the "Tube Down" and "Low Load" lights will go off when the hoist starts moving. The load cell reading will increase as the weight of the tube is lifted. When the tube is approximately 1' inches above the core, the hoist will leave the slow zone and the hoist control handle may be used to raise the tube. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.10.17 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolly on the index marks for the desired assembly. Confirm the assembly number and location.

8.10.18 Rotate the hoist control handle in the "down" direction and the "Tube Up" light will go off when the hoist starts moving. The hoist control handle may be used to lower the tube until the tube is approximately 11 inches above the core where the hoist enters a slow zone and stops. Push the "Jog Down" button on the pendant control and lower the tube. When the load cell reads approximately 1800 pounds, the hoist will stop and the "Low Load" and "Tube Down" lights will be illuminated.

8.10.19 Push the "Telescopic Cylinder Down" button; the "Cylinder Up First Stage" light will go off and when the telescopic cylinder is extended the "Cylinder Down" light will be illuminated. Check the "Z-Z" axis tape readings on the tube and cylinder. If the orifice rod is completely down, the readings will have a difference of (later).

8.10.20 Place the grapple control to "Test"; the "Control Rod Test" light will be illuminated and the "Engaged" light will go off.

8.10.21 Push the "Jog Up" button on the pendant control; the "Tube Down" and "Low Load" lights will go off when the hoist starts moving. The load cell reading will increase to between 75 and 125 pounds over the weight of the tube and the hoist will stop.

8.10.22 Check the "Z-Z" axis tape for the tube. If the tube has been lifted more than 9/16", the orifice rod is not locked into the assembly and Steps 8.10.12 through 8.10.14 will have to be repeated.

8.10.23 When the orifice rod is locked into the assembly, push the "Jog Down" button on the pendant control and lower the tube. The load cell reading will decrease to approximately 1800 lbs, the hoist will stop, and the "Low Load" and "Tube Down" lights will be illuminated.

8.10.24 Place the grapple control to "Disengaged"; the "Control Rod Test" light will go off and the "Disengaged" light will be illuminated.

8.10.25 Push the "Telescopic Cylinder Up" button; the "Cylinder Down" light will go off when the cylinder starts moving. When the cylinder is fully retracted, the "Cylinder Up First Stage" light will be illuminated.

8.10.26 Push the "Jog Up" button on the pendant control; the "Tube Down" and "Low Load" lights will go off when the hoist starts moving. The load cell reading will increase as the weight of the tube is lifted. When the tube is approximately 11 inches above the core, the hoist will leave the slow zone and the hoist control handle may be used to raise the tube. Raise the tube until the hoist stops and the "Tube Up" light is illuminated.

8.11 <u>SHUTDOWN OF THE MAIN FUEL HANDLING BRIDGE</u>

If restart of the main bridge is planned for the near future, the normal (short-term) shutdown procedure (Enclosure 9) should be used. If the bridge is to be shut down between refueling cycles or the next startup is indefinite, the long-term shutdown procedure (Enclosure 10) should be used.

9.0 SPENT FUEL HANDLING BRIDGE (FHCR-3)

9.1 STARTUP OF THE SPENT FUEL BRIDGE

See Enclosures 2A, 2B, and 2C2.

NOTE: Shutdown mode can be obtained from the Spent Fuel Handling Bridge Log Sheet attached to the bridge control console.

9.1.1 If the spent fuel handling bridge is currently in the long-term shutdown condition, startup will be accomplished using the long-term startup procedure (Enclosure 8).

9.1.2 If the spent fuel handling bridge is currently in the short-term shutdown condition, startup will be accomplished using the short-term startup procedure (Enclosure 7).

9.2 NEW FUEL ELEVATOR TO SPENT FUEL STORAGE RACKS

9.2.1 Determine new fuel elevator is in full "Down" position.

9.2.2 Move bridge to east end of "B" pool.

9.2.3 Move trolley Forward to row "E". This aligns grapple mast directly over new fuel elevator.

9.2.4 Rotate the hoist control handle to "Down"; the "Grapple Tube Up" light will go off when the hoist starts moving. The hoist will stop when the "Grapple Unloaded Slow Zone" (yellow indicator lamp) is illuminated. Push the "Jog Down" button on the pendant and lower the grapple until the hoist stops and the "Low Load" light is illuminated. Check the "Z-Z" axis tape to verify that the grapple is down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.2.5 Place the grapple control to "Engaged"; the "Grapple Disengaged" light will go off, the "Grapple Engaged" light and the "Grapple Loaded Slow Zone" (red) indicator lamp will be illuminated.

9.2.6 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load cell reading will increase to approximately 2,450 pounds (without CRA) when the weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

9.2.7 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired rack position.

9.2.8 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the hoist starts moving. When the load cell reads approximately 600 pounds, the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

9.2.9 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

9.2.10 Push the "Jog Up" button on the pendant control; the "Low Load" and "Grapple Tube Down" lights will go off when the hoist starts moving. Raise the grapple tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

9.3 SPENT FUEL STORAGE RACKS TO NEW FUEL ELEVATOR

9.3.1 Determine that the "Grapple Up Disengage" light is illuminated. If not, push "Jog Up" button on pendant control until it is illuminated.

9.3.2 Move the bridge control handle to the Right or Left to move the bridge to the desired numerical row.

9.3.3 Move the trolley control handle to "Forward" or "Reverse" to move the trolley to the desired alphabetical line.

9.3.4 Determine the grapple control is in the "Disengaged" position and the "Disengaged" light is illiminated.

9.3.5 Using the hoist control handle, lower the grapple until it is stopped by the "Grapple Unloaded Slow Zone" (yellow indicating light).

9.3.6 Using the pendant control, push the "Jog Down" button and lower the grapple to the top of the fuel assembly.

9.3.7 Determine that the "Low Load" and "Grapple Tube Down" lights are illuminated.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.3.8 Place the grapple control to the "Engaged" position. The "Disengaged" light will go off and the "Engaged" light will be illuminated.

9.3.9 Push the "Jog Up" button on the pendant control. The "Low Load" light will go off and the load cell reading will increase to about 2,450 lbs. when the full weight of the assembly is lifted.

9.3.10 Raise the fuel assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

9.3.11 Determine that the elevator is down.

9.3.12 Move the trolley onto the "E" line.

9.3.13 Move the bridge Right to position the bridge on the index marks for the elevator.

9.3.14 Push the "Jog Down" button on the pendant control and lower the fuel assembly into the elevator. When the fuel assembly reaches the bottom of the elevator, the "Low Load" light will be illuminated and the hoist will stop.

9.3.15 Determine correct position with "Z-Z" axis tape position indication. NOTE: See note in Section 8.2.8 if assembly does not seat.

9.3.16 Place the grapple control to the "Disengaged" position; "Engaged" light will go off and "Disengaged" light will be illuminated.

9.3.17 Push the "Jog Up" button on the pendant control and raise the grapple. When the slow zone light goes off, the hoist control handle may be used to raise the grapple. Raise the grapple until it stops and the "Grapple Up Disengage" light is illuminated.

9.3.18 Move the bridge Left to position it away from the elevator.

9.4 <u>SPENT FUEL STORAGE RACKS TO FUEL TRANSFER CARRIAGE</u>

9.4.1 Determine that the "Grapple Up Disengage" light is illuminated. If not, push the "Jog Up" button on the pendant control until it is illuminated.

9.4.2 Move the bridge control handle to the Right or Left to move the bridge to the desired row.

9.4.3 Move the trolley control handle to "Forward" or "Reverse" to move the trolley to the desired line.

9.4.4 Determine that the grapple control is in the "Disengaged" position and the "Disengaged" light is illuminated.

9.4.5 Using the hoist control handle, lower the grapple until it is stopped by the "Grapple Unloaded Slow Zone" (yellow indicating light).

9.4.6 Using the pendant control, push the "Jog Down" button and lower the grapple to the top of the fuel assembly. The "Grapple Tube Down" and "Low Load" lights will be illuminated and the hoist will stop.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.4.7 Verify correct position of "Z-Z" axis tape to within ± 1/8" according to chart attached to control panel.

9.4.8 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

9.4.9 Push the "Jog Up" button on the pendant control. The "Low Load" and "Grapple Tube Down" lights will go off and the load cell reading will increase to approximately 2,450 lbs. when the full weight of the assembly is lifted. Raise the fuel assembly until the hoist stops and the "Tube Up" light is illuminated.

9.4.10 Push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

9.4.11 Move the bridge Right or Left and the trolley Forward or Reverse to place the bridge and trolley on the index marks for the basket.

9.4.12 Push the "Jog Down" button on the pendant control and lower the fuel assembly into the basket. When the fuel assembly reaches the bottom of the basket, the load indication on the Dillon will move downscale to approximately 600 lbs., the hoist will stop, and the "Low Load" light will be illuminated. Verify correct position of "Z-Z" axis tape to within ± 1/8" according to chart attached to control panel.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

9.4.13 Place the grapple control to the "Disengaged" position and determine that the "Disengaged" light is illuminated.

9.4.14 Push the "Jog Up" button on the pendant control and raise the grapple. When the slow zone light goes off, the hoist control handle may be used to raise the grapple. Raise the grapple until it stops and the "Grapple Up Disengage" light is illuminated.

9.4.15 Move the bridge Left and the trolley Forward or Reverse to move the bridge and trolley away from the basket since the frame will not lower with the bridge and trolley over them.

9.4.16 Refer to Section 7.3.3 of this procedure for proper operation of fuel transfer equipment.

9.5 FUEL TRANSFER CARRIAGE TO SPENT FUEL STORAGE RACKS

9.5.1 Determine that the "Grapple Up Disengage" light is illuminated. If not, push the "Jog Up" button on the pendant control and raise the tube.

9.5.2 Push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

9.5.3 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket.

9.5.4 Using hoist control handle, lower the grapple until it is stopped by the "Grapple Unloaded Slow Zone" limits.

9.5.5 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the tube starts moving. Monitor the Dillon indicator. When the load cell reads approximately 600 lbs., the hoist will s p and the "Low Load" light will be illuminated.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.5.6 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated. Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load cell reading will increase to approximately 2,450 lbs. when the full weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

9.5.7 Verify with Nuclear Operator proper storage rack position.

9.5.8 Move the bridge Right or Left and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired storage rack position.

9.5.9 Push the "Jog Down" button on the pendant control; the "Tube Up" light will go off when the tube starts moving. Monitor the Dillon indicator. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

9.5.10 Place the grapple control to the "Disengaged" position; the "Engaged" light will go off and the "Disengaged" light will be illuminated.

9.5.11 Push the "Jog Up" button on the pendant control; the "Low Load" and "Grapple Tube Down" lights will go off when the tube starts moving. Raise the grapple tube until the hoist stops and the "Grapple Up Disengage" light is illuminated.

9.6 NEW FUEL ELEVATOR TO FUEL TRANSFER CARRIAGE

9.6.1 Determine new fuel elevator is in full "Down" position.

9.6.2 Move bridge to east end of "B" pool.

9.6.3 Move trolley Forward to row "E". This aligns grapple mast directly over new fuel elevator.

9.6.4 Rotate the hoist control handle to "Down"; the "Grapple Tube Up" light will go off when the hoist starts moving. The hoist will stop when the "Grapple Unloaded Slow Zone" (yellow indicator lamp) is illuminated. Push the "Jog Down" button on the pendant and lower the grapple until the hoist stops and the

"Low Load" light is illuminated. Check the "Z-Z" axis tape to verify that the grapple is down.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.6.5 Place the grapple control to "Engaged"; the "Grapple Disengaged" light will go off, the "Grapple Engaged" light and "Grapple Loaded Slow Zone" indicator lamp (red) will be illuminated.

9.6.6 Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load cell reading will increase to approximately 2,450 lbs. (without CRA) when the weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

9.6.7 Push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

9.6.8 Reverse to place the bridge and trolley on the index marks for the basket.

9.6.9 Push the "Jog Down" button on the pendant control and lower the fuel assembly into the basket. When the fuel assembly reaches the bottom of the basket, the load indication on the Dillon will move downscale to approximately 600 lbs., the hoist will stop, and the "Low Load" light will be illuminated. Verify correct position of "Z-Z" axis tape to within ± 1/8" according to chart attached to control panel.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

9.6.10 Place the grapple control to the "Disengaged" position and determine that the "Disengaged" light is illuminated.

9.6.11 Push the "Jog Up" button on the pendant control and raise the grapple. When the slow zone light goes off, the hoist control handle may be used to raise the grapple. Raise the grapple until it stops and the "Grapple Up Disengage" light is illuminated.

9.6.12 Move the bridge Left and the trolley Forward or Reverse to move the bridge and trolley away from the basket since the frame will not lower with the bridge and trolley over them.

9.6.13 Refer to Section 7.2 of this procedure for proper operation of fuel transfer equipment.

9.7 <u>FUEL TRANSFER CARRIAGE TO NEW FUEL ELEVATOR</u>

9.7.1 Determine that the "Grapple Up Disengage" light is illuminated. If not, push the "Jog Up" button on the pendant control and raise the tube.

9.7.2 Push the "Frame Up" button. The "Frame Down" light will go off when the frame starts moving and the "Frame Up" light will be illuminated when the frame reaches a vertical position.

9.7.3 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the basket.

9.7.4 Using hoist control handle, lower the grapple until it is stopped by the "Grapple Unloaded Slow Zone" limits.

9.7.5 Push the "Jog Down" button on the pendant control; the "Grapple Tube Up" light will go off when the tube starts moving. Monitor the Dillon indicator. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" light will be illuminated.

NOTE: See note in Section 8.2.4 if grapple does not seat.

9.7.6 Place the grapple control to "Engaged"; the "Disengaged" light will go off and the "Engaged" light will be illuminated. Push the "Jog Up" button on the pendant control; the "Low Load" light will go off when the hoist starts moving. The load cell reading will increase to approximately 2,450 lbs. when the full weight of the assembly is lifted. Raise the assembly until the hoist stops and the "Grapple Tube Up" light is illuminated.

9.7.7 Determine that the elevator is down.

9.7.8 Move the trolley onto the "E" line.

9.7.9 Move the bridge Right to position the bridge on the index marks for the elevator.

9.7.10 Push the "Jog Down" button on the pendant control and lower the fuel assembly into the elevator. When the fuel assembly reaches the bottom of the elevator, the "Low Load" light will be illuminated and the hoist will stop.

9.7.11 Determine correct position with "Z-Z" axis tape position indication.

NOTE: See note in Section 8.2.8 if fuel assembly does not seat.

9.7.12 Place the grapple control to the "Disengaged" position; "Engaged" light will go off and "Disengaged" light will be illuminated.

9.7.13 Push the "Jog Up" button on the pendant control and raise the grapple. When the slow zone light goes off, the hoist control handle may be used to raise the grapple. Raise the grapple until it stops and the "Grapple Up Disengage" light is illuminated.

9.7.14 Move the bridge Left to position it away from the elevator.

9.8 ROTATION OF FUEL ASSEMBLY USING THE BRIDGE FUEL MAST

9.8.1 Clockwise Rotation of an Assembly 90° or 180° From Its Zero Position

9.8.1.1 Index fuel mast over the assembly, lower grapple, engage the assembly, and raise the grapple to the "Grapple Tube Up" position.

9.8.1.2 Pull out the spring loaded locking pin at the top of the mast and using the attached rachet handle rotate the mast 90° counterclockwise (looking down mast). Release locking pin.

9.8.1.3 Lower the assembly, disengage grapple, and raise the grapple tube.

9.8.1.4 Pull out the spring loaded locking pin and rotate the mast clockwise (looking down mast) 90° to the zero position.

9.8.1.5 Release the locking pin back into its slot.

9.8.1.6 If it is desired to rotate the assembly 180° clockwise from its original zero position, repeat Sections 9.8.1.2 thru 9.8.1.4.

9.8.2 Counterclockwise Rotation of an Assembly 90° From Its Zero Position

9.8.2.1 Verify that the "Grapple Tube Up" light is illuminated. If not, raise grapple.

9.8.2.2 Pull out the spring loaded locking pin at the top of the mast and using the attached rachet handle rotate the mast 90° clockwise (looking down mast). Release locking pin.

9.8.2.3 Index fuel mast over the assembly, lower grapple, engage the assembly, and raise the grapple to the "Grapple Tube Up" position.

9.8.2.4 Pull out the spring loaded locking pin and rotate the mast counterclockwise (looking down mast) 90° to the zero position. Release the locking pin back into its slot.

9.8.2.5 Lower the assembly, disengage grapple, and raise the grapple tube.

9.9 SHUTDOWN OF THE SPENT FUEL BRIDGE

If restart of the spent fuel bridge is planned for the near future, the normal (short-term) shutdown procedure (Enclosure 9) should be used. If the bridge is to be shut down between refueling cycles or the next startup is indefinite, the long-term shutdown procedure (Enclosure 10) should be used.

10.0 AUXILIARY .UEL HANDLING BRIDGE (FHCR-2)

10.1 STARTUP OF THE AUXILIARY FUEL HANDLING BRIDGE

See Enclosures 2A, 2B, and 2C3.

NOTE: Shutdown mode can be obtained from the Auxiliary Fuel Handling Bridge Log Sheet attached to the bridge control console.

10.1.1 If the auxiliary fuel handling bridge is currently in the long-term shutdown condition, startup will be accomplished using the long-term startup procedure (Enclosure 8).

10.1.2 If the auxiliary fuel handling bridge is currently in the short-term shutdown condition, startup will be accomplished using the short-term startup procedure (Enclosure 7).

10.2 RELOCATION OF FUEL WITHIN THE CORE

DISCUSSION: Operators WILL BE very familiar with Technical Specification 3/4.9 (Refueling Operations).

NOTE: If the auxiliary bridge is not available to shuffle fuel within the core, fuel may be shuffled with the main bridge provided the auxiliary bridge is in its storage location.

10.2.1 On the auxiliary bridge, determine that the "Grapple Tube Up" light, and if the TV is used, the "TV Cylinder Up" light are illuminated.

10.2.2 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks for the desired fuel assembly. Check the fuel assembly number and location. (See Enclosure 5 of this procedure.)

10.2.3 Rotate the hoist control handle to the "Down" position; the "Grapple Tube Up" light will go off when the hoist starts moving. The hoist control handle can be used to lower the hoist until the hoist enters the grapple unloaded core slow zone (approximately 11 inches above the core) and stops. Push the "Jog Down" button on the pendant control and lower the grapple. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated.

10.2.4 Check the "Z-Z" axis tape to verify the grapple is properly seated on the fuel assembly upper end fitting.

NOTE: See note in Section 8.2.4 if grapple does not seat.

10.2.5 Place the grapple control to the "Engaged" position; the "Disengaged" light will go off and the "Engaged" light will be illuminated.

10.2.6 Push the "Jog Up" button on the pendant control. The "Low Load" and "Tube Down" lights will go off when the hoist starts moving. The load cell reading will increase to approximately 2,450 lbs. (2,575 with CRA) when the full weight of the assembly is lifted.

10.2.7 After leaving the grapple loaded core slow zone (bottom of assembly approximately 11 inches above core), use the hoist control handle to raise the assembly until the hoist stops and the "Tube Up" light is illuminated.

10.2.8 Move the bridge Left or Right and the trolley Forward or Reverse as required to position the bridge and trolley on the index marks of the desired core location.

10.2.9 Rotate the hoist control handle to the "Down" position and the "Grapple Tube Up" light will go off when the hoist starts moving. The hoist will continue down until the grapple reaches the grapple loaded core slow zone (bottom of assembly approximately 11 inches above core). When the grapple stops, push the "Jog Down" button on the pendant control. When the load cell reads approximately 600 lbs., the hoist will stop and the "Low Load" and "Grapple Tube Down" lights will be illuminated. Check the "Z-Z" axis tape to verify that the assembly is seated.

NOTE: See note in Section 8.2.S if fuel assembly does not seat.

10.2.10 Place the grapple control to the "Disengaged" position. The "Engaged" light will go off and the "Disengaged" light will be illuminated.

10.2.11 Push the "Jog Up" button on the pendant control; the "Low Load" and "Grapple Tube Down" lights will go off when the hoist starts moving. The load cell should read approximately 900 lbs. when the weight of the grapple tube is lifted. Approximately 11 inches above the core, the grapple will leave the grapple unloaded core slow zone and the hoist control may be used to raise the grapple. Raise the grapple until the hoist stops and the "Grapple Up Disengage" light is illuminated.

10.3 SHUTDOWN OF THE AUXILIARY FUEL HANDLING BRIDGE

If restart of the auxiliary bridge is planned for the near future, the normal (short-term) shutdown procedure (Enclosure 9) should be used. If the bridge is to be shut down between refueling cycles or the next startup is indefinite, the long-term shutdown procedure (Enclosure 10) should be accomplished.

11.0 MISCELLANEOUS FUEL HANDLING TOOLS

11.1 NEW FUEL HANDLING TOOL

11.1.1 Prior to placing over element, using 13" hex socket, turn hex nut to full counterclockwise position to open the grapple.

11.1.2 Place over element.

11.1.3 Using 15" hex socket, turn hex nut to full clockwise position to close grapple.

11.2 LONG-HANDLED TOOL AND HOOK ATTACHMENT

11.2.1 The long-handled tool with the hook fixture attachment is used for lowering the auxiliary detector into its holder,

11.2.2 Attach the hook fixture by releasing the anti-rotation lock, threading the fitting into the nut, and sliding the lock back into the slot above the threads.

11.2.3 Attach hook onto auxiliary detector when ready to lower into holder.

12.0 AUXILIARY BUILDING OVERHEAD CRANE (FHCR-5)

12.1 OPERATION

Refer to Enclosure 6.

12.1.1 Close "Fuel Handling Area Crane 3" breaker at 480V turbine bus 3B.

12.1.2 Energize the following equipment at disconnect panels mounted in the cab.

a. Crane Lights

b. Cab Control Switch

c. Hydraulic Oil Coolers (required during main hoist operation)

d. Energize space heaters when required.

12.1.3 Operate the following controls and/or switches on the push button control panel.

12.1.3.1 Turn selector switch to "On".

12.1.3.2 Press "Start" button to energize the control panels.

12.1.3.3 a. To raise hook, push "HOIST - UP" button; to lower hook, push "HOIST - DOWN" button. Hook will automatically stop and brake will set when button is released. DO NOT PRESS BOTH BUTTONS at the same time. This hoist has five speeds in each direction. The slowest speed is obtained by pushing the operating button only enough to start the motor: the speed increases as the button is further depressed.

b. To move the trolley across the bridge, push either the "TROLLEY - FORWARD" or "TROLLEY - REVERSE" button depending on the desired direction of motion. This trolley has five speeds in each direction.

c. To move the bridge along the runway, push either the "BRIDGE - FORWARD" or "BRIDGE - REVERSE" button depending on the desired direction of motion.

NOTE: When moving the bridge over spent fuel pool "B", the "Restricted" button must be depressed continuously.

12.1.3.4 Always allow crane to come to a complete stop before reversing direction of motion.

12.1.3.5 IF A CONTROL BUTTON SHOULD STICK IN AN "ON" POSITION, PRESS "STOP" BUTTON IMMEDIATELY. This shuts off all motion. Do not press "Start" button until the defective button has been repaired.

12.1.3.6 When the crane is no longer to be operated, always press the "Stop" button to de-energize the control station.

12.1.3.7 Energize the space heaters as needed.

12.1.3.8 De-energize crane lights and cab control disconnects.

12.2 <u>TRANSFERRING NEW FUEL FROM NEW FUEL STORAGE RACKS TO NEW FUEL ELEVATOR</u>

12.2.1 Energize the crane èquipment per Section 12.1 of this procedure.

12.2.2 Lower the pendant push button control station for floor operation.

12.2.3 Operate crane and main crane from the floor and position the hoist for attaching the new fuel handling tool assembly.

12.2.4 Inspect and securely attach tool assembly to the main hook.

12.2.5 Position crane for lifting new fuel element.

12.2.6 Assure that hook and tool assembly are in correct alignment with the fuel assembly.

12.2.7 Attach fuel handling tool to the selected fuel element per Section 11.0 of this procedure.

12.2.8 Lift new fuel assembly from the storage rack.

NOTE: Exercise caution when moving any fuel assembly.

12.2.9 Position crane and fuel assembly for final inspection and preparation prior to movement to the new fuel elevator.

12.2.10 Assure that new fuel elevator is positioned up to receive the fuel element.

12.2.11 Position crane and fuel element over new fuel elevator.

12.2.12 Assure that the fuel element is in correct alignment with the elevator and the fuel element ID number faces the west.

12.2.13 Lower the fuel element into the elevator.

12.2.14 When element is securely bottomed in the elevator, release the fuel handling tool from the fuel element and move the crane to the new fuel storage area.

13.0 AUXILIARY BUILDING MISSILE SHIELD CRANE (FHCR-7)

13.1 MISSILE SHIELD PLACEMENT AND REMOVAL

13.1.1 Refer to Suveillance Procedure SP-434, "Fueling Storage Pool Missile Shields"

13.2 OTHER LOADS

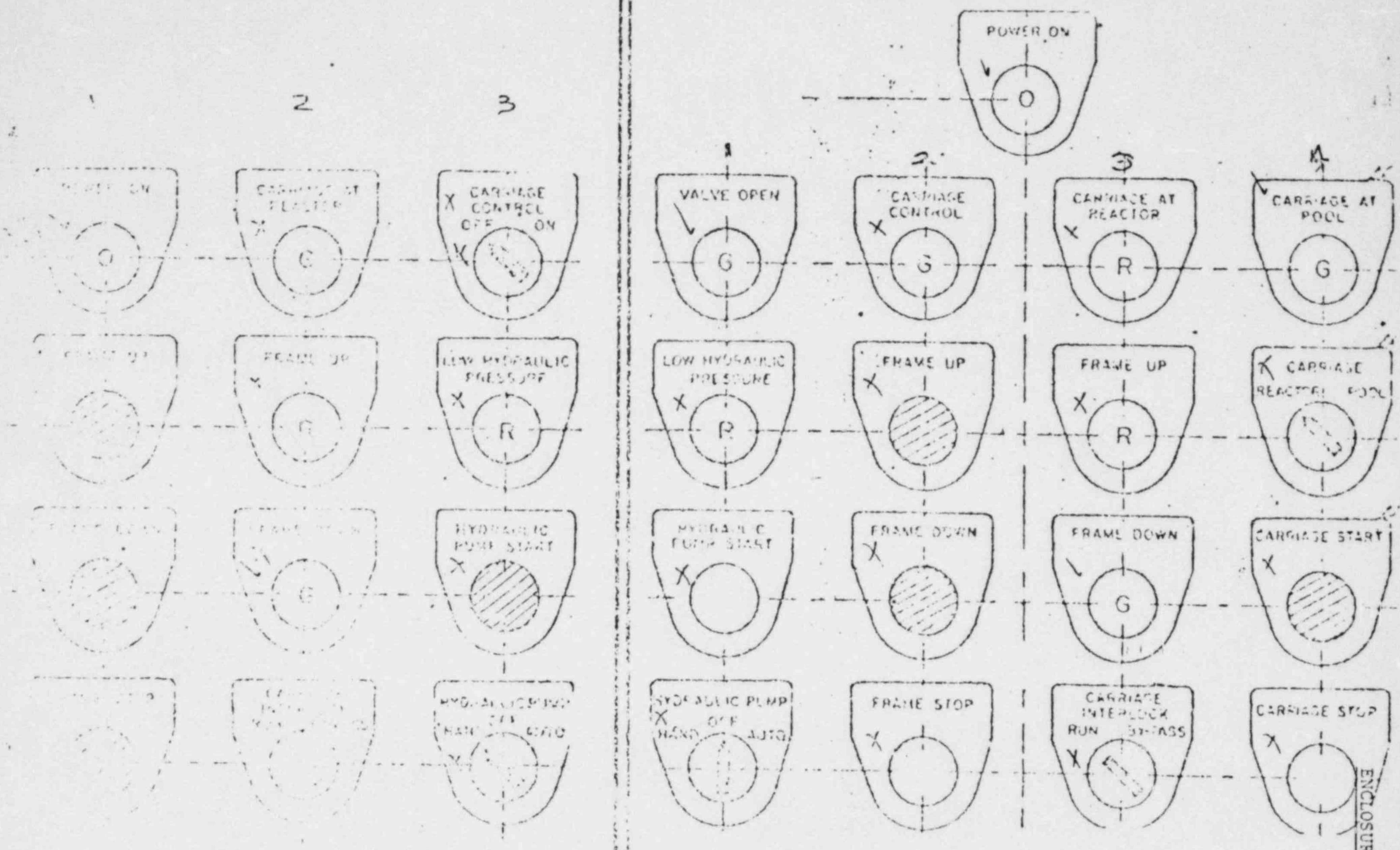
13.2.1 Observe the precaution stated in paragraph 4.5.1 of this procedure

ENCLOSURES

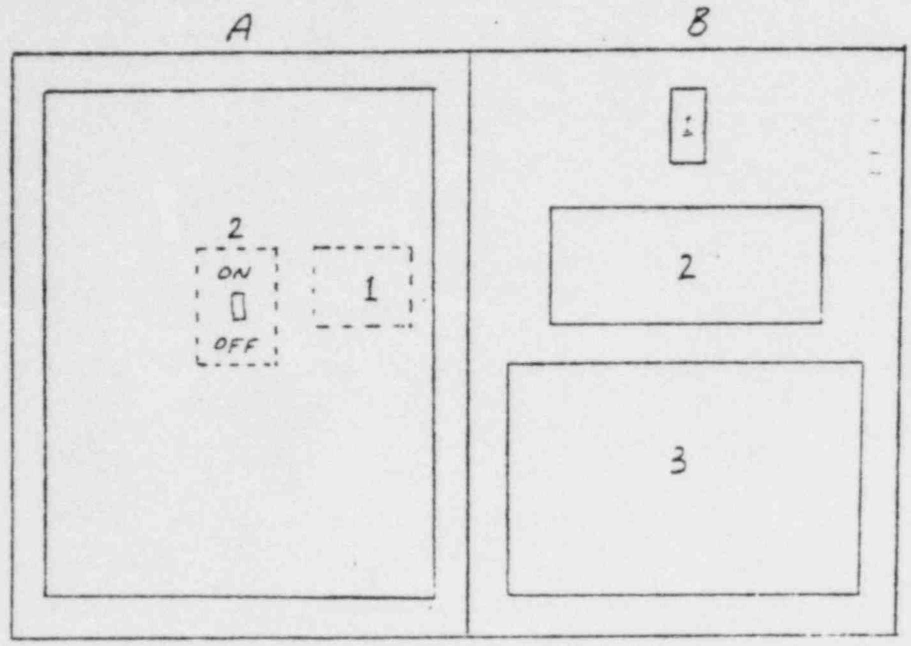
Enclosure 1	Fuel Transfer (Carriage and Upender) Control Panel
Enclosure 2A	Fuel Handling Bridge Electrical Panels
Enclosure 2B	Operators Console (Lower)
Enclosure 2C1	Main Fuel Handling Bridge Console
Enclosure 2C2	Spent Fuel Bridge Console
Enclosure 2C3	Auxiliary Fuel Bridge Console
Enclosure 2D1	Plan View Electrical Interlocks Reactor Main Bridge (FHCR-1)
Enclosure 2D2	Plan View Electrical Interlocks Reactor Auxiliary Bridge (FHCR-2)
Enclosure 3	Plan View Electrical Interlocks Spent Fuel Pool Handling Bridge (FHCR-3)
Enclosure 4	Spent Fuel Pools "A" and "B"
Enclosure 5	CR-3 Core Map
Enclosure 6	Auxiliary Building Overhead Crane Pendant Control Station
Enclosure 7	Short-Term Startup of Bridges
Enclosure 8	Startup of Fuel Handling Bridges (Long-Term)
Enclosure 9	Shutdown of Fuel Handling Bridges (Short-Term)
Enclosure 10	Shutdown of Fuel Handling Bridges (Long-Term)
Enclosure 11	Hoist (Z-Z) Tape Readings
Enclosure 12A	Verification of Fuel Transfer System Startup
Enclosure 12B	Verification of Fuel Handling Bridge Startup
Enclosure 12C	Verification of Fuel Handling Bridge Shutdown
Enclosure 13A	Spent Fuel Handling Bridge Log Sheet
Enclosure 13B	Reactor Building Bridges Log Sheet
Enclosure 14	Core Loading Map

REACTOR BUILDING CONTROL PANEL

FUEL STORAGE CONTROL PANEL



BRIDGE ELECTRICAL PANEL (ON TROLLEY)



CABINET "A"

1. Knife Switch (ISW)
2. Thyristor Circuit Breaker (ICB)

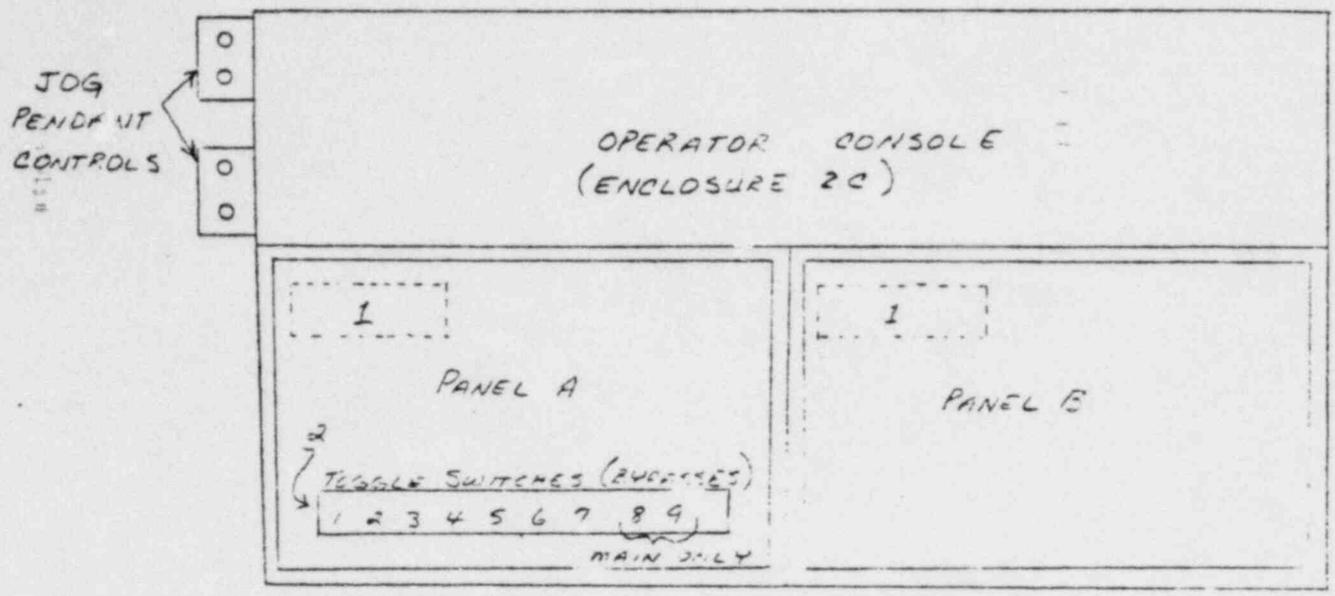
CABINET "B"

1. Circuit Breaker (ACB)
2. Lighting Panel Board (8 switches)

    1. Console Dillon and Selsyn
    2. Console Receptacle Outlet
    3. TV Power
    4. Console Receptacle Outlet
    5. Spare
    6. Shaded Light
    7. Spare
    8. Spare

3. Relays

FUEL HANDLING BRIDGE-LOWER CONTROL CONSOLE



PANEL "A"

1. Fuel Dillon Power Supply

   A. "On/Off" Switch ("On" - white indicating light)
   B. "Range" Switch

      A - 0 to 3,000 lbs.
      B - 3,000 to 6,000 lbs.

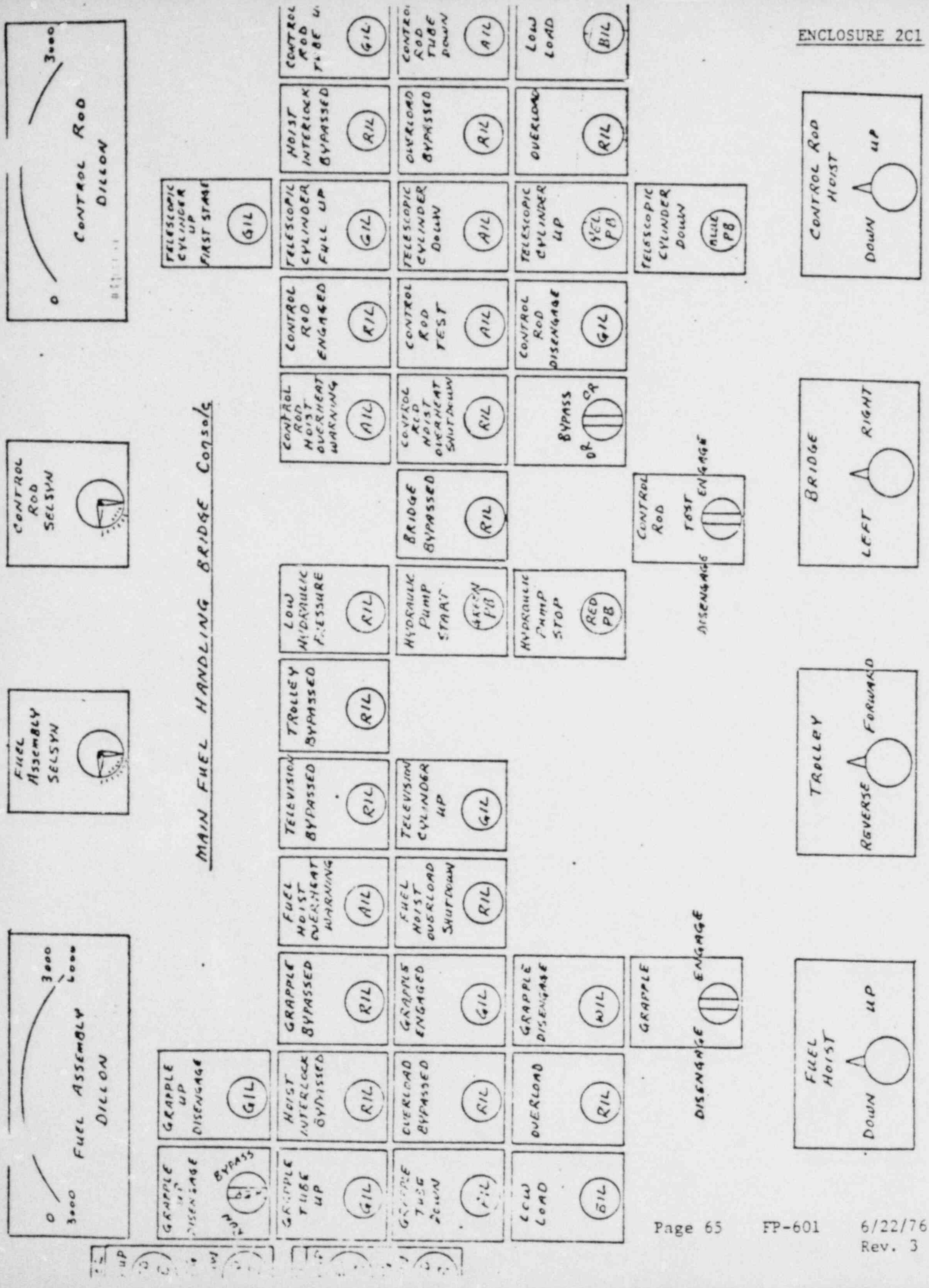
2. "Bypass" Toggle Switches

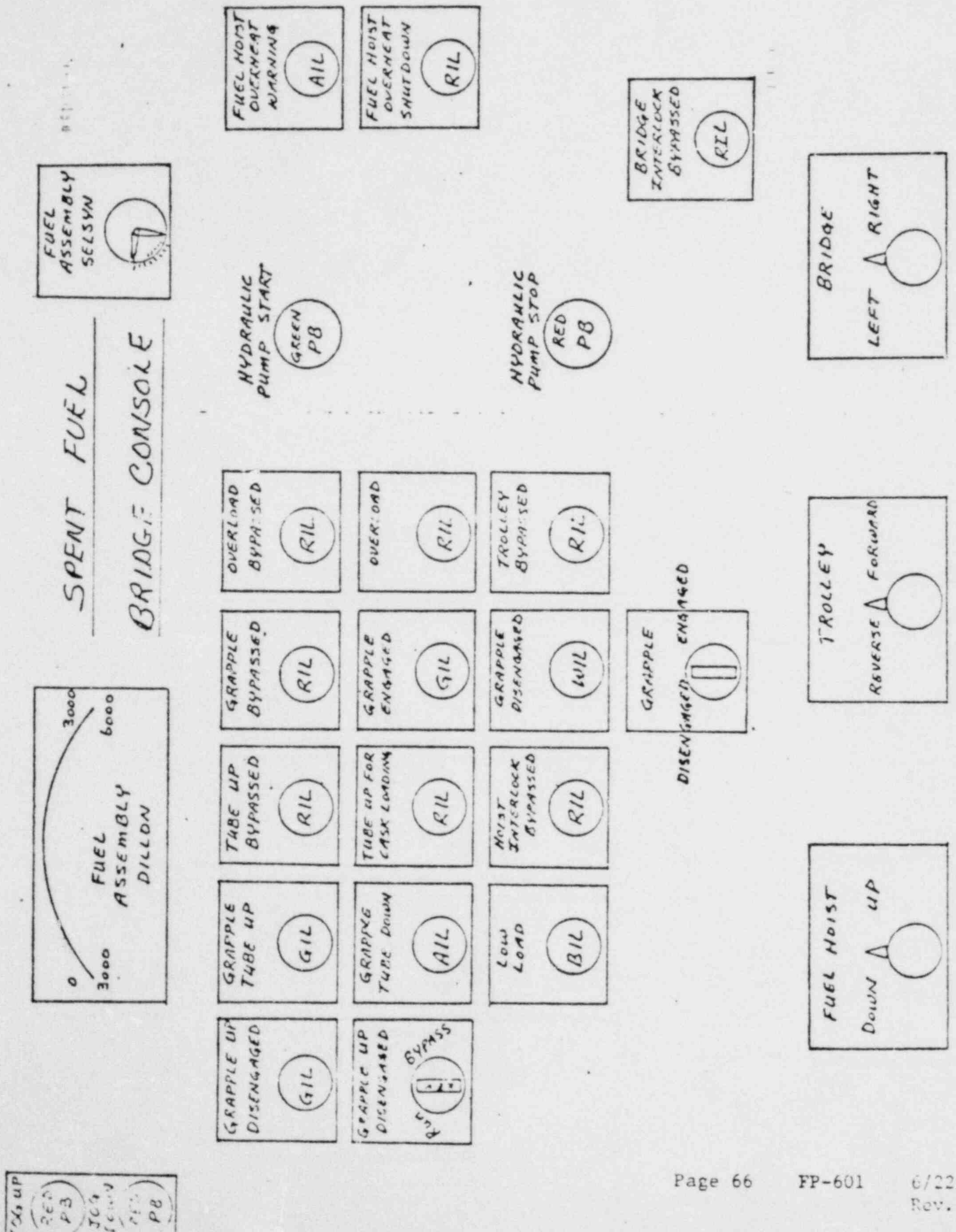
   1. Fuel Hoist Overload Bypass
   2. Fuel Hoist Interlocks Bypass
   3. Bridge Left Interlocks Bypass
   4. Bridge Right Interlocks Bypass
   5. Trolley Interlocks Bypass
   6. Fuel Grapple Bypass
   7. (Main Bridge) - Rod Hoist Overload Bypass
      (Auxiliary Bridge) - TV Bypass
      (Spent Fuel Bridge) - Tube Up Bypass
   8. Rod Hoist Interlock Bypass
   9. TV Bypass

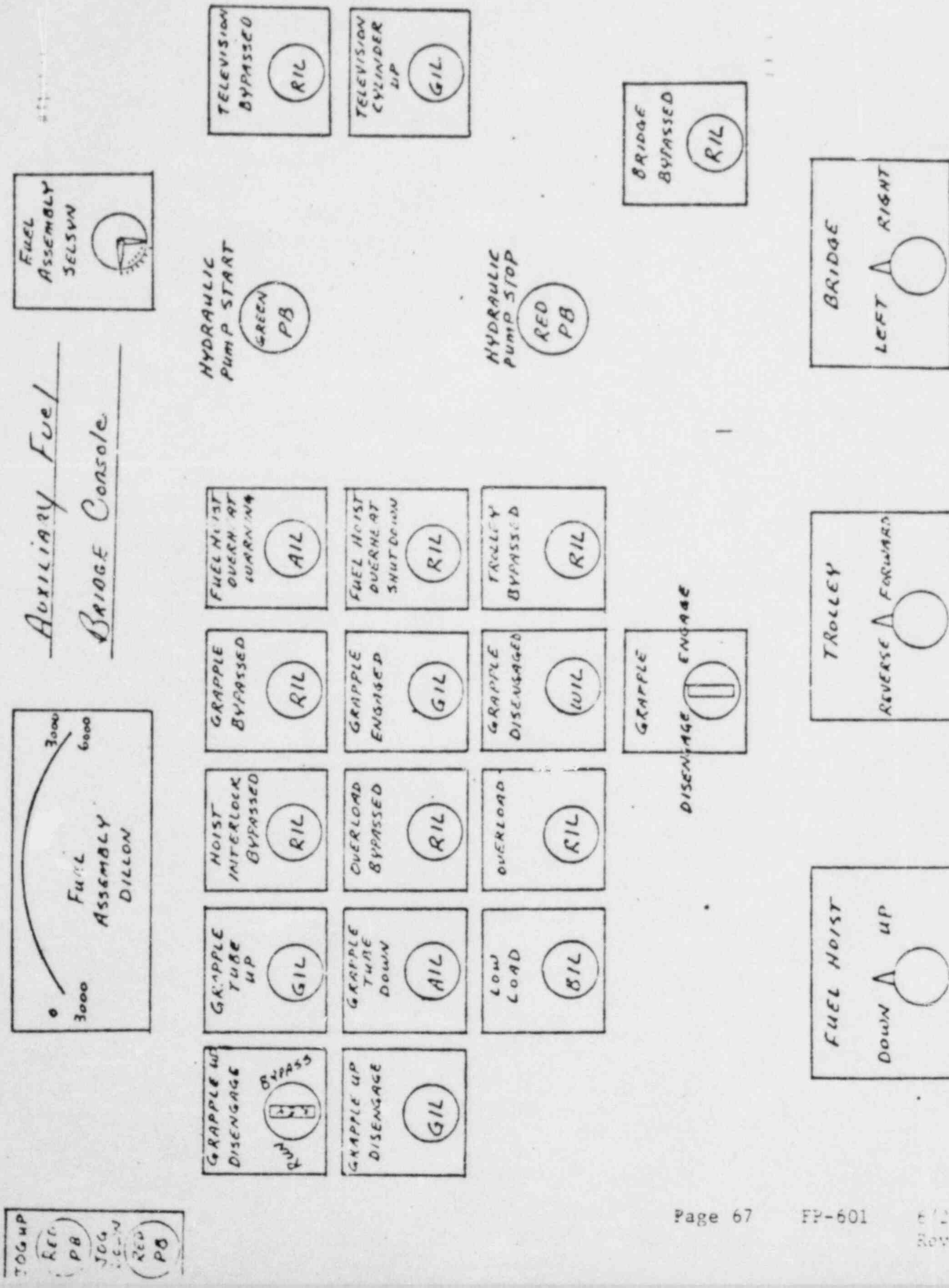
PANEL "B"

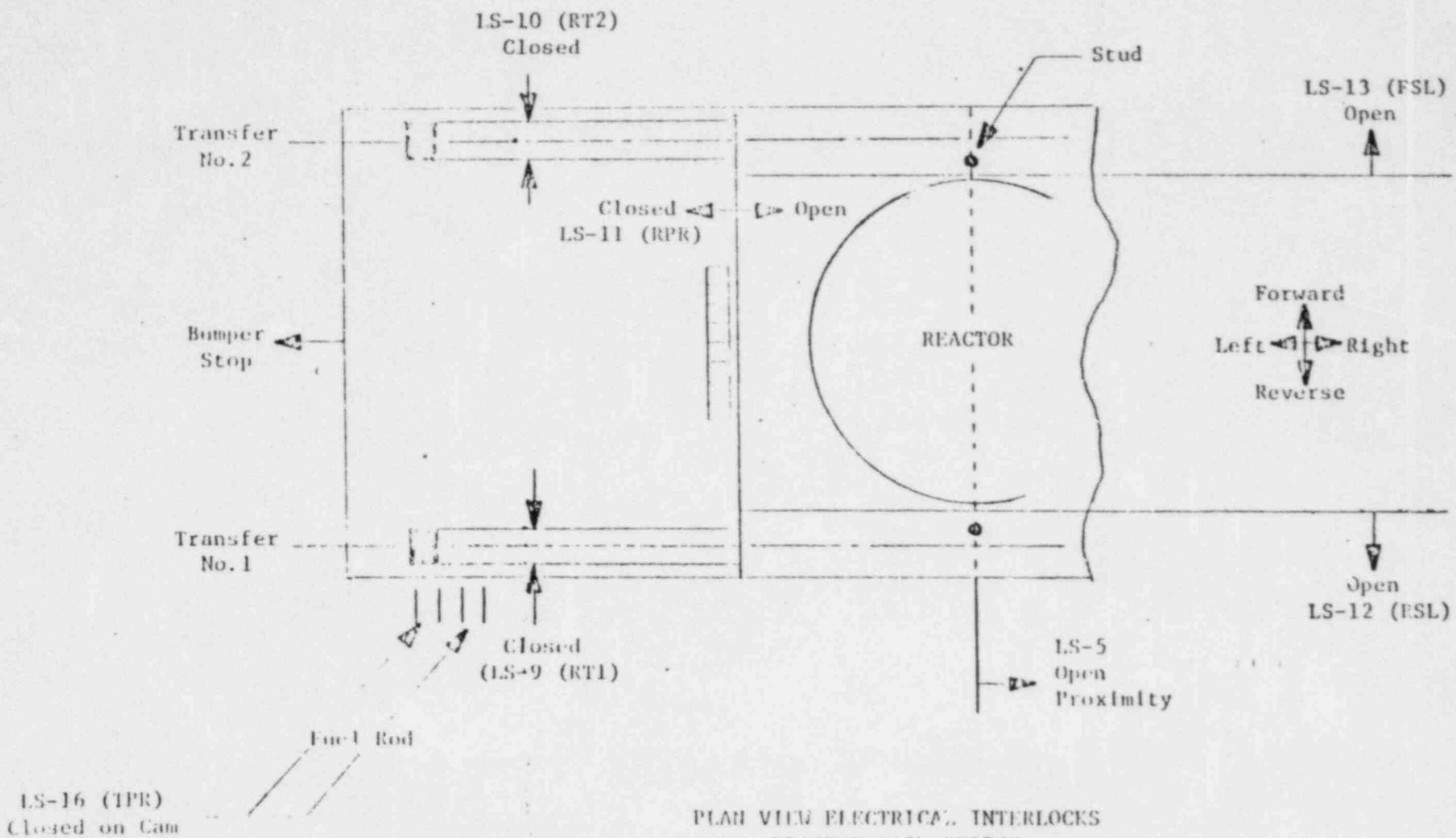
1. Rod Dillon Power Supply

   A. "On/Off" Switch ("On" - white indicating light)
   B. No "Range" Switch


MAIN FUEL HANDLING BRIDGE Console
CONTROL ROD DILLON
0
3000
CONTROL ROD SELSYN
FUEL ASSEMBLY SELSYN
FUEL ASSEMBLY DILLON
3000
6000
TELESCOPIC CYLINDER UP FIRST STAGE
GIL
CONTROL ROD TUBE UP
GIL
HOIST INTERLOCK BYPASSED
RIL
TELESCOPIC CYLINDER FULL UP
GIL
CONTROL ROD ENGAGED
RIL
CONTROL ROD HOIST OVERHEAT WARNING
AIL
CONTROL ROD TUBE DOWN
AIL
OVERLOAD BYPASSED
RIL
TELESCOPIC CYLINDER DOWN
AIL
CONTROL ROD TEST
AIL
CONTROL ROD HOIST OVERHEAT SHUTDOWN
RIL
BRIDGE BYPASSED
RIL
LOW LOAD
BIL
OVERLOAD
RIL
TELESCOPIC CYLINDER UP
YEL. PB
CONTROL ROD DISENGAGE
GIL
BYPASS
OR
TELESCOPIC CYLINDER DOWN
BLUE PB
CONTROL ROD
TEST
ENGAGE
DISENGAGE
CONTROL ROD HOIST
DOWN
UP
BRIDGE
LEFT
RIGHT
LOW HYDRAULIC PRESSURE
RIL
HYDRAULIC PUMP START
GREEN PB
HYDRAULIC PUMP STOP
RED PB
TROLLEY BYPASSED
RIL
TELEVISION BYPASSED
RIL
TELEVISION CYLINDER UP
GIL
TROLLEY
REVERSE
FORWARD
FUEL HOIST OVERHEAT WARNING
AIL
FUEL HOIST OVERLOAD SHUTDOWN
RIL
GRAPPLE BYPASSED
RIL
GRAPPLE ENGAGED
GIL
GRAPPLE DISENGAGE
GRAPPLE
ENGAGE
DISENGAGE
FUEL HOIST
DOWN
UP
GRAPPLE UP DISENGAGE
GIL
HOIST INTERLOCK BYPASSED
RIL
OVERLOAD BYPASSED
RIL
OVERLOAD
RIL
GRAPPLE TUBE UP
GIL
GRAPPLE TUBE DOWN
LOW LOAD
BIL
BYPASS

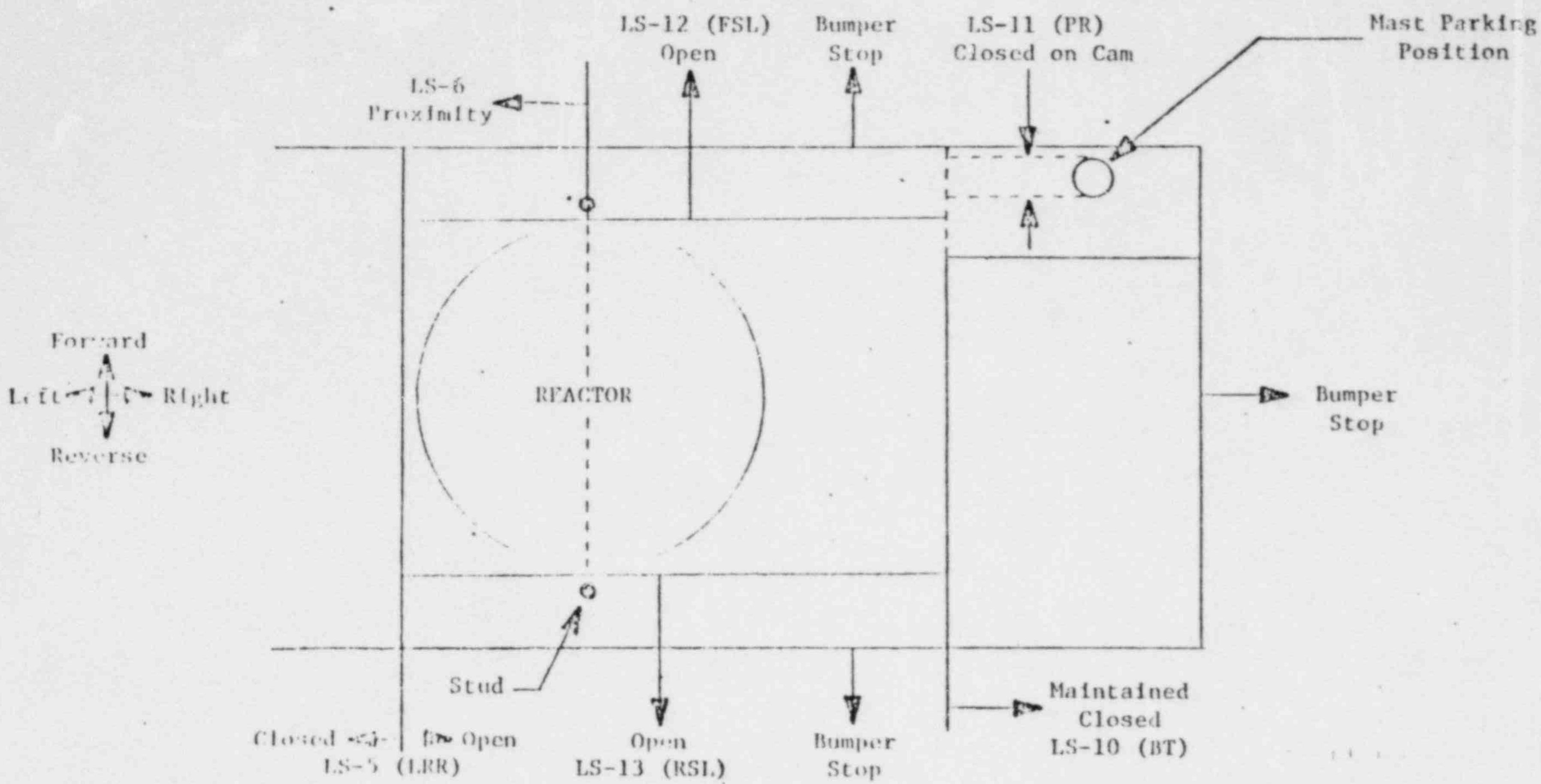

SPENT FUEL
BRIDGE CONSOLE
FUEL ASSEMBLY SELSYN
FUEL ASSEMBLY DILLON
0
3000
3000
6000
FUEL HOIST OVERHEAT WARNING
AIL
FUEL HOIST OVERHEAT SHUTDOWN
RIL
BRIDGE INTERLOCK BYPASSED
RIL
HYDRAULIC PUMP START
GREEN PB
HYDRAULIC PUMP STOP
RED PB
BRIDGE
LEFT
RIGHT
TROLLEY
REVERSE
FORWARD
FUEL HOIST
DOWN
UP
OVERLOAD BYPASSED
RIL
OVERLOAD
RIL
TROLLEY BYPASSED
RIL
GRAPPLE BYPASSED
RIL
GRAPPLE ENGAGED
GIL
GRAPPLE DISENGAGED
WIL
GRAPPLE
DISENGAGED
ENGAGED
TUBE UP BYPASSED
RIL
TUBE UP FOR CASK LOADING
RIL
HOIST INTERLOCK BYPASSED
RIL
GRAPPLE TUBE UP
GIL
GRAPPLE TUBE DOWN
AIL
LOW LOAD
BIL
GRAPPLE UP DISENGAGED
GIL
GRAPPLE UP DISENGAGED
BYPASS
JOG UP
RED PB
JOG DOWN
PB


Auxiliary Fuel
Bridge Console
Fuel Assembly Selsyn
Fuel Assembly Dillon
0
3000
3000
6000
Television Bypassed
RIL
Television Cylinder Up
GIL
Bridge Bypassed
RIL
Hydraulic Pump Start
GREEN PB
Hydraulic Pump Stop
RED PB
Bridge
Left
Right
Trolley
Reverse
Forward
Fuel Hoist
Down
Up
Fuel Hoist Overheat Warning
AIL
Fuel Hoist Overheat Shut Down
RIL
Trolley Bypassed
RIL
Grapple Bypassed
RIL
Grapple Engaged
GIL
Grapple Disengaged
WIL
Grapple
Disengage
Engage
Hoist Interlock Bypassed
RIL
Overload Bypassed
RIL
Overload
RIL
Grapple Tube Up
GIL
Grapple Tube Down
AIL
Low Load
BIL
Grapple Dn Disengage
Bypass
Run
Grapple Up Disengage
GIL
Jog Up
RED PB
Jog Down
RED PB

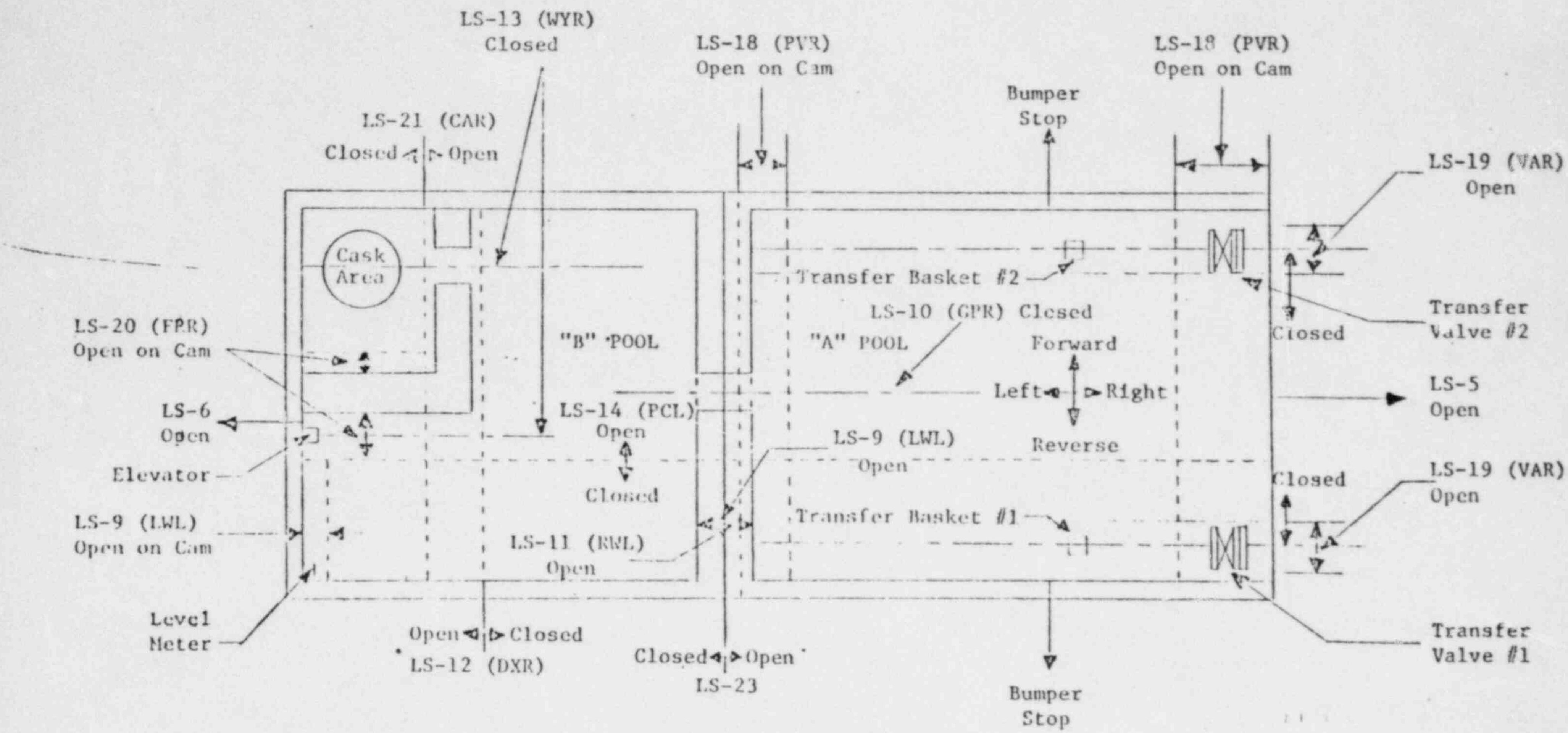


PLAN VIEW ELECTRICAL INTERLOCKS
REACTOR MAIN BRIDGE
(FHCR-1)

ENCLOSURE 2D1

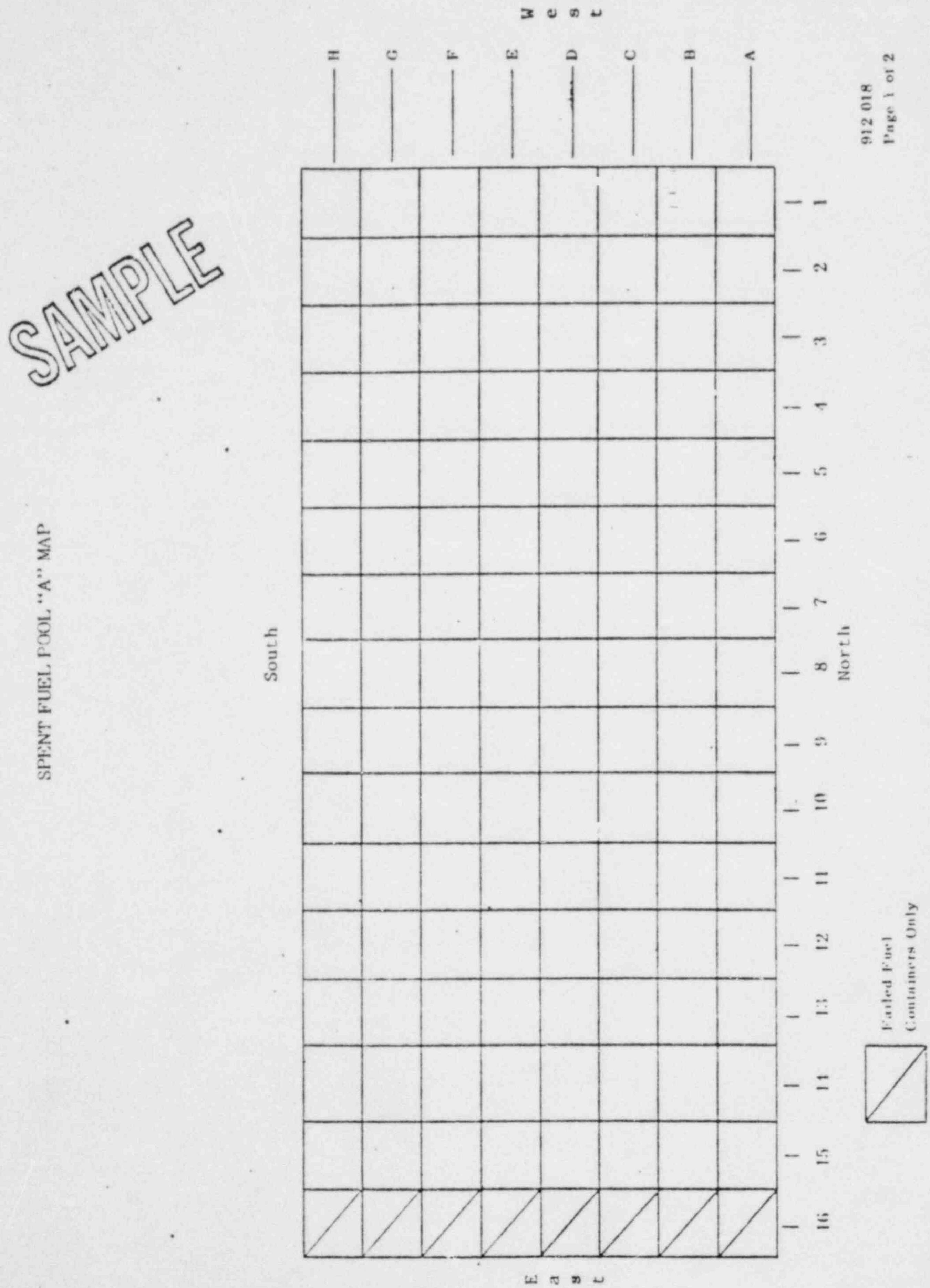


PLAN VIEW ELECTRICAL INTERLOCKS
REACTOR AUXILIARY BRIDGE
(FHCR-2)

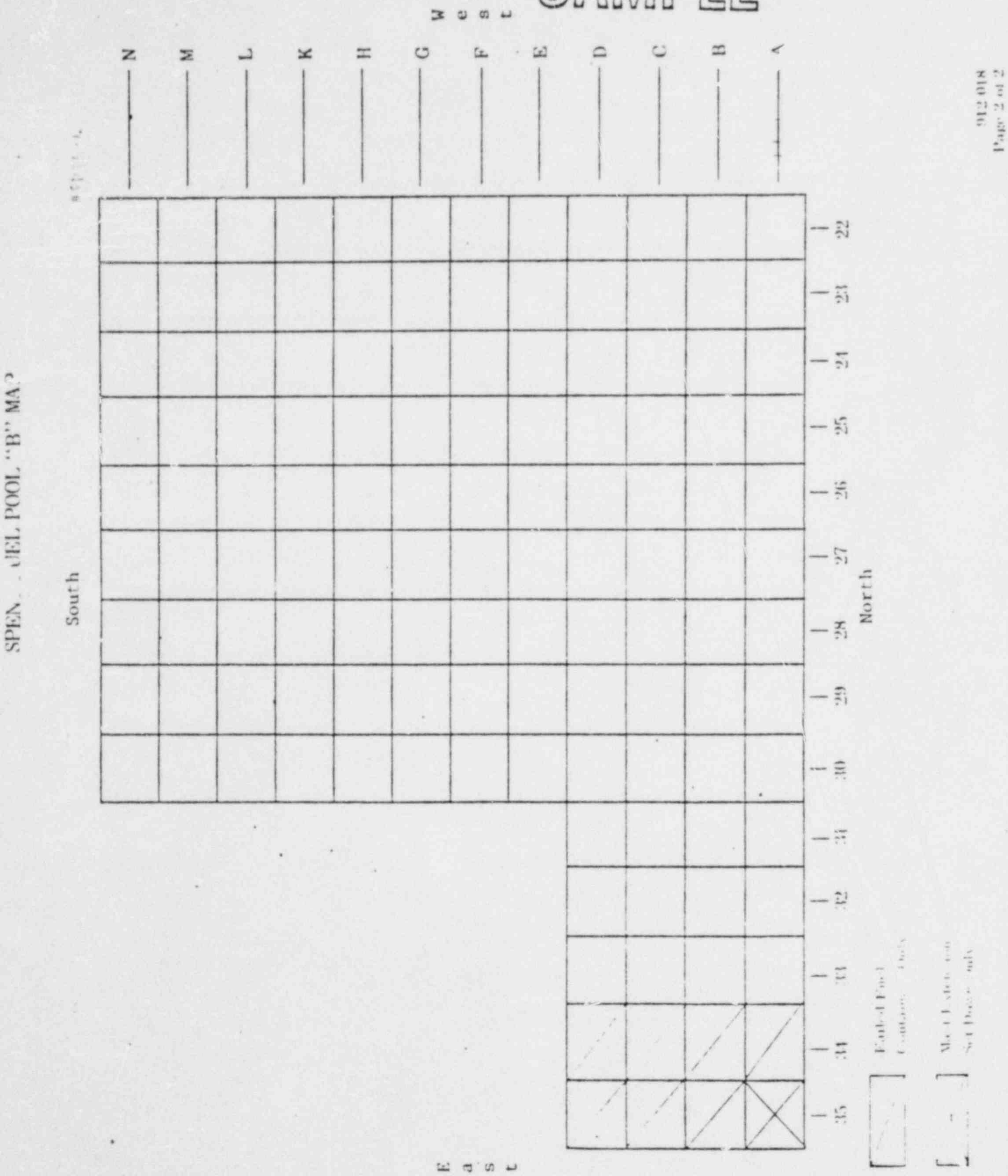


PLAN VIEW ELECTRICAL INTERLOCKS
SPENT FUEL POOL HANDLING BRIDGE
(FHCR-3)

ENCLOSURE 3


SAMPLE
SPENT FUEL POOL "A" MAP
912 018
Page 1 of 2
West
East
South
North
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Failed Fuel
Containers Only

SAMPLE


SPEN. .UEL POOL "B" MA?
West
East
South
North
N
M
L
K
H
G
F
E
D
C
B
A
22
23
24
25
26
27
28
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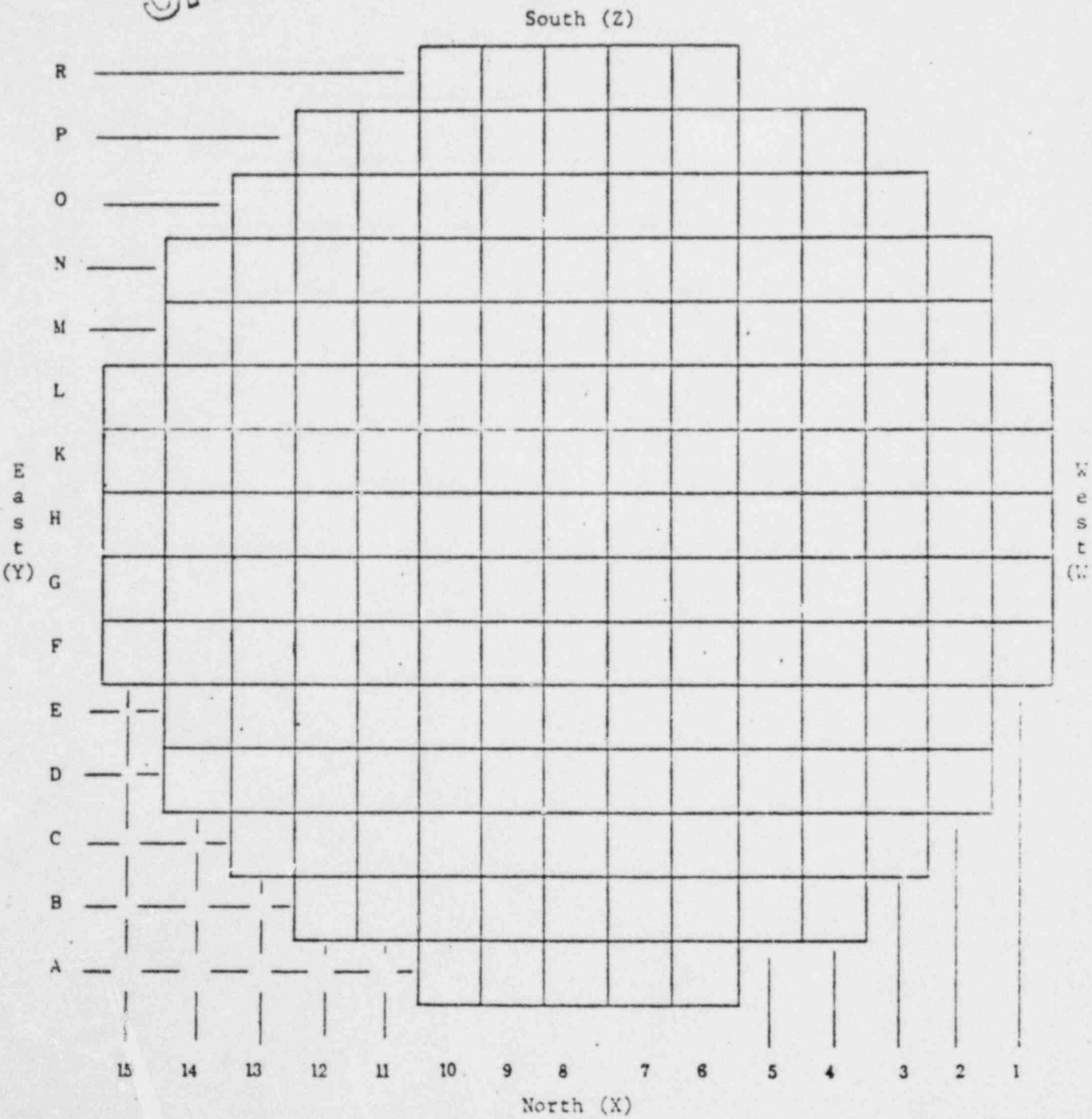
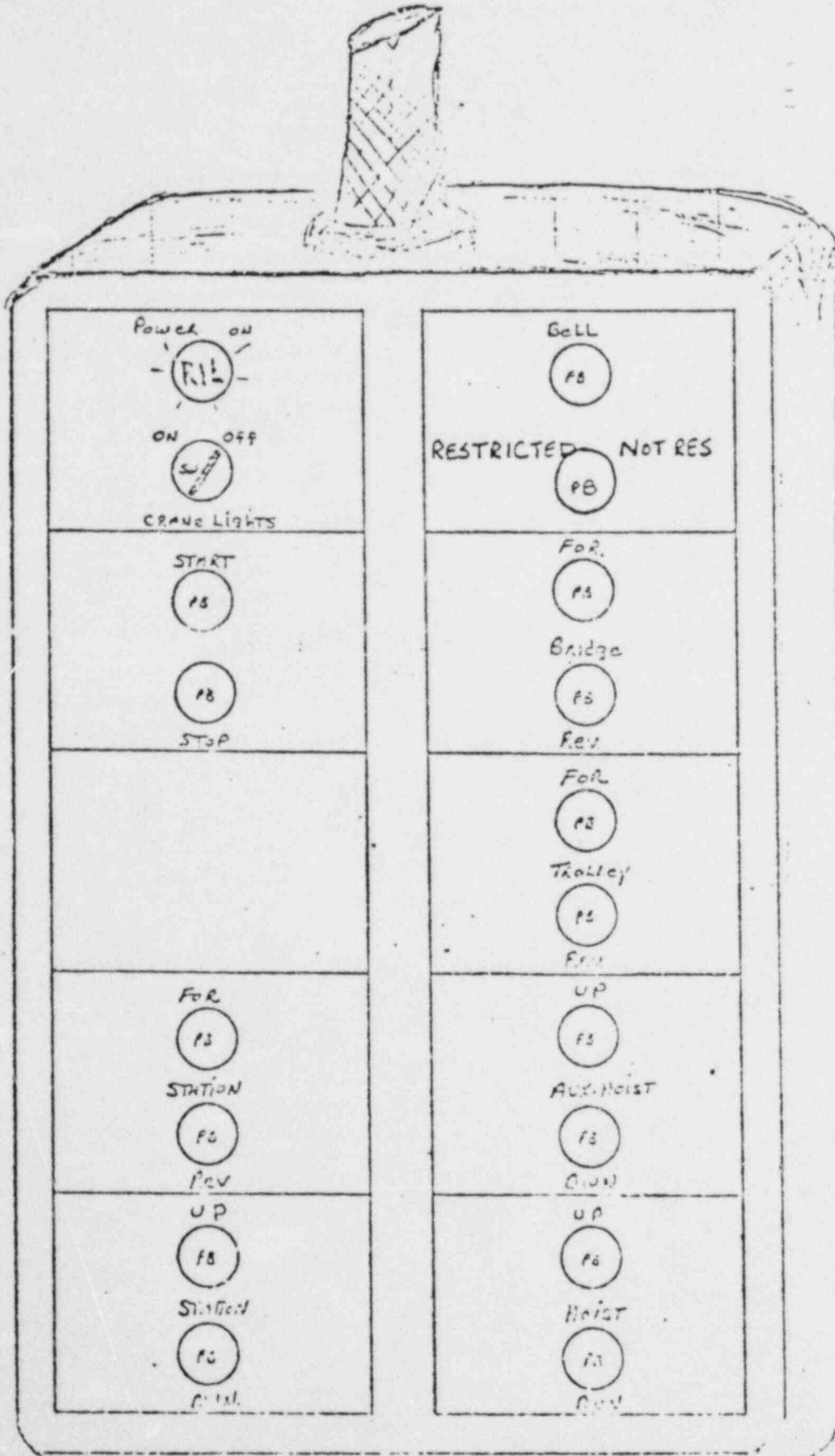
31
32
33
34
35

SAMPLE

CR-3 CORE MAP



AUXILIARY BUILDING OVERHEAD CRANE PENDANT CONTROL STATION



STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

Prior to energizing the system, the operator shall make the following checks to insure that the equipment is in the proper mode for startup.

NOTE: Some of the following steps are not applicable to all bridges. If a step is not applicable to the bridge being started up, that step should be disregarded. If any applicable step cannot be successfully completed, the operator shall notify his immediate supervisor. The supervisor will assume responsibility for evaluation of the difficulty and initiation of activities to rectify the problem.

1. Check yoke switch on southeast portion of bridge in proximity of Selsyn drive sprocket for proper orientation to prevent damage to switch or equipment.
2. Check water level in hydraulic reservoir to insure operating level of approximately 95% (estimate).
3. Brake on trolley drive engaged. (Brake release lever in "Engaged" position.)
4. Emergency handwheel on trolley drive removed and mounted in storage position.
5. Brake on bridge drive engaged. (Brake release lever in "Engaged" position.)
6. Emergency handwheel on bridge drive removed and mounted in storage position.
7. Brake on fuel hoist engaged.
8. Brake release bolt and emergency handwheel for fuel hoist removed and mounted in storage position.
9. Brake on control rod hoist engaged. (main bridge only)
10. Brake release bolt and emergency handwheel for the control rod hoist removed and mounted in storage position.

    NOTE: The bridge and trolley brake drives are normally engaged and released electrically as the master hand control is rotated.

STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

For brake adjustment, refer to parts sheet in Stearns-Roger, B & W instruction manual. The clearance between the nut and the pivot block must be 1/64" when the brake is applied. Turn adjusting nut for increased braking torque or liner wear. Readjust nut to maintain the 1/64" clearance.

11. Verify sprockets on Selsyn drive are properly engaged in chain.
12. Verify "Fuel Grapple Up Disengage" key-switch is turned to "Run" position and key removed from switch.
13. Unlock and open control console doors (Enclosure 2B) and verify the following "Bypass" switches are in the "Off" position:
    a. Fuel Hoist Overload Bypass
    b. Fuel Hoist Interlock Bypass
    c. Bridge Left Interlock Bypass
    d. Bridge Right Interlock Bypass
    e. Fuel Grapple Bypass
    f. Trolley Interlock Bypass
    g. Tube Up Bypass (spent fuel bridge only)
    h. Rod Hoist Overload Bypass (main bridge only)
    i. Rod Hoist Interlock Bypass (main bridge only)
    j. Television Bypass (auxiliary bridge only)

STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

NOTE: If a "Bypass" switch is in the "On" position, the operator shall notify his immediate supervisor before energizing the system.

14. Energize fuel handling bridge by closing the appropriate breaker.
    a. Main Bridge
       Supply breaker at ACDP-311.
    b. Spent Fuel Bridge
       Breaker 2AR at reactor MCC-3A-1.
    c. Auxiliary Bridge
       Breaker #6 in RB crane elevator panel #3.
15. Verify the following switch positions on the control console. (See Enclosure 2B.)
    a. "Power" switch for the fuel hoist Dillon in "On" position and "On" light illuminated.
    b. Fuel Dillon "Range" switch to desired range (normally low scale)
       1. "A" - 0 to 3,000 lbs.
       2. "B" - 3,000 to 6,000 lbs.

STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

c. "Power" switch for the rod hoist Dillon in "On" position (main bridge only).

d. Close and lock cabinet doors.

16. Close the following switches or breakers at the bridge electrical panel. (See Enclosure 2A.)

a. Cabinet "A" Knife Switch (ISW)

b. Cabinet "A" Circuit Breaker (ICB)

c. Cabinet "B" Circuit Breaker (ACB)

17. Verify the following lighting panel breakers are in the "On" position. (See Enclosure 2A.)

a. Breaker #1: Console, Dillon and Selsyn

b. Breaker #2: Light Receptacle

c. Breaker #3: TV Power (auxiliary bridge only)

d. Breaker #4: Light Receptacle

e. Breaker #6: Shaded Light

18. Close and lock cabinet doors.

19. Push "Hydraulic Pump Start" push button; verify pump start and hydraulic pressure between 180-210 psi.

20. Check all indicating lights (PUSH-TO-TEST) on the control console. If any light fails to illuminate, replace bulb and check again.

STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

21. Check selector switches on control panel for proper startup position. (See Enclosure 2C1, 2C2, or 2C3)
    a. "Fuel Grapple" switch in "Disengaged" position.
    b. "Control Rod Grapple" switch in "Disengaged" position. (main bridge only)
    c. "Rod Selector" switch in either "Control Rod" or "Orifice Rod" position. (main bridge only)
22. Verify the following equipment startup status per illuminated indicating lights.
    a. "Grapple Tube Up" or "Grapple Up Disengaged"
    b. "Grapple Disengage"
    c. "TV Cylinder Up" (auxiliary bridge only)
    d. "Telescopic Cylinder Up First Stage" (main bridge only)
    e. "Control Rod Disengage" (main bridge only)
    f. "Control Rod Tube Up" (main bridge only)

    NOTE: If any of the above lights are not illuminated, perform necessary manipulation of controls to assume proper startup position.
23. If necessary, perform SP-531, Spent Fuel Handling Bridge Interlock Surveillance and complete applicable portion of the Spent Fuel Handling Bridge Log Sheet (Enclosure 13A)
24. If necessary, perform SP-671, Spent Fuel Handling Bridge Load Surveillance and complete applicable portion of the Spent Fuel Handling Bridge Log Sheet (Enclosure 13A)

STARTUP OF THE FUEL HANDLING BRIDGES
MAIN BRIDGE (FHCR-1)
AUXILIARY BRIDGE (FHCR-2)
SPENT FUEL BRIDGE (FHCR-3)
NORMAL STARTUP PROCEDURE (SHORT-TERM)

25. If necessary, perform SP-532, Main and Auxiliary Fuel Handling Bridge Interlock Surveillance and complete applicable portion of the Reactor Building Fuel Handling Bridges Log Sheet (Enclosure 13B).

26. If necessary, perform SP-670, Reactor Building Fuel Handling Bridges Load Test and complete the applicable portion of the Reactor Building Fuel Handling Bridges Log Sheet (Enclosure 13B).

27. Verify startup in accordance with the above steps by completion of Enclosure 12B.

STARTUP OF FUEL HANDLING BRIDGES
LONG-TERM

Long-term startup is defined as any startup of the equipment which has been shut down between refueling cycles.

The field checkout and operating procedure shall be used for all long-term startup of bridges. This section will include steps to be taken in case of component failure or malfunction and expected maintenance, and follow the sequence of checkout procedure.

1. Drain hydraulic reservoir, flush, and fill with demineralized water.
   NOTE: Tank should be filled with telescopic cylinder full up on units with control rod mast to prevent overflow of tank in operation.
2. Release bridge and trolley brakes manually. Rotate drive coupling to ensure all drive components are free to operate. Engage brakes. Bridge and trolley brake adjustment is noted in the short-term startup checkout.
3. The Dillon load cell calibration check is found in the Stearns-Roger and B & W Instruction Manual. Original set points are found on the Stearns-Roger electrical schematic drawings for each unit.
4. If any component does not function properly, the cause should be determined and the component repaired or replaced as required.
5. Check and replace oil as required in hoist gear boxes, bridge, and trolley drive reducers as noted in Stearns-Roger, B & W Instruction Manual.

STARTUP OF FUEL HANDLING BRIDGES
LONG-TERM

6. Inspect hoist cable for wear or damage and replace as necessary.
7. Remove hydraulic filter and inspect cartridge. Replace cartridge as required.
8. Manually rotate hydraulic pump coupling to ensure the drive is free to rotate.
9. Check all hose reels, electric cable reels, and "Z-Z" axis tape reels to ensure they are free to rotate and that there is enough spring tension to retract.
10. Engage hoist emergency handwheel and engage hoist brake release bolt. Rotate handwheel to lower inner mast at least four inches. Rotate handwheel to raise inner mast to the original position. Remove brake release bolt and handwheel and mount in their respective storage positions.

    NOTE: "Fuel Grapple Engage" - "Disengage" switch turned to the "Disengaged" position.
11. Complete all steps in normal (short-term) startup procedure up to Step 19 which will start the hydraulic pump. Start pump and check the hydraulic pressure gage. If the gage will not indicate pressure, observe if the pump shaft is rotating and push the pump "Stop" push button. Check the inlet line to the pump if the pump shaft is rotating. Check the electrical power to the pump motor if the shaft is not rotating. Adjust or replace as necessary.

STARTUP OF FUEL HANDLING BRIDGES
LONG-TERM

NOTE: Some steps in this checkout and operating procedure may not be feasible because of water in the pool or dummy fuel assemblies not being available. However, every step that can be checked must be checked and any step that cannot be checked must be noted.

12. Raise and lower hoist(s); check all reels as hoist is being lowered and raised. Reels not retracting properly can cause damage to the hoses and electric cables.
13. Extend and retract telescopic cylinder through at least five complete cycles. Check reels for rotation as telescopic cylinder is extending and retracting to prevent damage to the hoses and electric cable.
14. Check all bridge and trolley travel electrical interlocks. (SP-531, Spent Fuel Handling Bridge Interlock Surveillance and SP-532, Reactor Building Main and Auxiliary Fuel Handling Bridges Electrical Interlock Surveillance) Manually actuate any limit switch which cannot be actuated by normal travel. Recheck all yoke switches and cams for proper location and orientation to prevent damage to switches and equipment.
15. Position bridge with the rail pointer over the permanent bench mark. The Selsyn readout should indicate that position.

    NOTE: Adjustment can be made by lifting the sprocket assembly out of the roller chain and rotating the sprocket until the Selsyn dial readout indicates the designated position.

STARTUP OF FUEL HANDLING BRIDGES
LONG-TERM

NOTE: Adjustment of less than one sprocket tooth may be required if the Selsyn transmitter assembly has been replaced or repaired. This can be obtained by loosening the locking screw (located 90° from the adjusting screw) and rotating the adjusting screw in the coupling. After adjustment is completed, tighten locking screw in the coupling. After adjustment is completed, tighten locking screw and recheck indicated position.

NOTE: The adjustable coupling is located between the metron speed increaser and the Selsyn transmitter.

16. Continue normal (short-term) startup procedure, beginning with Step 10 through completion.

NOTE: Main system pressure gage reading should be 100-200 psig. Telescopic cylinder down pressure gage reading shall be 0 psig. If the pressure gage readings do not correspond to the above values, the system pressure must be adjusted before initiating any handling operation.

SHUTDOWN OF THE FUEL HANDLING BRIDGES
NORMAL SHUTDOWN (SHORT-TERM)

Normal shutdown is defined as any stoppage of the equipment, when a period of time will exist, when an operator is not present. In addition, there must be a planned restart of the equipment in the near future.

Prior to de-energizing the system, the operator shall make the following checks to ensure the equipment is in the correct mode to initiate system shutdown.

NOTE: Some of the following steps are not applicable to all bridges. If a step is not applicable to the bridge being shut down, that step should be disregarded.

1. The operator shall check to ensure that all "Interlock Bypass" switches are in the "Off" position. Under NO circumstances shall the operator leave the equipment with a "bypass interlock" in the "On" position unless the equipment is tagged, noting the bypassed interlock.
2. Bridge drive and trolley drive brakes are engaged.

   NOTE: The bridge and trolley drive brakes are normally engaged.
3. Emergency handwheels for the bridge and trolley drives are mounted in their storage positions.
4. The fuel hoist and control rod hoist brakes are engaged.

   NOTE: The hoist brakes are normally engaged.
5. The fuel hoist and control rod hoist brake release bolts and emergency handwheels are mounted in their respective storage positions.
6. "Fuel Grapple Up Disengage" key-switch is in the "Run" position and the key removed from the switch.
7. "Grapple Disengage" light (opal) illuminated.

   NOTE: Operator shall not leave equipment when a fuel assembly is

SHUTDOWN OF THE FUEL HANDLING BRIDGES
NORMAL SHUTDOWN (SHORT-TERM)

positioned in the mast, except when relieved by a properly qualified operator.

SHUTDOWN OF THE FUEL HANDLING BRIDGES
NORMAL SHUTDOWN (SHORT-TERM)

8. "Grapple Up Disengage" light (green) illuminated.

   NOTE: Operator is to raise hoist to the designated "up" position, if required.

9. "Control Rod Grapple Disengage" light (green) illuminated. (main bridge only)

   NOTE: Operator shall not leave equipment with a control or orifice rod positioned in the mast, except when relieved by a properly qualified operator. After the designated checks have been completed and any equipment conditions requiring special attention noted, the operator shall proceed with de-energizing the system.

10. "Telescopic Cylinder Up" light (green) illuminated. (main bridge only)

    NOTE: Operator is to raise the telescopic cylinder to the designated "up" position, if required.

11. "Control Rod Tube Up" light (green) illuminated. (main bridge only)

    NOTE: Operator is to raise the control rod tube to the designated "up" position, if required.

12. Move bridge and trolley to designated storage position.

13. Turn off hydraulic pump. Push "Hydraulic Pump Stop" button (red); hydraulic pump will stop.

14. Turn the following circuit breakers located on the motor control center to the "Off" position:

    a. Breaker 1 - Console, Dillon and Selsyn

    b. Breaker 7 - Shaded Light

    c. Breaker 2 - Light Receptacle

SHUTDOWN OF THE FUEL HANDLING BRIDGES
NORMAL SHUTDOWN (SHORT-TERM)

d. Breaker 4 - Light Receptacle

e. Breaker 3 - TV Power (auxiliary bridge only)

15. Close doors of motor control center.

16. Turn off main circuit breaker located in panel "B", position #1 of the bridge electrical panel (Enclosure 2A).

17. Verify shutdown in accordance with the above steps by completion of Enclosure 12C.

SHUTDOWN OF FUEL HANDLING BRIDGES
LONG-TERM

Long-term shutdown is defined as any stoppage of equipment between refueling cycles or the startup is indefinite.

The operator shall perform the following applicable operations and checks to ensure the equipment is in the correct mode to shut down the system.

1. Move the bridge and trolley to a position not over the reactor or transfer station or to prevent interference with any intended work operation. The main bridge is normally positioned on the transfer system side of the reactor and the auxiliary bridge on the opposite end of the pool. The spent fuel storage bridge is positioned with the mast above cask loading area.
2. "Fuel Grapple Disengaged" light (opal) illuminated.

   NOTE: Operator shall not leave equipment when a fuel assembly is positioned in the mast.
3. "Fuel Grapple Up Disengage" key-switch in the "Run" position and key removed from switch.
4. "Grapple Tube Up" light (green) illuminated.

   NOTE: Operator is to raise hoist to the designated "up" position, if required.
5. "Control Rod Grapple Disengage" light (green) illuminated. (main bridge only)

   NOTE: Operator shall not leave equipment with a control rod or orifice rod positioned in the mast.
6. "Telescopic Cylinder Up" light (green) illuminated. (main bridge only)

   NOTE: Operator to raise the telescopic cylinder to the designated "up" position, if required.

SHUTDOWN OF FUEL HANDLING BRIDGES
LONG-TERM

7. "Control Rod Tube Up" light (green) illuminated. (main bridge only)

   NOTE: Operator to raise the control rod tube to the designated "up" position, if required.

8. Push "Hydraulic Pump Stop" button (red); hydraulic pump will stop.

9. Check all "Interlock Bypass" lights for illumination. If any light is illuminated, the "Bypass" switch must be tagged, noting the bypass interlock, until resolution, and the switch turned to "Off" position.

10. Turn all circuit breakers located in the motor control center to "Off" position. Close small circuit breaker door.

11. Turn main circuit breaker located in panel "B", position #1 of the motor control center to the "Off" position. (See Enclosure 2A.)

12. Open left-hand door (panel "A") of the motor control center (see Enclosure 2A), disengage the large knife switch, and turn the ICB breaker to "Off".

13. Close both door panels of the motor control center.

14. Check the front doors of the control console. The doors should be locked for normal operation and the keys removed and under administrative control. The control console doors should be locked and the keys removed for any long-term shutdown.

15. Bridge and trolley drive brakes must be engaged.

   NOTE: Refer to short-term startup for a complete check.

SHUTDOWN OF FUEL HANDLING BRIDGES
LONG-TERM

16. Fuel and control rod hoist brakes must be engaged.

    NOTE: If the hoist brake release bolts are in their respective storage positions, the brakes are engaged.

17. The emergency handwheels for the hoists, bridge, and the trolley drives must be mounted in their respective storage positions.

18. Notes shall be made by the operator of any function that will require future checking, possible new parts, or recalibration before the next startup. Any work required as a result of the notes shall be scheduled and completed, if possible, to assure the equipment will perform its handling function when required.

19. Facility power to the equipment shall be turned to the "Off" position.

    NOTE: Facility power to heaters for motors and panels must be turned to the "On" position.

20. Wash grippers and masts with demineralized water when reactor cavity has been drained.

21. Verify shutdown in accordance with the above steps by completion of Enclosure 12C.

HOIST (22) TAPE 'DINGS FOR SFA

LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING	
	FT	INS		FT	INS		FT	INS		FT	INS		FT	INS
1A	9	1/4	4B	9	1/16	7C	9	0	10D	9	1/16	13E	9	0
1B	9	1/8	4C	9	1/16	7D	9	1/16	10E	8	11 15/16	13F	8	11 7/8
1C	9	1/8	4D	9	1/8	7E	9	0	10F	9	0	13G	8	11 7/8
1D	9	3/16	4E	9	5/16	7F	8	11 15/16	10G	9	0	13H	9	0
1E	9	1/4	4F	9	3/16	7G	8	11 7/8	10H	8	11 15/16	14A	8	11 5/8
1F	9	3/16	4G	4	1/4	7H	8	11 15/16	11A	8	11 3/4	14B	8	11 5/8
1G	9	3/16	4H	9	1/4	8A	8	11 15/16	11B	8	11 13/16	14C	8	11 11/16
1H	9	1/4	5A	9	1/8	8B	8	11 15/16	11C	8	11 13/16	14D	8	11 11/16
2A	4	1/8	5B	9	1/8	8C	9	0	11D	8	11 1/16	14E	8	11 15/16
2B	9	0	5C	9	1/8	8D	9	0	11E	8	11 15/16	14F	8	11 7/8
2C	9	1/8	5D	9	1/8	8E	9	0	11F	8	11 7/8	14G	8	11 7/8
2D	9	1/8	5E	9	5/16	8F	9	0	11G	8	11 7/8	14H	9	1/16
2E	9	1/4	5F	9	5/16	8G	8	11 7/8	11H	8	11 7/8	15A	8	11 3/4
2F	9	1/4	5G	9	1/4	8H	8	11 15/16	12A	8	11 13/16	15B	8	11 5/8
2G	9	1/4	5H	9	3/16	9A	9	0	12B	8	11 7/8	15C	8	11 13/16
2H	4	1/4	6A	9	1/8	9B	8	11 15/16	12C	8	11 3/4	15D	8	11 13/16
3A	9	1/16	6B	8	11 15/16	9C	8	11 15/16	12D	8	11 7/8	15E	8	11 15/16
3B	9	1/16	6C	9	0	9D	9	1/16	12E	9	0	15F	8	11 13/16
3C	9	1/8	6D	9	1/8	9E	8	11 15/16	12F	8	11 7/8	15G	8	11 13/16
3D	9	3/16	6E	8	11 15/16	9F	9	0	12G	8	11 13/16	15H	9	0
3E	9	5/16	6F	8	11 15/16	9G	8	11 15/16	12H	9	0			
3F	9	1/8	6G	8	11 7/8	9H	8	11 15/16	13A	8	11 5/8	FTC-X		
3G	9	1/4	6H	8	11 7/8	10A	9	0	13B	8	11 3/4	FTC-Y		
3H	9	5/16	7A	9	0	10B	8	11 15/16	13C	8	11 11/16			
4A	9	0	7B	9	0	10C	9	0	13D	8	11 7/8			

FUEL HOIST (22) TA READINGS FOR SFB

LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS
22A	8	11 15/16	24C	8	11 13/16	26E	8	11 13/16	28G	8	11 3/4	30K	9	0
22B	8	11 13/16	24D	8	11 15/16	26F	8	11 7/8	28H	8	11 3/4	30L	8	11 7/8
22C	8	11 7/8	24E	8	11 11/16	26G	8	11 7/8	28K	8	11 3/4	30M	8	11 15/16
22D	8	11 15/16	24F	8	11 3/4	26H	8	11 7/8	28L	8	11 3/4	30N	8	11 15/16
22E	8	11 3/4	24G	8	11 13/16	26K	8	11 7/8	28M	8	11 3/4	31A	8	11 15/16
22F	8	11 3/4	24H	8	11 13/16	26L	8	11 7/8	28N	8	11 13/16	31B	8	11 3/4
22G	8	11 3/4	24K	8	11 3/4	26M	8	11 13/16	29A	9	0	31C	8	11 3/4
22H	8	11 11/16	24L	8	11 3/4	26N	8	11 3/4	29B	8	11 7/8	31D	8	11 15/16
22K	8	11 7/8	24M	8	11 3/4	27A	8	11 13/16	29C	8	11 15/16	32A	8	11 13/16
22L	8	11 13/16	24N	8	11 13/16	27B	8	11 3/4	29D	8	11 15/16	32B	8	11 3/4
22M	8	11 3/4	25A	8	11 13/16	27C	8	11 11/16	29E	8	11 7/8	32C	8	11 11/16
22N	8	11 7/8	25B	8	11 13/16	27D	8	11 13/16	29F	9	0	32D	8	11 3/4
23A	8	11 7/8	25C	8	11 13/16	27E	8	11 7/8	29G	8	11 13/16	33A	8	11 3/4
23B	9	3/16	25D	8	11 15/16	27F			29H	8	11 13/16	33B	8	11 13/16
23	8	11 7/8	25E	8	11 3/4	27G	9	0	29K	8	11 13/16	33C	8	11 13/16
23D	8	11 7/8	25F	8	11 3/4	27H	9	0	29L	8	11 13/16	33D	8	11 15/16
23E	8	11 3/4	25G	8	11 3/4	27K	9	0	29M	8	11 11/16			
23F	8	11 11/16	25H	8	11 3/4	27L	9	0	29N	8	11 11/16			
23G	8	11 11/16	25K	8	11 3/4	27M	9	0	30A	9	0			
23H	8	11 3/4	25L	8	11 13/16	27N	8	11 7/8	30B	8	11 15/16			
23K	8	11 13/16	25M	8	11 3/4	28A	8	11 11/16	30C	9	0			
23L	8	11 3/4	25N	8	11 3/4	28B	8	11 7/8	30D	9	0			
23M	8	11 3/4	26A	8	11 13/16	28C	8	11 7/8	30E	9	0			
23N	8	11 13/16	26B	8	11 15/16	28D	8	11 7/8	30F	9	1/8			
24A	8	11 13/16	26C	9	0	28E	8	11 7/8	30G	8	11 15/16			
24B	8	11 13/16	26D	9	1/16	28F	9	0	30H	9	0			

HOIST (22) TAPE Rz VGs FOR RTR (MAIN)

LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS
1F	3	1 3/8	4B	3	1 3/8	5P	3	1 3/8	7L			9E		
1G	3	1 3/8	4C	3	1 3/8	6A	3	1 3/8	7M			9F		
1H	3	1 3/8	4D			6B	3	1 3/8	7N			9G	3	1 3/8
1K	3	1 3/8	4E			6C			7Ø			9H	3	1 3/8
1L	3	1 3/8	4F			6D			7P			9K	3	1 3/8
2D	3	1 3/8	4G			6E			7R	3	1 3/8	9L		
2E	3	1 3/8	4H	3	1 3/8	6F			8A	3	1 3/8	9M		
2F	3	1 3/8	4K			6G	3	1 3/8	8B	3	1 3/8	9N		
2G			4L			6H	3	1 3/8	8C	3	1 3/8	9Ø		
2H	3	1 3/8	4M			6K	3	1 3/8	8D	3	1 3/8	9P		
2K			4N			6L			8E	3	1 3/8	9R	3	1 3/8
2L	3	1 3/8	4Ø	3	1 3/8	6M			8F	3	1 3/8	10A	3	1 3/8
2M	3	1 3/8	4P	3	1 3/8	6N	3	1 3/8	8G	3	1 3/8	10B	3	1 3/8
2N	3	1 3/8	5B	3	1 3/8	6Ø			8H	3	1 3/8	10C		
3C	3	1 3/8	5C			6P	3	1 3/8	8K	3	1 3/8	10D		
3D	3	1 3/8	5D	3	1 3/8	6K	3	1 3/8	8L	3	1 3/8	10E		
3E			5E	3	1 3/8	7A	3	1 3/8	8M	3	1 3/8	10F		
3F			5F			7B			8N	3	1 3/8	10G	3	1 3/8
3G			5G			7C			8Ø	3	1 3/8	10H	3	1 3/8
3H	3	1 3/8	5H	3	1 3/8	7D	3	1 3/8	8P	3	1 3/8	10K	3	1 3/8
3K			5K			7E			8R	3	1 3/8	10L		
3L			5L			7F			9A	3	1 3/8	10M		
3M	3	1 3/8	5M	3	1 3/8	7G	3	1 3/8	9B			10N		
3N	3	1 3/8	5N			7H	3	1 3/8	9C			10Ø		
3Ø	3	1 3/8	5Ø			7K	3	1 3/8	9D			10P	3	1 3/8

HOIST (22) TAPE . DINGS FOR RTR (MAIN)

LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS
10R	3	1 3/8	12Ø	3	1 3/8	15K	3	1 3/8						
11B	3	1 3/8	12P	3	1 3/8	15L	3	1 3/8						
11C			13C	3	1 3/8									
11D	3	1 3/8	13D	3	3/8									
11E	3	1 3/8	13E											
11F			13F											
11G			13G											
11H	3	1 3/8	13H	3	1 3/8									
11K			13K											
11L			13L											
11M	3	1 3/8	13M											
11N	3	[illegible]	13N	3	1 3/8									
11Ø			13Ø	3	1 9/16									
11P	3	1 3/8	14D	3	1 3/8									
12B	3	1 3/8	14E	3	1 3/8									
12C	3	1 3/8	14F	3	1 3/8									
12D			14G											
12E			14H	3	1 3/8									
12F	3	1 3/8	14K											
12G			14L	3	1 3/8									
12H	3	1 3/8	14M	3	1 3/8									
12K			14N	3	1 3/8									
12L	3	1 7/16	15F	3	1 3/8									
12M			15G	3	1 3/8									
12N			15H	3	1 3/8									

HOIST (ZZ) TAPE READING: : RTR (AUXILIARY)

LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS	LOCATION	TAPE READING FT	TAPE READING INS
1F	4	3 1/8	4B	4	3 1/8	6A	4	3 1/8	7N			9H	4	3 1/8
1G	4	3 1/8	4C	4	3 1/8	6B	4	3 1/8	7O			9K	4	3 1/8
1H	4	3 1/8	4D			6C			7P			9L		
1K	4	3 1/8	4E			6D			7R	4	3 1/8	9M		
1L	4	3 1/8	4F			6E			8A	4	3 1/8	9N		
2D	4	3 1/8	4G			6F			8B	4	3 1/8	9Ø		
2E	4	3 1/8	4H	4	3 1/8	6G	4	3 1/8	8C	4	3 1/8	9P		
2F	4	3 1/8	4K			6H	4	3 1/8	8D	4	3 1/8	9R	4	3 1/8
2G			4L			6K	4	3 1/8	8E	4	3 1/8	10A	4	3 1/8
2H	4	3 1/8	4M			6L			8F	4	3 1/8	10B	4	3 1/8
2K			4N			6M			8G	4	3 1/8	10C		
2L	4	3 1/8	4Ø	4	3 1/8	6N	4	3 1/8	8H	4	3 1/8	10D		
2M	4	3 1/8	4P	4	3 1/8	6Ø			8K	4	3 1/8	10E		
2N	4	3 1/8	5B	4	3 1/8	6P	4	3 1/8	8L	4	3 1/8	10F		
3C	4	3 1/8	5C			6R	4	3 1/8	8M	4	3 1/8	10G	4	3 1/8
3D	4	3 1/8	5D	4	3 1/8	7A	4	3 1/8	8N	4	3 1/8	10H	4	3 1/8
3E			5E	4	3 1/8	7B			8Ø	4	3 1/8	10K	4	3 1/8
3F			5F			7C			8P	4	3 1/8	10L		
3G			5G			7D	4	3 1/8	8R	4	3 1/8	10M		
3H	4	3 1/8	5H	4	3 1/8	7E			9A	4	3 1/8	10N		
3K			5K			7F			9B			10Ø		
3L			5L			7G	4	3 1/8	9C			10P	4	3 1/8
3M	4	3 1/8	5M	4	3 1/8	7H	4	3 1/8	9D			10R	4	3 1/8
3N	4	3 1/8	5N			7K	4	3 1/8	9E					
3Ø	4	3 1/8	5Ø			7L			9F					
			5P	4	3 1/8	7M			9G	4	3 1/8			

HOIST (22) TAPE Rc. INGS FOR RTR (AUXILIARY)

LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING		LOCATION	TAPE READING	
	FT	INS		FT	INS		FT	INS		FT	INS		FT	INS
11B	4	3 1/8	13C	4	3 1/8									
11C			13D	4	3 1/8									
11D	4	3 1/8	13E											
11E	4	3 1/8	13F											
11F			13G											
11G			13H	4	3 1/8									
11H	4	3 1/8	13K											
11K			13L											
11L			13M											
11M	4	3 1/8	13N	4	3 1/8									
11N	4	3 1/8	13Ø	4	3 1/8									
11Ø			14D	4	3 1/8									
11P	4	3 1/8	14E	4	3 1/8									
12B	4	3 1/8	14F	4	3 1/8									
12C	4	3 1/8	14G											
12D			14H	4	3 1/8									
12E			14K											
12F	4	3 1/8	14L	4	3 1/8									
12G			14M	4	3 1/8									
12H	4	3 1/8	14N	4	3 1/8									
12K			15F	4	3 1/8									
12L	4	3 1/8	15G	4	3 1/8									
12M			15H	4	3 1/8									
12N			15K	4	3 1/8									
12Ø	4	3 1/8	15L	4	3 1/8									
12P	4	3 1/8												

VERIFICATION OF FUEL TRANSFER SYSTEM STARTUP

1. All applicable steps in Section 7.1, Startup of the Fuel Transfer System, completed and verified by:

   Initials: ____________________ Date: ____________________

   Comments: ____

   ____

   ____

   ____

   ____

2. The system is now operable.

VERIFICATION OF FUEL HANDLING BRIDGE STARTUP

1. ______________________ Fuel Handling Bridge (Specify: Main, Auxiliary, Spent)

2. ______________________ Startup Procedure used (Specify: Normal (Short Term) or Long Term)

3. All applicable steps in Enclosure 7 and/or Enclosure 8 required to start up the fuel handling bridge specified in (1) above completed and verified by:

   Initials: ________________ Date: ______________

   Comments: ______________________________________

   ____

   ____

   ____

   ____

4. The bridge is now operable and the operator may proceed with instructed equipment operations.

VERIFICATION OF FUEL HANDLING BRIDGE SHUTDOWN

1. ______________________ Fuel Handling Bridge (Specify: Main, Auxiliary, or Spent)

2. ______________________ Shutdown Procedure used (Specify: Normal (Short Term) or Long Term)

3. All applicable steps in Enclosure 9 or Enclosure 10 required to perform shutdown of the Fuel Handling Bridge in (1) above completed and verified by:

   Initials: __________________ Date: __________________

   Comments: ____

   ____

   ____

   ____

   ____

4. Complete applicable portion of Fuel Handling Bridge Log Sheet.

SPENT FUEL HANDLING BRIDGE LOG SHEET

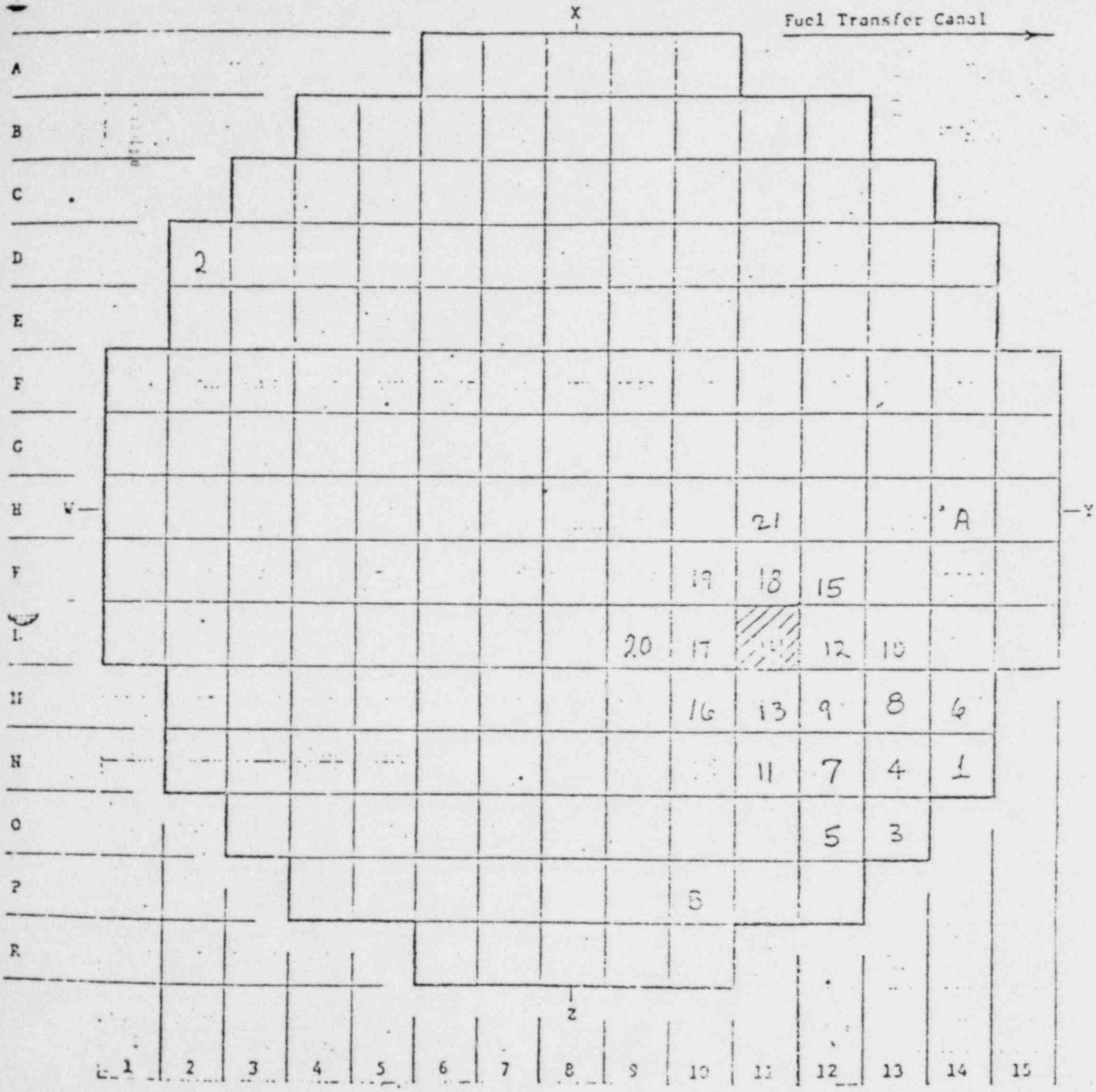
FP-601 Fuel Handling Equipment Operations (See Section 9.0 For Startup Instructions)				*(Perform Within 7 Days Prior to Handling Fuel and Each 7 Days) During Use			
				*SP-531 Spent Fuel Handling Bridge Interlock Surveillance		*SP-671 Spent Fuel Handling Bridge Load Test	
	Shutdown Mode						
Shutdown Date	Short Term (✓)	Long Term (✓)	Initials	Date	Initials	Date	Initials

REACTOR BUILDING B. ,ES LOG SHEET

FP-601 Fuel Handling Equipment Operations (See Section 8.0 for Main Bridge Startup) (See Section 10.0 for Auxiliary Bridge Startup)				SP-532 Reactor Bldg Main and Auxiliary Fuel Handling Bridge Electrical Interlock Surveillance. Perform within 7 days prior to Handling Fuel and Each 7 Days During Use.		SP-670 Reactor Bldg Fuel Handling Bridges Load Test. Perform within 100 hours prior to Handling Fuel	
Shutdown Date	Shutdown Mode: Short Term (✓)	Shutdown Mode: Long Term (✓)	Initials	Date	Initials	Date/Time	Initials

ENCLOSURE 13B

FIGURE ~~5~~ 8.2-1 CORE LOADING MAP ~~FOR~~ [illegible]



EXAMPLE

If the fuel assembly in L-11, Step 14, will not insert properly, return it to storage location. Complete steps 15 through 21 and attempt to reinsert the assembly in L-11.

REFUELING PROCEDURE

FP-1001

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

SPENT FUEL HANDLING

REVIEWED BY: Plant Review Committee

Paul F. McGee

Date 4/20/78

Meeting No. 78-16

APPROVED BY: Nuclear Plant Manager

Guy P. Beatty Jr.

Date 5/15/78

1.0 PURPOSE

To describe the procedure to be used in the receiving, loading, and preparing for shipment of spent fuel casks.

Mode	Section
Prior to Arrival of Spent Fuel Cask	6.0
Receipt and Placement of Single Assembly Cask	7.0
Loading Fuel in Cask	8.0
Preparation of Single Assembly Cask for Shipment	9.0

2.0 DESCRIPTION

2.1 The fuel handling system is designed to provide a safe, effective means of transporting and handling fuel from the time it is removed from the spent fuel pool to the time it is removed from the plant site in spent fuel casks.

2.2 This document will describe in check list form the procedures to be followed before, during, and after loading the spent fuel assemblies into the spent fuel casks.

3.0 REFERENCES

3.1 Refer to RP-101, Radiation Protection Manual, Section 6, for control and accountability of radioactive materials.

3.2 Crystal River Unit 3 FSAR, Section 9.6, Fuel Handling System, pages 9-24 through 9-29

3.3 Plant Operating Quality Assurance Manual, Volume VII, Refueling Operations

3.4 CR-3 Plant Operating Quality Assurance Manual, Volume XII, Special Nuclear Materials (SNM) Handling and Accountability

4.0 LIMITS AND PRECAUTIONS

4.1 Spent fuel must be cooled for at least 120 days before loading into casks.

4.2 Spent fuel casks must be washed down to remove any foreign materials before being placed into the spent fuel pool.

4.3 Radiation protection requirements as specified on work permits must be complied with when working with the casks or spent fuel assemblies.

4.4 Radiation and contamination levels must comply with the Code of Federal Regulations, Title 49, Chapter 1, prior to shipment from the plant.

4.5 Smear tests shall be performed on the casks before unloading to insure compliance with Section 6.1 of RP-101, Radiation Protection Manual.

4.6 If casks are to be shipped to areas where outside temperatures may reach freezing, suitable antifreeze such as silver nitrate will be added to the coolant. The amount will be specified by the Chemistry and Radiation Protection Department.

(TS) 4.7 No spent fuel shall be stored in spent fuel pool "B" (east) and the gate between pools "A" (west) and "B" (east) must be in place whenever a spent fuel cask is being handled over spent fuel pool "B" (east) or the cask loading area.

(TS) 4.8 No spent fuel cask shall be handled over spent fuel pool "A" (west).

4.9 Cranes to be used operate satisfactorily in accordance with applicable portions of FP-301, Preparation for Refueling.

5.0 SET POINTS

5.1 Spent Fuel Storage Pool Level: Normal

5.2 Purification Flow: 180 gpm

5.3 Filter Differential Pressure: < 25 psi

5.4 Spent Fuel Pump Discharge Pressure: $\geq$ 40 psig

5.5 Spent Fuel Pool Temperature: $\leq$ 105°F

5.6 Spent Fuel Storage Pool Discharge Flow: 1500 gpm > 2300 gpm

PROCEDURE

6.0 PRIOR TO ARRIVAL OF SPENT FUEL CASK

6.1 Notify Nuclear Plant Manager of date and time of arrival of spent fuel cask.

6.2 Notify Radwaste Management Supervisor of arrival of spent fuel cask.

6.3 Notify Plant Reactor Engineer of arrival time and date, and assure that Spent Fuel Shipping Cask Loading Form (CR-3 Form SPSCL, No. 912-010) will be filled out and available at that time.

(TS) 6.4 Insert gates in track to separate spent fuel cask loading area from main spent fuel pool and between pools "A" and "B".

6.5 Lower water level in spent fuel cask area using installed suction line and a portable pump.

6.6 When water level gets to bottom of installed suction line, valve off line so pump will not cavitate.

6.7 Continue lowering water level with portable pump until pit contains less than 15 feet of water, then secure portable pump.

6.8 Remove fuel building hatch with building crane and place in storage area.

7.0 RECEIPT AND PLACEMENT OF SINGLE ASSEMBLY CASK

7.1 INITIAL CONDITIONS

Section 6.0 has been completed.

7.2 Upon arrival of spent fuel shipping cask, complete Check List "A", Receiving and Unloading Single Assembly Spent Fuel Cask.

8.0 LOADING FUEL IN CASK

8.1 Reflood cask loading area using installed line.

8.2 Remove gate separating cask area from rest of spent fuel pool and gate separating spent fuel pools "A" and "B".

8.3 Check Spent Fuel Shipping Cask Loading Form (CR-3 Form SFSCL, No. 912-010) to determine which assembly should be loaded.

8.4 Complete Check List "B", Loading Fuel Into Cask.

9.0 PREPARATION OF SINGLE ASSEMBLY CASK FOR SHIPMENT

Complete Check List "C", Removal of Cask from Spent Fuel Pool and Preparation for Shipment.

ENCLOSURES

Enclosure 1	Check List "A", Receiving and Unloading Single Assembly Spent Fuel Cask
Enclosure 2	Check List "B", Loading Fuel Into Cask
Enclosure 3	Check List "C", Removal of Cask From Spent Fuel Pool and Preparation for Shipment

CHECK LIST "A"

RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date ______________ Initials

1. Health Physics has surveyed trailer and personnel barrier. ________
2. Inspect trailer and personnel barrier for damage. Report any damage to Plant Reactor Engineer. ________
3. Position trailer under fuel building hatch. Set brakes and block wheels against movement in either direction. ________
4. Remove access panel by hand from personnel barrier. ________
5. Close water jacket vent valve and expansion tank valve. Relieve water pressure in line connecting water jacket expansion tank by opening draincock located in line. Disconnect water jacket expansion line from water jacket. ________
6. Attach special slings to main hook. Attach slings to personnel barrier. Remove personnel barrier and set aside. ________
7. Health Physics has smeared test cask for surface contamination and adjacent surfaces of trailer. ________
8. Inspect cask and trailer for damage. Complete receiving inspection portion of shipping document. ________
9. Wash off road dirt only if smear shows no contamination. If trailer is contaminated, then trailer must be washed with controlled effluent of wash water. If cask is contaminated, then road dirt and contamination will be removed once cask is placed in the decontamination area. ________

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date ________________ Initials

10. Remove lockwire and bolts from front tiedown. __________

11. Remove top and bottom impact structures and store on trailer bed. __________

12. Using cask lifting yokes, engage trunnions on front end of cask. Raise cask to a vertical position on rear support, moving crane as required to keep crane cable vertical. When cask is fully vertical, remove cask from trailer. __________

13. Place cask in decontamination area. Disengage lifting yoke. Clean cask surfaces as required for entry into spent fuel pool. __________

14. Back off outer closure head bolts. Remove protective cover plates from valve boxes. Remove valve lead seals and dust covers. Remove threaded plugs from top of outer closure head and replace with threaded eyebolts. Check to see that closure head cavity drain valves are closed. __________

15. Using shackles, attach lifting slings to eyebolts on top of closure head. Remove outer closure head and set it on supports which are suitable for radiological control and for maintaining the cleanliness of closure head. Carefully inspect O-ring seal in underside of closure head. If O-ring shows any damage, replace O-ring. Be certain that replacement O-ring is properly installed and seated. Note any damage or repairs on shipping document. __________

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date ____________________ Initials

16. Remove inner container closure head nuts. Using main crane hook, attach lifting slings to two welded lugs on inner container closure head. Remove inner container closure head and set down on a clean surface. ________

17. Check to see closure head valves are closed. Remove dust covers from closure head drain valve and fill valve. Open closure head cavity drain valves which are located on the side of the cask. ________

18. Remove fuel assembly holddown by means of a special long rod with hook end and set down on supports which are suitable for radiological control and for maintaining the cleanliness of holddown.

19. Survey cask internals. Visually inspect cask(s) inner container cavity for foreign material damages, etc. Also inspect gasket in suction drain line flange. Note any discrepancy on shipping documents. Replace fuel assembly holddown. ________

20. Check water level in water jacket. If necessary, connect water jacket drain valve to a supply of demineralized water by means of a hose. Open water jacket drain and vent valves. Open water supply valve and wait until solid stream of water exits from water jacket vent valve. Close both valves and disconnect hose from water jacket and replace water jacket valve box cover gaskets and cover

CHECK LIST "A" (Cont'd)
RECEIVING AND UNLOADING SINGLE ASSEMBLY
SPENT FUEL CASK

Date ____________________ Initials

plates. Fill cask cavity with demineralized water up to level of inner container flange. ________

21. Engage cask lifting yoke with cask trunnions and pick up cask. Lift cask to clear all appurtenances on the way to the fuel pool. ________

22. Slowly lower cask to cask loading area of spent fuel pool. ________

23. Disengage lifting yoke from cask by means of special long service tools. ________

24. Lift main crane hook, lifting yoke, and remove from cask storage area. ________

25. Wash down all (lifting yoke and inner closure head) wetted parts before setting any components aside. ________

Check List Completed ______________________ ________
Supervisor Date

CHECK LIST "B"

LOADING FUEL INTO CASK

Date ____________ Initials

1. Read identification number on top of fuel assembly via binoculars. Record identification number on shipping document. ______
2. Pick up fuel assembly using manipulator crane. ______
3. Position refueling bridge over cask. Center the fuel assembly over cask cavity. Carefully lower fuel assembly into cask. ______
4. Watch assembly as it approaches cask. If assembly is not properly aligned, withdraw assembly to full "Up" position and move bridge as necessary to correct alignment. ______
5. Lower assembly into cask, repeating Step 4 if necessary. ______
6. Release grapple from fuel assembly and raise grapple to full "Up" position. ______
7. Confirm that fuel assembly is fully seated in cask. ______
8. Move refueling bridge clear of cask. ______

Check List Completed ____________________ Supervisor ____________ Date

CHECK LIST "C"

REMOVAL OF CASK FROM SPENT FUEL POOL AND PREPARATION FOR SHIPMENT

Date ________________ Initials

1. Install fuel assembly holddown into cask by means of a special long rod with hook end. __________

2. Attach two-legged sling to cask lifting yoke. Position cask lifting yoke over inner container closure head located on a stand at fuel pool ledge. Attach closure head lifting cables to welded lugs on outer surface of inner closure head, using shackles. Open closure head suction and fill valves. __________

3. Position inner head over cask and slowly lower onto cask, making sure that the dowel pins located in the cask flange provide final positive alignment. Visually confirm that inner head is seated by the use of binoculars. __________

4. Lower cask handling yoke to slacken the closure head cables which in turn locate yoke legs relative to cask trunnions. Laterally move yoke legs by means of a positive drive system to engage cask trunnions. Begin lifting cask with main crane. __________

5. Monitor cask continuously for radiation dose as top of cask comes within approximately five feet of pool water surface. Stop crane lift at the direction of Health Physicist below pool water level. Install underwater, all inner container closure head nuts, in pairs, 180° apart,

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date ____________________ Initials

first hand-tight; then torque to given foot-pounds in two equal steps. As all wetted surfaces continue to emerge from surface of pool water, hose with demineralized water those items such as the cask, cask handling yoke, and the crane hook assembly. Monitor radiation levels on all surfaces of cask. __________

6. Continue to raise cask until closure head cavity drain valves are accessible from refueling bridge platform. Open closure head cavity drain valves. After pool water has drained from closure head cavity, close closure head cavity drain valves. __________

7. Connect hose from demineralized water supply to quick-disconnect fitting on inner container fill valve. Connect a hose to inner container suction drain valve with free end of hose to be placed in pool water or contaminated drain. Open demineralized water supply valve and proceed to flush cask inner container for a period of 20 minutes. __________

8. Close demineralized water supply valve. Close inner container fill valve. Disconnect hose from demineralized water supply. Connect T-fitting with pressure gauge and isolation valve to quick-disconnect fitting on inner container fill line. (The discharge side of the suction valve is still connected to a hose with one end placed into the pool water.) __________

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date ____________ Initials

9. Connect helium bottles (with pressure regulated to 10 psig) to quick-disconnect on isolation valve assembly. Open inner container suction drain valve, fill valve, and isolation valve. Open helium supply valve for a few minutes to allow helium to push out a monitored quantity of water from inner container which represents not more than 25% of the water volume in the inner container. At least 75% of water should remain in inner container until leak-testing operation has been completed. ________

10. Connect discharge end of the hose on the inner container suction valve to a graduated container. Draw off a sample of inner container water by closing inner container fill valve and opening inner container suction valve. After drawing sample, open the inner container fill valve and close inner container suction valve. ________

11. Health Physics has analyzed coolant for radioactive contents and recorded results on shipping document. Close helium supply valve. ________

12. Close suction drain valve and open helium supply valve. Pressurize inner container to 10 psig. Close helium supply and inner container fill valve. Hold pressure for 10 minutes and open inner container fill valve. If there is no pressure drop, the seal and valves are satisfactory. Record results on shipping document. ________

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND PREPARATION FOR SHIPMENT

Date ______________________ Initials

13. Open inner container suction drain valve and release pressure on inner container through free end of hose which has been returned to the pool water. Now allow helium flow to push out remaining inner container water until there is no further discharge from the suction drain line, discernible by the appearance of helium bubbles issuing from pool water surface. __________

14. Immediately after appearance of helium bubbles issuing from hose, connect discharge end of suction drain hose to an evacuated, calibrated collection vessel. Draw off specified volume of helium gas by closing the petcock on collection vessel and close suction drain valve. Analyze for radioactive contents and record on shipping document. Close inner container fill and suction drain valves. Close helium supply valve. __________

15. Disconnect helium supply bottle, pressure gauge, and isolation valve assembly. Remove suction drain hose. Remove fill valve hose. Decontaminate pressure gauge and isolation valve assembly before further use. __________

16. Connect hose from suction pump to quick-disconnect fittings on cask cavity suction drain line. Allow free end of hose from discharge side of suction pump to be placed into pool water. Pump water from cask cavity (annulus). __________

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date ______________________ Initials

17. Disconnect suction drain line hose and suction pump. Install cap on quick-disconnect fitting. ______

18. Continue hosing cask down with demineralized water. Monitor radiation dose rate as cask emerges from pool. When all cask surfaces have been hosed, install cask drip pan, if desired. Immediately move cask out of fuel pool to decontamination area. Remove cask drip pan and set cask down. Remove lifting yoke and closure head lifting cables. An effort should be made to prevent the cask surface from drying after removal from fuel pool on its way to decontamination area. ______

19. Immediately commence decontamination procedures in decontamination area using demineralized water, steam, detergent and scrub brushes, as required. ______

20. Attach closure head lift cables to eyebolt on outer closure head which is resting on outer closure head stand in decontamination area. Lift outer closure head and position outer closure head on cask flange. Visually confirm that outer closure head is seated. Remove closure head lift cables. ______

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date ______________________ Initials

21. Remove eyebolts from outer closure head and insert metal threaded plugs. Store eyebolts in box. Torque outer closure head bolts, in pairs, 180° apart, first hand-tight; then torque to given foot-pounds, in two steps. __________

22. Connect compressed air supply line to second closure head cavity drain valve. __________

23. Open compressed air supply valve and pressurize cask cavity space between inner and outer closure heads to 10 psig. Close air supply valve and second drain valve. Hold pressure for 10 minutes. If there is no pressure drop, the outer closure seal and closure head cavity drain valves are satisfactory. If pressure drops, correct source of leak and repeat test. Record results on shipping document. __________

24. Open isolation valve and relieve pressure in cavity between cask heads. Close closure head cavity drain valves and remove pressure gauge and isolation valve assembly. __________

25. Lockwire both closure head cavity drain valves closed. Install pressure caps on quick-disconnect fittings on both valves. __________

26. Health Physics has surveyed entire cask for the surface contamination and radiation dose rates. If surface contamination values are higher than those specified for

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND
PREPARATION FOR SHIPMENT

Date ______________________ Initials

shipment, continue decontamination procedure. During decontamination procedure, be sure to lift cask sufficiently to decontaminate cask bottom surface. Record final values on shipping document. __________

27. Install lead seal between two adjacent cask outer closure bolts. __________

28. Install valve box covers on the closure head cavity drain valve boxes with bolts for each valve box. Verify that water jacket vent valve is "open." Install water jacket vent valve box covers with bolts. __________

29. Attach lifting yoke to cask. Lift and move cask to trailer locations. Position cask to engage cutouts in bottom end of cask with rear tiedown trunnions. Lower cask to rest on front tiedown saddle, moving cask lifting yoke as required to keep crane cables vertical. Disengage cask lifting yoke in decontamination area. __________

30. Health Physics has surveyed cask closure head areas and valve boxes for surface contamination to assure compliance with DOT Regulation 173.393(a). Record final values on shipping document. __________

31. Install and torque front tiedown bolts to given foot-pounds in two steps. Install top impact structure with bolts and torque to given foot-pounds. Install bottom impact structure with bolts and torque to given foot-pounds. Lockwire all bolts. __________

CHECK LIST "C"
REMOVAL OF CASK FROM SPENT FUEL POOL AND PREPARATION FOR SHIPMENT

Date ____________________

Initials

32. Install personnel barrier on trailer and bolt in place with bolts. Connect cask water jacket to expansion tank via access panel by connecting flexible metal hose from expansion tank to quick-fitting on vent valve. Check to see that expansion tank valves (two) are open. Be sure draincock is closed. Install access panel and fasten with bolts. Torque to given foot-pounds. ________

33. Paste shipping placards to outside of personnel barrier as required by 49 CFR 173.399. ________

34. Perform final health physics survey of truck system. ________

35. Return all service equipment decontaminated to normal storage. ________

36. Complete all forms and prepare Bill of Lading for shipment. ________

37. Shift Supervisor has reviewed shipping document for completeness and accuracy. Sign-off as "cask with acceptable limits and ready for shipment." ________

Check List Completed ______________________ Supervisor ____________ Date