

CALVERT CLIFFS NUCLEAR POWER PLANT

TECHNICAL PROCEDURE

Fuel Handling Procedure 305 (FH-305)

Core Alterations

Revision 12

Safety Related

Reference Use

Applicable To: Calvert Cliffs Nuclear Power Plant Unit 1 and Unit 2

Sponsor: Engineering Supervisor – Nuclear Fuel Management

Approval Authority: General Supervisor – Nuclear Fuel Services

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Summary of Alterations

Revision 11

Location

Reason

Page 8: Added reference 3.2.AA

Reference ES200500540

Page 17, step 6.1.I: changed ES-FOSU to person contacted

anyone in PWR Core Design can ensure required engineering has been completed

Page 27, step 6.5: relocated dispersion criteria to this step

to ensure that fuel is dispersed within 60 days after shutdown AFTER refueling has taken place

Page 32: added basis B-184

Basis capture requirement in ES200500540

Pages 37-39: Clarified when a step can be N/A'd (several places). Relocated step 16 requirements to step 6.5. Added requirement to not place fuel on or adjacent fuel on rack spacers per this procedure.

Clarification and control of fuel moves to rack spacers in one procedure only

Page 63, step 4: added requirements per ES200500540

control start of refueling in accordance with ES200500540

Revision 12

Page 38 and 39: Added Item 19 to the responsibilities

To prevent movement of the damaged pinstorage basket .

1.0 PURPOSE

The purpose of this procedure is to provide a safe, organized method for the refueling of Calvert Cliffs Unit 1/ Unit 2 and to move core components in the Spent Fuel Pool (SFP) independent of core alterations.

2.0 APPLICABILITY/SCOPE

- 2.1 This procedure supports the applicable Operating Instructions (OIs). All fuel/CEA handling is accomplished per the applicable OIs.
- 2.2 This procedure directs the Refueling Control Room Operator (RCRO) in the centralized coordination and monitoring of all core component movement between and within the SFP and the RFP. Core component movement in the SFP independent of core alterations (movement before or after core alterations or during a period in which core alterations are temporarily secured) shall not require RCRO control. CEA coupling or uncoupling is not an activity governed by FH-305.
- 2.3 This procedure directs the preparation of Special Nuclear Material Transfer Forms (SNM Form 2s) needed to safely move fuel and CEAs.
- 2.4 This procedure implements Technical Specification 3.9.1, Boron Concentration. The RCRO and Nuclear Fuel Management-Shift Engineer (NFM-SE) shall ensure that the minimum boron sampling requirements are met and documented on Attachment FH-305-6, Boron Concentration Log Sheet. **[B-10]**
- 2.5 The initial copy of an attachment used in this procedure is accounted for in the initial page check of this procedure. Use of each subsequent copy of attachments of this procedure shall be documented on Attachment FH-305-1, Attachment Log Sheet. Additionally, changes and any other documents generated during the use of this procedure that should be incorporated into this procedure shall be documented on Attachment FH-305-1. Each attachment type shall be listed on a separate Attachment FH-305-1. SNM Form 2s are accounted for on Attachment FH-305-4, Modification to the Fuel/CEA Move Sequence.
- ## 2.6 Communications
- A. This procedure implements Technical Normal Condition 15.9.2, Communications. Uninterrupted voice communications between the Control Room personnel and the RFM shall be maintained during core alterations. All core alterations shall cease if such communications are lost. Uninterrupted voice communications between the Control Room personnel and the SFHM Operator shall be maintained during fuel movement in the SFP not independent of core alterations. All fuel movement in the SFP not independent of core alterations shall cease if communication with the SFHM Operator is lost. The Transfer Carriage Operators shall be in voice communications with the Control Room, SFHM, and RFM when the transfer carriage has fuel in the carriages. At other times, voice communication is not required for the Transfer Carriage Operators. Attachment FH-305-7, Voice Communications Log Sheet, documents that communications have been demonstrated as operable at least once per 12 hours during core alterations. The RCRO or an NFM-SE shall perform and document the communications check PER Attachment FH-305-7. **[B-11]**

2.6 Communications (Continued)

- B. In the event that the Fuel Handling Supervisor (FHS) has specified that some refueling stations may be secured PER Attachment FH-305-5, Minimum Crew Requirements for Core Alterations, while core alterations continue, communications shall continue to be verified as operable at the remaining stations and shall be re-verified once the secured stations have been re-manned. The RCRO or NFM-SE shall perform the verification and shall document it on Attachment FH-305-7. An example of this would be if fuel handling problems in the core were expected to take such a long time to resolve that the FHS directed that fuel handlers in the Spent Fuel Storage Area should secure their stations. If core alterations are temporarily secured, use Attachment FH-305-11, Core Alterations Restart Checklist, to restart core alterations.
- C. All personnel that will participate in the core alterations shall be briefed PER Attachment FH-305-2, Pre-Evolution Brief Guide, before manning their stations for the first time. **[B-62]**
- D. The Control Room Supervisor (CRS) of the unit in refueling and Shift Manager (SM) shall be briefed on the status of fuel handling at the start of each OPS shift.
- E. This procedure contains steps which are Reactivity Management sensitive. Pre-job briefs shall include discussions of the Reactivity Management aspects of this procedure. **[B-146]**

2.7 Off-Normal Fuel Handling Situations

Recovery from off-normal fuel handling situations (such as leaning assemblies or CEAs inadvertently grappled and lifted free of the fuel assembly) which can be performed using only the RFM, SFHM, or CEA Handling Tool is considered to be within the scope of this procedure, and may be performed without a procedure change. Actions taken to recover from these situations shall be documented on Attachment FH-305-4 describing in detail the actions to be taken. One of the two NFM sign offs (initiator or reviewer) shall be performed by the ES-NFM and the Shift Manager shall initial after the ES-NFM documenting his approval. If further action is required for recovery, a change to the procedure shall be generated to describe the actions to be taken. Steps may be taken immediately with the concurrence of the Nuclear Fuel Management - Lead Engineer (NFM-LE), FHS, System Engineer, and the Shift Manager, to stabilize the components, ensuring safety until the fuel moves or required procedure change is approved. Record all off-normal fuel handling situations and the resolution on Attachment FH-305-3, Fuel/CEA Handling Problem Documentation Sheet.

2.8 Procedure Instructions

- A. Step 6.6, SFP Fuel Movement Independent of Core Alterations, may be performed before Step 6.1 or in parallel with Step 6.3. Step 6.6 may also be performed in parallel with Step 6.2 if core alterations have not started or have been temporarily secured.
- B. Steps 6.2.J and 6.2.K may be performed in any order, repeated, and at the same time if the RCRO has determined that there will be no interference with the separate pieces of refueling equipment.
- C. Attachment FH-305-14, Instructions for Moving Control Element Assemblies (CEAs), shall be performed in parallel with Steps 6.2.J and 6.2.K.

2.8 Procedure Instructions (Continued)

- D. With ES-NFM concurrence, Step 6.2.O may begin prior to completing Steps 6.2.J, 6.2.K, 6.2.L and 6.2.M, provided any core component or core location affected by steps performed in 6.2.J, 6.2.K and 6.2.L are verified after these components or locations are in their final configuration.

2.9 At least once per month, any MN-1-110, Attachment PC-1's generated by this procedure and in the Control Room PC-1 Log shall be reviewed. **[B-111]**

2.10 All potential fuel handling paths in the Spent Fuel Pool and the Refueling Pool are acceptable for the following items:

- Fuel assemblies up to 1430 pounds (including a CEA) dry
- Dummy fuel assemblies weighing up to 1750 dry
- ICI Trash Cans weighing up to 1600 pounds dry

Design calculations have demonstrated that a drop of any of these items will not create an unacceptable condition. **[B-135]**

3.0 REFERENCES AND DEFINITIONS**3.1 Developmental References**

- A. Technical Specifications 3/4.1, Reactivity Control Systems.
- B. Technical Specifications 3/4.8, Electrical Power Systems.
- C. Technical Specifications 3/4.9, Refueling Operations.
- D. UFSAR Section 14.3, Boron Dilution Event.
- E. NO-1-100, Rev. 10, Conduct of Operations.
- F. NO-1-200, Rev. 13, Control of Shift Activities.
- G. UFSAR Section 14.18, Fuel Handling Incident.
- H. EN-1-111, Rev. 1, Special Nuclear Material Accountability.
- I. Nuclear Fuel Management Qualification Manual, Rev. 1.
- J. Calvert Cliffs Industrial Safety Manual, Chapter 24.2, Safety Around the Spent Fuel/Refuel Pool.
- K. TR-1-301, Rev. 0, Technical Services Engineering Qualification and Training Program
- L. Letter, G. C. Creel (BG&E) to Document Control Desk (NRC), CCNPP, Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318, 10 CFR Part 21 Written Report: "Nuclear Fuel-Potential Loss of Shutdown Margin," dated March 15, 1989.
- M. EN-1-311, Rev. 5, Special Nuclear Material Movement and Tracking

3.1 Developmental References (Continued)

- N. FH-210, Rev. 1, Unit 2 Core Offload.
- O. SOER 85-01, Reactor Cavity Seal Failure, Recommendation 4.
- P. SOER 85-01, Reactor Cavity Seal Failure, Recommendation 5.
- Q. SER 18-89, Potential for Reduction in Boron Concentration in the Reactor.
- R. MN-1-110, Rev. 3, Troubleshooting and Procedure Controlled Activities.
- S. OP-7, Rev. 10, Shutdown Operations
- T. NO-1-102, Rev. 2, Conduct of Infrequent Tests or Evolutions

3.2 Performance References

- A. OI-25A, Spent Fuel Handling Machine.
- B. OI-25C, Refueling Machine.
- C. OI-25E, Fuel Transfer System.
- D. CNG-MN-1.01-1001, Foreign Material Exclusion.
- E. AOP-6D, Fuel Handling Incident.
- F. NEOP-23, Technical Data Book (U-2).
- G. REP-21, Reactor Engineering Surveillance Procedure (U-2).
- H. EN-1-311, Special Nuclear Material Movement and Tracking
- I. NFMSP-17, Interfacing with the Spent Fuel Handling Machine Computer.
- J. NFMSP-21, Reactivity Monitoring.
- K. NFMSP-32, Guidance for Reviewing Sequence Files from ShuffleWorks.
- L. MN-1-110, Trouble Shooting and Procedure Controlled Activities.
- M. PR-3-100, Records Management.
- N. MN-1-104, Load Handling Procedure.
- O. NO-1-200, Control of Shift Activities.
- P. OI-25G, Control Element Assembly Handling Tool
- Q. AOP-6E, Loss of Refueling Pool Level
- R. AOP-6F, Spent Fuel Pool Cooling Malfunction
- S. REP-11, Reactor Engineering Surveillance Procedure (U-1).
- T. NEOP-13, Technical Data Book (U-1).
- U. NO-1-117, Integrated Risk Management
- V. EN-1-111, Special Nuclear Material Accountability
- W. ESP _____ for crediting CEAs during an incore shuffle, if necessary
- X. Criticality Analysis for Units 1 and 2 Onload, CA05698
- Y. ESP _____ associated with loading/unloading Areva LFAs.
- Z. Technical Specification 3.7.17, SFP Storage.
- AA. ES 200500540, Reduced Time to Offload Due to Decay Heat Load

3.3 Definitions

- A. Core Alterations - For this procedure, core alterations means movement or handling of fuel assemblies, Control Element Assemblies (CEAs), Neutron Sources, or Guide Tube Inserts (GTIs) to, from and within the Reactor Vessel.
- B. Core Components - Fuel Assemblies, CEAs, Neutron Sources, GTIs.
- C. Fuel or Fuel Assembly - A fuel assembly that may have a CEA, GTI, or Neutron Source resident.
- D. Secured Refueling Operations - Core alterations shall be considered secured if the RFM is unmanned for the purpose of securing core alterations.
- E. Recently Irradiated Fuel – Fuel that has occupied part of a critical reactor core within the previous 32 days. (T. S. Bases 3.7.11)

4.0 PREREQUISITES

4.1 Specifications/Surveillance

None.

4.2 Personnel Skill Levels Required

A. Refueling Control Room Operator (RCRO)

1. The RCRO shall be a Licensed Operator stationed in the Control Room.
2. Detailed responsibilities for the RCRO are contained in Attachment FH-305-10, Instructions for the RCRO During Refueling.

B. Fuel Handling Supervisor (FHS)

1. The FHS shall be a SRO. **[B-132]**
2. Detailed responsibilities for the FHS are contained in Attachment FH-305-13, Instructions for the FHS During Refueling.

C. Nuclear Fuel Management Shift Engineer (NFM-SE)

1. NFM-SEs are qualified as a Shift Engineer, Fuel Handling, by the ES-NFM PER TR-1-301 and the NFM Qualification Manual.
2. The ES-NFM shall designate one NFM-SE as the Lead Engineer (LE) for each shift. The NFM-LE is responsible for keeping the Shift Manager apprised of all fuel handling activities.

D. Engineering Supervisor - Nuclear Fuel Management (ES-NFM)

The Engineer Supervisor - Nuclear Fuel Management shall sign Attachment FH-305-4 with the number of steps, and the date on the attachment, indicating approval of the movement. A NFM-SE may sign for the ES-NFM if authorized in writing per EN-1-111.

4.2 Personnel Skill Levels Required (Continued)

E. Special Nuclear Material Handling Supervisor (SNM-HS)

The Special Nuclear Material Handling Supervisor (SNM-HS) shall sign and date the Attachment FH-305-4 when the SNM Computer Database has been updated to reflect the completed moves.

F. General Supervisor - Nuclear Plant Operations

The GS-NPO or his alternate/designee will act as the Activity Manager in accordance with NO-1-117.

4.3 Special Tools and Equipment Required

- A. Underwater Camera
- B. VCR/tapes and/or DVD/discs.
- C. Underwater lights, as required.
- D. Vented/Shielded graphite poles, as required. [B-13]

4.4 Documentation and Support

A. Fuel Move Log.

1. A Fuel Move Log shall be established to support this procedure. This Log may be set up in a separate binder from this procedure.
2. The Fuel Move Log shall contain, at a minimum, the latest reviewed copies of the following:
 - * Fuel assembly and CEA map by serial number at the start and finish of the core alteration.
 - * Allowable refueling machine mast orientations.
 - * Core bridge and trolley coordinates.
 - * SFHM allowable mast orientations.
 - * SFP bridge and trolley coordinates.
 - * Documentation of allowable alternate core locations.
 - * SFP rack feet locations
 - * List of CEAs with 12" Ag-In-Cd slugs
3. A copy of all approved and reviewed SNM Form 2s shall be maintained in the Fuel Move Log.

4.4 Documentation and Support (Continued)

4. The Fuel Move Log shall be maintained in the Control Room during core alterations and upon completion of all fuel handling should be consolidated with the Control Room Copy of FH-305.
5. A separate binder may be established for the RCRO's, RFM's, and SFHM's copies of the SNM Form 2s.

4.5 Initial Conditions

A. This procedure has been page checked.

_____/_____
NFM-SE / Date

B. A Controlled Copy of this procedure is in the Control Room.

_____/_____
NFM-SE / Date

NOTE:

Steps 4.5.C and 4.5.D do not need to be completed until Step 6.2.G.1.

C. A pre-job briefing of the initial shift personnel involved in FH-305 has been conducted prior to the start of refueling per NO-1-100. The briefing covered the topics below:

- Objectives, prerequisites, and precautions.
- Expected indications, plant performance, and sequence of events.
- Personnel duties and responsibilities.
- Risks involved and potential problems.
- Previous events and significant incidents resulting from similar activities.
- Actions to be taken if unexpected or abnormal conditions occur.
- Reactivity Management concerns.

_____/_____/_____
Date / Time / Initial/NFM-SE

D. A management briefing of the initial shift personnel involved in FH-305 has been conducted prior to the start of refueling per NO-1-117. The briefing covered the topics below:

- The need for exercising caution and conservatism during refueling, especially when uncertainties are encountered.
- Emphasis on maintaining the highest margins of safety and placing the proper perspective on any prevailing sense of urgency.

4.5 Initial Conditions (Continued)

- Assigned responsibilities for the activity and any deviation from normal shift duties and accountabilities.
- The need for open communications.
- The application of lessons learned from pertinent in-house and industry operating experience to assist operations and other involved personnel in internalizing these lessons.

_____/_____/_____
Date Time Initial

4.6 FH-305 is identified as an infrequent test or evolution per NO-1-117, Conduct of Infrequent Tests or Evolutions. Therefore, refueling shall be performed in accordance with NO-1-117.

5.0 PRECAUTIONS

5.1 When transporting tools in either pool, ensure that adequate lighting and water clarity exist in the pool to allow verification that the submerged portion of the tool does not contact any underwater projections or inadvertently lift a CEA.

5.2 Personnel Safety

- A. The divider wall shall not be used as a walkway across the SFP unless the SFHM bridge is backed against the dam to provide handrail support. **[B-1]**
- B. **Exposure Hazard**
1. No items shall be removed from or placed into the RFP or SFP without prior Radiation Safety Technician (RST) approval. **[B-27]**
 2. All tool poles used in the SFP and the RFP shall be properly vented or shielded to preclude radiation from streaming through the poles. **[B-13]**
 3. Access to the 45 ft. containment level near the fuel transfer tube shall be restricted during fuel and equipment transfers. **[B-14] [B-138]**
- C. **WHEN** working in radiological controlled areas,
1. SWP requirements and good radiological work practices shall be observed.
 2. Fluids and components shall be treated as contaminated unless certified radiologically clean.

5.3 REACTIVITY MONITORING/WIDE RANGE NUCLEAR INSTRUMENTS (NIS)

NOTE:

An inverse count rate (1/M) is taken whenever fuel is being inserted (after being fully withdrawn) or CEAs are withdrawn from fuel in the reactor core to monitor the reactivity status of the core.

- A. A plot of count rate ratio (C_o/C_i) versus time shall be maintained for at least two wide range NIs during core alterations which add positive reactivity PER NFMSP-21. These plots shall be referred to as inverse multiplication (1/M) plots. The RCRO shall verify that the 1/M count is acceptable prior to the RFM ungrappling each assembly in the core or prior to completely removing a CEA from an assembly in the core.
- B. The following steps apply to the wide range NIs that are coupled to the fuel mass.
1. **IF** one wide range NI begins to show an unexpected increase in count rate, cease all fuel/CEA motion and observe the behavior of this NI relative to the other operating NIs. If at least two other wide range NIs are operable and if no other NI indicates a rising count rate, then consider the NI to be unreliable. If only one other wide range NI is operable stop core alterations until two operable NI channels are available.
 2. **IF** an unexpected doubling of count rate occurs on any single wide range NI or **IF** an unexpected increase in count rate occurs on more than one NI, withdraw any fuel assembly which is being inserted, or insert any CEA which is being withdrawn. Verify the RCS boron concentration is equal to or greater than the value specified in Step 6.2.A.
 3. **IF** two or more NIs indicate a sustained rising count rate after a fuel assembly has been inserted (or a CEA withdrawn) notify the FHS and Shift Manager immediately.
 4. **IF** a CHI square test failure occurs on any single wide range NI notify the NFM-SE. If continuous test failures are experienced then consider the channel inoperable until the problem is resolved.
- C. During refueling operations, no core alterations shall take place until at least two wide range NIs are operable, each with continuous visual indication in the Control Room and one with audible indication in the containment and the Control Room (Technical Specification 3.9.2). If less than two NIs are operable, cease all core alterations and any fuel assembly/CEA in transit shall be moved to a safe configuration (away from the core).
- D. If during core alterations two of the four wide range NIs are declared inoperable, E&C shall work to restore at least one of the inoperable NIs. **[B-20]**
- E. If core alterations are suspended or interrupted while fuel is in the reactor vessel, then the inverse count rate ratio shall be monitored at least once per hour for the first two hours and then at least once per every four hours for the remainder of the interruption.

5.3 Reactivity Monitoring/Wide Range Nuclear Instruments (NIs) (Continued)

- F. During the first several fuel moves of a core onload and the last few moves of the core offload, Technical Specification 3.9.2 is satisfied provided that two detectors meet the surveillance requirement. The eight fuel locations which bridge between the two detectors are to be the first ones filled during a core onload and the last ones unloaded during a core offload. This positioning ensures that the eight or less fuel assembly configuration will not go critical during an RCS dilution event or during a mispositioning of the most reactive fuel assembly until two wide range NI's are connected to the core mass. [B-176]

5.4 Fuel Handling Incident

IF a Fuel Handling Incident (FHI) occurs, perform immediate actions as specified in AOP-6D. All fuel handlers shall place fuel assemblies, CEAs and fuel handling equipment not involved in the FHI in a safe configuration PER the applicable OI-25 procedure. These actions shall ensure that fuel/CEAs are placed in allowable locations at the lowest possible elevation. [B-17]

5.5 Protection Against Inadvertent Threat to the 5% Shutdown Margin

- A. All fuel assemblies being taken from the SFP to the core shall be verified to be "SHINY" (new assembly) or to be "DARK" (irradiated assembly) by the SFHM or Upender Operator and the RFM Operators or FHS. For core-to-core moves, the RFM Operator or FHS shall verify the assembly as "SHINY" or "DARK". [B-2]
- B. To ensure that each fuel assembly is inserted in its correct core location, the RFM personnel shall confirm the SNM Form 2 "TO" location with the RCRO and shall wait for an independent verification of the SNM Form 2 "TO" location coordinates by the FHS before the assembly is placed into the core. [B-2]
- C. After an assembly is placed into the core, the FHS shall visually verify that the SNM Form 2 "TO" location contains a fuel assembly. [B-2]
- D. If the SDC boron and RFP boron do not agree, within 100 ppm, then stratification of the RFP is suspect. Attachment FH-305-6, Boron Concentration Log Sheet, ensures that an underwater Hydrovac will be turned on to mix the RFP. Since lower boron concentrations will remain near the surface of the RFP, core alterations may continue. Once Chemistry verifies there is no stratification, the Hydrovac may be secured until the RFP and SDC boron concentration are observed to diverge further. [B-114]

5.6 Ventilation

Fuel movement will be suspended in the event of the loss of one of two operating air supply fans, or a change in Auxiliary Building ventilation lineup with a single fan operating. [B-152]

5.7 CEA Crediting

To reduce Refueling Boron Concentration, a number of CEAs may be credited. To ensure that the plant is still within the bounds of the CEA crediting analysis the following must be ensured:

- A. That all tools and lights placed in the pool do not rest on the core such that lifting of the items would result in the lifting of a CEA.

5.7 CEA Crediting (Continued)

- B. If performing an onload, host fuel assemblies with credited CEAs SHALL be placed in their final locations in the core. Placement outside of the core in a trashcan rack is allowed as well as transfer back to the spent fuel pool.
- C. If performing an onload, all fuel assemblies with credited CEAs shall be identified by the Upender Operators as having CEAs in them when they are being transferred from the SFP to the RFP. If a credited CEA is not present in a fuel assembly that should be hosting one, then the onload activities shall be stopped immediately and the discrepancy resolved.
- D. If crediting CEAs while performing an incore shuffle, the number of CEAs and their location in the core must be in accordance with reference 3.2.W. [B-172]

6.0 PERFORMANCE

6.1 Pre-Refueling Verifications

NOTE:

Section 6.1 should be marked "N/A" if performing a core offload.

NOTE:

Steps 6.1.A through 6.1.E may be performed using the results of a video-recorded serial number check performed per EN-1-311.

NOTE:

Recording serial numbers is not required for GTIs or new CEAs. Recording "GTI" as a serial number is acceptable. Documentation of the new CEAs location in new fuel while in the new fuel storage area is adequate to satisfy step 6.1.A.

A. **DOCUMENT** on Attachment FH-305-8, Pre-Refueling SFP Verification, the serial numbers, locations and orientations (as appropriate) of the Core Components that will be used this cycle **AND RECORD** the verification on a VCR tape and/or DVD.

_____ / _____
NFM-SE Date

B. **VERIFY** each Core Component serial number on the Attachment FH-305-8 against the serial number on the final, Q/A'd reload core map in the Fuel Move Log and the SNM Computer database. [B-36]

_____ / _____
NFM-SE Date

C. **VERIFY** that each Credited CEA serial number on the Attachment FH-305-8 resides in its final host assembly per FOSU Memo _____. N/A if not crediting CEA's or performing an incore shuffle. [B-160]

_____ / _____
NFM-SE Date

6.1 Pre-Refueling Verifications (Continued)

- D. **VERIFY** that no encapsulation tubes exist in fuel assemblies that are being reinserted back into the reactor after storage in the spent fuel pool. N/A this Step if no irradiated fuel assemblies from the SFP will be re-inserted into the core. **[B-129]**

Reference: _____

_____/_____
NFM-SE / Date

- E. **RESOLVE** any discrepancies **AND DOCUMENT** on Attachment FH-305-8. N/A this Step if there are no discrepancies.

_____/_____
NFM-SE / Date

NOTE:

Steps 6.1.F through 6.1.I may be performed in any order and in parallel with Steps 6.1.A through 6.1.E.

- F. **VERIFY** that all irradiated reinsert fuel assemblies which were stored in the SFP have no debris in the guide tubes. This only applies to those reinserts receiving CEAs next cycle. N/A this Step if no irradiated fuel assemblies from the SFP will be re-inserted into the core. **[B-22]**

Reference: _____

_____/_____
NFM-SE / Date

- G. **ENSURE** that Certifications of Compliance for all new Core Components that will be placed in the core for this cycle are onsite and that the new fuel assemblies have a debris resistant design. **[B-55]**

_____/_____
NFM-SE / Date

- H. **VERIFY** that an inspection/repair campaign will be performed on the reload fuel assemblies or the ES-NFM has written a letter to the Fuel Performance file justifying why it will not be performed. **[B-127]**

Inspection to be Performed / Letter Written
(Circle one)

_____/_____
ES-NFM / Date

Reference: _____
N/A if inspection performed

6.1 Pre-Refueling Verifications (Continued)

- 1. **ENSURE** that all reload assemblies will be flagged for further examination by a screening process (UT, LEF visuals, etc.) and will have any findings resolved or the ES-NFM has written a letter to the Fuel Performance file justifying reinsertion without work or inspections completed. **[B-128]**

Work will be Completed / Letter Written
(Circle one)

Reference: _____ / _____
 N/A if work will be done or ES-NFM Date
 if a letter was written for Step 6.1.H

- 2. **RECORD** the serial numbers of each fuel assembly that has been reconstituted and/or had debris removed on Attachment FH-305-12, Fuel Assembly Re-Certification Log Sheet as the work is completed.
 - a. **INITIAL** Attachment FH-305-12 when the ES-NFM has accepted the fuel assembly for reuse.

- I. **VERIFY** with the PWR Core Design Unit that all required engineering and NRC approvals (if applicable) have been completed prior to loading the new fuel into the reactor vessel. **[B-36]**

Person Contacted: _____

_____ / _____
 NFM-SE Date

6.2 Core Alterations

NOTE:

Steps 6.2.A through 6.2.F may be performed in any order and in parallel with Step 6.1 and 6.6.

A. **CALCULATE** the minimum boron concentration: **[B-114]**

$$\frac{\text{NEOP-13 Fig. 1-II.A.6 for Unit 1 Cycle } \underline{\hspace{2cm}}}{\text{OR (NEOP-23 Fig. 2-II.A.6 for Unit 2 Cycle } \underline{\hspace{2cm}})} + \frac{\text{(Boron Dilution Value for Unit _ Cycle } \underline{\hspace{2cm}})}{\text{Boron value for temp. orientations}} = \underline{\hspace{2cm}} \text{ ppm}$$

Boron Dilution Reference: _____

Boron Value for Temporary Orientations Reference: _____

_____/_____
NFM-SE Date

_____/_____
Reviewer Date

1. **RECORD** the minimum boron concentration on Attachment FH-305-6, Boron Concentration Log Sheet.
2. **VERIFY** that the minimum refueling boron concentration is greater than 1350 ppm. **[B-176]**

_____/_____
NFM-SE Date

B. **ENSURE** the following briefs have been performed PER Attachment FH-305-2:

- * The first fuel handling crew to participate in the core refueling. **[B-62]**
- * The CRS of the unit in refueling and SM on the status of fuel handling at the start of their shift.

C. **ENSURE** that the required tag boards are in the Control Room.

1. **VERIFY** the area where fuel movement is to occur on the tag boards against the SNM Computer database.

_____/_____
NFM-SE Date

D. **VERIFY** access to the fuel transfer tube access hatch walkway area inside of containment has been restricted. **[B-14], [B-138]**

_____/_____
NFM-SE Date

6.2 Core Alterations (Continued)

Steps 6.2.E may be marked N/A for an onload if the 1/M computer was not disconnected following the offload.

CAUTION:

The possibility for disabling the audible count rate speakers exists. If a BNC "T" connector was used on the GAMMA METRICS J14 connector ensure that when the cables are disconnected from the RPS wide range NI drawers that any other component connected to the other connection on the "T" connector remains connected to the GAMMA METRICS J14 connector.

E. **SETUP** 1/M Computer:

The end of the cable used at the RPS is normally coiled on top of the RPS cabinets. The end of the cable used at the counters is normally coiled on the floor inside panel 1/2C17. The use of a BNC "T" connector on the GAMMA METRICS J14 connector is allowed. [B-38]

1. **RECEIVE** Control Room permission to connect the I/M Computer **AND THEN CONNECT** the 1/M computer cables to the NI drawer's J-14 connectors **PER** MN-1-110.

The cable marked "From 1/2C15A to 1C186" connects to Channel A.
The cable marked "From 1/2C15B to 1C186" connects to Channel B.
The cable marked "From 1/2C15C to 1C186" connects to Channel C.
The cable marked "From 1/2C15D to 1C186" connects to Channel D.

_____/_____
NFM-SE / Date

2. **VERIFY** the cables are connected to the NI drawer's J14 connector for Channels A, B, C, and D as described above **PER** MN-1-110 **AND PUT** a copy of the Attachment PC-1 in the Control Room PC-1 Log.

_____/_____
Independent Verifier / Date

3. **RECORD** the calibration data for each counter/timer below. N/A any unused lines.

	Serial No.	Cal. Due Date:
Counter/Timer 1	_____	_____
Counter/Timer 2	_____	_____
Counter/Timer 3	_____	_____
Counter/Timer 4	_____	_____

- F. **ISSUE** the first set of fuel/CEA moves **PER** Attachment FH-305-4, Modification to the Fuel/CEA Move Sequence.

_____/_____
NFM-SE / Date

1. **ISSUE** other sets of moves **PER** Attachment FH-305-4 as directed by the NFM-SE.

6.2 Core Alterations (Continued)

G. Steps to begin core alterations:

1. **VERIFY** that Initial Condition Steps 4.5.C and 4.5.D are complete.

_____/_____
NFM-SE / Date

2. **VERIFY** all applicable sign-off's in section 6.1 and 6.2A thru 6.2.F are complete.

_____/_____
NFM-SE / Date

3. **COMPLETE** an Attachment FH-305-11, Core Alterations Restart Checklist.

_____/_____
NFM-SE / Date

- I. **VERIFY** once every 12 hours during core alterations that voice communications are operational on Attachment FH-305-7, Voice Communications Log Sheet.
[B-11]

NOTE:

The steps in the subsections of 6.2.J and 6.2.K detail the RCRO's interaction with the four refueling stations. Steps 6.2.J and 6.2.K may be performed in any order and at the same time as determined by the RCRO. This will allow the RCRO to coordinate several steps on the SNM Form 2 to be in progress simultaneously (involving separate pieces of refueling equipment) if he has verified that there will be no interference. Additionally, the RCRO (in conjunction with the FHS and NFM-LE) may coordinate that the SNM Form 2 steps be skipped or performed out of sequence if he has verified that there will be no interference.

NOTE:

Three-way communications shall be used as described in NO-1-200.

J. RCRO Interaction With the RFM and SFHM Operators

1. **INFORM** the personnel of the SNM Form 2 step number, the bridge and trolley coordinates and/or location for the "FROM" move, and the mast or CEA Handling Tool orientation.
2. **RECEIVE** acknowledgment from the personnel of the SNM Form 2 step number, the bridge and trolley coordinates and/or location for the "FROM" move, and the mast or tool orientation **AND VERIFY** they are correct.
3. **INFORM** the personnel that the move information is correct and to proceed to the "FROM" location.
4. **WHEN** the machine has been positioned over the "FROM" location, **THEN CONFIRM** with the personnel that the location and orientations are correct.

6.2 Core Alterations (Continued)

5. **IF** the move involves a fuel assembly, **THEN REQUEST** the personnel to determine whether or not the assembly has a CEA or Guide Tube Insert(s) in it, **RECEIVE** notification from the personnel, **AND VERIFY** that the information is correct.
6. **INFORM** the personnel that the assembly or CEA may be grappled.
7. **RECEIVE** notification from the personnel that the assembly/CEA is grappled and being withdrawn.

NOTE:

For an assembly being withdrawn using the SFHM, it may be possible for the SFHM operator to read the serial number using the SFHM camera.

8. **RECEIVE** notification from the personnel of the weight of the assembly/CEA being withdrawn.
 - a. **RECORD** the weight of the assembly/CEA on the SNM Form 2.

NOTE:

The new batch of fuel assemblies (_____) are "SHINY". All other assemblies are "DARK".

- b. **IF** a fuel assembly is being removed from the core or RFP upender, **THEN RECEIVE** notification from the RFM personnel whether the assembly is "SHINY" or "DARK" in appearance **AND VERIFY** it is correct. **RECORD** in the "S/D" column either an "S" or a "D," as appropriate. **[B-2]**

NOTE:

The count rate period is typically 100 seconds.

- c. **IF** a CEA was removed from the core, **THEN VERIFY** that the count rate is satisfactory.
 - (1) **INFORM** the RFM personnel when the count rate is satisfactory.
9. **INITIAL** the "VER" column in the "FROM" section of the SNM Form 2.
10. **INFORM** the personnel of the SNM Form 2 step number, the bridge and trolley coordinates and/or location for the "TO" move, and the mast or tool orientation.
11. **RECEIVE** acknowledgment from the personnel of the SNM Form 2 step number, the bridge and trolley coordinates and/or location for the "TO" move, and the mast or tool orientation **AND VERIFY** that they are correct.
12. **INFORM** the personnel that the move information is correct and to proceed to the "TO" location **AND INITIAL** the "VER" column in the "TO" section of the SNM Form 2.
13. **WHEN** the machine has been positioned over the "TO" location, **THEN CONFIRM** with the personnel that the location and orientations are correct.

6.2 Core Alterations (Continued)

14. **INFORM** the personnel that the assembly or CEA may be inserted into the "TO" location.

NOTE:

The new batch of fuel assemblies (_____) are "SHINY". All other assemblies are "DARK".

15. **IF** a fuel assembly is being moved into the SFP Upender, **THEN RECEIVE** notification from the SFHM personnel whether the assembly is "SHINY" or "DARK" in appearance and has/has not a "CREDITED CEA" **AND VERIFY** it is correct. **RECORD** in the "S/D/C" column either an "S", "D," or "C" as appropriate. **If** the assembly is one which hosts a credited CEA, then **VERIFY** with upender personnel that the assembly indeed has a CEA. **[B-2] [B-160]**

NOTE:

The count rate period is typically 100 seconds.

16. **IF** a fuel assembly was inserted into the core, **THEN VERIFY** that the count rate is satisfactory.
- INFORM** the RM personnel when the count rate is satisfactory.
 - INFORM** the RM personnel that the assembly may be ungrappled.
17. **RECEIVE** notification that the "TO" location contains an assembly or CEA. **[B-2]**

NOTE:

The weight of the empty grapple is about 0 lbs. (SFHM), 220 lbs. (RM) or 110 lbs. (CEA Handling Tool). A reading of about 80 lbs. (SFHM), 300 lbs. (RM) or 190 lbs. (CEA Handling Tool) may indicate an inadvertently grappled CEA.

18. **RECEIVE** notification from the personnel of the weight of the empty grapple.
- IF** there are indications that the grapple is not empty, **THEN INFORM** the personnel to halt the move **AND ASSIST** the FHS in deciding the course of action to take to correct the problem.
 - VERIFY** the grapple is empty **AND RECORD** grapple weight on SNM Form 2.
19. **RECEIVE** notification from the personnel of the completion of the move.
20. **RECORD** the date and time **AND INITIAL** the "STEP COMP" block on the SNM Form 2.
21. **UPDATE** the tag board.

6.2 Core Alterations (Continued)**NOTE:**

If the transfer carriage is empty, a SNM Form 2 is not required to move between pools.

NOTE:

Three-way communications shall be used as described in NO-1-200.

NOTE:

In order to minimize the time required to close the transfer tube gate valve in response to a loss of Refueling Pool level, the Transfer Carriage should be moved to the SFP side when the Transfer Machine is not in use for an extended period. **[B-137]**

K. RCRO Interaction With the Transfer Machine Operators

1. **WHEN** the transfer carriage is to be sent from one pool to the other pool, **THEN:**
 - a. **INSTRUCT** the Transfer Machine Operator to transfer the carriage.
 - b. **RECEIVE** notification from the opposite Transfer Machine Operator when the carriage has been received.

NOTE:

Step 6.2.K.1.c is not required if the transfer carriage is empty.

- c. **RECORD** the date and time **AND INITIAL** the "STEP COMP" block on the SNM Form 2.
 - d. **UPDATE** the tag board.
- L. VERIFY** that all temporary/alternate configuration listed on Attachment FH-305-15, Final Configuration Restoration Sheet, have been restored to their correct configuration.

NOTE:

Step 6.2.M applies for a certain type of CEA crediting during an incore shuffle. Step 6.2.M is only required to be performed if CEAs were swapped **AFTER** the fuel shuffle. If the CEA swaps were performed **BEFORE** the shuffle, this step is N/A.

- M. After the fuel shuffle, BUT prior to the CEA swap VERIFY** that the CEAs are in their intermediate location per reference 3.2.W by performing the following:
1. **MARK** on Attachment FH-305-14B or FH-305-14D the locations where CEAs exist in the core after the fuel shuffle.
 2. **VERIFY** the locations marked on the appropriate attachment against reference 3.2.W.
 - a. **IF** the locations marked match reference 3.2.W, **THEN** proceed with the CEA swap,
 - b. **IF** the locations **DO NOT** match reference 3.2.W, **THEN** take action to correct the error.

6.2 Core Alterations (Continued)

- c. **DETERMINE** the cause of the error and correct as appropriate, **THEN** proceed with the CEA swaps.

N. **RECORD** the date and time of the completion of the core alterations.

Core Alterations Completed Time: _____

Date: _____

NOTE:

Step 6.2.O should be marked "N/A" if performing core offload.

O. **Core Verification**

- 1. **COMPARE** the core tag board and SNM computer data base against the final, Q/A'd core reload map. **[B-36]**

- a. **NOTE** any discrepancies on Attachment FH-305-9B, Unit 1 - Core Verification - Control Room or Attachment FH-305-9D, Unit 2 - Core Verification - Control Room.

_____/_____
NFM-SE Date

- 2. **ESTABLISH** communications between the Control Room and the RFM.

- a. **ENSURE** that a Controlled Copy of Step 6.2.O.3 is on the RFM.

_____/_____
NFM-SE Date

- b. **ENSURE** the correct Attachment FH-305-9 is being used for the Unit being refueled.

_____/_____
NFM-SE Date

- 3. **PERFORM AND RECORD** on a VCR tape and/or DVD disc the verification:

NOTE:

Steps 6.2.O.3.a through 6.2.O.3.c and 6.2.O.3.e through 6.2.O.3.f are performed on the RFM by the NFM-SEs. Steps 6.2.O.3.d and 6.2.O.3.f.3 are performed in the Control Room by the RCRO.

- a. **VERIFY** with the RCRO in the Control Room that the fuel assembly serial number, orientation, and the location of the CEA/GTI are correct using the underwater camera.

- b. **INDEPENDENTLY VERIFY** the fuel assembly serial number, orientation, and the location of the CEA/GTI using the underwater camera.

6.2 Core Alterations (Continued)**NOTE:**

Steps 6.2.O.3.c through 6.2.O.3.d may be performed in parallel.

- c. **RECORD** the fuel assembly serial number, orientation and the location of the CEA/GTI and any debris or anomalies on Attachment FH-305-9A, Unit 1 - Core Verification - Containment or Attachment FH-305-9C, Unit 2 - Core Verification - Containment.
- d. **RECORD** on Attachment FH-305-9B, Unit 1 - Core Verification - Control Room or Attachment FH-305-9D, Unit 2 - Core Verification - Control Room, the fuel assembly serial number, orientation, and location of the CEA/GTI.
- e. **RETURN** to Step 6.2.O.3.a for each core location.
- f. **IF** the CEA serial numbers and orientation were not already verified in Step 6.1.A **OR** if CEAs were moved within the vessel, **THEN PERFORM** Steps 6.2.O.3.f.1 thru 6.2.O.3.f.6, else **GO TO** Step 6.2.O.4.
 - (1) **VERIFY** with the RCRO in the Control Room that the CEA serial number and orientation is correct using the underwater camera.
 - (2) **INDEPENDENTLY VERIFY** the CEA serial number and orientation using the underwater camera.

NOTE:

Steps 6.2.O.3.f.3 through 6.2.O.3.f.4 may be performed in parallel.

- (3) **RECORD** the CEA serial number, orientation and any anomalies on Attachment FH-305-9A, Unit 1 - Core Verification - Containment or Attachment FH-305-9C, Unit 2 - Core Verification - Containment.
 - (4) **RECORD** on Attachment FH-305-9B, Core Verification - Control Room or Attachment FH-305-9D, Unit 2 - Core Verification - Control Room, the CEA serial number and orientation.
 - (5) **RETURN** to Step 6.2.O.3.f.1 for each core location with a CEA.
 - (6) **INITIAL AND DATE** all completed copies of Attachment FH-305-9A and Attachment FH-305-9B or Attachment FH-305-9C and Attachment FH-305-9D as appropriate.
4. **VERIFY** that all Attachment FH-305-9As and Attachment FH-305-9Bs or Attachment FH-305-9Cs and Attachment FH-305-9Ds are complete **AND COMPARE** against each other and the final, Q/A'd core reload map. **[B-36]**

_____/_____
NFM-SE / Date

6.2 Core Alterations (Continued)

- a. **RESOLVE** any discrepancies (remove debris, etc.) noted on the Attachment FH-305-9As or Attachment FH-305-9Bs. N/A if not performed.

_____/_____
NFM-SE / Date

- (1) **PERFORM** fuel/CEA movements PER Steps 6.2.J and 6.2.K as necessary to resolve physical discrepancies **AND RE-VERIFY** the location(s) where the fuel/CEA movement occurred PER Steps 6.2.O.2 through 6.2.O.4.a.(1). N/A if not performed.

_____/_____
NFM-SE / Date

- b. **REMOVE** the Controlled Copy of Step 6.2.O.3 from the RFM.

_____/_____
NFM-SE / Date

6.3 DISCONNECT the 1/M Computer

NOTE:

Step 6.3 may be marked N/A for an offload at the discretion of the NFM-LE to allow the 1/M computer to remain connected.

NOTE:

Steps 6.3 through 6.6 may be performed in any order and in parallel.

CAUTION:

The possibility for disabling the audible count rate speakers exists. If a BNC "T" connector was used on the GAMMA METRICS J14 connector ensure that when the cables are disconnected from the RPS wide range NI drawers that any other component connected to the other connection on the "T" connector remains connected to the GAMMA METRICS J14 connector.

- A. **RECEIVE** Control Room permission to disconnect the 1/M Computer from the RPS.

_____/_____
NFM-SE / Date

- B. **DISCONNECT** the 1/M Computer cables from the NI drawer's (Channels A, B, C, and D) J-14 connectors PER the applicable MN-1-110 Attachment PC-1.

_____/_____
NFM-SE / Date

- C. **VERIFY** the cables are removed from the NI drawer's J-14 connectors on Channels A, B, C, and D) PER the applicable MN-1-110 Attachment PC-1.

_____/_____
Independent Verifier / Date

- D. **NOTIFY** the Shift Manager that the cables are removed **AND REMOVE** the PC-1 copy from the Control Room PC Log.

_____/_____
NFM-SE / Date

6.4 **NOTIFY** the Shift Manager that core alterations are complete.

_____/_____
NFM-SE Date

6.5 **ENSURE** the dispersion of fuel recently removed from the reactor meets the minimum dispersion requirements (as stated below) within 60 days of core shutdown.

- "Knight's move" pattern apart if less than 4 months since reactor shutdown
- Checkerboard pattern if greater than 4 months since reactor shutdown
- No dispersion necessary if greater than 10 months since reactor shutdown.

Exception: Dispersion not required during interim core offload or shuffle period, or to support accelerated exposure of spent fuel rack poison sample coupons. **[B-181]**

_____/_____
NFM-SE Date

6.6 **SFP Fuel Movement Independent of Core Alterations**

- ENSURE** that an ISFSI cask is not in the SFP.
- ENSURE** that fuel moves are issued PER Attachment FH-305-4.
- BRIEF** the CRS and personnel that will participate in the SFP fuel movement on applicable sections of Attachment FH-305-2, Pre-Evolution Brief Guide. **[B-62]**
- NOTIFY** the Shift Manager that fuel handling will begin and to log performance of the procedure. **[B-25]**
- PERFORM** the fuel moves PER OI-25A and using the SNM Form 2.

7.0 POST-PERFORMANCE ACTIVITIES

NOTE:
Steps 7.1 through 7.4 may be performed in any order.

7.1 ENSURE that the tag boards are updated.

_____/_____
NFM-SE Date

7.2 ENSURE that the SNM computer database is updated.

_____/_____
NFM-SE Date

NOTE:
Step 7.3 should be marked "N/A" if performing core offload.

7.3 VERIFY that NEOP-13/23 Figures 1/2-I.A.1 and 1/2-I.A.3 have been updated for the current cycle. [B-56]

_____/_____
NFM-SE Date

7.4 ENSURE that any Refueling Equipment trend data is sent to the Refueling Equipment System Engineer. N/A if no trend data was collected.

_____/_____
NFM-SE Date

7.5 PERFORM a page check of this procedure, include all additional pages documented on the Attachment FH-305-1s.

_____/_____
NFM-SE Date

8.0 BASES FOR REVISIONS/CHANGES

Entry No.	Revision Number	Change Number	Basis for Step/Revision/Change
B-1	0		Calvert Cliffs Industrial Safety Manual - to promote safety around the Refueling Pool and spent fuel pool.
B-2	0		To maintain the K_{eff} of the core below 0.95 by limiting the types of fuel assembly configurations. (Letter, G. C. Creel (BG&E), to Document Control Desk (NRC), "Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318, 10 CFR Part 21 Written Report: Nuclear Fuel-Potential Loss of Shutdown Margin," dated March 15, 1989).
B-10	0		Technical Specification 3.9.1's Surveillance Requirement 4.9.1.2 is listed on the Technical Specification Cross Reference List (TSCRL) as being controlled by FH-305. If changes to FH-305 occur that cause the TSCRL to be updated then NFM shall report this to the Licensing Unit per RM-1-102.
B-11	1		To meet the requirements of T.N.C. 15.9.2.
B-13	0		To prevent personnel over exposure from sources and radiation that could stream through unvented and unshielded poles while working in the pools. (NETWORK OE 3478 and NRC INFO Notice 90-33)
B-14	0		NRC Bulletin 78-08 requires positive control and posting, as necessary, to prevent excessive radiation exposure from the fuel transfer tube during refueling operations. Permanent shielding is provided, but radiation streaming during irradiated fuel movement requires restricted access to the fuel transfer tube access hatch area inside of containment. Access restriction is initiated by Radiation Control - Operations, at the beginning of each refueling evolution, where notification of Radiation Control - Operations to initiate the restrictions is controlled by NFM's Refueling Procedure.
B-17	0		To ensure this procedure meets a commitment made in Change 89-1243 to AOP-6D which states that "Nuclear Engineering Unit procedures will ensure fuel handlers place fuel bundles and fuel handling equipment in safe configurations and that the Control Room has been notified of the [fuel handling] incident."
B-18	0		The RFP level alarm band of ± 0.2 feet and additional boron to compensate for dilution ensure that operators will be able to respond to a RFP dilution before shutdown margin is lost.
B-19	0		To ensure that the boron concentration of the reactor coolant system (RCS) and the Refueling Pool shall be maintained equal to or greater than the value specified on REP-11 Attachment 11-12 (REP-21 Attachment 21-12) without any stratification of the RCS or the Refueling Pool.
B-20	0		To ensure as a measure of conservatism that at the beginning of refueling operations three Wide Range NIs are operable and that, if at any time during refueling only two NIs are operable, a mechanism is in place to ensure that a replacement NI will be available if one of the remaining two NIs becomes inoperable.

8.0 BASES FOR REVISIONS/CHANGES (Continued)

Entry No.	Revision Number	Change Number	Basis for Step/Revision/Change
B-22	0		To ensure that all fuel assemblies are assured of having debris-free guide tubes. During the Pre-Refueling Core Scan (FH-6, Rev. 17, Appendix D) lockwire was found on top of Unit 2 Cycle 8's core (NCR 8152). This lockwire indicates that the potential exists for debris to get into fuel assembly guide tubes, which could lead to debris interference with CEA movement. (Similar to the event that occurred at Arizona Public Service where a ball bearing stopped a CEA from inserting.)
B-23	0		To ensure that the requirements for the closure of SOER 85-01 are met.
B-25	0		NO-1-204 requires the Shift Manager to log the performance of fuel handling procedures.
B-27	0		To ensure only radiation compatible storage containers are used and proper radiological controls are enforced to protect personnel from possible overexposure from unknown or unexpected sources in the SFP. For example, where polyurethane containers have been used at other plants for storage of highly radioactive material, the radiation exposure has disintegrated the polyurethane matrix and allowed "Hot Particles" to float to the pool surface riding on pieces of the buoyant polyurethane. (INPO SER 4-90, POEAC OI, 90-10-04G, COMMITMENT #009074)
B-32	0		To ensure that a fuel assembly that is to be withdrawn from the core is not inadvertently grappled on an outer guide post and to ensure that in the unlikely event that an assembly is misgrappled that there is no potential for dropping the assembly. (POSRC OI 90-041, OE 3666.)
B-33	0		To ensure compliance with LER 90-16, which requires that when communicating with Operations, directions shall be clear, precise, and component specific. The directions are to be repeated back in sufficient detail to ensure that they were understood.
B-36	0		To ensure that a final, approved core loading pattern is in place prior to startup following refueling (I & E Inspection report 81-04, and D. W. Latham to POSRC, "Technical Specifications Violations Noted in NRC Inspection Reports 50-317/81-04, 50-318/81-04; and 50-317/81-08, 50-318," September 2, 1981).
B-38	0		Letter, J. R. Brannon to C. J. Schnick, "Review of FH-6, Procedure to Connect Temporary Counters to the Wide Range Nuclear Instruments," I&C 90-885, 10/17/90.
B-39	0		Requiring a minimum RFP level of 65 feet ensures that a sufficient amount of water (at least 96 inches) covers the assembly when the hoist is raised to the "Hoist Up" position to provide adequate shielding for personnel on the RM. (FCR 89-3001 and NCR 11162)
B-41	0		NFM memo 82-352 and 85-233 commit to using administrative controls to prevent putting fuel into unanalyzed or unusable racks.
B-42	0		An Operator was fatally injured while attempting to board a moving Refueling Machine. The Operator's head was caught between the moving bridge and an adjacent stationary electrical panel mounted on the wall (SER #30-85).
B-55	0		To ensure that debris resistance fuel designs are used in the new reload Batch of fuel assemblies.
B-56	0		To ensure that the figures in the Technical Data Book, NEOP-13/23, are updated to reflect the new operating cycle. (NCR 11388)

8.0 BASES FOR REVISIONS/CHANGES (Continued)

Entry No.	Revision Number	Change Number	Basis for Step/Revision/Change
B-62	0		EN-1-311 requires that personnel be briefed before beginning SNM transfers.
B-101	0		Verbal instructions to skip a fuel move step shall be documented on the move sheet with the NFM-SE's name, date, and time of instructions. The NFM-SE shall insure proper repeat back of the verbal instructions. All modifications to issued fuel moves shall be made to the SFHM (RM) copy immediately after approval. (NFM 93-043)
B-105	0		To ensure that the Fuel Handling Equipment Operators restart on the correct fuel move sequence number. (Q/A Surveillance No. S-92-29 and NFM Memo NFM 92-377)
B-111	0		To ensure all procedure controlled MN-1-110 packages (MN-1-110-PCs) issued by the procedure are reviewed monthly PER MN-1-110. (NFM Memo 92-297)
B-112	0		To ensure excore detector coupling is maintained between at least 2 OPERABLE NI channels during core fuel handling. (Reg Guide 1.68 and Maine Yankee's Initial Startup Report)
B-113	0		The Operators shall Contact the Control Room Supervisor if there are any problems completing the moves due to equipment failure, interference, etc. Do not resume fuel movement until the NFM-SE has corrected any necessary paperwork and rebriefed the operators on the conditions that have changed.
B-114	0		The 100 ppm limit is meant to be a conservative indicator to look for possible RFP stratification. At a greater than 100 ppm difference, NFM will ensure an underwater Hydrovac is running to mix the RFP and will notify Chemistry to verify there is no stratification. The additional ppm is added to the minimum boron concentration to insure adequate margin in case of boron dilution. (T.S. 3.9.1)
B-127	0		To ensure that the commitment in Step 4.14.T of EN-1-113, Nuclear Fuel Reliability, is met.
B-128	0		To ensure that any leaking fuel assembly identified is not returned to the core without being repaired.
B-129	0		To ensure that no encapsulation tubes exist in the guide tubes of fuel to be reinserted back into the reactor after storage in the spent fuel pool.
B-132	0		To meet the requirements of 10CFR50.54(m)(2)(iv) for the Fuel Handling Supervisor.
B-135	0		To ensure that the boundaries of the fuel assembly drop analysis are documented. (NFM Memo NFM 96-028)
B-136	0		To eliminate the potential for grid-to-grid interference for intermediate moves. (NFM Memo NFM 96-028)
B-137	0		This is a suitable precautionary measure and a good practice that will minimize the response time required for a loss of Refueling Pool level. (NFM Memo NFM 95-266).
B-138	0		NRC Information Notice 95-56 indicated that both fuel transfer and equipment transfer can significantly increase dose rates around the transfer tube.

8.0 BASES FOR REVISIONS/CHANGES (Continued)

Entry No.	Revision Number	Change Number	Basis for Step/Revision/Change
B-141	0		UFSAR Section 9.7.3.3 requires that the alignment of the CEA Handling Tool be visually verified by a licensed operator prior to grappling.
B-146	0		To comply with the requirements of NO-2-100 that all individuals involved in activities that could affect reactivity, be briefed.
B-149	0		To ensure that lifting forces do not damage fuel assembly grids. Reference CE Letter B-89-095, dated June 29, 1989.
B-152	0		To ensure that the SFP area is maintained at a negative pressure relative to the Auxiliary Building whenever SFP ventilation is required to be operable (LER 97-001).
B-160	0		SE00256 for crediting CEAs in association with the refueling boron concentration.
B-172	5	04-001	SE00443/ESP200200274, supp 018 for crediting CEAs in association with the refueling boron concentration during an incore shuffle.
B-175	5		To preclude insertion of insufficiently burned fuel into the Unit 2 SFP due to boraflex degradation. (TS 3.7.17 and FOSU DCALC CA06015)
B-176	6		Calculation CA05698, Criticality Analysis for Units 1 and 2 Onload shows that when loading fresh VAP fuel enriched to 5% w/o in the specific loading patterns described and a minimum boron concentration of 1350 ppm, it is impossible to exceed 0.95 Keff.
B-181	8		NRC Letter, R. W. Borchardt for J.E. Dyer to Holders of Licenses for Operating Power Reactors as listed in enclosure 1 NRC Staff Guidance for Use in Achieving Satisfactory Compliance with February 25, 2002, Order B.5.b, February 25, 2005
B-182	9		To ensure all SFP cells have been cleaned after 5/1/2006 prior to placing an assembly, gridcage, trashcan, dummy or surveillance assembly into the cell. CAT 1 Root Cause Analysis IR200600026, IRE-011-547
B-184	11		To ensure that spent fuel pool decay heat removal capability is not compromised per ES200500540.

9.0 RECORDS

9.1 Records generated by this procedure shall be captured and controlled. Prior to transferring to Records Management for retention, legibility and completeness of the record shall be verified by the transmitting organization.

9.2 Retention Requirements

- A. This procedure and all records generated by this procedure are lifetime plant documents.
- B. This procedure and all records generated by this procedure shall be controlled **PER** PR-3-100, Records Management.

Attachment FH-305-2
PRE-EVOLUTION BRIEF GUIDE
Page 1 of 2

Sequence No. _____

Brief Leader: _____

Date: _____

PRE-EVOLUTION BRIEF GUIDE

This attachment shall be used as a guide when performing the Pre-Evolution brief in accordance with NO-1-100, NO-1-200, NO-1-117 and NO-2-100. Include a discussion of Basis as applicable. All steps may not apply to the planned activity.

General Information:

All communications involving control of plant equipment shall be clear, concise, and specific using proper terminology and three way communications. The recipient shall repeat the communication back in sufficient detail to allow the originator to ensure that the communication was understood. **[B-33]**

The RM and SFHM camera should be used to view any fuel assembly being withdrawn or inserted. The RM and SFHM Operator should tell the RCRO of any obvious assembly damage or deformation and the RCRO should record it on Attachment FH-305-3, Fuel/CEA Handling Problem Documentation Sheet. If the RM camera is not operable, the FHS shall determine if pool clarity is adequate so that the Spotter can satisfactorily view the assemblies as they are moved into the core and then the FHS shall direct the Spotter to closely monitor the assembly during movement. If clarity is a problem then an auxiliary camera may be used. The Shift Manager shall approve the alternative and document the approval in the Shift Manager's Log. The SFHM camera is not required for fuel movement in the SFP.

Review an SNM Form 2 with the RM and SFHM Operators plus the RCRO and FHS. All SNM Transfer Form 2s (SNM Form 2s) and tag boards shall at all times reflect the current status of all core components during Core alterations. For Core Component movement in the SFP independent of Core alterations only the SNM Form 2 shall be current and the tag board shall be updated at the end of the SFP movement. The RCRO or the NFM-SE may authorize that fuel move sequence steps be skipped, performed out of sequence, or performed at the same time as other steps, if he has verified that there will be no interference. Instructions to skip moves for SFP moves independent of Core Alterations shall be documented on the move sheet with the name (initials) of the NFM-SE, date and time of the instructions. **[B-101]**

For SFP moves independent of core alterations, the SFHM operator shall contact the Control Room Supervisor if there are any problems completing the moves due to equipment failure, interference, etc. Fuel movement shall not resume until the NFM-SE has corrected any necessary paperwork and rebriefed the operators on the conditions that have changed. **[B-113]**

Review Attachments FH-305-13, Instructions for the FHS During Refueling, and FH-305-10, Instructions for the RCRO During Refueling, with the FHS and RCRO, respectively.

For moves involving temporary/alternate configurations, SHUFFLEWORKS should be kept as updated as possible to ensure a smooth transition back to the correct configuration. These temporary or alternate configurations shall be logged on Attachment FH-305-15.

Recently discharged fuel should be dispersed and not be placed in rack feet locations. Dispersion is not required during an interim core offload period or to support exposure of spent fuel rack poison sample coupons. **[B-181]**

CEAs with 8" Ag-In-Cd slugs are not to be mixed with CEAs with 12' Ag-In-Cd slugs for placement on a dual CEA extension shaft and CEAs with 12' Ag-In-Cd slugs maintain quarter core symmetry (rotational or reflective) for the regulating banks and shutdown banks subject to symmetry testing. Half core symmetry is to be maintained for any remaining shutdown banks.

Review Section 5.0 as applicable.

Attachment FH-305-2
PRE-EVOLUTION BRIEF GUIDE
Page 2 of 2

Sequence No. _____

Reactivity Management / Nuclear Safety

Personnel are familiar with the impact performing this procedure will have on Reactivity Management. Personnel are aware of what Reactivity Management controls are employed by this procedure.

[B-146]

Reactivity Changes

1. Whenever it is necessary to add water to the RCS, the makeup water shall be from a water source that has a boron concentration equal to or greater than the value specified on Step 6.2.A. Decontamination water is allowed as long as the source is not left unattended. The RFP level alarm will alarm prior to any significant dilution and any lighter concentrations of boric acid will remain near the pool surface away from the core. **[B-19]**
2. Any operation (other than Core Component movement) which could adversely affect the reactivity status if the reactor during Core Alterations (such as makeup water addition except for non-continuous rinse down activities for decontamination purposes) shall only be performed when no Core Component movement is taking place. Prior approval of the Shift Manager and the FHS is required.
3. Inadvertent withdrawal of a CEA is not a nuclear criticality problem but may result in a reduction in shutdown margin as some CEA's are being credited to reduce the refueling boron concentration.

Discuss the meaning of "SHINY" and "DARK" fuel assemblies and how this insures the 5% shut down margin. **[B-2]**

Discuss the significance of Credited CEAs and the controls in this procedure to ensure they remain in their host assemblies. **[B-160]**

Discuss minimum burnup requirements for fuel assemblies placed in the south (Unit 2) SFP racks due to boraflex degradation. **[B-175]**

Discuss the Significance of the fuel move verification controls.

This Procedure may be safely secured at any time once all fuel assemblies have been removed from the refueling equipment and have been placed in approved locations.

Personnel Safety:

Watch for pinch points around moving equipment. No one is to board or exit any moving equipment without verbal permission from the Machine Operator. **[B-42]**

Plant Response:

This evolution will not affect the operating unit. The only effect on operation will be relative to ventilation requirements. SFP ventilation with charcoal filters is required for movement of recently irradiated fuel (in a critical reactor within the previous 32 days) in the Auxiliary Building.

An unexpected Area RMS alarm may indicate a fuel assembly has been damaged or an unexpected radiation source has been removed from the pool. The Control Room should respond to any unexpected fuel handling area RMS alarm during fuel movement as if it were a fuel handling incident until verified otherwise (secure any CTMT purges and follow AOP-6D). **[B-17]**

Additional Comments (changes, operating experiences, trends, temporary equipment in the RFP and SFP, equipment concerns, special operational concerns, fuel move step to start at, etc.) **[B-105]:**

**Attachment FH-305-3
FUEL/CEA HANDLING PROBLEM DOCUMENTATION SHEET**

Sequence No. _____

PROBLEM	RESOLUTION	DATE/TIME/ INITIAL (RCRO)

Attachment FH-305-4
MODIFICATION TO THE FUEL/CEA MOVE SEQUENCE
Page 1 of 3

Instructions

Modifications to the move sequence shall be completed by an NFM-SE (the Initiator). If the move involves alternate or temporary locations or reorientation of a fuel assembly or CEA then the Reviewer shall be the NFM-LE. Alternate locations or orientations of core components shall be logged on Attachment FH-305-15.

Initiator's Responsibilities

For each item on the checklist, the Initiator shall verify that the item was completed correctly by ensuring that:

- (1) Moves are written legibly and the ID is correct for the core component to be moved.
- (2) The core component to be moved is located in the "FROM" location and is oriented correctly as per the SNM computer database.
- (3) The Refueling Machine and SFHM bridge and trolley coordinates are in agreement with the Fuel Move Log documentation. This may be N/A'd if the moves were generated by a QA'd computer program or for CEA only moves.
- (4) The Refueling Machine and SFHM mast or CEA Handling Tool orientations are in agreement with the Fuel Move Log documentation. This may be N/A'd if the moves were generated by a QA'd computer program. Unit 1 assemblies should be oriented North and CEAs Northwest. Unit 2 assemblies should be oriented South and CEAs Southeast.
- (5) The "TO" location is an authorized location in the SFP, F/A, an upender carriage or if to a core location it is per a QA'd final core loading position or other analyzed alternative core location and is allowable. For an intermediate move with the purpose of changing the fuel assembly orientation, or mast orientation, the "TO" location may be the ICI Trash Can Racks. If the "TO" location is a cell in the SFP then ensure it has been cleaned after 5/1/2006 OR the use of the cell has been approved by the Spent Fuel Pool Coordinator. **[B-2] [B-36] [B-41] [B-136] [B-182]**
- (6) For core onloads, the core fuel pattern maintains detector coupling between at least two OPERABLE NI channels and the core fuel mass per Reference 3.2.X, with one audible count rate monitoring the core mass. For core offloads, the core fuel pattern maintains detector coupling between at least two OPERABLE NI channels and the core fuel mass until two rows of fuel assemblies remain in the core. Coupling shall mean at least two adjacent rows of fuel connected to the core mass. This is normally true for incore shuffles. **[B-112] [B-176]**
- (7) Mark "S" for shiny (unirradiated) or "D" for dark (irradiated) or "C" for credited CEA under the fuel assembly serial number on the RCRO copy of the SNM Form 2s. **[B-2]**
- (8) The fuel assemblies that are listed on Attachment FH-305-12, Fuel Assembly Re-Certification Log Sheet, are approved for reuse. This may be N/A'd if there are no fuel assemblies on the SNM Form 2s listed on the Attachment FH-305-12.
- (9) If the "TO" location or orientation is an alternate or temporary configuration, then the core component is logged on Attachment FH-305-15. Ensure that the total number of fuel assemblies that are in alternate/temporary orientations is less than the maximum allowed. This may be N/A'd if there are no alternate or temporary locations or orientations.
- (10) Credited CEAs exist in their Host Assembly prior to insertion into the core. N/A if the sequence does not involve moving host assemblies/credited CEAs or is an incore shuffle. **[B-160]**
- (11) For CEA moves in the core, ensure that credited CEAs ARE NOT being removed from their host assembly. N/A for non CEA moves in the core or for an incore shuffle. **[B-160]**

Attachment FH-305-4
MODIFICATION TO THE FUEL/CEA MOVE SEQUENCE
Page 2 of 3

- (12) The handswitch numbers are correct. 2: standard F/A, 3: standard F/A with CEA, 4: VAP F/A, 5: VAP F/A with CEA, 6: Dummy F/A
- (13) CEA swaps performed after an incore shuffle are in accordance with reference 3.2.W. N/A if performing an onload, offload or if not crediting CEAs. **[B-172]**
- (14) Fuel assemblies moved to the south (Unit 2) SFP racks meet minimum burnup and initial nominal enrichment requirements of Technical Specification 3.7.17 or are surrounded on all four adjacent faces by empty rack cells or other non-reactive materials. N/A if only moving fuel to north (Unit 1) SFP. **[B-175]**
- (15) Areva Lead Fuel Assemblies and fuel assemblies contacting the Areva Lead Fuel Assemblies are loaded/unloaded in accordance with ES Reference 3.2.Y. N/A if fuel to be moved is not Areva LFAs or surrounding fuel assemblies.
- (16) Moves to the SFP do not place fuel on rack spacers or in cells adjacent to fuel already on rack spacers.
- (17) Fuel assemblies discharged less than 10 months since reactor shutdown are not placed in SFP rack feet locations. **[B-181]**
- (18) CEAs with 8" Ag-In-Cd slugs are not mixed with CEAs with 12" Ag-In-Cd slugs for placement on a dual CEA extension shaft and CEAs with 12" Ag-In-Cd slugs maintain quarter core symmetry (rotational or reflective) for the regulating banks and shutdown banks subject to symmetry testing. Half core symmetry is maintained for any remaining shutdown banks. N/A if all CEAs have 12" slugs.
- (19) The 81-pin pin storage basket (PS-01) is not moved.

The Initiator shall document verification by initialing the applicable blocks on page 3. If the fuel move sequence modification is issuing fuel or CEA moves in the SFP only, then the Initiator shall only verify that items 1 through 5, 10, 14, 16, 17, 18 and 19 have been completed; N/A shall be entered for items 6 through 9, 11, 12, 13, and 15.

Reviewer's Responsibilities

- (1) The Reviewer shall verify that all items completed by the Initiator are correct and shall document the Reviewer's verification by initialing the applicable blocks.

Engineer Supervisor - Nuclear Fuel Management Responsibilities

The ES-NFM shall sign page 3 of 3 of this attachment with the number of steps and the date, indicating approval of the movements.

Special Nuclear Material Handling Supervisor's Responsibilities

The SNM-HS shall sign and date page 3 of 3 of this attachment when the SNM Computer Database has been updated to reflect the completed moves.

If the modification involves currently issued fuel/CEA moves then it shall immediately be issued to the appropriate fuel handling stations. **[B-101]**

**Attachment FH-305-4
MODIFICATION TO THE FUEL/CEA MOVE SEQUENCE
Page 3 of 3**

Sequence No. _____

Number of SNM Form 2's Attached: _____

Modification:

Reason For Modification:

Review Criteria	Initiator/Date	Reviewer/Date
1) Component ID		
2) Consistent with SNM computer database		
3) Bridge and trolley coordinates correct		
4) Mast orientations correct		
5) "To" location acceptable [B-2, B-36, B-41, B-136, B-182]		
6) NI coupling maintained [B-112] [B-176]		
7) RCRO copy marked "S"/"D"/"C" [B-2]		
8) Reuse approval		
9) Alternate or Temporary Configurations		
10) Credited CEAs in their host assembly [B-160]		
11) Credited CEAs not being moved in the core [B-160]		
12) Handswitch numbers are correct		
13) Incore Shuffle CEA crediting rules [B-172]		
14) Fuel assemblies moved to the south (Unit 2) SFP racks meet minimum requirements of TS 3.7.17. [B-175]		
15) Areva fuel assembly loading/unloading in accordance with Reference 3.2.Y		
16) No Fuel moved to rack spacers or adjacent to fuel already on one.		
17) Recently discharged fuel is not placed in SFP rack feet locations. [B-181]		
18) CEA slug length mixes and symmetry		
19) The 81-pin pin storage basket (PS-01) is not moved.		

TO

_____/_____/_____
APPROVED / STEPS / DATE
(ES-NFM/SM)

_____/_____
COMPLETED FORMS / DATE
& DATABASE UPDATED
(SNM-HS)

**Attachment FH-305-5
MINIMUM CREW REQUIREMENTS FOR CORE ALTERATIONS**

OPERATIONS:

1. Shift Manager
2. Refueling Control Room Operator
3. Refueling Machine Operator (Note 1)
4. Transfer Carriage Operators (2)
5. Spent Fuel Handling Machine Operator
6. Plant Operators (as required)
7. Fuel Handling Supervisor
8. Count Rate Monitor (Note 2)
9. Fuel Spotters (2) (Note 3)

Note 1: If the RFM operator is not a Licensed Operator then the FHS shall remain stationed on the RFM.

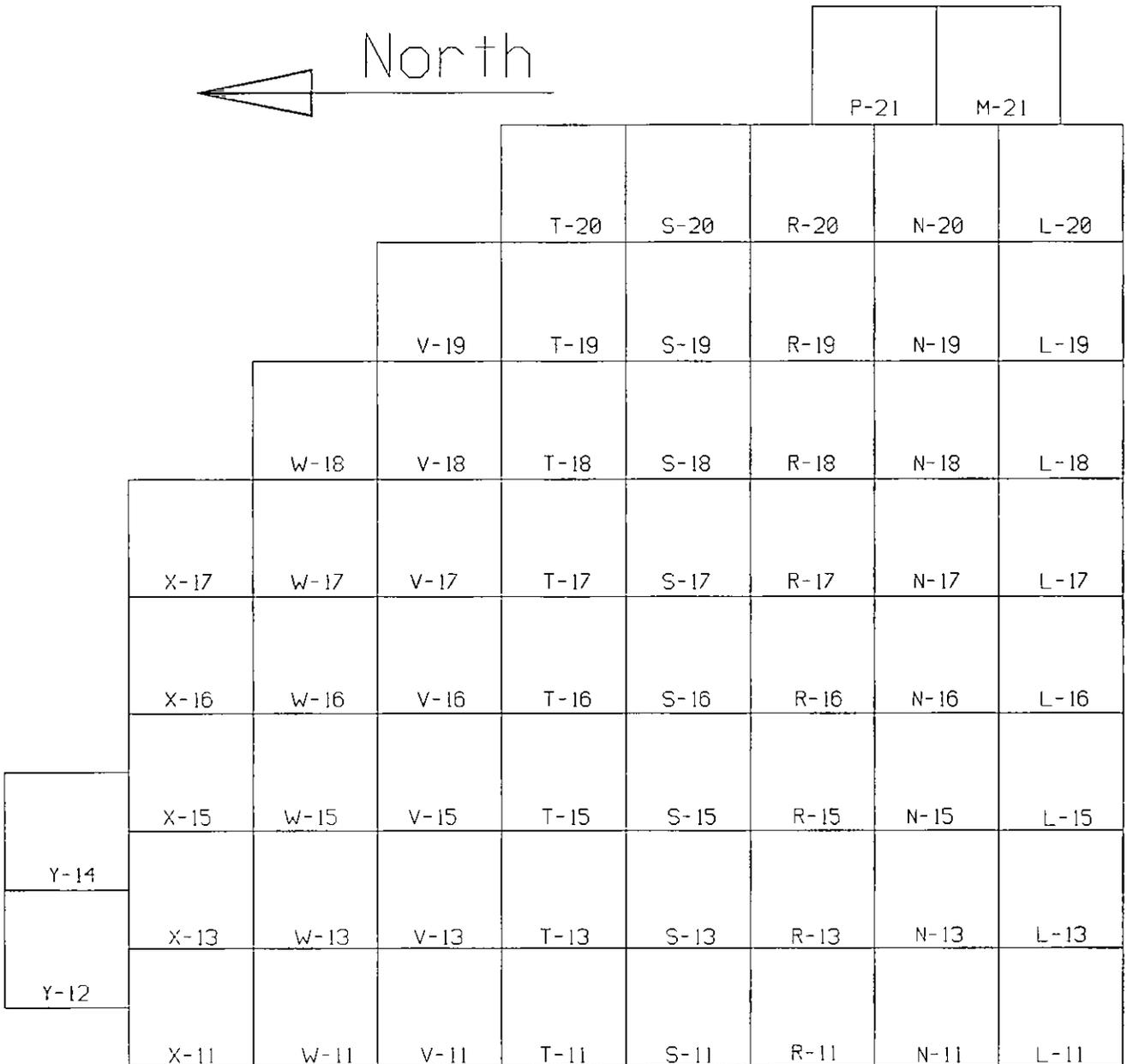
Note 2: If a personal computer is used for 1/M monitoring, the Refueling Control Room Operator may be the Count Rate Monitor.

Note 3: With FHS concurrence, the SFP Transfer Carriage Operator may be the Fuel Spotter for the SFHM Operator.

These minimum requirements apply for core alterations only.

Attachment FH-305-9A
UNIT 1 - CORE VERIFICATION - CONTAINMENT
Page 1 of 4 -- NE Quadrant

Sequence No. _____



Place a "X" in each location that contains a CEA/GTI.

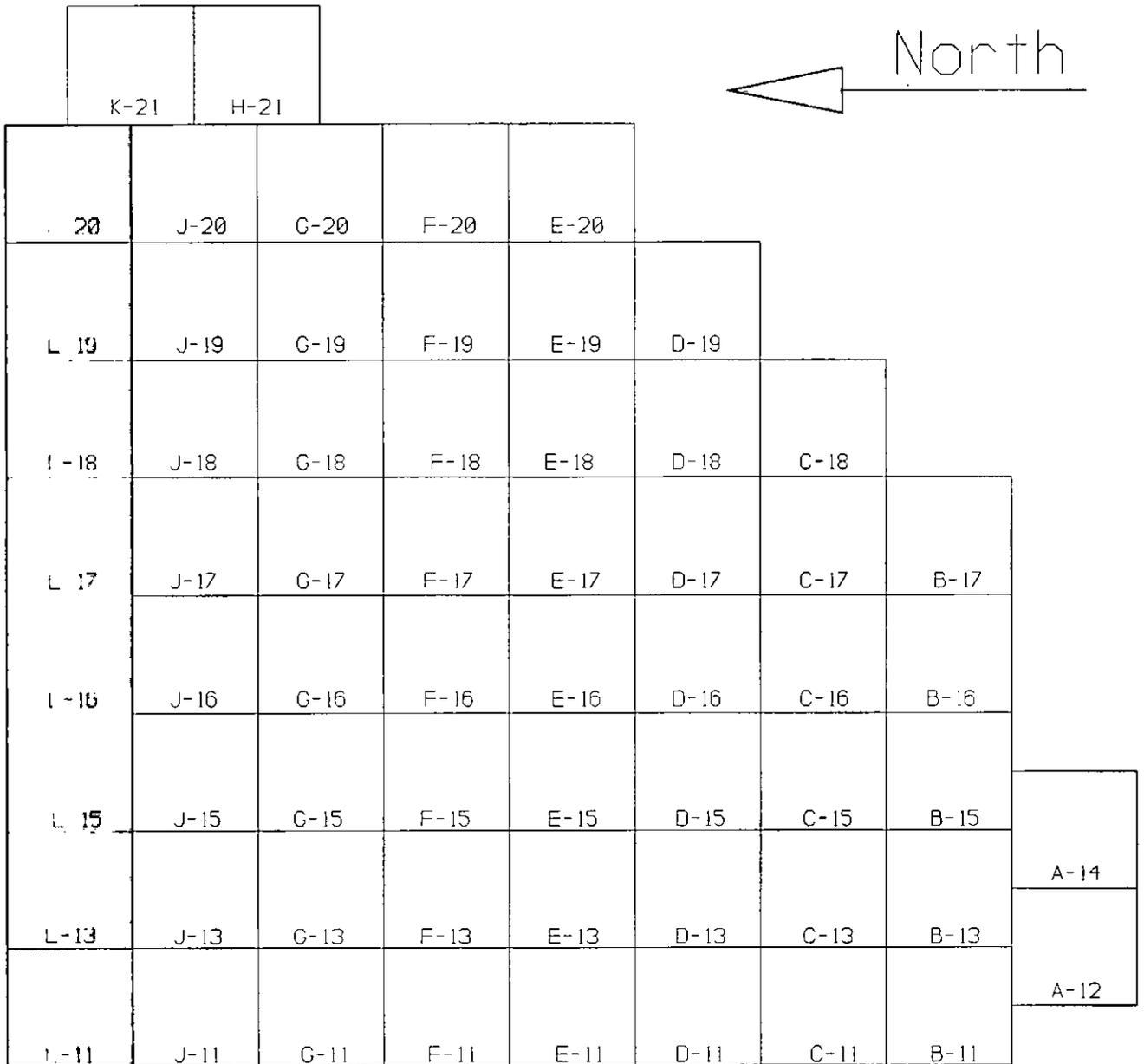
COMMENT	RESOLUTION
NFM-SE: _____ / _____ Initial Date	NFM-SE VERIFIER: _____ / _____ Initial Date

CORE ALTERATIONS

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Rev. 12
Page 46 of 73

Attachment FH-305-9A
UNIT 1 - CORE VERIFICATION - CONTAINMENT
Page 2 of 4 -- SE Quadrant

Sequence No. _____



Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____		NFM-SE VERIFIER: _____ / _____	
Initial Date		Initial Date	

Attachment FH-305-9A
UNIT 1 - CORE VERIFICATION - CONTAINMENT
Page 3 of 4 -- NW Quadrant

Sequence No. _____

	X-11	W-11	V-11	T-11	S-11	R-11	N-11	L-11
Y-10								
	X-9	W-9	V-9	T-9	S-9	R-9	N-9	L-9
Y-8								
	X-7	W-7	V-7	T-7	S-7	R-7	N-7	L-7
	X-6	W-6	V-6	T-6	S-6	R-6	N-6	L-6
	X-5	W-5	V-5	T-5	S-5	R-5	N-5	L-5
		W-4	V-4	T-4	S-4	R-4	N-4	L-4
			V-3	T-3	S-3	R-3	N-3	L-3
				T-2	S-2	R-2	N-2	L-2
						P-1	M-1	



Place a "X" in each location that contains a CEA/GTI.

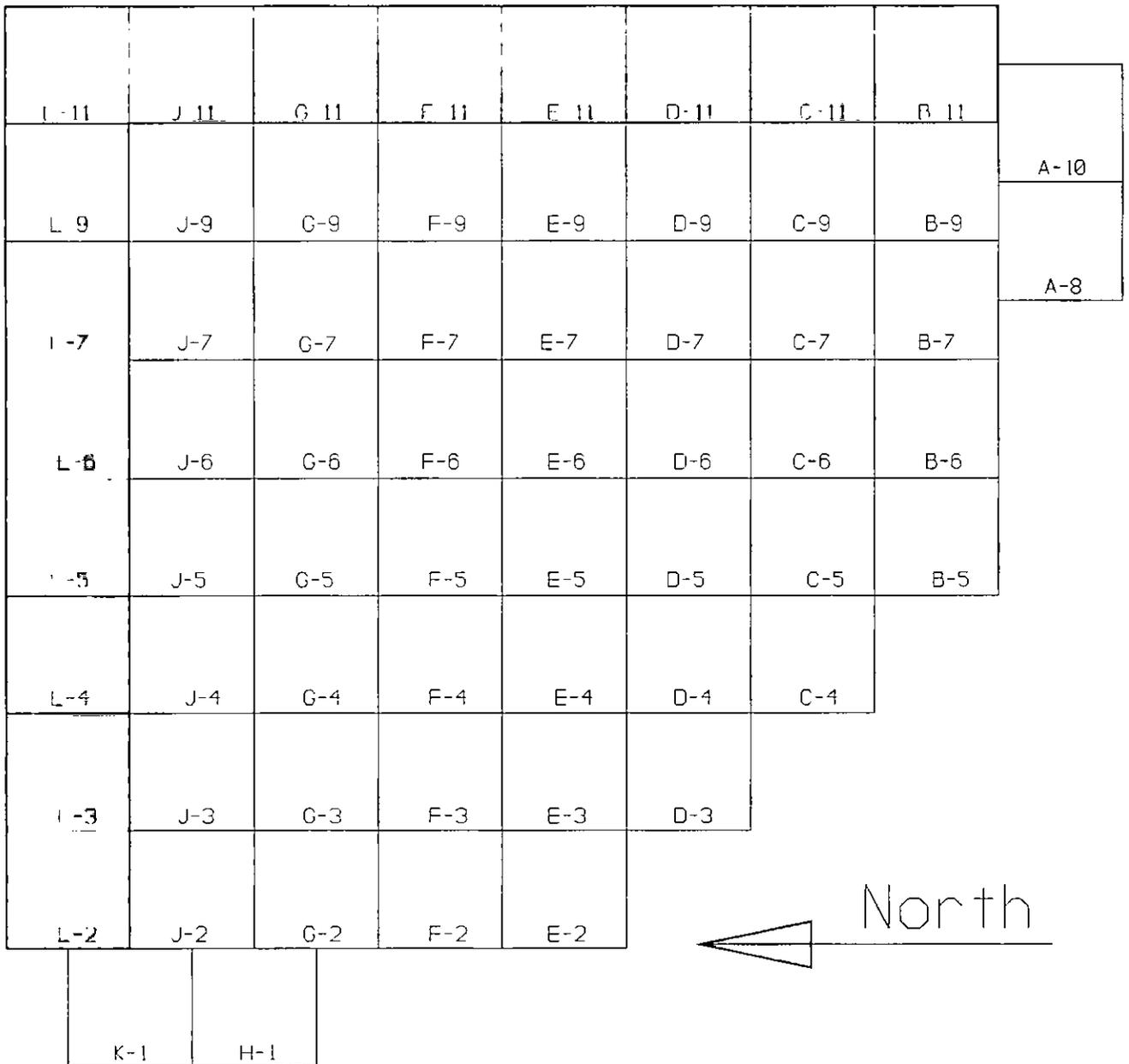
COMMENT		RESOLUTION	
NFM-SE: _____ / _____	Initial	Date	NFM-SE VERIFIER: _____ / _____
			Initial
			Date

CORE ALTERATIONS

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Attachment FH-305-9A
UNIT 1 - CORE VERIFICATION - CONTAINMENT
Page 4 of 4 -- SW Quadrant

Sequence No. _____



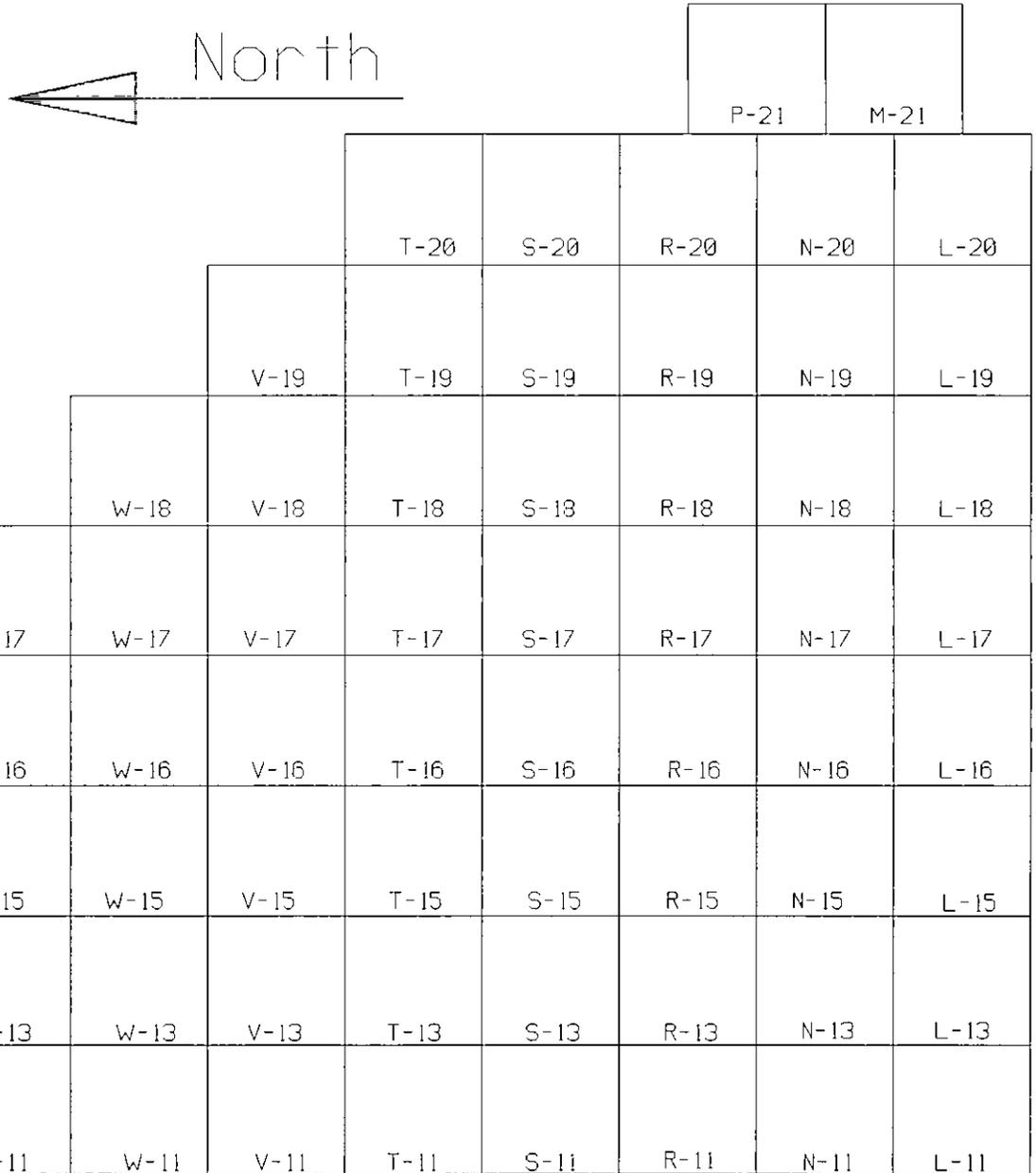
Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____		NFM-SE VERIFIER: _____ / _____	
Initial Date		Initial Date	

Attachment FH-305-9B
UNIT 1 - CORE VERIFICATION - CONTROL ROOM
Page 1 of 4 -- NE Quadrant

Sequence No. _____

Place a "X" in each location that contains a CEA/GTI.



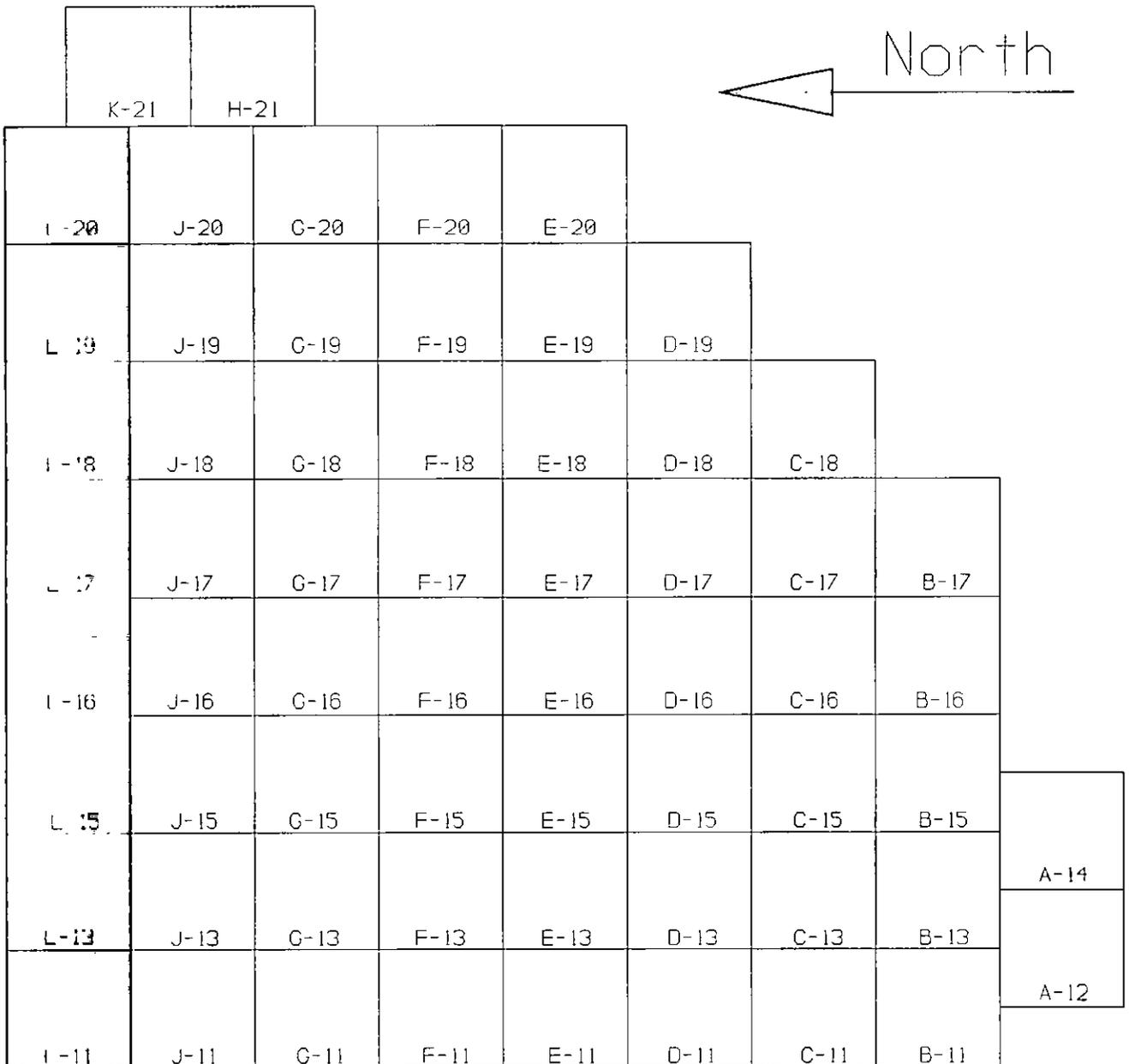
COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

CORE ALTERATIONS

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Rev. 12
Page 50 of 73

Attachment FH-305-9B
UNIT 1 - CORE VERIFICATION - CONTROL ROOM
Page 2 of 4 -- SE Quadrant

Sequence No. _____

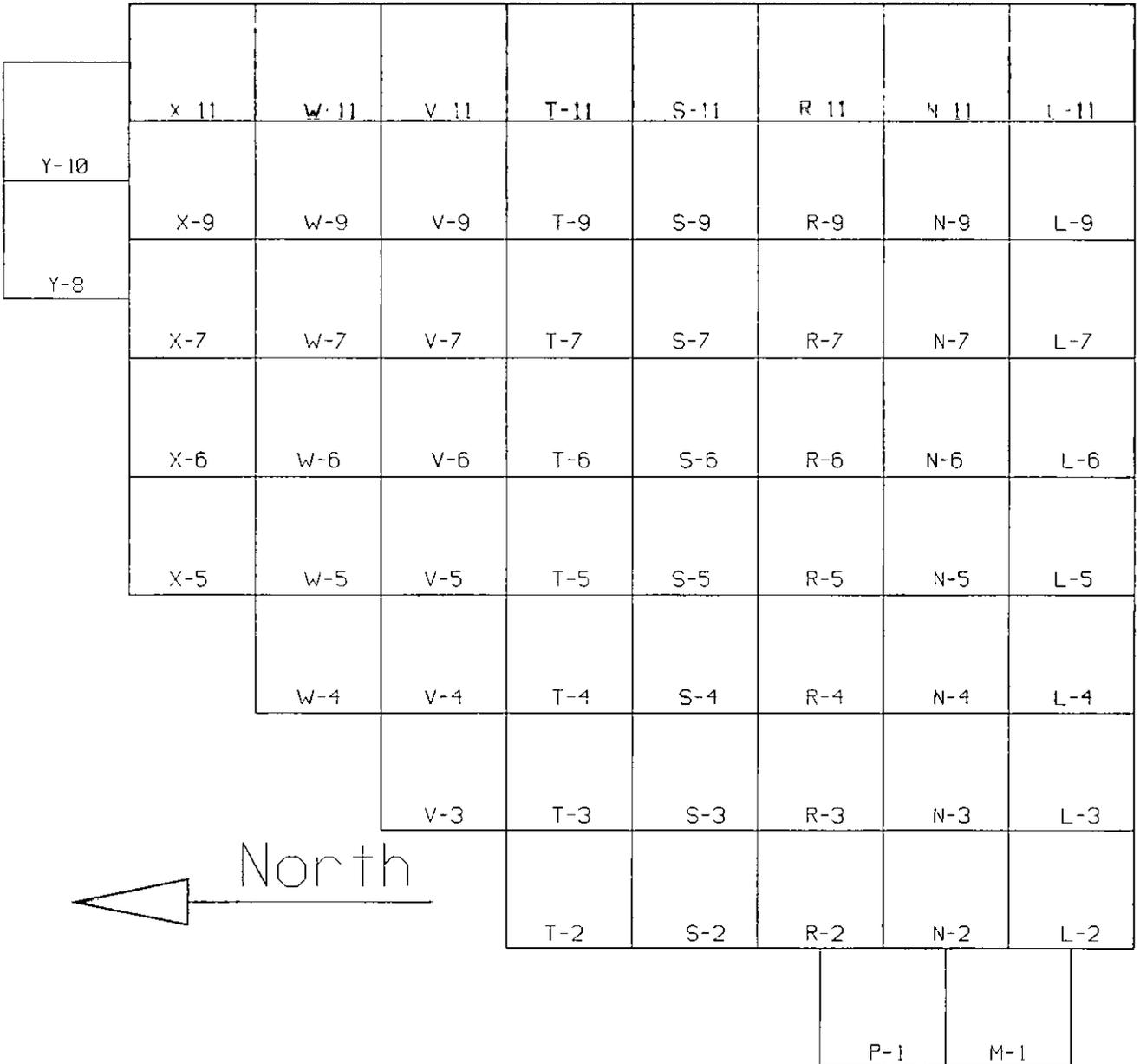


Place a "X" in each location that contains a CE/AGTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

Attachment FH-305-9B
UNIT 1 - CORE VERIFICATION - CONTROL ROOM
Page 3 of 4 -- NW Quadrant

Sequence No. _____



Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

CORE ALTERATIONS

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Rev. 12
Page 52 of 73

Attachment FH-305-9B
UNIT 1 - CORE VERIFICATION - CONTROL ROOM
Page 4 of 4 -- SW Quadrant

Sequence No. _____



Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

Attachment FH-305-9C
UNIT 2 - CORE VERIFICATION - CONTAINMENT
Page 1 of 4 -- NE Quadrant

Sequence No. _____

						H-1	K-1	
			E-2	F-2	G-2	J-2	L-2	
		D-3	E-3	F-3	G-3	J-3	L-3	
	C-4	D-4	E-4	F-4	G-4	J-4	L-4	
B-5	C-5	D-5	E-5	F-5	G-5	J-5	L-5	
B-6	C-6	D-6	E-6	F-6	G-6	J-6	L-6	
A-8	B-7	C-7	D-7	E-7	F-7	G-7	J-7	L-7
A-10	B-9	C-9	D-9	E-9	F-9	G-9	J-9	L-9
	B-11	C-11	D-11	E-11	F-11	G-11	J-11	L-11

← NORTH
(to Upender)

Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____	NFM-SE VERIFIER: _____ / _____	Initial	Date

Attachment FH-305-9C
UNIT 2 - CORE VERIFICATION - CONTAINMENT
Page 2 of 4 -- SE Quadrant

Sequence No. _____

	M-1	P-1						
L-2	N-2	R-2	S-2	T-2				
L-3	N-3	R-3	S-3	T-3	V-3			
L-4	N-4	R-4	S-4	T-4	V-4	W-4		
L-5	N-5	R-5	S-5	T-5	V-5	W-5	X-5	
L-6	N-6	R-6	S-6	T-6	V-6	W-6	X-6	
L-7	N-7	R-7	S-7	T-7	V-7	W-7	X-7	Y-8
L-9	N-9	R-9	S-9	T-9	V-9	W-9	X-9	Y-10
L-11	N-11	R-11	S-11	T-11	V-11	W-11	X-11	

← NORTH
(to Upender)

Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____	Initial	Date	NFM-SE VERIFIER: _____ / _____
			Initial
			Date

Attachment FH-305-9C
UNIT 2 - CORE VERIFICATION - CONTAINMENT
Page 3 of 4 -- NW Quadrant

Sequence No. _____

	B-11	C-11	D-11	E-11	F-11	G-11	J-11	L-11
A-12								
	B-13	C-13	D-13	E-13	F-13	G-13	J-13	L-13
A-14								
	B-15	C-15	D-15	E-15	F-15	G-15	J-15	L-15
	B-16	C-16	D-16	E-16	F-16	G-16	J-16	L-16
	B-17	C-17	D-17	E-17	F-17	G-17	J-17	L-17
		C-18	D-18	E-18	F-18	G-18	J-18	L-18
			D-19	E-19	F-19	G-19	J-19	L-19
				E-20	F-20	G-20	J-20	L-20
						H-21	K-21	

← NORTH
(to Upender)

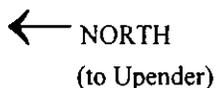
Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____	Initial	Date	NFM-SE VERIFIER: _____ / _____
			Initial
			Date

Attachment FH-305-9C
UNIT 2 - CORE VERIFICATION - CONTAINMENT
Page 4 of 4 -- SW Quadrant

Sequence No. _____

L-11	N-11	R-11	S-11	T-11	V-11	W-11	X-11	
								Y-12
L-13	N-13	R-13	S-13	T-13	V-13	W-13	X-13	
								Y-14
L-15	N-15	R-15	S-15	T-15	V-15	W-15	X-15	
L-16	N-16	R-16	S-16	T-16	V-16	W-16	X-16	
L-17	N-17	R-17	S-17	T-17	V-17	W-17	X-17	
L-18	N-18	R-18	S-18	T-18	V-18	W-18		
L-19	N-19	R-19	S-19	T-19	V-19			
L-20	N-20	R-20	S-20	T-20				
	M-21	P-21						



Place a "X" in each location that contains a CEA/GTI.

COMMENT		RESOLUTION	
NFM-SE: _____ / _____		NFM-SE VERIFIER: _____ / _____	
Initial Date		Initial Date	

Attachment FH-305-9D
UNIT 2 - CORE VERIFICATION - CONTROL ROOM
Page 1 of 4 -- NE Quadrant

Sequence No. _____

						H-1	K-1	
			E-2	F-2	G-2	J-2	L-2	
		D-3	E-3	F-3	G-3	J-3	L-3	
	C-4	D-4	E-4	F-4	G-4	J-4	L-4	
B-5	C-5	D-5	E-5	F-5	G-5	J-5	L-5	
B-6	C-6	D-6	E-6	F-6	G-6	J-6	L-6	
A-8	B-7	C-7	D-7	E-7	F-7	G-7	J-7	L-7
A-10	B-9	C-9	D-9	E-9	F-9	G-9	J-9	L-9
	B-11	C-11	D-11	E-11	F-11	G-11	J-11	L-11

← NORTH
(to Upender)

Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

CORE ALTERATIONS

FH-305
Rev. 12
Page 58 of 73

Attachment FH-305-9D
UNIT 2 - CORE VERIFICATION - CONTROL ROOM
Page 2 of 4 -- SE Quadrant

Sequence No. _____

	M-1	P-1						
L-2	N-2	R-2	S-2	T-2				
L-3	N-3	R-3	S-3	T-3	V-3			
L-4	N-4	R-4	S-4	T-4	V-4	W-4		
L-5	N-5	R-5	S-5	T-5	V-5	W-5	X-5	
L-6	N-6	R-6	S-6	T-6	V-6	W-6	X-6	
L-7	N-7	R-7	S-7	T-7	V-7	W-7	X-7	
								Y-8
L-9	N-9	R-9	S-9	T-9	V-9	W-9	X-9	
								Y-10
L-11	N-11	R-11	S-11	T-11	V-11	W-11	X-11	

← NORTH
(to Upender)

Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

Attachment FH-305-9D
UNIT 2 - CORE VERIFICATION - CONTROL ROOM
Page 3 of 4 -- NW Quadrant

Sequence No. _____

A-12	B-11	C-11	D-11	E-11	F-11	G-11	J-11	L-11
A-14	B-13	C-13	D-13	E-13	F-13	G-13	J-13	L-13
	B-15	C-15	D-15	E-15	F-15	G-15	J-15	L-15
	B-16	C-16	D-16	E-16	F-16	G-16	J-16	L-16
	B-17	C-17	D-17	E-17	F-17	G-17	J-17	L-17
		C-18	D-18	E-18	F-18	G-18	J-18	L-18
		D-19	E-19	F-19	G-19	J-19	L-19	
			E-20	F-20	G-20	J-20	L-20	
						H-21	K-21	

← NORTH
(to Upender)

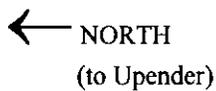
Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

Attachment FH-305-9D
UNIT 2 - CORE VERIFICATION - CONTROL ROOM
Page 4 of 4 -- SW Quadrant

Sequence No. _____

L-11	N-11	R-11	S-11	T-11	V-11	W-11	X-11	
								Y-12
L-13	N-13	R-13	S-13	T-13	V-13	W-13	X-13	
								Y-14
L-15	N-15	R-15	S-15	T-15	V-15	W-15	X-15	
L-16	N-16	R-16	S-16	T-16	V-16	W-16	X-16	
L-17	N-17	R-17	S-17	T-17	V-17	W-17	X-17	
L-18	N-18	R-18	S-18	T-18	V-18	W-18		
L-19	N-19	R-19	S-19	T-19	V-19			
L-20	N-20	R-20	S-20	T-20				
	M-21	P-21						



Place a "X" in each location that contains a CEA/GTI.

COMMENT	RESOLUTION
RCRO: _____ / _____ Initial Date	

Attachment FH-305-10
INSTRUCTIONS FOR THE RCRO DURING REFUELING
Page 1 of 2

A. The Refueling Control Room Operator (RCRO) Shall:

1. Coordinate the movement of fuel and CEAs during core alterations. (RCRO participation is not required for movement of fuel in the SFP independent of core alterations.)
2. Throughout core alterations, receive notification of fuel and CEA movement and acknowledge such notification by step number, SNM Form 2 "FROM" location, "TO" location and RFM and SFHM mast orientation, plus CEA Handling Tool orientation.
3. Receive notification of the start and completion of all move evolutions. Record the start and completion times of these evolutions in the appropriate blocks on the SNM Form 2s.
4. Maintain the tag boards to reflect the current status of all fuel assemblies and CEAs during core alterations. Be cognizant of the configuration of the core tag board at all times as it gives a direct indication of the configuration of the core.
5. Maintain fuel handling records. After completing all appropriate columns of the SNM Form 2 initial the "Step Comp." block. The RCRO's initial indicates that the step was verified as complete by the RFM Operator or SFHM Operator, that the Control Room tag boards have been updated with correct fuel assembly and CEA identification number, orientation and location, and that all locations were verified prior to an assembly being inserted into the location and after the assembly was inserted into the location.
6. During a step which places a fully withdrawn fuel assembly in the core, or before a CEA is fully withdrawn from a fuel assembly, direct the RFM Operator to proceed only **AFTER** the neutron count rate has been verified as satisfactory.
7. Record any RFM and SFHM Operator or FHS comments about fuel assembly/CEA hang-ups or assembly damage or deformation on Attachment FH-305-3, Fuel/CEA Handling Problem Documentation Sheets. Hang-ups may occur when inserting or removing a fuel assembly from the core or SFP. (Step B describes the actions which may be taken to resolve a hang-up.) Document, on Attachment FH-305-3, each time a deviation of more than 50 pounds occurs on the load cell. Indicate the number of attempts made as well as the locations at which the attempts were made and the final resolution (e.g., fuel assembly hung up four times at 125" (55 lbs.), finally moved 0.1 inch North and East. Fuel assembly withdrawn with no hang-up.). Also record any other operating personnel's comments on fuel assembly hang-ups/anomalies during core alterations on Attachment FH-305-3.
8. Stop fuel movement immediately if any discrepancy is noted which could adversely affect safety, and immediately notify the Shift Manager, FHS and the NFM-SE for resolution. Notify the System Engineer of any Refueling Equipment problems or issues.
9. Demonstrate at least once per 12 hours during refueling operations that the direct communications between the Control Room personnel and the personnel at the appropriate refueling stations are operable. (An NFM-SE may also perform this check.) The RCRO or the NFM-SE shall document on Attachment FH-305-7, Voice Communications Log Sheet, that communications have been checked. **[B-11]**

Attachment FH-305-10
INSTRUCTIONS FOR THE RCRO DURING REFUELING
Page 2 of 2

10. Verify the tag board during Attachment FH-305-9B, Core Verification - Control Room. The NFM-SE may also perform this function.
11. Ensure that the RFM/SFHM Operators identify the correct fuel assemblies as "SHINY" or "DARK". **[B-2]**

B. Resolution of Fuel Assembly Hang-ups:

The following sequence of events/deviations shall be documented on an Attachment FH-305-3 once the assembly hang-up has been resolved and does not require a procedure change. Any deviations from the original bridge and trolley coordinates shall be recorded on the SNM Form 2 and does not require Attachment FH-305-4, Modification to the Fuel/CEA Move Sequence, to be completed.

NOTE:

The likelihood of interference is much greater in irradiated fuel assemblies due to bowing and twisting which is enhanced by irradiation so these Steps may be performed in anticipation of a hang-up.

NOTE:

The Steps to resolve the fuel assembly hang-up may be performed as directed by the FHS.

1. **WHEN** a deviation of more than 50 pounds is indicated on the load cell during insertion or withdrawal of a fuel assembly from the core or upender, movement shall stop and then be recommenced with caution.
2. **IF** the deviation increases to greater than 100 pounds, movement shall stop and the FHS shall be notified. The fuel assembly should be returned to its initial position (either fully raised or fully inserted) and then the RFM coordinates may be hand cranked away from the fuel pack to eliminate the hang-up.
3. **IF** directed by the FHS, deviations of up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud) and 300 lbs. may be made with the concurrence of the NFM-LE. The FHS may authorize movement greater than 0.5 inches if the direction of travel is clear (no adjacent assemblies or shroud wall). **[B-149]**
4. **IF** directed by the FHS the fuel assembly may be lowered clear of the core to just above the pins, hand crank the RFM over the "TO" location, then lowered on to the pins. This method prevents any grid to grid interference.
5. **IF** the RFM alignment is suspect, then reverify the RFM scribe readings with the original I&C alignment readings.
6. **IF** directed by the NFM-LE, a bowed fuel assembly may be inserted into the reactor core at a TEMPORARY orientation. This temporary orientation SHALL be documented on an SNM Transfer Form 2 and Attachment FH-305-15.

Attachment FH-305-11
CORE ALTERATIONS RESTART CHECKLIST
Page 1 of 2

Sequence No. _____

This Attachment shall be used to begin the core alteration or if an interruption in refueling pool fuel movement operations is long enough to allow personnel to secure their stations. This Attachment is not required if refueling pool operations occur where the RFM is manned and other stations have been secured. An example of this would be if fuel handling problems in the core were to take such a long time to resolve that the FHS dictated that fuel handlers in the Spent Fuel Storage Area should secure their stations. In such a case, the RCRO would indicate on Attachment FH-305-7, Voice Communications Log Sheet, that he has reverified communications when the Spent Fuel Storage Area Fuel Handlers had re-manned their stations.

Steps 1 through 14 may be performed in any order.

1. A base count rate on at least two wide range NIs coupled to the fuel mass has been determined and 1/M monitoring has started PER NFMSP-21. N/A if there is not enough fuel in the reactor vessel to determine the base count rate. **[B-112]**

_____/_____
NFM-SE Date
2. The MN-1-110 Attachment PC-1 paperwork initiated for the I/M Computer in the Control Room PC Log has been reviewed in the last 30 days. N/A if still within the month that the MN-1-110 paperwork was issued. **[B-111]**

_____/_____
NFM-SE Date
3. The Refueling Pool level is at least 65 feet, the Refueling Pool level alarm band is set to + or - 0.2 feet (if performing core alterations other than CEA swaps) and the Refueling Pool and SFP clarity and lighting are adequate. **[B-18] [B-39]**

_____/_____
CRS Date
4. SRW HX Outlet temperature (as measured in the Control Room or locally) is less than 65 degrees F AND the reactor has been sub-critical for at least 3 days. If SRW temperature is greater than 65 degrees F, then the reactor has been sub-critical for the appropriate time as specified in Reference 3.2.AA. **[B-184]**

_____/_____
CRS Date
5. Direct Voice Communications between the Control Room and personnel on Refueling Stations are established within one hour prior to core alterations.

_____/_____
RCRO Date
6. If moving recently irradiated fuel, then the SFP Ventilation is in service with Charcoal Filters per OI-22D. N/A if not moving recently irradiated fuel.

_____/_____
CRS Date
7. Plant Chemistry has begun taking samples as specified on Attachment FH-305-6, Boron Concentration Log Sheet. The SDC, RFP and SFP boron concentrations are greater than the value documented on Step 6.2.A (Technical Specification 3.9.1) AND the SDC and RFP sample points agree within 100 ppm of each other. If the RFP and SDC sample results do not fall within 100 ppm of each other then ensure an underwater Hydrovac is operating to mix the RFP AND NOTIFY Plant Chemistry to take additional refueling pool samples to test for stratification. **[B-10] [B-19] [B-114]**

_____/_____
NFM-SE Date

Attachment FH-305-11
CORE ALTERATIONS RESTART CHECKLIST
Page 2 of 2

- 8. All required personnel have been briefed and are on station. **[B-62]**
_____ / _____
CRS Date
- 9. The transfer tube is open. (N/A if only performing core alterations in containment)
_____ / _____
CRS Date
- 10. An ISFSI Cask is not in the SFP.
_____ / _____
NFM-SE Date
- 11. The OP-7 Section 6.9, "Core Alterations Preparations Checklist," has been completed.
_____ / _____
SM Date
- 12. At least 60 days have elapsed between the shutdown of the unit in refueling and the previous refueling outage (of either unit) or a 50.59 has been performed.
_____ / _____
NFM-SE Date
- 13. The Shift Manager gives permission for core alterations to begin (restart) PER the applicable OI's Attachment FH-305-14 if required, and the SNM Transfer Form 2, AND has logged performance of this procedure. **[B-25]**
_____ / _____
SM Date
- 14. Record the date and time for core alteration starting (restarting): Date: _____ Time: _____

Attachment FH-305-13
INSTRUCTIONS FOR THE FHS DURING REFUELING
Page 1 of 2

A. The Fuel Handling Supervisor (FHS) Shall:

1. Supervise the Refueling operations and have no other concurrent responsibilities. He shall maintain an overview of the fuel and CEA handling process and should not act as an equipment operator. **[B-132]**
2. Be on the Refueling Machine if the Refueling Machine Operator is not a licensed Reactor Operator. If the operator is a licensed operator then the FHS may tour the 69' area.
3. Be aware of the potential for some assemblies to be bowed or twisted. If the RFM Operator is about to pick up an assembly that in the FHS' judgment is not aligned correctly with respect to the rest of the core, to the point that the RFM Operator may not be able to grapple the center guide tube post of the assembly, the FHS may with concurrence of the NFM-SE direct the RFM Operator to position the RFM as necessary to allow proper grappling of the assembly. The RFM will then be hand cranked as necessary, to prevent any swing, prior to lifting. The FHS shall ensure that the RCRO documents the corrective actions taken. **[B-32]**
4. Independently verify the RFM coordinates when on the RFM. **[B-2]**
5. Verify that the "TO" core location contains a fuel assembly or CEA after a core Fuel/CEA Move Sequence step has been performed when on the RFM. **[B-2]**
6. Direct fuel handling personnel in response to loss of Refueling Pool level, loss of communications, fuel handling incident, or loss of audible count rate. Stop all fuel handling if any discrepancy arises that adversely affects safety until it is resolved.
7. Ensure that the audible count rate monitor is operating and can be heard.
8. Be cognizant of the ICI platform proximity. Dose rates are higher near the ICI platform and may cause alarming dose rate monitors on the RFM to alarm.
9. Provide guidance as necessary on corrective actions for fuel assembly or CEA hang-ups.
10. Ensure reactivity monitoring is completed, as required, following insertion of a fully withdrawn fuel assembly into the core or removal of a CEA from an assembly.
11. Verify the location of the CEA Handling Tool during CEA movement over the core. **[B-141]**
12. Ensure all equipment problems/concerns are noted by the RCRO and IR's are written on problems and reviewed by a FHS.

Attachment FH-305-13
INSTRUCTIONS FOR THE FHS DURING REFUELING
Page 2 of 2

B. Resolution of Fuel Assembly Hang-ups:

The following sequence of events/deviations shall be documented on an Attachment FH-305-3 once the assembly hang-up has been resolved and does not require a procedure change. Any deviations from the original bridge and trolley coordinates shall be recorded on the SNM Form 2 and does not require Attachment FH-305-4, Modification to the Fuel/CEA Move Sequence, to be completed.

NOTE:

The likelihood of interference is much greater in irradiated fuel assemblies due to bowing and twisting which is enhanced by irradiation so these Steps may be performed in anticipation of a hang-up.

NOTE:

The Steps to resolve the fuel assembly hang-up may be performed as directed by the FHS.

1. **WHEN** a deviation of more than 50 pounds is indicated on the load cell during insertion or withdrawal of a fuel assembly from the core or upender, movement shall stop and then be recommenced with caution.
2. **IF** the deviation increases to greater than 100 pounds, movement shall stop and the FHS shall be notified. The fuel assembly should be returned to its initial position (either fully raised or fully inserted) and then the RFM coordinates may be hand cranked away from the fuel pack to eliminate the hang-up.
3. **IF** directed by the FHS, deviations of up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud) and 300 lbs. may be made with the concurrence of the NFM-LE. The FHS may authorize movement greater than 0.5 inches if the direction of travel is clear (no adjacent assemblies or shroud wall). **[B-149]**
4. **IF** directed by the FHS the fuel assembly may be lowered clear of the core to just above the pins, hand crank the RFM over the "TO" location, then lowered on to the pins. This method prevents any grid to grid interference.
5. **IF** the RFM alignment is suspect, then reverify the RFM scribe readings with the original I&C alignment readings.
6. **IF** directed by the NFM-LE, a bowed fuel assembly may be inserted into the reactor core **TEMPORARILY**. This temporary orientation **SHALL** be documented on an SNM Transfer Form 2 and Attachment FH-305-15.

Attachment FH-305-14
INSTRUCTIONS FOR MOVING CONTROL ELEMENT ASSEMBLIES (CEAs)

1. **CEA movement Maps**
 - a. **USING** Attachment FH-305-4, Modification to the Fuel/CEA Move Sequence and either Attachment FH-305-14A, Unit 1 CEA Movement Map or Attachment FH-305-14C, Unit 2 CEA Movement Map or appropriate SFP map, **DRAW** a triangle on the location listed as the SNM Form 2 "FROM" location and a circle on the location listed as the SNM Form 2 "TO" location.
 - b. **DRAW** a line connecting the triangle and circle with an arrowhead on the end of the line pointing at the circle.
 - c. **RECORD** the SNM Form 2 step number for the CEA move in the triangle and circle.
 - d. **REPEAT** Step 1.a through 1.c for each of the CEA moves on the SNM Form 2.
 - e. **SIGN AND DATE** Attachment FH-305-14A, or Attachment FH-305-14C, or the SFP map, as appropriate, as the Initiator.
 - f. **INDEPENDENTLY REVIEW** Attachment FH-305-14A or Attachment FH-305-14C, or the SFP map, as appropriate, **THEN SIGN AND DATE** the attachment as the Reviewer once the map is verified.
2. **ENSURE** STP-O-92-1/2 is complete within 72 hours prior to moving CEAs within Reactor vessel for the first time.
3. **PERFORM** CEA movement **PER** OI-25G, Attachment FH-305-14A/C, or an appropriate SFP map and the SNM Transfer Form 2s.

NOTE:

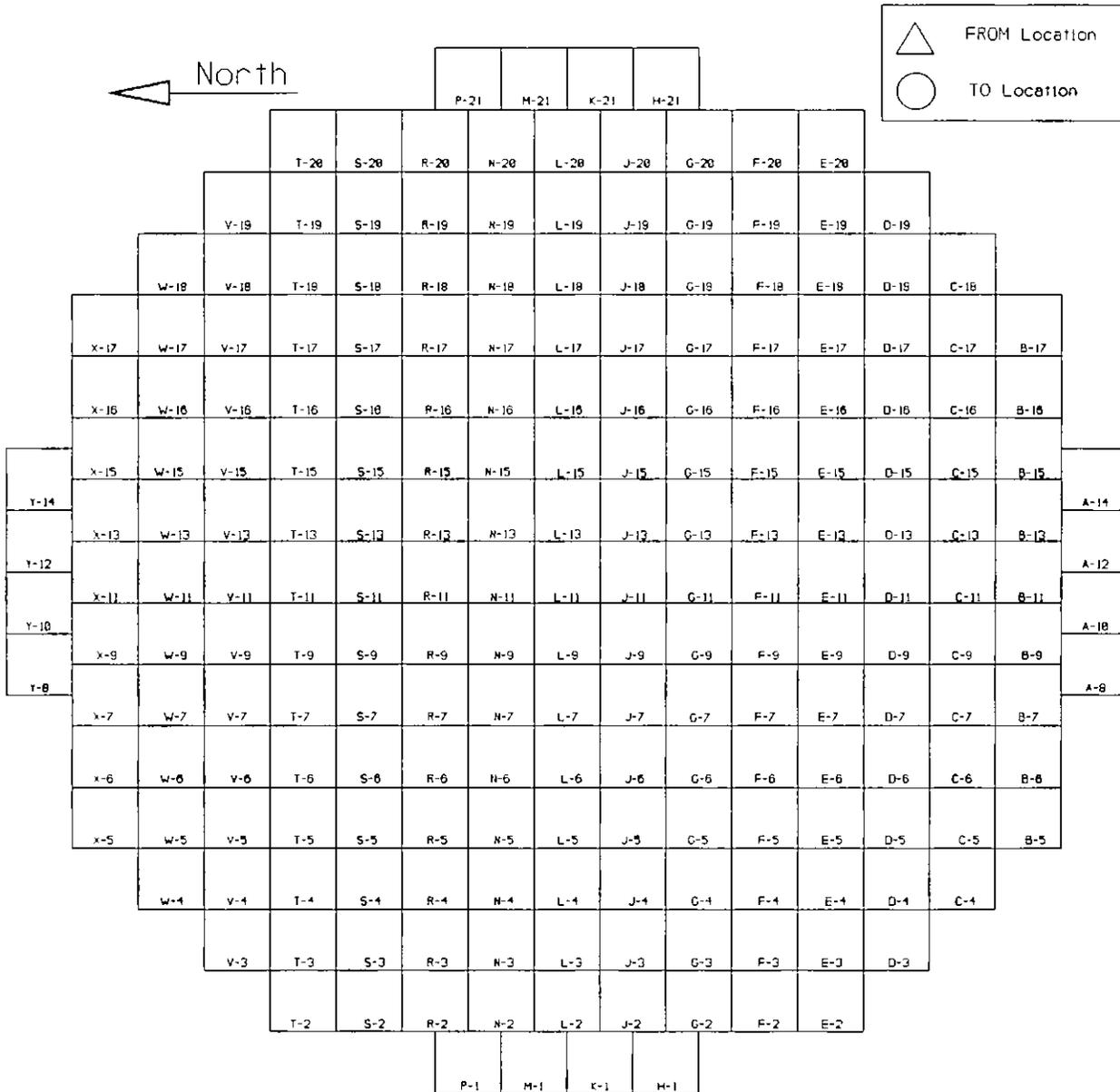
At NFM-SE discretion, the CEA verification may be performed in selected locations.

4. **USING** Attachment FH-305-14B, Unit 1 CEA Verification Map or Attachment FH-305-14D, Unit 2 CEA Verification Map, or an appropriate SFP map **PLACE** a "X" in each of the core locations that contain a CEA.
5. **COMPARE** Attachment FH-305-14B or Attachment FH-305-14D, or SFP map location with the SNM Form 2s.
 - a. **RESOLVE** any discrepancies **AND DOCUMENT** on Attachment FH-305-14B or Attachment FH-305-14D, or the SFP map.
 - b. **SIGN AND DATE** Attachment FH-305-14B or Attachment FH-305-14D, or the SFP map.

**Attachment FH-305-14A
UNIT 1 CEA MOVEMENT MAP**

Page _____ of _____

Sequence No. _____

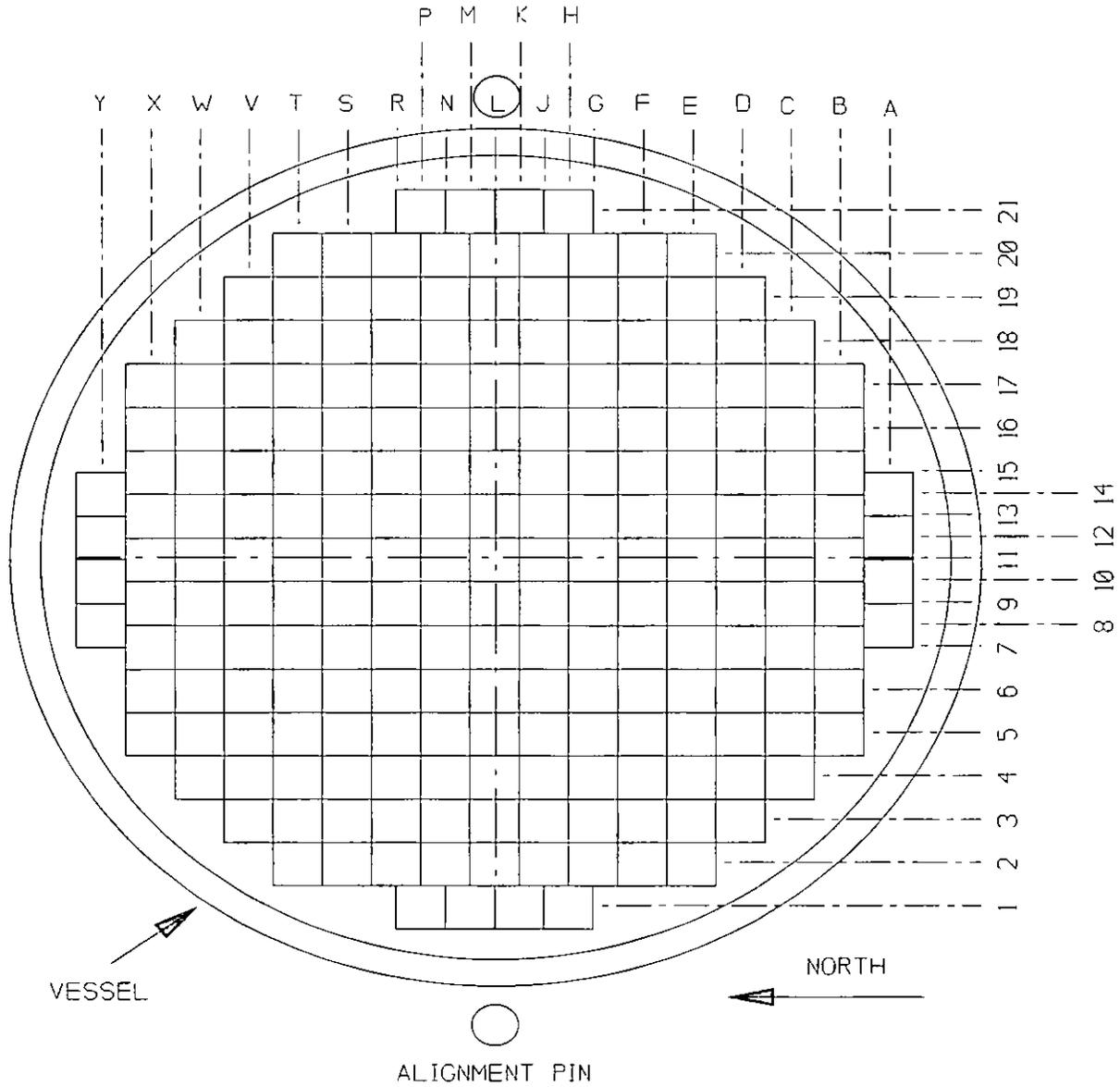


Initiator _____ / _____
Date

Reviewer _____ / _____
Date

**Attachment FH-305-14B
UNIT 1 CEA VERIFICATION MAP**

Sequence No. _____



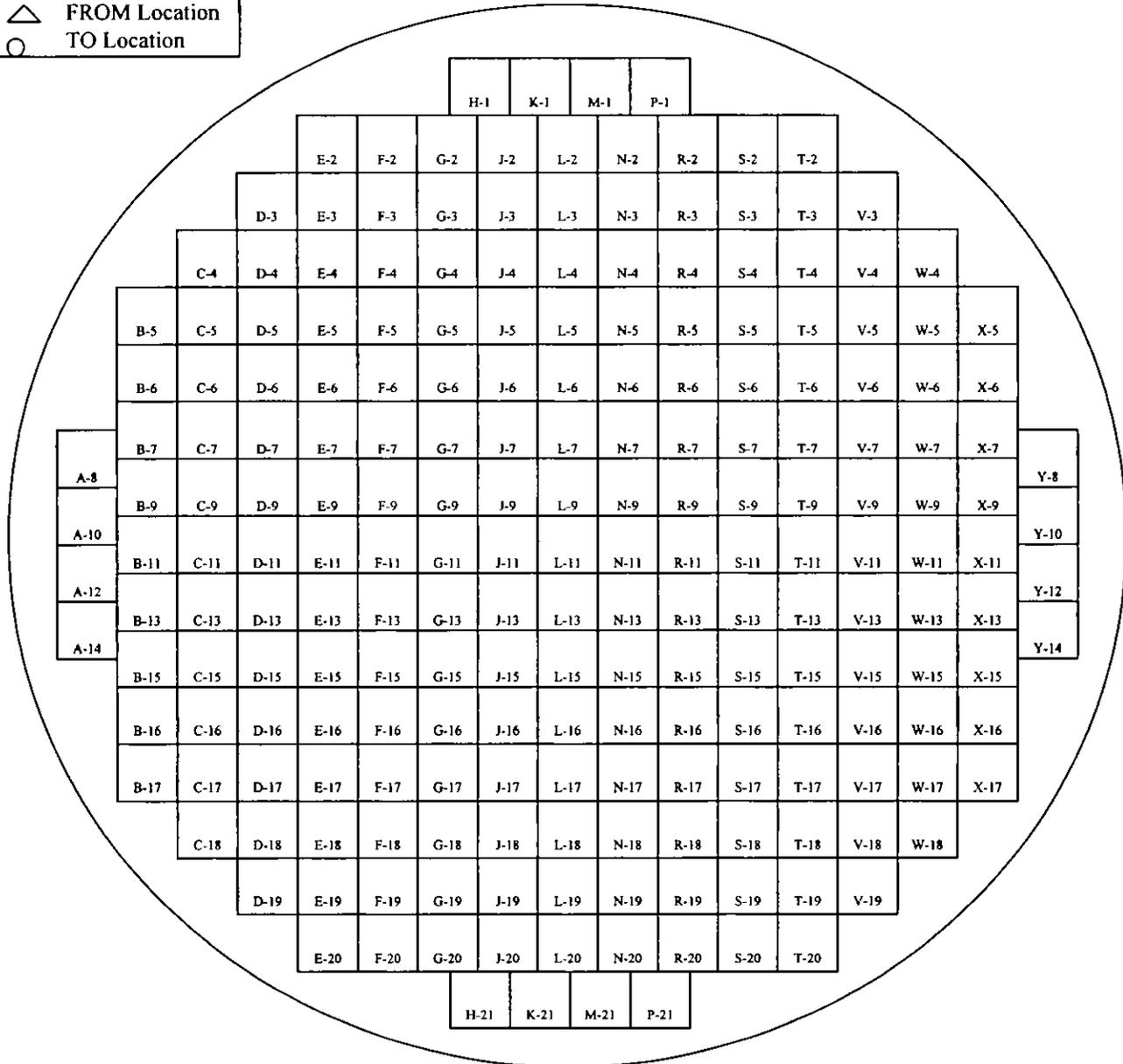
Place a "X" in each core location that contains a CEA.

COMMENT		RESOLUTION	
Completed By: _____ / _____		Verified By: _____ / _____	
Initial	Date	Initial	Date

**Attachment FH-305-14C
UNIT 2 CEA MOVEMENT MAP**

Page _____ of _____

Sequence No. _____



← NORTH
(to Upender)

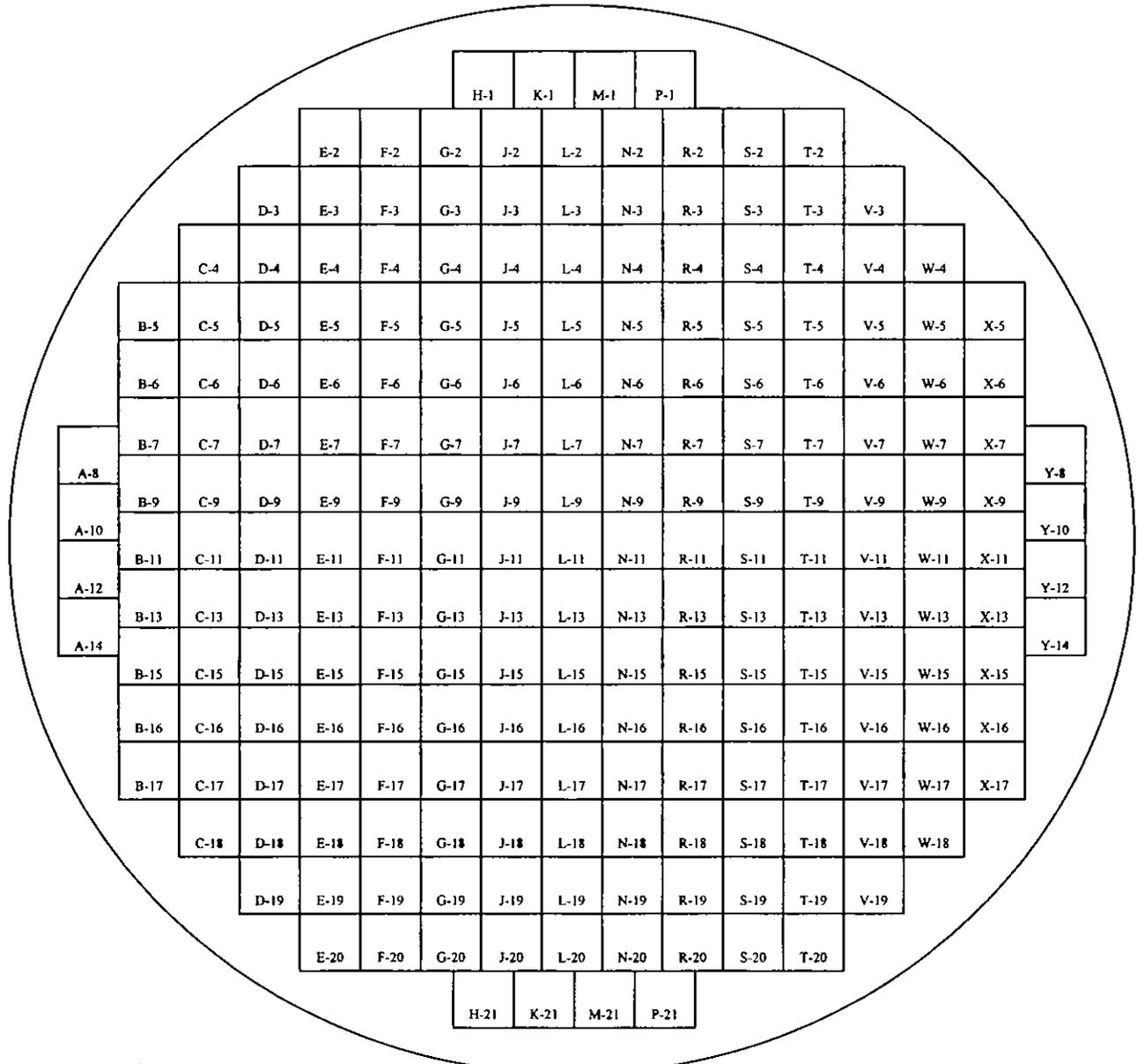
_____/_____
Initiator Date

_____/_____
Reviewer Date

**Attachment FH-305-14D
UNIT 2 CEA VERIFICATION MAP**

Sequence No. _____

Alignment Pin



← NORTH
(to Upender)

Alignment Pin

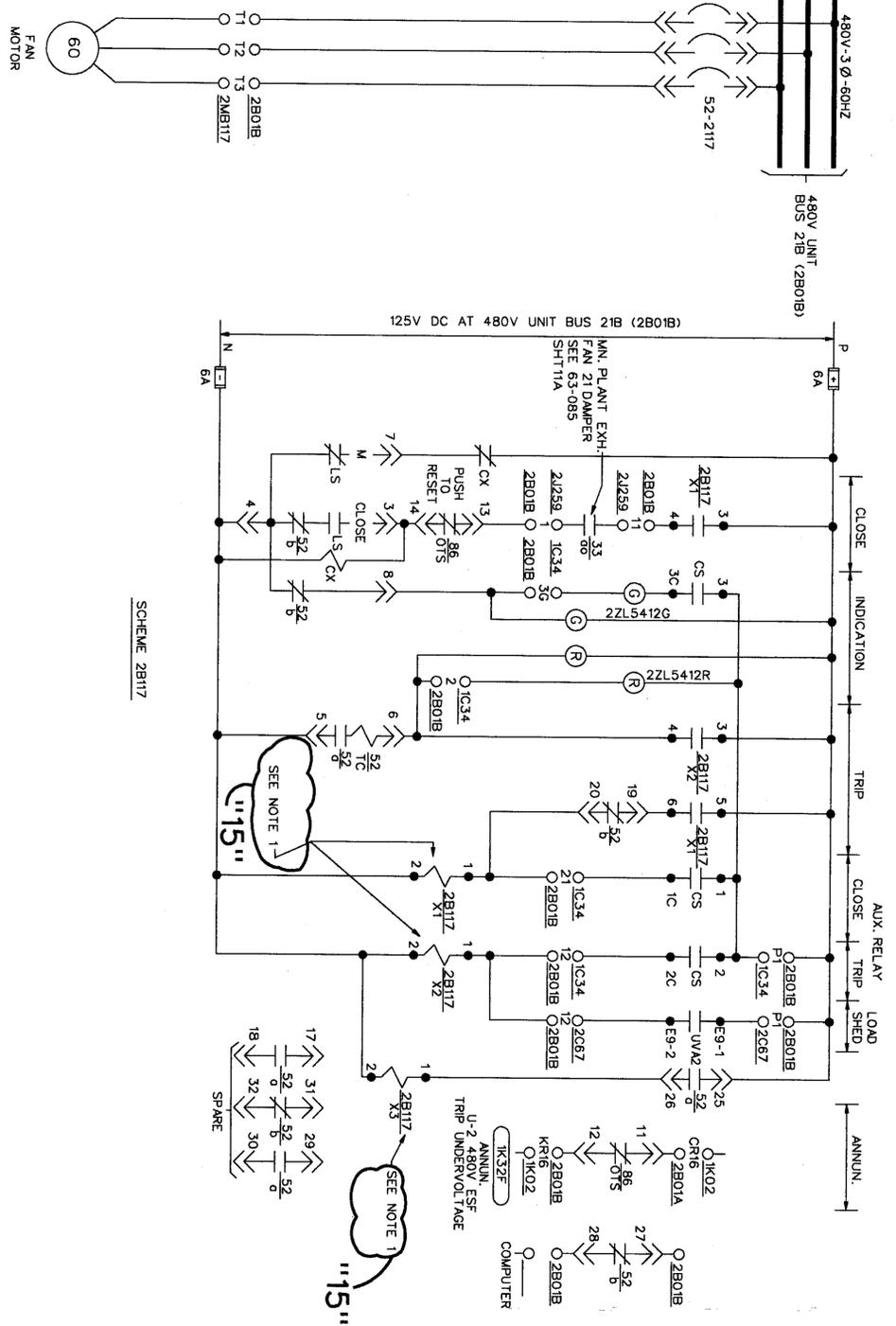
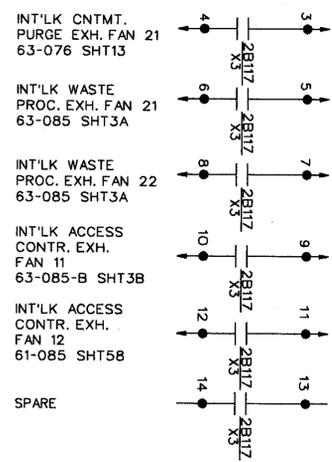
Place a "X" in each core location that contains a CEA.

COMMENT		RESOLUTION	
Completed By: _____ / _____	Verified By: _____ / _____		
Initial Date	Initial Date		

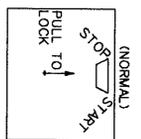
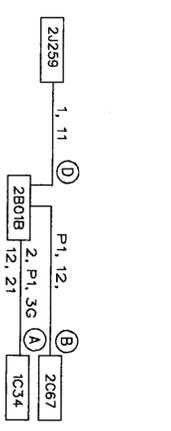
NOTES:
1. BECHTEL FIELD TO FURNISH AND INSTALL
AUX. RELAY 2B117/X1, X2 & X3

REF. DWGS.
63-009 METER & RELAY DNG. 480V UNIT
BUSES 21A, 21B, 24A & 24B

LEGEND
UVA2 - ENG. SAFETY FEATURES LOAD SHED RELAY



SCHEME NO.	DESCRIPTION	BKR. NO.	LOCATIONS	INDICATING LAMPS	RELAY	CONTR. SW.	FAC.	CONTACTS	AUX. RELAY
2B117	MAIN EXHAUST FAN 21	52-2117	2B01B	2C67	UVA2	2-HS-5412	A	E9-1, E9-2	2B117 2B117 2B117 X1 X2 X3
2B417	MAIN EXHAUST FAN 22	52-2417	2B04B	2C68	UVA2	2-HS-5413	B	E1-1, E1-2	2B417 2B417 2B417 X1 X2 X3



2HS5412

CONTACTS	HANDLE	END	NO	NC	NO	NC	NO	NC	NO	NC
1	1C	2C	1	X						
2	3C	4C	2	X						
3	5C	6C	3	X						
4	7C	8C	4	X						
5	9C	10C	5	X						
6	11C	12C	6	X						
7	13C	14C	7	X						
8	15C	16C	8	X						
9	17C	18C	9	X						
10	19C	20C	10	X						

CS USED AT 10C34.
SPRING RETURN TO NORMAL
C.E. TYPE SBM MODEL NO. 10AA122

FILE LOC.

REV	DATE	DESCRIPTION	DNM	DSGN	DE	TR	APPROVED
15	11/15/85	AS BUILT INFO ONLY (ESP E31995004533)					

NOTICE
USERS MUST REFER TO THE DCN CATALOGS OR THE COMPUTERIZED DCN INDEX FOR APPL. CABLE DCNS

BALTIMORE GAS AND ELECTRIC COMPANY
NUCLEAR ENGINEERING DEPARTMENT

CALVERT CLIFFS UNIT 2
ELECTRIC PRODUCTION PLANT

SCALE: NONE
REVISION NO. 2E-85 SH.11
INTER NO. 8008 DCN

DATE: 8008 DCN

10
15

CALVERT CLIFFS NUCLEAR POWER PLANT

UNIT ONE AND TWO

OI-22A

MAIN EXHAUST FAN SYSTEM

REVISION 8

SAFETY RELATED

CONTINUOUS USE

Approval Authority:

 7-23-02

Effective Date:

7/24/02

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PROCEDURE ALTERATIONS

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5, 7, 8, 9	08/00

1.0 PURPOSE

- A. The purpose of this procedure is to provide detailed instructions for the operation of Units 1 and 2 Main Exhaust Fans.

2.0 APPLICABILITY/SCOPE

- A. This procedure will cover starting up and securing Main Exhaust Fans on Unit 1 and Unit 2.

3.0 REFERENCES AND DEFINITIONS

3.1 DEVELOPMENTAL REFERENCES

- A. Offsite Dose Calculation Manual.
- B. Technical Specifications.
- C. Drawings:
1. OM-64 (60-722-E), Auxiliary Building Ventilation System Units 1 and 2 (Sheet 1).
 2. 1E-85 (61-085-B), Schematic Diagram, Heating & Ventilation, Main Plant Exhaust Fans 11 & 12 (Sheets 11 and 11A).
 3. 2E-85 (63-085-B), Schematic Diagram, Heating & Ventilation, Main Plant Exhaust Fans 21 & 22 (Sheets 11 and 11A).

3.2 PERFORMANCE REFERENCES

None

3.3 DEFINITIONS

None

4.0 PREREQUISITES

- A. Prerequisites will vary depending on the section of the procedure being performed. Prerequisites for each section will be listed as Initial Conditions at the beginning of the applicable section.

5.0 PRECAUTIONS**NOTE**

12 Auxiliary Building and Waste Processing Supply Fan will trip if ALL Main Exhaust Fans are stopped on BOTH units.

8/00

- A. The following fans will trip if the only operating Main Exhaust Fan on Unit 1 is secured:
- Unit 1 Containment Purge Supply and Exhaust Fan
 - 11 Auxiliary Building and Waste Processing Supply Fan
 - 11 **AND** 12 Auxiliary Building and Waste Processing Exhaust Fans
 - 11 **AND** 12 Fuel Handling Area Exhaust Fans
- B. The following fans will trip if the only operating Main Exhaust Fan on Unit 2 is secured:
- Unit 2 Containment Purge Supply and Exhaust Fan
 - 21 Auxiliary Building and Waste Processing Supply Fan
 - 21 **AND** 22 Auxiliary Building and Waste Processing Exhaust Fans
 - 11 **AND** 12 Access Control Area Exhaust Fans
- C. Main Exhaust Fan operation on a unit may continue with the Main Vent Gaseous Radiation Monitor for that unit out of service, **PER** ODCM 3.3.3.9, provided one of the following conditions is satisfied:
- Grab samples are taken and analyzed for gross activity on the affected unit at least once every 24 hours
 - An equivalent radiation monitor is provided
- D. Main Vent Stack flow values used by Chemistry to calculate offsite dose are **NOT** obtained from differential pressure indicators 1-PDI-5412 and 2-PDI-5412; they are calculated semiannually using a maintenance procedure. Chemistry and System Engineering are contacted when differential pressure does not indicate as expected, in order that this calculation can be checked and redone as necessary.

8/00

8/00

6.0 SYSTEM OPERATION

6.1 SYSTEM STARTUP

A. Initial Conditions

1. One of the following conditions is met on the unit to be started:
 - Main vent gaseous radiation monitor (1-RI-5415 for Unit 1 **OR** 2-RI-5415 for Unit 2), associated portable iodine and particulate sampler, and tritium sampler are in operation
 - Grab samples are taken and analyzed for gross activity on the affected unit at least once every 24 hours
 - Equivalent radiation monitoring is provided

B. Procedure

NOTE

Chemistry assumes a main vent exhaust flow to calculate offsite dose and dose rates, which are limited by ODCM 3.11.2.1, 3.11.2.2 and 3.11.2.3.

1. **NOTIFY** Chemistry **AND** Radiation Safety Supervision that main vent exhaust flow will be initiated on the selected unit.

NOTE

- It takes up to 20 seconds for a Main Exhaust Fan to start, due to time required for damper operation.
- Each handswitch spring returns to the "auto" position. This position is unmarked, and lies between STOP and START.

2. Momentarily **PLACE** control switch for selected Main Exhaust Fan in START at panel 1C34, **AND CHECK** that it returns to auto when released:

- 11 MAIN EXH FAN.....1-HS-5412
- 12 MAIN EXH FAN.....1-HS-5413
- 21 MAIN EXH FAN.....2-HS-5412
- 22 MAIN EXH FAN.....2-HS-5413

6.1.B Procedure (Continued)

3. **PERFORM** the following to check flow on the affected unit:
- a. **IF** a Unit 1 fan was started,
THEN CHECK that flow is greater than 107,405 SCFM, using local indicator 1-PDI-5412. 8/00
 - b. **IF** a Unit 2 fan was started,
THEN CHECK that flow is greater than 87,070 SCFM, using local indicator 2-PDI-5412.
4. **IF** flow is **NOT** above the minimum value,
THEN CHECK the following locally: 8/00
- Desired exhaust fan is running
 - No abnormal noise or vibration is present
 - Discharge damper is open on running fan
5. **IF** abnormalities are noted,
THEN PERFORM the following:
- a. **NOTIFY** Chemistry **AND** System Engineering that main vent flow local indication is **NOT** above the minimum value on the affected unit. System Engineering will initiate an Issue Report if necessary. 8/00

**** END ****

6.2 **SHIFTING MAIN EXHAUST FANS**

A. Initial Conditions

- 1. One Main Exhaust Fan is running on the selected unit.

B. Procedure

CAUTION

Operating more than one Main Exhaust Fan continuously will affect Main Vent Radiation Monitor readings.

NOTE

- It takes up to 20 seconds for a Main Exhaust Fan to start, due to time required for damper operation.
- Each handswitch spring returns to the "auto" position. This position is unmarked, and lies between STOP and START.

- 1. Momentarily **PLACE** control switch for Main Exhaust Fan to be started in START at panel 1C34, **AND CHECK** that it returns to auto when released:

- 11 MAIN EXH FAN.....1-HS-5412
- 12 MAIN EXH FAN.....1-HS-5413
- 21 MAIN EXH FAN.....2-HS-5412
- 22 MAIN EXH FAN.....2-HS-5413

- 2. **WHEN** selected fan has started, **THEN** momentarily **PLACE** control switch for Main Exhaust Fan being secured in STOP, **AND CHECK** that it returns to auto when released.

- 3. **PERFORM** the following to check flow on the affected unit:

- a. **IF** a Unit 1 fan was started, **THEN CHECK** that flow is greater than 107,405 SCFM, using local indicator 1-PDI-5412.
- b. **IF** a Unit 2 fan was started, **THEN CHECK** that flow is greater than 87,070 SCFM, using local indicator 2-PDI-5412.

6.2.B Procedure (Continued)

4. **IF** flow is **NOT** above the minimum value,
THEN CHECK the following: 8/00
- Desired exhaust fan is running
 - No abnormal noise or vibration is present
 - Discharge damper is open on running fan
5. **IF** abnormalities are noted,
THEN PERFORM the following: 8/00
- a. **NOTIFY** Chemistry **AND** System Engineering that main vent flow local indication is **NOT** above the minimum value on the affected unit. System Engineering will initiate an Issue Report if necessary.
 - b. **CONSIDER** shifting fan alignment to previous configuration.

**** END ****

6.3 SYSTEM SHUTDOWN

A. Initial Conditions

1. Waste Gas discharge header is lined up to the plant vent which is to remain in service, **PER** OI-17B, WASTE GAS SYSTEM.
2. Auxiliary Building and Waste Processing Ventilation System on the affected unit is secured **PER** OI-22B, AUXILIARY BUILDING & WASTE PROCESSING AREA VENTILATION.
3. Containment Purge System on the affected unit is secured **PER** OI-36, CONTAINMENT PURGE SYSTEM.
4. The following radiation monitors are secured on the affected unit **PER** OI-35, RADIATION MONITORING SYSTEM:
 - Containment Atmosphere Radiation Monitor
 - Control Room Ventilation Radiation Monitor
5. **IF** Unit 1 Main Exhaust is being secured, **THEN** Fuel Handling Area Ventilation System is secured **PER** OI-22D, FUEL HANDLING AREA VENTILATION SYSTEM.
6. **IF** Unit 2 Main Exhaust is being secured, **THEN** Access Control Area Ventilation System is secured **PER** OI-22E, ACCESS CONTROL AREA HVAC.

B. Procedure

1. **NOTIFY** Chemistry and Radiation Safety Supervision that main vent exhaust flow will be secured on the selected unit, **AND ENSURE** that Chemistry has implemented any required alternate sampling methods.

NOTE

Each handswitch spring returns to the "auto" position. This position is unmarked, and lies between STOP and START.

2. Momentarily **PLACE** control switch for selected Main Exhaust Fan in STOP at panel 1C34, **AND CHECK** that it returns to auto when released:
 - 11 MAIN EXH FAN.....1-HS-5412
 - 12 MAIN EXH FAN.....1-HS-5413
 - 21 MAIN EXH FAN.....2-HS-5412
 - 22 MAIN EXH FAN.....2-HS-5413

**** END ****

7.0 POST PERFORMANCE ACTIVITIES

- A. Upon completion of attachments, forward the original(s) to the Operations Senior Administrative Assistant for retention **PER** PR-3-100, Records Management.

8.0 BASES

None

9.0 RECORDS

- A. Records generated by this procedure shall be transferred to Records Management **PER** PR-3-100, Records Management.

ATTACHMENT 1A
UNIT 1 MAIN EXHAUST FAN SYSTEM

VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
1-HVAC-121	----	MAIN EXH FANS 11 & 12 MAKEUP GRAVITY DAMPER	69 ft FAN RM TOP OF EXHAUST FANS		
1-HVAC-5412	SHUT (1)	MAIN EXH FAN 11 DISCH DAMPER	69 ft FAN RM		
1-HVAC-5413	SHUT (1)	MAIN EXH FAN 12 DISCH DAMPER	69 ft FAN RM		
1-HVAC-101	OPEN	1-HVAC-5412 PDI ISOL	69 ft FAN RM		
1-HVAC-102	OPEN	1-HVAC-5412 PDI ISOL	69 ft FAN RM		
1-HVAC-103	SHUT	1-HVAC-5412 PDI EQUAL	69 ft FAN RM		
1-HVAC-402	SHUT	MAIN EXH PLT DRN VLV	69 ft FAN RM		

(1) DAMPER WILL OPEN WHEN ASSOCIATED FAN IS STARTED.

ATTACHMENT 1B
UNIT 2 MAIN EXHAUST FAN SYSTEM

VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
2-HVAC-121	----	MAIN EXH FAN 21 & 22 MAKEUP GRAVITY DAMPER	69 ft FAN RM TOP OF EXHAUST FANS		
2-HVAC-5412	SHUT (1)	MAIN EXH FAN 21 DISCH DAMPER	69 ft FAN RM		
2-HVAC-5413	SHUT (1)	MAIN EXH FAN 22 DISCH DAMPER	69 ft FAN RM		
2-HVAC-101	OPEN	2-HVAC-5412 PDI ISOL	69 ft FAN RM		
2-HVAC-102	OPEN	2-HVAC-5412 PDI ISOL	69 ft FAN RM		
2-HVAC-103	SHUT	2-HVAC-5412 PDI EQUAL	69 ft FAN RM		

(1) DAMPER WILL OPEN WHEN ASSOCIATED FAN IS STARTED.

CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT ONE AND TWO
OI-22D
FUEL HANDLING AREA VENTILATION SYSTEM
REVISION 15

SAFETY RELATED

CONTINUOUS USE

Approval Authority: E. D. Dean III

Effective Date: 1/17/2007

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REV/CHG

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1.0 PURPOSE

- A. The purpose of this procedure is to give a detailed description of the operation of the Fuel Handling Area Ventilation System.

2.0 APPLICABILITY/SCOPE

- A. This procedure will cover operation of the Fuel Handling Area Ventilation System during startup & shutdown, preparation for fuel handling, operation of the charcoal filters, and New Fuel Storage Area Supply Fan operation.

3.0 REFERENCES AND DEFINITIONS

3.1 DEVELOPMENTAL REFERENCES

- A. Technical Specifications.
- B. P&IDs
 - 1. Bechtel Drawing No. OM-64, sheet 1 of 2.

3.2 PERFORMANCE REFERENCES

None

3.3 DEFINITIONS

- 1. CORE COMPONENT- A Fuel assembly, Neutron Sources, CEAs, Guide Tube inserts **OR** other items as directed by NFM.
- 2. RECENTLY IRRADIATED FUEL - Fuel that has occupied part of a critical reactor core within the previous 32 days. (T.S. Bases 3.7.11)

4.0 PREREQUISITES

- A. Prerequisites will vary depending on which section of the procedure is being performed. Prerequisites for each section will be listed at the beginning of the applicable section.

5.0 PRECAUTIONS

- A. The following is required to ensure that a negative pressure is maintained in the Fuel Handling Area:
1. Two Aux Bldg & WP Supply Fans running (one per unit) **OR** an engineering evaluation completed.
 2. The Cask Unloading Hatch **AND** ALL doors associated with the Fuel Handling Area shut.

If **BOTH** conditions 1 and 2 can **NOT** be met, consider Spent Fuel Pool Area Ventilation Out Of Service and refer to Tech Spec 3.7.11.

- B. The Spent Fuel Pool Supply Fans shall be secured during fuel handling evolutions involving recently irradiated fuel.
- C. The Spent Fuel Area Ventilation Filters are unable to withstand simultaneous operation of both exhaust fans. Thus, shifting exhaust fans requires that the operating fan be shutdown prior to starting the standby fan.
- D. **IF** the Transfer Tube Isolation Valve is open, **THEN** Refueling Pool Level and Spent Fuel Pool level should be closely monitored when performing any of the following:
- Changing the status of the Fuel Handling Area or Containment Ventilation Systems.
 - Performing any evolution that may change the differential pressure between the Containment and Auxiliary Building. **[B0055]**
- E. Temperature switches trip the supply fans upon sensing 40° F air temperature out of the heating coils, and may need to be manually reset prior to fan restart.
- F. Starting a SFP Exhaust Fan while personnel are in the Spent Fuel Charcoal Filter housing could cause a personnel injury.
- G. To ensure SFP Ventilation is operable when the PAL interlocks are defeated **AND** either the Containment Equipment hatch is installed **OR** the Containment Outage Door (COD) is shut, the following lineup is required: **[B0390]**
- The Containment Purge Supply **AND** Exhaust fans must be running
- OR**
- Containment Purge must be secured

5.0 PRECAUTIONS (Continued)

H. **IF** any of the following SFP area manometers fail to indicate a negative pressure in the SFP area, consider Tech Spec 3.7.11:

- 0-PDI-5440, SFP Area - Access Control Hallway
- 0-PDI-5442, SFP Area - Elevator Vestibule (Door 550)
- 0-PDI-5443, SFP Area - Stairwell (Door 533)
- 0-PDI-5444, SFP Area - Outside (Door 546)
- 0-PDI-5446, SFP Area - U-1 Hallway (Door 534)
- 0-PDI-5447, SFP Area - U-2 Hallway (Door526)

6.0 SYSTEM OPERATION

6.1 SYSTEM STARTUP

A. Initial Conditions

1. 11 or 12 Main Vent Exhaust Fan is in operation.
2. Fuel Handling Area Ventilation System Dampers are aligned **PER** ATTACHMENT 1.
3. Instrument Air is available.
4. Fuel Handling Area Ventilation System Radiation Monitor, 0-RE-5420, is in service, if available.

B. Procedure

1. **NOTIFY** Health Physics Supervision that SFP Area Ventilation will be started.

CAUTION

The Spent Fuel Area Ventilation Filters are unable to withstand simultaneous operation of both exhaust fans.

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2. **PLACE** the desired Spent Fuel Pool Exhaust Fan handswitch to START:

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- 11 SFP EXH FAN handswitch, 0-HS-5419

OR

- 12 SFP EXH FAN handswitch, 0-HS-5420

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3. **VERIFY** standby Spent Fuel Pool Exhaust Fan **NOT** rotating backwards.
4. **LOCALLY VERIFY** using 0-PDIS-5418, that SFP HEPA Filter delta p is less than 2.5" H₂O.
5. **IF** delta p is not within specification, **THEN INITIATE** a Condition Report.

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CAUTION

To prevent heating coil rupture when the outside air temperature is less than 45° F, Plant Heating System shall be lined up to the heating coils of the air handling units **OR** the coils isolated and drained.

6. **IF** outside air temperature is less than 60° F **AND** Plant Heating is available, **THEN VERIFY** the desired Fuel Handling Area H&V Plant Heating Circulating Pump in service **PER** APPENDIX A.

6.1.B Procedure (Continued)

7. **IF** Plant Heating is **NOT** available, **AND** outside air temperature is less than 45° F, **THEN ISOLATE AND DRAIN** the heating coils **PER** APPENDIX B.

NOTE

It is desirable to maintain negative pressure in the Spent Fuel Pool Area.

8. **IF** it is desired to start a Spent Fuel Pool Supply Fan, **AND** fuel handling evolutions involving recently irradiated fuel are **NOT** in progress, **THEN PROCEED** as follows:
- a. **OBTAIN** permission from the Shift Manager.
 - b. **PLACE** the desired Spent Fuel Pool Supply Fan handswitch to START:
 - 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

 - 12 SFP SUPP FAN handswitch, 0-HS-5415
 - c. **IF** the SFP Supply Fan does **NOT** start due to the low temperature switch **AND** temperature condition is clear **AND IF** necessary, **THEN RESET** the applicable Supply fan temperature switch as follows:
 - 11 SFP Supply Fan Temperature Switch 0-TS-5414

OR

 - 12 SFP Supply Fan Temperature Switch 0-TS-5415
9. **IF** fuel handling evolutions involving recently irradiated fuel are expected to be performed, **THEN PLACE** Charcoal Filters in service **PER** Section 6.2, CHARCOAL FILTER OPERATION.

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6.2 CHARCOAL FILTER OPERATION

A. Initial Conditions

1. The Fuel Handling Area Ventilation System is in operation **PER** Section 6.1, SYSTEM STARTUP.

B. Placing Charcoal Filters In Service

INITIALS

NOTE

Charcoal Filters are required to be in service when performing fuel handling evolutions involving recently irradiated fuel.

1. **ENSURE** SFP EXH FILT handswitch, 0-HS-5416, to FILTER. _____
2. **LOG** start time in the Charcoal Filter Log. (N/A if already in service) _____

NOTE

Spent Fuel Pool Ventilation is considered Out Of Service if Charcoal Filter D/P is less than .9" H₂O.

3. Locally **CHECK** using 0-PDI-5417, that SFP Charcoal Filter delta p is greater than or equal to .9" H₂O and less than or equal to 1.3" H₂O. _____
 - a. **IF** 0-PDI-5417 reads greater than 1.3" H₂O, **THEN INITIATE** a Condition Report to replace the filters. _____
 - b. **IF** 0-PDI-5417 reads less than .9" H₂O, **THEN INITIATE** a Condition Report **AND REFER** to Tech Spec SR 3.7.11.2. _____
4. Locally **CHECK** using 0-PDIS-5418, that SFP HEPA Filter delta p is less than or equal to 2.5" H₂O. _____
 - a. **IF** 0-PDIS-5418 reads greater than 2.5" H₂O, **THEN INITIATE** a Condition Report to replace the filters. _____

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6.2.B Placing Charcoal Filters In Service (Continued)

INITIALS

NOTE

Spent Fuel Pool Ventilation is considered Out Of Service if combined delta p is greater than or equal to 4.0" H₂O.

5. **SUM** the readings on 0-PDI-5417 and 0-PDIS-5418 to ensure the combined SFP Roughing, HEPA, and Charcoal Filter delta p are less than 4.0" H₂O. _____
- a. **IF** the sum of 0-PDI-5417 and 0-PDIS-5418 are greater than or equal to 4.0" H₂O,
THEN PERFORM the following:
 - (1) **INITIATE** a Condition Report to replace filters. _____ | 1500
 - (2) **REFER** to Tech Spec SR 3.7.11.2. _____
6. **VERIFY** standby Spent Fuel Pool Exhaust Fan **NOT** rotating backwards. _____

NOTE

Local verification of the fan running is required to ensure the fan belt is intact.

7. Locally **VERIFY** a SFP Exhaust Fan is operating. _____

NOTE

- Local verification of the fans running is required to ensure the fan belts are intact.
- Two Aux Bldg & WP Supply Fans running (one per unit) **OR** an engineering evaluation is required to ensure Spent Fuel Pool Area Ventilation operability.

8. Locally **VERIFY** that two Aux Bldg & WP Supply Fans are operating (one per unit) **OR** an engineering evaluation completed for Spent Fuel Pool Area Ventilation. _____
9. **IF** PAL interlocks are defeated **AND** either the Containment Equipment hatch is installed **OR** the Containment Outage Door (COD) is shut,
THEN ENSURE the following Containment Purge lineup: **[B0390]** _____
 - The Containment Purge Supply **AND** Exhaust fans must be running

OR

 - Containment Purge must be secured

6.2.B Placing Charcoal Filters In Service (Continued)

INITIALS

10. **IF** placing Charcoal Filters on service for movement of recently irradiated fuel assemblies in the Auxiliary Building,
THEN PERFORM APPENDIX C, VENTILATION WALKDOWN CHECKLIST.

6.2 CHARCOAL FILTER OPERATION (Continued)**C. Bypassing the Charcoal Filters**

1. **VERIFY** that fuel handling evolutions involving recently irradiated fuel are **NOT** in progress **OR** expected to be performed.
2. **CHECK** that the Fuel Handling Area Ventilation System Radiation Monitor, 0-RE-5420, is in operation **AND** not in an alarm state.
3. **PLACE** SFP EXH FILT handswitch, 0-HS-5416, to BYPASS.
4. **IF** Charcoal Filters were in service due to high radiation detected in the Fuel Handling Area,
THEN MONITOR the Fuel Handling Area Ventilation System Radiation Monitor for increased reading.
5. **LOG** stop time in the Charcoal Filter Log.
6. **NOTIFY** Fire and Safety that moves in the SFP are complete and Fire Barrier Permits may be issued.

6.3 NEW FUEL STORAGE AREA SUPPLY FAN OPERATION

A. Initial Conditions

NONE

B. Procedure

1. **IF** desired to place New Fuel Storage Area Supply Fan in service,
THEN PLACE handswitch 0-HS-5441 to START.
2. **WHEN** desired to remove New Fuel Storage Area Supply Fan from service,
THEN PLACE handswitch 0-HS-5441 to STOP.

6.4 SYSTEM SHUTDOWN

A. Initial Conditions

1. Fuel handling is **NOT** in progress.
2. Tech Spec 3.7.11 has been reviewed for applicability.
3. No activities are in progress in the SFP area that require ventilation.
4. **IF** The Fuel Handling Area Ventilation System Radiation Monitor, 0-RE-5420, is in operation,
THEN it is not in an alarm state.
5. **IF** The Fuel Handling Area Ventilation System Radiation Monitor, 0-RE-5420, is not in operation,
THEN Health Physics Supervision has determined that no high airborne or particulate radiation levels exist in the Fuel Handling Area.

B. Procedure

1. **NOTIFY** Health Physics Supervision that the SFP Area Ventilation will be shutdown.
2. **IF** a Spent Fuel Pool Supply Fan is in operation,
THEN PLACE the running Spent Fuel Pool Supply Fan handswitch to STOP:
 - 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

 - 12 SFP SUPP FAN handswitch, 0-HS-5415

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1500

NOTE

The Spent Fuel Area Ventilation Filters are unable to withstand simultaneous operation of both exhaust fans.

1500

3. **PLACE** the running Spent Fuel Pool Exhaust Fan handswitch to STOP:
 - 11 SFP EXH FAN handswitch, 0-HS-5419

OR

 - 12 SFP EXH FAN handswitch, 0-HS-5420

1500
1500

6.5 OPERATION OF SPENT FUEL POOL FANS

A. Initial Conditions

- 1. The Fuel Handling Area Ventilation System is in operation **PER** Section 6.1, SYSTEM STARTUP. | 1500

B. Starting a Spent Fuel Pool Supply Fan

- 1. **NOTIFY** Health Physics Supervision that SFP Area Ventilation will be changed. | 1500

CAUTION

To prevent heating coil rupture when the outside air temperature is less than 45° F, Plant Heating System shall be lined up to the heating coils of the air handling units **OR** the coils isolated and drained. | 1500

- 2. **IF** outside air temperature is less than 60° F **AND** Plant Heating is available, **THEN VERIFY** the desired Fuel Handling Area H&V Plant Heating Circulating Pump in service **PER** APPENDIX A. | 1500

- 3. **IF** Plant Heating is **NOT** available, **AND** outside air temperature is less than 45° F, **THEN ENSURE** the heating coils are **ISOLATED AND DRAINED PER** APPENDIX B. | 1500

- 4. **VERIFY** a Spent Fuel Pool Exhaust Fan is in operation. | 1500

- 5. **VERIFY** fuel handling evolutions involving recently irradiated fuel are **NOT** in progress | 1500

6.5.B Starting a Spent Fuel Pool Supply Fan (Continued)

NOTE

It is desirable to maintain negative pressure in the Spent Fuel Pool Area.

1500

6. **PERFORM** the following to start the desired Spent Fuel Pool Supply Fan:

1500

a. **OBTAIN** permission from the Shift Manager.

b. **PLACE** the desired Spent Fuel Pool Supply Fan handswitch to START:

- 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

- 12 SFP SUPP FAN handswitch, 0-HS-5415

1500

c. **IF** the SFP Supply Fan does **NOT** start due to the low temperature switch **AND** temperature condition is clear **AND IF** necessary, **THEN RESET** the applicable Supply fan temperature switch as follows:

- 11 SFP Supply Fan Temperature Switch 0-TS-5414

OR

- 12 SFP Supply Fan Temperature Switch 0-TS-5415

1500

C. Shifting Spent Fuel Pool Supply Fans

1. **NOTIFY** Health Physics Supervision that SFP Area Ventilation will be changed.

1500

2. **PLACE** the running Spent Fuel Pool Supply Fan handswitch to STOP:

1500

- 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

- 12 SFP SUPP FAN handswitch, 0-HS-5415

1500

3. **PLACE** the desired Spent Fuel Pool Supply Fan handswitch to START:

1500

- 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

- 12 SFP SUPP FAN handswitch, 0-HS-5415

1500

D. Stopping Spent Fuel Pool Supply Fans

1. **NOTIFY** Health Physics Supervision that SFP Area Ventilation will be changed.

1500

6.5.D Stopping Spent Fuel Pool Supply Fans (Continued)

- 2. **PLACE** the running Spent Fuel Pool Supply Fan handswitch to STOP: | 1500
 - 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

 - 12 SFP SUPP FAN handswitch, 0-HS-5415 | 1500

E. Shifting Spent Fuel Pool Exhaust Fans

- 1. **NOTIFY** Health Physics Supervision that SFP Area Ventilation will be changed. | 1500
- 2. **IF** a Spent Fuel Pool Supply Fan is in operation, **THEN PLACE** the running Spent Fuel Pool Supply Fan handswitch to STOP: | 1500
 - 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

 - 12 SFP SUPP FAN handswitch, 0-HS-5415 | 1500

NOTE

The Spent Fuel Area Ventilation Filters are unable to withstand simultaneous operation of both exhaust fans. | 1500

- 3. **PLACE** the running Spent Fuel Pool Exhaust Fan handswitch to STOP: | 1500
 - 11 SFP EXH FAN handswitch, 0-HS-5419

OR

 - 12 SFP EXH FAN handswitch, 0-HS-5420 | 1500
- 4. **PLACE** the desired Spent Fuel Pool Exhaust Fan handswitch to START: | 1500
 - 11 SFP EXH FAN handswitch, 0-HS-5419

OR

 - 12 SFP EXH FAN handswitch, 0-HS-5420 | 1500
- 5. **VERIFY** standby Spent Fuel Pool Exhaust Fan **NOT** rotating backwards. | 1500
- 6. **LOCALLY VERIFY** using 0-PDIS-5418, that SFP HEPA Filter delta p is less than 2.5" H₂O. | 1500
- 7. **IF** delta p is not within specification, **THEN INITIATE** a Condition Report. | 1500

6.5.E Shifting Spent Fuel Pool Exhaust Fans (Continued)

8. **IF** a Spent Fuel Pool Supply Fan was secured in Step 2,
THEN PLACE the desired Spent Fuel Pool Supply Fan handswitch to START:

| 1500

- 11 SFP SUPP FAN handswitch, 0-HS-5414

OR

- 12 SFP SUPP FAN handswitch, 0-HS-5415

| 1500

7.0 POST-PERFORMANCE ACTIVITIES

- A. Upon completion of attachments, forward the original(s) to the Operations Senior Administrative Assistant for retention **PER** PR-3-100, Records Management.

8.0 BASES

[B0055] Precaution 5. 0. E addresses concerns brought about from INPO OE-3989, Spent Fuel Pool Overflow Due To Containment Overpressure.

[B0390] Memo dated 3/19/97: Results from ETP 97-014, which identifies a CNTMT Purge lineup that causes SFP Ventilation to be inoperable.

[M0002] A page check of attachments is performed **PER** a corrective action of LER 89-01.

9.0 RECORDS

- A. Records generated by this procedure shall be transferred to Records Management **PER** PR-3-100, Records Management.

10.0 ATTACHMENTS

- A. APPENDIX A, ALIGNING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS.
- B. APPENDIX B, ISOLATING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS.
- C. APPENDIX C, VENTILATION WALKDOWN CHECKLIST.
- D. ATTACHMENT 1, FUEL HANDLING AREA VENTILATION SYSTEM.

ALIGNING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS

1. **IF** desired to place 11 Fuel Handling Area H&V Hot Water Circulating Pump in service,
THEN PERFORM the following:
 - a. **ENSURE SHUT** 11 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-834.
 - b. **ENSURE SHUT** 11 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-835.
 - c. **ENSURE OPEN** 11 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP SUCT VLV, 0-PH-369.
 - d. **ENSURE OPEN** 11 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP DISCH VLV, 0-PH-371.
 - e. **ENSURE OPEN** 11 FUEL HANDLING AREA H&V UNIT TCV OUTLET VLV, 0-PH-372.
 - f. **IF** system was Isolated **AND** Drained,
THEN PERFORM the following:
 - (1) **CONNECT** tygon tubing down stream of 11 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-834 **AND RUN** to suitable container or floor drain.

WARNING

Plant Heating water may be extremely hot. Avoid contact with the skin.

- (2) **OPEN** 11 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-834.
- (3) **WHEN** water issues from 0-PH-834,
THEN SHUT 0-PH-834.
- (4) **REMOVE** tygon tubing from 0-PH-834.
- (5) **INSTALL** cap on 0-PH-834.
- g. **PLACE** 11 Fuel Handling Area H&V Hot Water Circulating Pump handswitch, 0-HS-6575, in START.

ALIGNING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS

2. **IF** desired to place 12 Fuel Handling Area H&V Hot Water Circulating Pump in service,
THEN PERFORM the following:
 - a. **ENSURE SHUT** 12 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-840.
 - b. **ENSURE SHUT** 12 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-842.
 - c. **ENSURE OPEN** 12 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP SUCT VLV, 0-PH-364.
 - d. **ENSURE OPEN** 12 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP DISCH VLV, 0-PH-366.
 - e. **ENSURE OPEN** 12 FUEL HANDLING AREA H&V UNIT TCV OUTLET VLV, 0-PH-367.
 - f. **IF** system was Isolated **AND** Drained,
THEN PERFORM the following:
 - (1) **CONNECT** tygon tubing down stream of 12 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-840 **AND RUN** to suitable container or floor drain.

WARNING

Plant Heating water may be extremely hot. Avoid contact with the skin.

- (2) **OPEN** 12 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-840.
- (3) **WHEN** water issues from 0-PH-840,
THEN SHUT 0-PH-840.
- (4) **REMOVE** tygon tubing from 0-PH-840.
- (5) **INSTALL** cap on 0-PH-840.
- g. **PLACE** 12 Fuel Handling Area H&V Hot Water Circulating Pump handswitch, 0-HS-6576, in START.

ISOLATING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS

1. **IF** desired to remove 11 Fuel Handling Area H&V Hot Water Circulating Pump from service,
THEN PERFORM the following steps:
 - a. **PLACE** 11 Fuel Handling Area H&V Hot Water Circulating Pump handswitch, 0-HS-6575, to STOP.
 - b. **SHUT** 11 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP SUCT VLV, 0-PH-369.
 - c. **SHUT** 11 FUEL HANDLING AREA H&V UNIT TCV OUTLET VLV, 0-PH-372.
 - d. **CONNECT** tygon tubing down stream of 11 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-835 **AND** **RUN** to suitable container or floor drain.

WARNING

Plant Heating water may be extremely hot. Avoid contact with the skin.

- e. **OPEN** 11 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-835.
- f. **OPEN** 11 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-834.

ISOLATING PLANT HEATING TO FUEL HANDLING AREA SUPPLY FANS

2. **IF** desired to remove 12 Fuel Handling Area H&V Hot Water Circulating Pump from service,
THEN PERFORM the following steps:
 - a. **PLACE** 12 Fuel Handling Area H&V Hot Water Circulating Pump handswitch, 0-HS-6576, to STOP.
 - b. **SHUT** 12 FUEL HANDLING AREA H&V UNIT HOT WATER CIRCULATING PP SUCT VLV, 0-PH-364.
 - c. **SHUT** 12 FUEL HANDLING AREA H&V UNIT TCV OUTLET VLV, 0-PH-367.
 - d. **CONNECT** tygon tubing down stream of 12 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-842 **AND** **RUN** to suitable container or floor drain.

WARNING

Plant Heating water may be extremely hot. Avoid contact with the skin.

- e. **OPEN** 12 FUEL HANDLING AREA H&V HOT WATER CIRCULATING PP OUTLET DRAIN VLV, 0-PH-842.
- f. **OPEN** 12 FUEL HANDLING AREA H&V HTG COIL OUTLET VENT VLV, 0-PH-840.

VENTILATION WALKDOWN CHECKLIST [B0408]

NOTE

The Ventilation Walkdown Checklist shall be performed prior to the commencement of movement of irradiated fuel assemblies within containment **AND/OR** movement of recently irradiated fuel assemblies in the Auxiliary Building. APPENDIX C, VENTILATION WALKDOWN CHECKLIST will be performed every 12 hours thereafter while these evolutions are in progress.

1500

- A. This appendix has been page checked against the LIST OF EFFECTIVE PAGES. [M0002]

_____/_____
Init Date

NOTE

Steps B - G may be done in any order.

- B. Control Room Radiation Monitoring

1. **VERIFY** the Control Room Ventilation Radiation Monitor, 0-RI-5350, is in service **AND NOT** in alarm, **OR** the required actions of Tech Spec 3.3.8 Action C.1 have been taken. _____

- C. Ventilation Systems and Components

- **VERIFY** Required Train of CREVS operable **PER** Tech Spec 3.7.8. (N/A if **NOT** moving irradiated fuel assemblies) _____
- **VERIFY** Required Train of CRETS operable **PER** Tech Spec 3.7.9. (N/A if **NOT** moving irradiated fuel assemblies) _____
- **VERIFY** at least one Containment Iodine Filter is available for service (N/A if movement of irradiated fuel assemblies within containment **NOT** in progress) _____

1500

VENTILATION WALKDOWN CHECKLIST [B0408]

- D. Spent Fuel Pool Area Ventilation Systems and Components
 (N/A if **NOT** moving recently irradiated fuel assemblies in the Auxiliary Building)
- **VERIFY** 11 or 12 Main Vent Exhaust Fan in operation _____
 - Locally **VERIFY** two Auxiliary Building Supply Fans are running
 (one per unit) _____
 - Locally **VERIFY** Spent Fuel Pool Exhaust Fan running _____
 - **VERIFY** standby Spent Fuel Pool Exhaust Fan **NOT** rotating
 backwards _____
 - **VERIFY** Spent Fuel Pool Supply Fans **NOT** in operation _____
 - **VERIFY** Spent Fuel Pool Exhaust Ventilation filters in service:
 - 0-HS-5416 in FILTER position at 1C34 _____
 - 0-PDI-5417 reads greater than or equal to .9" H₂O. _____
 - **SUM** the readings on 0-PDI-5417 and 0-PDIS-5418 to ensure the
 combined SFP Roughing, HEPA, and Charcoal Filter delta p are less
 than 4.0" H₂O. _____

VENTILATION WALKDOWN CHECKLIST [B0408]

NOTE

Spent Fuel Pool Ventilation is considered Out Of Service if Charcoal Filter D/P is less than .9" H₂O **OR** combined delta p is greater than or equal to 4.0" H₂O.

- **IF** 0-PDI-5417 reads less than .9" H₂O, **OR** combined readings of 0-PDI-5417 and 0-PDIS-5418 is greater than or equal to 4.0" H₂O, **THEN REFER** to Tech Spec SR 3.7.11.2. _____

- **IF** PAL interlocks are defeated **AND** either the Containment Equipment hatch is installed **OR** the Containment Outage Door (COD) is shut, **THEN ENSURE** the following Containment Purge lineup: **[B0390]** _____

- The Containment Purge Supply **AND** Exhaust fans must be running

- OR**

- Containment Purge must be secured

- **VERIFY** the following SFP area manometers indicate a negative pressure in the SFP area:
 - 0-PDI-5440, SFP Area - Access Control Hallway _____
 - 0-PDI-5442, SFP Area - Elevator Vestibule (Door 550) _____
 - 0-PDI-5443, SFP Area - Stairwell (Door 533) _____
 - 0-PDI-5444, SFP Area - Outside (Door 546) _____
 - 0-PDI-5446, SFP Area - U-1 Hallway (Door 534) _____
 - 0-PDI-5447, SFP Area - U-2 Hallway (Door 526) _____

VENTILATION WALKDOWN CHECKLIST [B0408]

E. Doors and Hatches

(N/A if **NOT** moving recently irradiated fuel assemblies in the Auxiliary Building)

- **VERIFY** the 69' to 45' rolling door (Cask loading hatch) SHUT. _____
- **VERIFY** the 69' to 45' rolling door pushbutton handswitch cover is **INSTALLED AND LOCKED**. _____

NOTE

The Caution signs should state "OPENING RENDERS SFP VENTILATION OOS. NEED SHIFT MANAGER'S PERMISSION TO OPEN".

- **VERIFY** the following doors are **SHUT** and Caution signs are hung on the doors:
 - * Door 545 Roof access-Security alarm door to 2A/1B DG _____
 - * Door 546 Roof access-Security alarm door to AB/2B DG _____
 - * (4) Hatches to the Auxiliary Building Supply Intake Plenum _____
- **VERIFY** the following doors are **NOT** blocked open:
 - * Door 526, East SFP Access (south) _____
 - * Door 534, Aux Bldg and SFP area (north) _____
 - * Door 533, Aux Bldg Stairtower _____
 - * Door 550, Aux Bldg Elevator _____
- **VERIFY** that there are **NO** existing Fire Barrier Permits **AND** controls are in place to prohibit issuing Fire Barrier Permits for the doors listed in the 3rd and 4th bulleted substeps above. _____

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F. Spent Fuel Pool Radiation Monitoring

(N/A if **NOT** moving Core Components in the SFP)

1. **VERIFY** the Fuel Handling Area Vent Area Radiation Monitor, 0-RI-5420, is in service **AND NOT** in alarm. _____

VENTILATION WALKDOWN CHECKLIST [B0408]

G. Containment Radiation Monitoring
(N/A if movement of irradiated fuel assemblies within containment **NOT** in progress)

1500

1. **VERIFY** the following radiation monitors are in service:

- **IF** Contmt Purge is in service,
THEN 69 ft Elevation Containment Area Radiation Monitors, RI-5316A thru D, are operable **PER** Tech Spec 3.3.7. This includes a check of the CRS Sensor Modules **AND** bypass keys on ESFAS. _____
- **IF** Contmt Purge is secured,
THEN at least one of the 69 ft Elevation Containment Area Radiation Monitors, RI-5316A thru D _____

NOTE

This checklist must be completed every 12 hours during the movement of recently irradiated fuel assemblies in the Auxiliary Building to meet the requirements of Tech Spec SR 3.7.11.1.

H. **SCHEDULE** performance of this checklist once per every 12 hours on the Shift Turnover Information Sheet. _____

I. **LOG** completion of this checklist in the CRO Log. _____

J. This appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____/_____
Init Date

Completed by DATE/TIME

Reviewed by (CRS) DATE

ATTACHMENT 1
FUEL HANDLING AREA VENTILATION SYSTEM

0I-22D
 Rev. 15
 Page 1 of 2

VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
0-HVAC-385	OPEN	0-PDIS-5418 HS ISOL	SFP FAN RM BELOW 0-PDIS-5418		
0-HVAC-386	SHUT	0-PDIS-5418 EQUAL	SFP FAN RM BELOW 0-PDIS-5418		
0-HVAC-387	OPEN	0-PDIS-5418 LS ISOL	SFP FAN RM BELOW 0-PDIS-5418		
0-HVAC-5414-PO	SHUT (1) OPEN	FUEL HNDLG AREA HTG & VENT UNIT NO. 11 SUCT DMPR	ABOVE AUX BLDG SUPPLY FAN ROOM		
0-HVAC-5415-PO	SHUT (1) OPEN	FUEL HNDLG AREA HTG & VENT UNIT NO. 12 SUCT DMPR	ABOVE AUX BLDG SUPPLY FAN ROOM		
0-HVAC-5416-PO	(2) OPEN	FUEL POOL EXH FILT CHAR FILT BYP DMPR	SFP EXHAUST FAN ROOM		
0-HVAC-5417-PO	(3) SHUT	FUEL POOL EXH FILT CHAR FILT INLET DMPR	SFP EXHAUST FAN ROOM		

- (1) Opens when selected fan is started.
- (2) Open when 0-HS-5416 in BYPASS position.
Shut when 0-HS-5416 in FILTER position.
- (3) Shut when 0-HS-5416 in BYPASS position.
Open when 0-HS-5416 in FILTER position.

ATTACHMENT 1
FUEL HANDLING AREA VENTILATION SYSTEM

0I-22D
 Rev. 15
 Page 2 of 2

VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
0-HVAC-5418-PO	(3) SHUT	FUEL POOL EXH FILT CHAR FILT INLET DMPR	SFP EXHAUST FAN ROOM		
0-HVAC-5419	SHUT (1) OPEN	FUEL POOL EXH FAN NO 11 DISCH DMPR	SFP EXHAUST FAN ROOM		
0-HVAC-5420	SHUT (1) OPEN	FUEL POOL EXH FAN NO 12 DISCH DMPR	SFP EXHAUST FAN ROOM		
0-HVAC-7335	THROTTLED (4)	FUEL POOL EXH EQUIP RM EXH MANUAL DMPR	SFP EXHAUST FAN ROOM SOUTH END IN OVERHEAD		

- (3) Shut when 0-HS-5416 in BYPASS position.
 Open when 0-HS-5416 in FILTER position.
- (1) Opens when selected fan is started.
- (4) Throttled to 150 SCFM. Electrically disconnected.

CALVERT CLIFFS NUCLEAR POWER PLANT

UNIT ONE AND TWO

OI-25C

REFUELING MACHINE

REVISION 35

SAFETY RELATED

MULTIPLE USE

Approval Authority: R.C. Jones

Effective Date: 3/4/2008

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1.0 PURPOSE

- A. The purpose of this procedure is to provide directions for operating the Refueling Machine (RFM).

2.0 APPLICABILITY/SCOPE

- A. This procedure will cover the various operational aspects of the RFM, including operation and securing.
 - 1. Section 6.3, which provides detailed instructions for the actual manipulation of the switches for operating the various RFM components, may be performed from memory, but shall be performed in conjunction with the applicable subsections of Section 6.4, which provides detailed instructions for each move sequence, or in conjunction with APPENDIX A.

3.0 REFERENCES AND DEFINITIONS**3.1 DEVELOPMENTAL REFERENCES**

- A. Technical Specification.
- B. Technical Requirements Manual (TRM).
- C. Vendor Technical Manuals
- D. CNG-HU-1.01-1001, Human Performance Tools and Verification Practices.

3.2 PERFORMANCE REFERENCES

None

3.3 DEFINITIONS

- A. Fuel Handling Supervisor (FHS) - The FHS is the SRO stationed on the 69 ft elevation within the Containment to directly supervise the core alteration activities with no concurrent duties.
- B. Refueling Control Room Operator (RCRO) - The RCRO shall be a Licensed Operator (RO or SRO) stationed in the Control Room to coordinate the refueling activities, maintain the Refueling Status Board, and monitor for reactivity changes, while maintaining direct communications with the personnel operating the refueling equipment.
- C. SNM Transfer Form 2 - This form is the "move sheet" prepared by Nuclear Fuel Management (NFM) to provide administrative control and a tracking mechanism for the movement of fuel or other objects which may affect core geometry or actual neutron count rate within the core.
- D. Fuel Spotter - The Spotter's primary responsibility is to provide additional safety for the fuel and handling equipment (reference APPENDIX B).

4.0 PREREQUISITES

- A. Prerequisites will vary depending on which section of the procedure is being performed. Prerequisites for each section will be listed as Initial Conditions at the beginning of the applicable section.

5.0 PRECAUTIONS

- A. Prior to performing Core Alterations, direct communications between the Control Room and personnel on the RFM and SFHM shall be established and verified (TRM 15.9.2). **ALL** Core Alterations shall cease if such communications are lost.
1. The transfer carriage operators shall also be in voice communication with the Control Room, SFHM, and RFM when the transfer carriage has fuel in the carriage. At other times, voice communication is **NOT** required.
- B. **ALL** RFM equipment shall be thoroughly inspected and tested using APPENDIX A. The responsible System Engineer may schedule the performance of the PE at anytime.
- C. All manual handwheels shall be removed from their extension shafts except during manual operation.
- D. A fuel spotter shall be used anytime the RFM is being moved. Spotter shall be proficient **PER** NO-1-200, Control of Shift Activities. **[B0167]**
- E. Core alterations shall be performed under the direct supervision of a Senior Reactor Operator, designated Fuel Handling Supervisor (FHS) **AND** stationed on the 69 ft elevation of the Containment of the Unit being refueled.
1. **IF** the Refueling Machine Operator is **NOT** a licensed Reactor Operator qualified on the Refueling Machine, **THEN** the FHS shall be located on the RFM platform.
- F. For a dropped or damaged fuel assembly incident in the RFP, the following conditions shall be established; **ANY** fuel assembly **NOT** involved is to be placed in a safe condition, refueling activities stopped, the area evacuated, and the Control Room notified.
- G. For sudden reductions in RFP level any grappled fuel assembly shall be immediately lowered as low as practical, and the area shall be evacuated and the Control Room notified.
- H. Extreme caution shall be exercised when operating near the walls to avoid camera or mast contact with wall mounted brackets, lights, or piping.
- I. **IF** an abnormally rising count rate occurs on the monitor while a fuel assembly is being inserted into the core, **THEN** the fuel assembly shall be immediately returned to its previous position and the FHS and RCRO notified. **[B0270]**
- J. Life jackets or lifelines are required anytime work is being done within three feet of the pool and there is **NOT** a handrail between the worker and the water.

5.0 PRECAUTIONS (Continued)

- K. SWP requirements and good radiological work practices must be observed. All fluids shall be treated as contaminated unless certified radiologically clean by Plant Chemistry. All components shall be treated as contaminated unless certified radiologically clean by Radiation Safety Supervision.
- L. Access to the fuel transfer tube access area on the 45 ft Elevation shall be restricted prior to movement of any fuel through the transfer tube.
- M. All fuel assemblies being transferred from the SFP to the core shall be checked to be shiny (new assembly) or dark (irradiated assembly).
1. For core-to-core moves, the assemblies shall be checked to be shiny or dark by the RFM spotter.
- N. No one shall board or exit the RFM while it is in motion. Pinch points may be created at the side of the pool. The RFM operator SHALL ensure that ALL personnel on the RFM are aware of the RFM movements. **[B0212]**
- O. Items (such as radiation meters, life vests, tools) shall **NOT** be placed on the bridge floor such that they protrude into the path of the trolley.
- P. The RFM operator should be cognizant of the ICI platform proximity. Dose rates are typically higher near the ICI platform **AND** may cause alarming dose rate meters on the RFM to alarm. Also the ICI bridge location is **NOT** programmed into the RFM computer. This can allow the RFM to contact the ICI bridge in the SEMI-AUTO or AUTO mode of operation.
- Q. Rotation of the mast with a fuel assembly present may result in an assembly being placed in the core or SFP with the wrong orientation.
1. The mast orientation shall be verified to be in agreement with the SNM Transfer Form 2 prior to lowering into the target location.
- R. In Mode 6, at least two Wide Range NIs shall be operable, each with continuous visual indication in the Control Room **AND** one with audible indication in the containment and the Control Room. (Tech Spec 3.9.2)
1. **IF** less than two NIs are operable, **THEN** immediately perform the following:
 - a. **SUSPEND** positive reactivity additions.
 - b. Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than that required to meet the minimum boron concentration of LCO 3.9.1.
 - c. **ANY** fuel assembly/CEA in transit shall be moved to a safe configuration (away from the core).

5.0 PRECAUTIONS (Continued)

- S. After the FHS has double checked the SNM Form 2 "TO" location and the FUEL SELECTOR switch position with the RCRO, an independent verification of the "TO" location coordinates **AND** the FUEL SELECTOR switch position shall be performed (N/A if operating the RFM in AUTO with NO SNM form 2 on the bridge).
- T. After an assembly has been placed into the core, a visual check that a fuel assembly is present in the "TO" location shall be performed by the FHS and/or RFM spotter, **AND** the RCRO shall be notified of the check completion.
- U. Prior to preparations for core alterations (machine checkout), a binocular inspection has been completed of all equipment paths for foreign material interference.
- V. If the camera is not available to provide visual verification of the grapple position, the RFM operator should ensure via the RFM spotter, that the grapple has been rotated in the correct position when grappling and ungrappling a fuel assembly.
- W. The RFM operator should ensure via the RFM spotter, that the camera is properly orientated to avoid any interferences.
- X. CREVS operable per Tech Spec 3.7.8.
- Y. CRETS operable per Tech Spec 3.7.9.
- Z. Evolutions should be stopped and the SM/FHS notified immediately of any abnormal or unexpected indications received during the operation of the RFM.
- AA. The EMERGENCY STOP pushbutton provides for quick stop response of the RFM equipment. If the EMERGENCY STOP pushbutton is depressed, the operator must wait at least 60 seconds before resetting the Emergency Stop. Resetting the Emergency Stop earlier could result in breakers tripping and possible damage to drive controllers.
- AB. The HOIST MAX OVERLOAD pushbutton bypasses the overload cutoff limit of 3500#, which is required by TRM 15.9.3.
- AC. DO **NOT** use the COMPUTER OVERRIDE Keyswitch without procedural guidance due to that it will override ALL interlocks.
- AD. Due to possible damage of the festoon cable, the Refueling Bridge should **NOT** be moved past the coordinate of 890. Extreme caution should be used if bridge is driven past this coordinate.
- AE. The Spreader shall **NOT** be operated while the Hoist Box is in motion.
- AF. This procedure has been reviewed for Risk Based Verification Practices. No specific steps were identified. The SM, CRS, or any other person involved with the task may designate steps requiring the use of Verification Practices.

6.0 SYSTEM OPERATION**6.1 STARTUP OF THE REFUELING MACHINE [CONTINUOUS USE]****A. Initial Conditions**

1. A SWP is approved for the Refueling Machine activities.
2. The Refueling Machine Console has been installed and connected.
3. All manual handwheels are removed from their extension shafts.
4. **ALL** RFM equipment shall be thoroughly inspected and tested using APPENDIX A if the RFM has been shutdown for greater than 90 days. The responsible System Engineer may schedule the performance of the PE at anytime. (N/A Initial Condition 4, if performing PE 0-81-2-0-R)
5. Power is available to the Refueling Machine.
6. Instrument Air is available to the Refueling Machine.

B. Procedure**NOTE**

1L19 is located on U-1 Cntmt 45' NE corner biowall. 2L18 is located on U-2 Cntmt 45' SE corner biowall.

1. **VERIFY** Power is aligned to the appropriate unit Refueling machine **PER** the following:
 - Feeder Breaker 52-10517 (52-20517) is ON.
 - **BOTH** Pool side disconnects are SHUT.
 - P-Panel Breaker 1L19-28 (2L18-27) is ON.

6.1.B Procedure (Continued)**NOTE**

Refueling Machine Start-Up Section is written to assume that the system usage is for fuel handling.

IF the Start-up of the system is for testing of interlocks **OR** Post maintenance testing, **THEN** initial conditions and steps may be omitted with the concurrence of the SM **OR** CRS.

2. **IF** the Refueling Machine is being started up from a long term shutdown (shutdown longer than 90 days), **THEN PERFORM** the following:

NOTE

Refer to FIGURE 3, RFM SPREADER ARM for step B.2.a.

- a. **ENSURE** the pins for both spreader arms are in the OPERATE position.
- b. **COMPLETE** APPENDIX A, REFUELING MACHINE CHECK OUT (N/A if startup of system is for testing of interlocks, maintenance or post maintenance testing).
- c. **IF** Refueling Operations will begin, **THEN PERFORM** the following:
 - **ENSURE** APPENDIX C, REFUELING OPERATIONS CHECKLIST is complete. **[B0408]** (N/A if performed as part of APPENDIX A)
 - **ENSURE** OI-22D, FUEL HANDLING AREA VENTILATION SYSTEM APPENDIX C, VENTILATION WALKDOWN CHECKLIST is complete. **[B0408]**

6.1.B Procedure (Continued)

3. **IF** the Refueling Machine is being started up from a short term shutdown (shutdown 90 days or less),
THEN PERFORM the following:
 - a. **PLACE** the MAIN BREAKER to ON. (located on back of RFM Console.)
 - b. **DEPRESS** the POWER ON pushbutton on the console panel.
 - c. **ENSURE** the HEATER ON light is extinguished.
 - d. **ENSURE** the PLC ACTIVE light is flashing. (Located on the right side of the RFM Console.)
 - e. **IF** the computer is available,
THEN log on to the computer as follows:
 - (1) **TOUCH** the LOG ON touch pad.
 - (2) **TOUCH** in the user name (normal fuel moves will be "FHS") **AND TOUCH** the ENTER touch pad.
 - (3) **TOUCH** the ENTER PASSWORD touch pad.
 - (4) **TOUCH** in the password (normal fuel moves will again be "FHS") **AND TOUCH** the ENTER touch pad.
 - (5) **TOUCH** the PRESS FOR OPERATION touch pad.
 - f. **ENSURE** a complete copy of APPENDIX A, REFUELING MACHINE CHECK OUT has been completed within the last 90 days (N/A if startup of system is for testing of interlocks, maintenance or post maintenance testing).
 - g. **IF** Refueling Operations will begin,
THEN PERFORM the following:
 - **ENSURE** APPENDIX C, REFUELING OPERATIONS CHECKLIST is complete. **[B0408]** (N/A if performed as part of APPENDIX A)
 - **ENSURE** OI-22D, FUEL HANDLING AREA VENTILATION SYSTEM APPENDIX C, VENTILATION WALKDOWN CHECKLIST is complete. **[B0408]**

**** END ****

6.2 MANUAL OPERATION OF THE REFUELING MACHINE [CONTINUOUS USE]**A. Initial Conditions**

1. A SWP is approved for performance of the refueling activities to be performed within this procedure.
2. The RCSS has been notified of the moves to be performed within this procedure.
3. Bridge and trolley rails and intended path of mast are clear of interferences.
4. The clarity and lighting of the Refueling Pool is adequate to allow the verification that the mast is free of obstructions prior to movement.
5. A spotter (PPO, RFHM qualified personel, or personnel designated by the AOM shall be used if operating mast/grapple to grapple core components) is available to observe fuel movement **[B0167]**
6. Startup of the Refueling Machine has been completed **PER** Section 6.1, **STARTUP OF THE REFUELING MACHINE.**

B. Procedure**CAUTION**

- **ALL** electrical interlocks are inoperative during manual operation.
- When working with the handwheels over the RFP, the handwheels are required to be tethered except when installed and being operated.

NOTE

When actuating the EMERGENCY STOP pushbutton, allow 60 seconds before resetting the emergency stop to prevent causing a lockup of the PLC (Programmable Logic Controller).

1. **DEPRESS** the EMERGENCY STOP pushbutton **AND ENSURE** SYSTEM FAULT is indicated on the CRT.

6.2.B Procedure (Continued)**NOTE**

Steps 2, 3 and 4 may be performed as necessary in any order.

2. **OPERATE** the bridge as follows:
 - a. **IF** it is necessary it manually move the bridge greater than 12 inches, **THEN CONTACT** the Electric Shop to have the motor connector at TB2 on the bridge API motor drive disconnected before continuing.
 - b. **INSTALL** the handwheel on the input shaft extension of the gear reducer.

NOTE

With the brake released, the bridge can be pushed by hand if it becomes necessary to move it a long distance. The brake automatically resets when the motor is re-energized.

- c. **RELEASE** the motor brake attached to the front end of the drive motor by moving the brake release lever on the side of the brake housing 90° clockwise.
 - d. **OPERATE** the handwheel as needed.
3. **OPERATE** the trolley as follows:
 - a. **IF** it is necessary it manually move the trolley greater than 12 inches, **THEN CONTACT** the Electric Shop to have the motor connector at TB2 on the trolley API motor drive disconnected before continuing.
 - b. **INSTALL** the handwheel on the input shaft extension of the gear reducer.

NOTE

The brake automatically resets when the motor is re-energized.

- c. **RELEASE** the motor brake attached to the front end of the drive motor by moving the brake release lever on the side of the brake housing 90° clockwise.
 - d. **IF** necessary for ease of operation, **THEN NOTIFY** Mechanical Maintenance to uncouple the trolley drive motor shaft coupling to reduce the handwheel torque required during manual operation.
 - e. **OPERATE** the handwheel as needed.

6.2.B Procedure (Continued)**CAUTION**

Manual operation of the hoist should only be used to place a fuel assembly in a safe condition. Manual operation of the hoist does not provide an overload cutoff as required by Tech. Specs.

4. **OPERATE** the hoist as follows:
 - a. **REMOVE** the protective cover from the extension shaft provided on the redundant brake housing.
 - b. **INSTALL** the handwheel on the extension shaft provided on the redundant brake housing.

WARNING

- When releasing the last of either of the two brakes, resisting torque shall be applied to the handwheel to prevent the hoist from lowering.
- If the handwheel starts freewheeling, immediately reset either brake.

- c. While applying resisting torque to the handwheel, **RELEASE BOTH** the motor brake and the redundant brake by turning the knob clockwise.
- d. **OPERATE** the handwheel as needed to raise or lower the hoist.
- e. **IF** required to hold the hoist stationary at any position above the down (mechanical) stop, **THEN RESET BOTH** brakes.
- f. **WHEN** manual operation of the hoist is complete, **THEN INSTALL** the protective cover over the extension shaft provided on the redundant brake housing.

6.2.B Procedure (Continued)

5. **OPERATE** the mast rotate drive as follows:
 - a. **IF** it is necessary it manually move the mast greater than 30° ,
THEN CONTACT the Electric Shop to have the motor connector at TB2 on the mast API motor drive disconnected before continuing.
 - b. **INSTALL** the handwheel on the mast rotate pinion shaft above the output end of the rotate drive.
 - c. **SHUT** U-1(2) RFM MAST DETENT 1(2)SV0517/MDD ISOL, 1(2)-IA-1632, to secure air to the mast detent.
 - d. **ADJUST** the associated air regulator to approximately 0 PSIG to vent air from the mast detent.
 - e. **DISENGAGE** the mast detent pin by pulling up on the pin manually.
 - f. **ROTATE** the mast as needed.
6. Manually **OPERATE** the grapple as follows:

NOTE

With power off, the grapple actuator solenoid coils are de-energized allowing manual operation. If necessary, a backup method may be used to manually open the grapple by isolating the grapple air supply **AND** venting off the pressure (disconnect the grapple air lines).

- a. **IF** removed,
THEN ATTACH the grapple manual operating lever onto the grapple actuator shaft **AND OPERATE** as needed.
- b. **IF** it becomes necessary to manually open the grapple using the backup method,
THEN SHUT U-1(2) RFM GRAPPLE OPEN/CLOSE 1(2)SV0517/GO/GC ISOL, 1(2)-IA-1630, the grapple air supply **AND DISCONNECT** the grapple air lines. This will vent off the pressure, allowing the grapple to open when cable slack occurs (no downward force on the grapple).

6.2.B Procedure (Continued)

7. **IF** restoring power **AND** continued movement using the RFM is desired, **THEN PERFORM** the following:
 - a. **SECURE** from manual RFM operation as follows:
 - (1) **REMOVE** the handwheel from the bridge gear reducer input shaft extension.
 - (a) **IF** the motor connector at TB2 on the bridge API motor drive was disconnected, **THEN CONTACT** the Electric Shop to have the motor connector at TB2 on the bridge API motor drive reconnected before continuing.
 - (2) **REMOVE** the handwheel from the trolley gear reducer input shaft extension.
 - (a) **IF** the motor connector at TB2 on the trolley API motor drive was disconnected, **THEN CONTACT** the Electric Shop to have the motor connector at TB2 on the trolley API motor drive reconnected before continuing.
 - (b) **IF** uncoupled, **THEN NOTIFY** Mechanical Maintenance to recouple the trolley drive gear motor shaft coupling.
 - (3) **ENSURE BOTH** brakes are reset **AND REMOVE** the handwheel from the hoist redundant brake housing extension shaft.
 - (4) **ENSURE** the protective cover is installed over the extension shaft provided on the redundant brake housing.
 - (5) **REMOVE** the handwheel from the mast rotate pinion shaft of the mast rotate drive **AND ENGAGE** the mast detent pin.
 - (a) **IF** the motor connector at TB2 on the mast API motor drive was disconnected, **THEN CONTACT** the Electric Shop to have the motor connector at TB2 on the mast API motor drive reconnected before continuing.
 - (6) **ENSURE OPEN** U-1(2) RFM MAST DETENT 1(2)SV0517/MDD ISOL, 1(2)-IA-1632, **AND** the associated air regulator adjusted as necessary to maintain 70 +/- 5 PSIG.
 - (7) **ENSURE** the grapple manual operating lever from the grapple actuator shaft is removed.
 - (8) **IF** the backup method for opening the grapple was used, **THEN RE-CONNECT** the grapple air lines **AND OPEN** U-1(2) RFM GRAPPLE OPEN/CLOSE 1(2)SV0517/GO/GC ISOL, 1(2)-IA-1630, the grapple air supply.

6.2.B.7.a Procedure (Continued)**NOTE**

When the EMERGENCY STOP has been activated, allow 60 seconds before resetting to prevent causing a lockup of the PLC (Programmable Logic Controller).

- (9) **RESET** the EMERGENCY STOP by rotating the pushbutton clockwise until it pops out **AND ENSURE** the SYSTEM FAULT indication goes out.
- (10) **IF** a fuel assembly was lowered, to place it in a safe condition, into a location other than its desired destination of the move sequence, **THEN PERFORM** the following:
 - (a) **RAISE** the hoist until the fuel assembly is fully raised into the fuel hoist.
 - (b) **ENSURE** the spreader is up.
 - (c) **ENSURE** the camera selector switch is in vertical.
 - (d) **RAISE** the hoist to the up limit **AND CONTINUE** movement **PER** the appropriate Section 6.4 move sequence in use prior to the power loss.

6.2.B Procedure (Continued)

8. To completely secure the RFM from manual operation, **PERFORM** the following:
 - a. **REMOVE** the handwheel from the bridge gear reducer input shaft extension.
 - b. **REMOVE** the handwheel from the trolley gear reducer input shaft extension.
 - (1) **IF** uncoupled,
THEN RECOUPLE the trolley drive gear motor shaft coupling.
 - c. **ENSURE BOTH** brakes are reset **AND REMOVE** the handwheel from the hoist load brake housing extension shaft.
 - d. **ENSURE** the protective cover is installed over the extension shaft provided on the redundant brake housing.
 - e. **REMOVE** the handwheel from the mast rotate pinion shaft of the mast rotate drive **AND ENGAGE** the mast detent pin.
 - f. **ENSURE OPEN** U-1(2) RFM MAST DETENT 1(2)SV0517/MDD ISOL, 1(2)-IA-1632, **AND** the associated air regulator adjusted as necessary to maintain 70 +/- 5 PSIG.
 - g. **REMOVE** the grapple manual operating lever from the grapple actuator shaft.
 - h. **IF** the backup method for opening the grapple was used,
THEN RE-CONNECT the grapple air lines.
 - i. **PROCEED** to Section 6.5, SECURING THE REFUELING MACHINE.

**** END ****

6.3 OPERATION OF THE MAJOR RFM COMPONENT CONTROLS [REFERENCE USE]**A. Initial Conditions****NOTE**

This section provides the directions for operation of the various RFM component controls and switches and the steps may be performed in any order. This section may be performed from memory, but shall be performed in conjunction with the applicable sequence of movement for the RFM as directed in the applicable subsection of Section 6.4 **OR** APPENDIX A.

1. Power is available to the RFM.
2. Instrument Air is available to the RFM.
3. Startup of the Refueling Machine has been completed **PER** Section 6.1, STARTUP OF THE REFUELING MACHINE. (N/A if performing APPENDIX A, REFUELING MACHINE CHECK OUT.)

B. Procedure**CAUTION**

If the bridge is to be used as a working platform, the hoist must be maintained in the full up position.

1. **MANUALLY OPERATE** the bridge as follows:
 - a. **IF** the bridge is to be used as a working platform, **THEN ENSURE** the hoist is in the full up position.

NOTE

Bridge operation is restricted to the slow speed range when approaching a restricted zone. To prevent a BRIDGE TROLLEY LOCKOUT, a loaded hoist must be in the FUEL AND HOIST region, **AND** an unloaded hoist must be above the LOW ZONE (150" at the upender, 268" over the core).

- b. **MOVE** the control lever toward the direction of desired travel (LEFT or RIGHT). Speed is proportional to switch displacement from the neutral position. (Maximum speed is 50 feet per minute.)
- c. **SLOWLY RELEASE** the control lever to stop the bridge.

6.3.B Procedure (Continued)

2. **OPERATE** the trolley as follows:

NOTE

Trolley speed is restricted to the slow speed range when approaching a restricted zone. To prevent a BRIDGE TROLLEY LOCKOUT, a loaded hoist must be in the FUEL AND HOIST region, **AND** an unloaded hoist must be above the LOW ZONE (150" at the upender, 268" over the core).

- a. **MOVE** the control lever toward the direction of desired travel (FORWARD or REVERSE). Speed is proportional to switch displacement from the neutral position. (Maximum speed is 50 feet per minute.)
- b. **SLOWLY RELEASE** the control lever to stop the trolley.

NOTE

Hoist Load Bypass must be used by momentarily pulling out the HOIST LOAD BYPASS pushbutton, to lower an empty hoist due to an underload condition

3. **OPERATE** the hoist as follows:

- a. **MOVE** the operating lever toward the direction of desired travel (Up or Down). Speed is proportional to lever displacement from the neutral position. (Maximum speed is 18 feet per minute.)
- b. **RELEASE** the lever to stop the hoist.

CAUTION

- The spreader **CANNOT** be extended when over the upender.
- The Spreader shall **NOT** be operated while the Hoist Box is in motion.

4. **OPERATE** the spreader as follows:

- a. **PLACE** the FUEL SPREADER selector switch in the desired position (RETRACT or EXTEND).
 - (1) The spreader should only be actuated over the core and with the fuel hoist box fully extended.
 - **WHEN** the spreader is fully extended, **THEN** FUEL SPREADER EXTENDED is indicated on the CRT.
 - **WHEN** the spreader is fully retracted, **THEN** the FUEL SPREADER RETRACTED light should be lit **AND** FUEL SPREADER RETRACTED indicated on the CRT.

6.3.B Procedure (Continued)**CAUTION**

- The mast shall be rotated to keep the TV camera clear of the core support barrel when operating outside of the core clear area.
- The TV camera must be vertical to permit mast rotation.

5. **OPERATE** the TV Camera as follows:
 - a. **IF** desired to tilt the TV Camera,
THEN DEPRESS the CAMERA TILT pushbutton. (Camera tilt is indicated by the CAMERA TILT pushbutton being lit and CAMERA TILT indication on the CRT.)
 - b. **IF** desired to return the TV Camera to vertical,
THEN PULL-OUT the CAMERA TILT pushbutton.

NOTE

The grapple is operable only when in the upper or lower grapple operate zone. Indicator lights are provided for both zones.

6. For grapple operation, **PLACE** the GRAPPLE SELECTOR switch in the desired position (OPEN or CLOSE) **AND CHECK** the appropriate indication:
 - GRAPPLE CLOSED light and GRAPPLE CLOSED indication on CRT.
 - GRAPPLE OPEN light and GRAPPLE OPEN indication on CRT.

6.3.B Procedure (Continued)**NOTE**

The mast can be rotated approximately 290° (-11° - 280°) and locked in 90° increments. Any of the four positions can be used when operating over the inner portion of the core. When operating outside of the core clear area, the mast shall be indexed where the TV camera is clear of the core support barrel. The TV camera must be vertical to permit mast rotation.

7. **ROTATE** the mast as follows:
 - a. **TOUCH SHOW HOIST** on the Main CRT screen.
 - b. **TOUCH SHOW MAST**.
 - c. **ENSURE** the camera is not tilted.
 - d. **IF** desired to rotate the mast using the CRT,
THEN TOUCH ONE of the four position touch pads (0° , 90° , 180° , 270°)
AND VERIFY the following:
 - (1) Mast Detent disengages and the MAST DETENT DISENGAGED light illuminates.
 - (2) Mast rotates to the desired position.
 - (3) Mast Detent engages **AND** the MAST DETENT DISENGAGED indicator light extinguishes.

6.3.B.7 Procedure (Continued)**NOTE**

The mast rotate pushbuttons on the console will allow mast rotation to any position within the travel limits provided all interlocks are met.

- e. **IF** desired to rotate the mast using the MAST COUNTER CLOCKWISE **OR** MAST CLOCKWISE console pushbuttons, **THEN PERFORM** the following:
- (1) **TOUCH FREE MAST AND VERIFY** the Mast Detent disengages and the MAST DETENT DISENGAGED light illuminates.
 - (2) **DEPRESS AND HOLD** the desired mast rotation pushbutton.
 - (3) **ENSURE** the Mast Detent disengages and the MAST DETENT DISENGAGED light illuminates.
 - (4) **WHEN** the mast is rotated to the desired position, **THEN RELEASE** the mast rotation pushbutton.

NOTE

The mast detent will only engage when the mast is rotated to 90° angles. (0° , 90° , 180° , 270°)

- (5) **TOUCH** the LOCK MAST touch pad.
- (6) **VERIFY** the Mast Detent engages **AND** the MAST DETENT DISENGAGED indicator light extinguishes.

6.3.B Procedure (Continued)**NOTE**

To prevent a BRIDGE TROLLEY LOCKOUT, a loaded hoist must be in the FUEL AND HOIST region, **AND** an unloaded hoist must be above the LOW ZONE (150" at the upender, 268" over the core).

8. **OPERATE** an empty RFM as follows:
 - a. **VERIFY** hoist position:
 - **IF** performing core to core moves, **THEN ENSURE** the hoist is above 268 inches.
 - **IF** performing other than core to core moves **AND** traveling over the 44' elevation, **THEN ENSURE** the hoist is at the UP LIMIT.
 - **IF** performing other than core to core moves **AND NOT** traveling over the 44' elevation, **THEN ENSURE** the hoist is above 150".
 - b. **OPERATE** the bridge and trolley as required to position the RFM.

NOTE

- Must be over either the core or upender for this option to be available.
- If transitioning to a core location in automatic with the hoist above the Down Stop Bypass Zone, when the desired location is reached the hoist will automatically lower to the Down Stop Bypass Zone. It will be necessary to activate the Hoist Load Bypass before an empty grapple can be lowered.

CAUTION

The ICI bridge location is **NOT** programmed into the RFM computer. This can allow the RFM to contact the ICI bridge in the SEMI-AUTO or AUTO mode of operation.

9. **PERFORM** AUTOMATIC positioning of the RFM as follows:
 - a. **ENSURE** NFM has loaded the proper fuel moves into the RFM computer.
 - b. **IF** at any time a step in the Automatic Sequence loaded by NFM can **NOT** be performed as written, **THEN STOP AND OBTAIN** new sequence instructions from NFM. The move may then be performed using either SEMI AUTO **OR** MANUAL operation of the RFM.
 - c. **TOUCH** the SELECT AUTO touch pad.

6.3.B.9 Procedure (Continued)

- d. **ENSURE** AUTO STEP SEQUENCING ACTIVE is displayed on the touch pad.
- e. **TOUCH** the SELECT NEW STEP NUMBER touch pad.
- f. **SELECT** the proper step using the INCREMENT STEP touch pad.
- g. **VERIFY** the correct pickup and setdown information is displayed **AND** **TOUCH** the VERIFY touch pad.

NOTE

Bridge and Trolley movement may commence when Auto Run is selected (unless off-indexing is requested).

- h. **TOUCH** the AUTO RUN touch pad.

NOTE

- The RFM must be over either the core or upender for this option to be available. If an Automatic sequence must be interrupted for any reason, machine must be driven in Manual into the core area or the upender zone in order to complete the sequence in Automatic.
- If transitioning to a core location in automatic with the hoist above the Down Stop Bypass Zone, when the desired location is reached the hoist will automatically lower to the Down Stop Bypass Zone. It will be necessary to activate the Hoist Load Bypass before an empty grapple can be lowered.

10. **PERFORM** SEMI-AUTOMATIC positioning of the RFM as follows:
 - a. **TOUCH** the SELECT AUTO touch pad.
 - b. **ENSURE** SEMI-AUTO SELECTION is displayed on the touch pad.
 - c. **TOUCH** the REQUEST touch pad.

NOTE

When entering a core location be sure to place a dash (-) between the letter and number.

- d. **ENTER** the desired location **AND** **TOUCH** the ENTER touch pad.
 - (1) **IF** Camera Interference message is received, **THEN** either **ABORT** **OR** **ROTATE** the mast by touching the desired rotation selection.
- e. **VERIFY** the correct destination is displayed **AND** **TOUCH** the VERIFY touch pad.

6.3.B.10 Procedure (Continued)**NOTE**

Bridge and Trolley movement may commence when Auto Run is selected (unless off-indexing is requested).

- f. **TOUCH** the AUTO RUN touch pad.

NOTE

- Off-Indexing may be available for removal or insertion of a fuel assembly depending upon the location.
- Off-Indexing allows the hoist to operate in fast speed below the Down Stop Bypass Zone.

11. **IF** available **AND WHEN** desired,
THEN PERFORM Off-Indexing as follows:
- a. **WHEN** questioned by the CRT for OFF-INDEXING MOVE CONFIRMATION,
THEN TOUCH the YES, USE PROPOSED LOCATION touch pad.
 - b. **IF** Off-Indexing when placing a fuel assembly into the core,
THEN PERFORM the following:

NOTE

The RFM will automatically move to a spot off-indexed from the desired location.

- (1) **WHEN** the RFM travel has stopped on the desired location's Off-Index spot,
THEN LOWER the Hoist as per the correct section of this OI until the Hoist Auto Stop appears on the CRT.

NOTE

If OFF INDEX TEMP ZONE BREACHED is indicated on the CRT, Travel Override must be used to return to the proper zone (within the dotted lines).

- (2) **MOVE** the bridge and trolley, using their respective joysticks, to place the crosshairs of the Off Indexing screen inside the little green box, which will position the fuel assembly to On-Index.

6.3.B.11 Procedure (Continued)

- c. **IF** Off-Indexing when withdrawing a fuel assembly from the core,
THEN PERFORM the following:

NOTE

If OFF INDEX TEMP ZONE BREACHED is indicated on the CRT, Travel Override must be used to return to the proper zone (within the dotted lines).

- (1) **MOVE** the bridge and trolley, using their respective joysticks, to place the crosshairs of the Off Indexing screen inside the big green box, which will position the fuel assembly to Off-Index.
- (2) **RAISE** the Hoist as per the correct section of this OI.

CAUTION

During single encoder operation, failure of the remaining encoder will prevent further machine operation.

12. **IF** desired to use single encoder operation of Refueling Machine Bridge, Trolley, or Hoist,
THEN PERFORM the following:
 - a. **OBTAIN** permission from Shift Manager to use single encoder mode.
 - b. **PRESS SHOW MENU** from the Main or Hoist screen.
 - c. **PRESS** the GO TO ADMINISTRATION from the Menu screen.
 - d. **PRESS ENABLE** for the desired encoder to be removed from service.
 - e. **ENSURE** the encoder indication for the encoder removed from service changes color from green to black.
 - f. **PRESS RETURN TO OPERATION** to begin single encoder operation of the Refueling Machine.
 - g. **WHEN** it is desired to return to dual encoder operation,
THEN PRESS SHOW MENU from the Main or Hoist screen.
 - h. **PRESS** the GO TO ADMINISTRATION from the Menu screen.
 - i. **PRESS ENABLE** for the desired encoder to be placed in service.
 - j. **ENSURE** the encoder indication for the encoder returned to service changes color from black to green.
 - k. **PRESS RETURN TO OPERATION** to begin normal operation of the Refueling Machine.

6.3.B Procedure (Continued)**CAUTION**

A deviation between the primary and redundant encoders of greater than 1 inch and less than 3 inches will result in the machine completing its current move, but it will **NOT** start another move. A deviation of greater than 3 inches will result in the machine **NOT** moving at all, unless using single encoder operation. Encoders are **NOT** used to drive the RFM.

13. **IF** encoder mismatch is detected,
THEN PERFORM the following:
- PLACE** the Refueling Machine into single encoder operation **PER** 6.3.B.12.
 - INSPECT** the associated gear track for interference or broken teeth and correct before moving.
 - In Electrical Manual Mode, **POSITION** the bridge and trolley such that the Gauge Blocks are square to the scribe mark located adjacent to the bridge and pool rails.
 - LIFT AND ROTATE** the primary and/or redundant bridge or trolley encoder gears as required to obtain the following position displays:

	Bridge display			Trolley display		
	MIN	DESIRED	MAX	MIN	DESIRED	MAX
Unit-1	428.83	428.88	428.93	835.83	835.88	835.93
Unit-2	426.85	426.90	426.95	747.52	747.57	747.62

- IF** only one of the encoders can be calibrated,
THEN CONTINUE operation in single encoder operation with the calibrated encoder **AND INITIATE** a CR to repair the off-service encoder.
- IF NO** encoders can be calibrated,
THEN DISCONTINUE operation of the Refueling Machine **AND INITIATE** a CR.
- IF** the primary and redundant position displays are calibrated to within one inch,
THEN RETURN to dual encoder operation **PER** 6.3.B.12

**** END ****

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]**6.4.A Initial Conditions****NOTE**

This section provides the sequence of movements for the RFM. This section may be performed from memory, and may also be performed in conjunction with the applicable steps in Section 6.3.

1. All manual handwheels are removed from their extension shafts.
2. Power is available to the RFM.
3. Instrument Air is available to the RFM.
4. **IF** performing Core Alterations,
THEN ALL requirements documented on OP-7, Section Titled CORE ALTERATION PREPARATIONS are completed.
5. Startup of the Refueling Machine has been completed **PER** Section 6.1, **STARTUP OF THE REFUELING MACHINE**, **OR** APPENDIX A, **REFUELING MACHINE CHECK OUT**.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.B Core to Upender Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions has been completed)
 - A spotter (PPO, RFHM qualified personel, or personnel designated by the AOM shall be used if operating mast/grapple to grapple core components) is available to observe fuel movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is above 268 inches **AND** the grapple is empty.
2. **RECEIVE** notification of the fuel move step number, mast orientation, core location, and required FUEL SELECTOR switch position from the RCRO.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, core location, and required FUEL SELECTOR switch position.
4. **ENSURE** the FUEL SELECTOR switch is in the correct position.
5. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
6. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

- Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.
- The Mechanical pointer and scale system is available for both the bridge and trolley position as another means of determining position.

7. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired core location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct core coordinates and the grapple is directly above the assembly.
8. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2 (N/A if NO SNM form on machine).
9. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

6.4.B Core to Upender Movement Sequence (Continued)**NOTE**

Just prior to the fuel hoist box being fully extended (supported by down stop: nominal hoist coordinate 126.56) hoist speed will be automatically reduced to slow speed to prevent bump at down stop.

10. **LOWER** the hoist until the hoist box is at the Down Stop Bypass Zone (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).

NOTE

Steps 11, 12 and 13 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

11. **IF** spreader operation is directed by the FHS,
THEN LOWER the spreader.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

12. **IF** camera operation is directed by the FHS,
THEN TILT the camera.
13. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE (UGOZ) is indicated (~277 inches).
14. **OPEN** the grapple.

6.4.B Core to Upender Movement Sequence (Continued)**NOTE**

Movement should be stopped **AND** the FHS informed, if during the process of lowering it appears that the assembly cannot be grappled on the center guide post.

15. **LOWER** the grapple until the Hoist Lower Limit is reached **OR** CABLE SLACK is indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE (LGOZ) indication will come on first.
 - The hoist is automatically stopped when the Hoist Lower Limit occurs (nominal hoist coordinate for this position is 298.00).
 - The top plate webs should be in the grapple "entrance" slots.
16. **GRAPPLE** the assembly as follows:
 - a. **IF** CABLE SLACK is indicated on the CRT, **THEN RAISE** the grapple until just after the Cable Slack indication goes away **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grapping.
- The weight of the assembly should be between the over and under load limits as shown on the analog load display on the CRT.

17. **RAISE** the hoist approximately three inches to verify load increases.
18. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists,
THEN RAISE the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 15 through 17.

6.4.B Core to Upender Movement Sequence (Continued)

19. **NOTIFY** the RCRO when the assembly is grappled **AND PROVIDE** the weight of the assembly.
 - a. **RECEIVE** notification of the mast orientation and upender cavity coordinates, and that the move may continue.
20. **RECORD** the weight of the assembly on the SNM Transfer Form 2 for the applicable step.
21. **RAISE** the hoist **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the assembly is picked up:
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the lower grapple operate zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is fully raised into the hoist box
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the upper grapple operate zone (UGOZ) (approximately 277.00)
 - b. **IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 22.
 - c. **IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** withdrawal with caution.

6.4.B.21 Core to Upender Movement Sequence (Continued)**NOTE**

- At the direction of the FHS, the actions of Step 21.d may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 21.d are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- d. **IF** the deviation increases to 100 lbs or greater, **THEN STOP** withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- **RETURN** the fuel assembly to the fully inserted position **AND** either HAND-CRANK **OR** use the Travel Override pushbutton (max speed 1 fpm) to move the RFM up to 0.2 inches in any direction.
 - HAND-CRANK **OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (than fully inserted).

6.4.B.21 Core to Upender Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from potential grid interferences.
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference.
 - **IF** the fuel assembly has no adjacent assemblies, **AND** if NFM concurs, **THEN** the differential force registered on the load cell indication may be raised incrementally, **NOT** to exceed the hoist overload setpoint.
- e. **REPEAT** Step 21, as necessary to remove the fuel assembly.

6.4.B Core to Upender Movement Sequence (Continued)**NOTE**

- The HOIST LOAD BYPASS light indicates that the FUEL ONLY overload is bypassed. The FUEL PLUS HOIST overload is still active.
- The Load Transition Zone starts at approximately 128.00 inches, and is indicated by the Hoist Load Bypass light automatically coming on.

22. **CONTINUE** raising the hoist until the fuel assembly is fully raised into the hoist box (at 126.56 inches the weight of the hoist box is picked up by the grapple).
 - a. **RELEASE** the HOIST control switch when the Hoist Box weight is picked up:
 - The HOIST LOAD BYPASS light should start flashing at approximately 3 inches prior to the weighing meter indicating the load has increased due to the hoist pick up
 - The HOIST LOAD BYPASS light will continue flashing for a short period of raising (approximately 6 inches), so it is possible to raise the hoist slightly above this point

CAUTION

The spotter shall observe retraction of the spreader to verify that it does **NOT** catch an adjacent CEA while being raised. **[B0207]**

23. **IF** the spreader was used, **THEN RAISE** the spreader **AND OBSERVE** spreader retraction.
24. **IF** used, **PLACE** the TV Camera in the vertical position **AND OBSERVE** the camera is vertical.

NOTE

- The Down Stop Bypass Zone starts at approximately 128.00 inches, and is indicated by the HOIST LOAD BYPASS light automatically flashing.
- The Fuel plus Hoist overload is expected when initially picking up the hoist box at approximately 126.56 inches.

25. **RAISE** the hoist to the Hoist Up Limit **AND IF** the hoist stops on overload, **THEN PERFORM** the following:
 - a. **CHECK** the load cell indication.
 - b. **NOTIFY** the FHS **AND** NFM for further direction.
26. **ENSURE** the mast orientation agrees with the SNM Transfer Form 2.

6.4.B Core to Upender Movement Sequence (Continued)

27. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

28. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the specified upender cavity coordinates.
- a. **COORDINATE** with the spotter to verify correct RFM position, the specified upender cavity is empty, and the mast is directly over the cavity.
29. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, mast orientation and RFM coordinates.
- a. **RECEIVE** confirmation from the RCRO that the step number, mast orientation and RFM coordinates are correct.

NOTE

Steps 30 and 31 may be performed concurrently.

30. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21"):
- The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

31. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.

6.4.B Core to Upender Movement Sequence (Continued)

32. **LOWER** the hoist to insert the assembly into the fuel carrier, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 32.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs, **THEN STOP** insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the TRAVEL OVERRIDE pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.

CAUTION

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference.
33. **LOWER** the hoist to insert the assembly into the fuel carrier until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the fuel assembly is taken up by the fuel carrier:
- The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
34. **CONTINUE** lowering the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, and the hoist stops automatically (nominal hoist index of approximately 178 inches).

6.4.B Core to Upender Movement Sequence (Continued)

35. **UNGRAPPLE** the assembly as follows:
- RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - OPEN** the grapple.

CAUTION

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

36. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
- COMPARE** the weight indicated on the load cell with the weight documented on the SNM Transfer Form 2.
 - IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
37. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- CLOSE** the grapple.
38. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed. (N/A if NO SNM form on machine)
- NOTIFY** the RCRO of the completion of the step giving the step number, upender location, and empty grapple weight.

6.4.B Core to Upender Movement Sequence (Continued)

39. **IF** travel will be between upenders,
THEN RAISE the hoist above 150":

NOTE

To move the bridge or trolley before the hoist is at the up limit, the RFM will select the Manual-Electric mode. If this condition exists, the Fuel Selector switch will need to be selected to the actual position listed on the SNM Transfer Form 2 to ensure the proper hoist overload and underload settings. If the mast needs to be rotated, it must be rotated prior to grappling the fuel bundle.

- a. **VERIFY PER** the RCRO that the following are correct using the SNM Transfer Form 2:
- Refueling Machine Coordinates
 - Detent Position
 - Fuel Selector switch
- b. **AFTER** positioning the machine over the new upender coordinates, **LOWER** the hoist to the UGOZ **AND OPEN** the grapple.
- c. **CONTINUE** lowering the hoist until the cable slack is received, **THEN RAISE** the hoist to clear cable slack and grapple weight only is indicated..
- d. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).
- e. **RAISE** the hoist approximately 3 inches to verify load increases **AND** provide the weight to the RCRO.
- f. **AFTER** raising the hoist to receive the encoder UP **LIMIT** indication **AND** observing that AUTO STEP is activated **AND** increment step as necessary, **THEN VERIFY** the following:
- Current step number
 - FUEL SELECTOR position is in 1 for AUTO
 - Mast detent position
 - Core location
40. **IF** travel will **NOT** be between upenders,
THEN RAISE the hoist to the HOIST UP LIMIT.
41. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section for the next move.
42. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.C Uponder to Core Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions has been completed)
 - A spotter is available to observe fuel movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The grapple is empty
 - The hoist is at the up limit **OR** above 150" if previous location was the upender.
2. **RECEIVE** notification of the fuel move step number, mast orientation, upender coordinates, and required FUEL SELECTOR switch position from the RCRO.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, upender coordinates, and required FUEL SELECTOR switch position.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired upender location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct RFM position **AND** the grapple is directly above the upender.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

6.4.C Uender to Core Movement Sequence (Continued)**NOTE**

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.

NOTE

Movement should be stopped **AND** the FHS informed, if during the process of lowering it appears that the assembly cannot be grappled on the center guide post.

11. **LOWER** the hoist until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate is approximately 178.00)
 - The grapple weight should now be partially supported by the fuel assembly top plate
 - The fuel assembly top plate webs should be in the grapple "entrance" slots.
12. **GRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).

6.4.C Upender to Core Movement Sequence (Continued)**NOTE**

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grappling.
- The weight of the assembly should be between the over and under load limits as shown on the analog load display on the CRT.

13. **RAISE** the hoist approximately three inches to verify load increases.
14. **IF** no load is observed after approximately three inches of travel, **THEN** have the spotter visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists,
THEN RAISE the grapple to the UGOZ **AND OPEN** the grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 13.
15. **NOTIFY** the RCRO when the assembly is grappled:
 - a. **PROVIDE** the weight of the assembly and whether the assembly is shiny or dark.
 - b. **RECEIVE** notification of the mast orientation and core location and permission for the move to continue.
 - c. **ACKNOWLEDGE** the RCRO notification of the mast orientation and core location.
16. **RECORD** the weight of the assembly on the SNM Transfer Form 2 for the applicable step.

6.4.C Upender to Core Movement Sequence (Continued)

17. **RAISE** the hoist to the up limit **AND PERFORM** the following, observing hoist load indication during hoisting:
- a. **CHECK** load increases as the assembly is picked up.
- The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the Lower Grapple Operate Zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is raised above the Hoist Slow Zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the UGOZ

NOTE

- Any actions taken in Step 17.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

6.4.C.17 Upender to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
 - c. **WHEN** the rubbing has been alleviated in Step 17.b, if required, **THEN CONTINUE** raising the hoist to the Hoist Up Limit.
18. **IF** used, **THEN PLACE** the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
 19. **IF** necessary, **THEN ROTATE** the mast to the orientation specified on the SNM Transfer Form 2.
 20. Spotter **CHECK** equipment **PER APPENDIX B, FUEL SPOTTER RESPONSIBILITIES** to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

21. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the core coordinates specified on the SNM Transfer Form 2.
 - a. **COMPARE** the digital and pointer coordinates with those specified on the SNM Transfer Form 2.
 - b. **COORDINATE** with the spotter to ensure that the position is empty and in agreement with the specified coordinates.

6.4.C Upender to Core Movement Sequence (Continued)

22. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, core coordinates, and mast orientation.
 - a. **RECEIVE** confirmation from the RCRO that the step number, core coordinates, and mast orientation are correct.
 - b. **RECEIVE** permission from the RCRO to continue the move.

CAUTION

Just prior to the fuel hoist box being fully extended (nominal hoist coordinate 126.56) hoist speed shall be reduced to slow speed to prevent bump at the down stop.

23. **LOWER** the hoist until the hoist box is at the Down Stop Bypass Zone (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).
24. **CHECK** the alignment of the mast and designated core location.

NOTE

- The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.
- Steps 25 and 26 may be performed concurrently.

25. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

26. **IF** spreader operation is directed by the FHS, **THEN LOWER** the spreader.

NOTE

Step 27 is to be performed concurrently with Steps 28 through 30.

27. **INSERT** the fuel into the core, **AND USE** the audible counter **AND REPORT** any abnormally rising count rate to the FHS and RCRO. **[B0270]**

6.4.C Upender to Core Movement Sequence (Continued)

28. **LOWER** the hoist to insert the fuel assembly into the designated core location, observing hoist load indication during insertion:
- IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 29.
 - IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** insertion with caution.

NOTE

- At the direction of the FHS, the actions of Step 28.c may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 28.c are to be documented in the applicable Fuel Handling Procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- IF** the deviation increases to 100 lbs or greater,
THEN STOP insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - **RAISE** the assembly until fully clear of the core support alignment pins **AND HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction
 - **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (partially inserted)

6.4.C.28 Upender to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE (FLEX)** the hoist cable to free the fuel assembly from potential grid interferences
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference
 - **LOWER** the assembly into the core in line with the "To" location of the SNM Transfer Form 2 and away from any other fuel assembly to a position just above the core support plate alignment pins **AND** **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM coordinates to those of the SNM Transfer Form 2
- d. **REPEAT** Step 28, as necessary to insert the assembly.
- e. **IF** the hang-up persists **AND** the NFM-Lead engineer, with the concurrence of the FHS, directs a modification to the fuel move sequence be initiated to temporarily relocate the assembly to a different approved location, **THEN PERFORM** the following:
- (1) **RAISE** the hoist until the assembly is fully clear of the core support alignment pins.
 - (2) **RETURN** to Step 17 **AND** USE the new coordinates given by the NFM-Lead engineer, as applicable, for the new destination.

6.4.C Uender to Core Movement Sequence (Continued)

29. **LOWER** the hoist until the fuel assembly is seated in the core, as indicated by load decreasing **AND** a HOIST UNDERLOAD condition occurring as the weight of the fuel assembly is taken up by the fuel alignment pins (hoist index of approximately 297 inches).
30. **CONTINUE** lowering the hoist until the Hoist Lower Limit is reached, CABLE SLACK is indicated on the CRT, and the hoist stops automatically (nominal hoist coordinates of 298.00).
31. **NOTIFY** the RCRO the assembly is fully inserted.
 - a. **RECEIVE** permission from the RCRO to ungrapple the assembly.
 - (1) The RCRO shall check the 1/m count is acceptable prior to giving permission. **[B0270]**
32. **ENSURE** the assembly is properly aligned with the core.
33. **UNGRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until the Cable Slack indication goes away **AND** GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

CAUTION

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

34. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight documented on the SNM Transfer Form 2.
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2.
35. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.

6.4.C Upender to Core Movement Sequence (Continued)

36. **CHECK** there is an assembly present in the core location listed on the SNM Transfer Form 2 "To" location by using Figure 1A or 1B, as applicable, and looking at the core.
 - a. **NOTIFY** the RCRO that the "TO" location contains an assembly.
37. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, final location, mast orientation, and empty grapple weight.

NOTE

Steps 38, 39, 40 and 41 may be performed concurrently.

CAUTION

- The spotter shall observe retraction of the spreader to verify that it does **NOT** catch on an adjacent CEA while being raised. **[B0207]**
- The Spreader shall **NOT** be operated while the Hoist Box is in motion.

38. **IF** the spreader was used,
THEN RAISE the spreader **AND OBSERVE** retraction.
39. **ENSURE** the TV camera is vertical.
40. **IF** continuing movement and the next location is within the core,
THEN RAISE the hoist to above the UGOZ (above hoist index of 268 inches).
41. **IF** additional moves other than core to core moves are to be performed,
THEN RAISE the hoist to the Hoist Up Limit.
42. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
43. **IF** fuel movement is complete,
THEN PROCEED to Section 6.5, **SECURING THE REFUELING MACHINE**, to secure the RFM.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.D Core to Core Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, has been completed)
 - A spotter is available to observe fuel movement **[B0167]**
 - The hoist is above 268 inches **AND** the grapple is empty.
2. **RECEIVE** notification of the fuel move step number, mast orientation, core location, and required FUEL SELECTOR switch position from the RCRO.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, core coordinates, and mast orientation for the fuel assembly to be moved.
4. **ENSURE** the FUEL SELECTOR switch is in the correct position.
5. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
6. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

7. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired core location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct core coordinates and the grapple is directly above the assembly.
8. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
9. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

6.4.D Core to Core Movement Sequence (Continued)**CAUTION**

Just prior to the fuel hoist box being fully extended (supported by down stop: nominal hoist coordinate 121.00) hoist speed shall be reduced to slow speed to prevent bump at down stop.

10. **IF** the hoist is above the Down Stop Bypass Zone,
THEN LOWER the hoist until the hoist box is at the mechanical down stop (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).

NOTE

Steps 11, 12 and 13 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

11. **IF** spreader operation is directed by the FHS,
THEN LOWER the spreader.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

12. **IF** camera operation is directed by the FHS,
THEN TILT the camera.
13. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE (UGOZ) is indicated (~277 inches).
14. **OPEN** the GRAPPLE.

6.4.D Core to Core Movement Sequence (Continued)**NOTE**

Movement should be stopped **AND** the FHS informed, if during the process of lowering it appears that the assembly cannot be grappled on the center guide post.

15. **LOWER** the grapple until the Hoist Lower Limit is reached **OR** CABLE SLACK is indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE (LGOZ) indication will come on first.
 - The hoist is automatically stopped when the Hoist Lower Limit occurs (nominal hoist coordinate for this position is 298.00).
 - The top plate webs should be in the grapple "entrance" slots.
16. **GRAPPLE** the assembly as follows:
 - a. **IF** CABLE SLACK is indicated on the CRT, **THEN RAISE** the grapple until just after the Cable Slack indication goes away **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grapping.
- The weight of the assembly should be between the over and under load limits as shown on the analog load display on the CRT.

17. **RAISE** the hoist approximately three inches to verify load increases.
18. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists,
THEN RAISE the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 15 through 17.

6.4.D Core to Core Movement Sequence (Continued)

19. **NOTIFY** the RCRO when the assembly is grappled **AND PROVIDE** the weight of the assembly.
 - a. **RECEIVE** notification of the mast orientation and core location and permission for the move to continue.
 - b. **ACKNOWLEDGE** the RCRO notification of the mast orientation and core location.
20. **RECORD** the weight of the assembly on the SNM Transfer Form 2 for the applicable step.
21. **RAISE** the hoist into the fuel hoist box **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the assembly is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the lower grapple operate zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is fully raised into the hoist box
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the upper grapple operate zone (UGOZ) (approximately 277.00)
 - b. **IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 22.
 - c. **IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** withdrawal with caution.

6.4.D.21 Core to Core Movement Sequence (Continued)**NOTE**

- At the direction of the FHS, the actions of Step 21.d may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 21.d are to be documented in the applicable Fuel Handling Procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- d. **IF** the deviation increases to 100 lbs or greater, **THEN STOP** withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- **RETURN** the fuel assembly to the fully inserted position **AND** either HAND-CRANK **OR** use the Travel Override pushbutton (max speed 1 fpm) to move the RFM up to 0.2 inches in any direction
 - HAND-CRANK **OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (than fully inserted)

6.4.D.21 Core to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from potential grid interferences
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference
- e. **REPEAT** Step 21, as necessary to remove the fuel assembly.

6.4.D Core to Core Movement Sequence (Continued)**NOTE**

- The HOIST LOAD BYPASS light indicates that the FUEL ONLY overload is bypassed. The FUEL PLUS HOIST overload is still active.
- The Load Transition Zone starts at approximately 128.00 inches, and is indicated by the HOIST LOAD BYPASS light flashing.

22. **CONTINUE** raising the hoist until the fuel assembly is fully raised into the hoist box (at 126.56 inches the weight of the hoist box is picked up by the grapple).
 - a. **RELEASE** the HOIST control switch when the Hoist Box weight is picked up:
 - The HOIST LOAD BYPASS light should start flashing at approximately 3 inches prior to the weighing meter indicating the load has increased due to the hoist pick up
 - The HOIST LOAD BYPASS light will continue flashing for a short period of raising (approximately 6 inches), so it is possible to raise the hoist slightly above this point

NOTE

Steps 23 and 24 may be performed concurrently.

CAUTION

The spotter shall observe retraction of the spreader to verify that it does **NOT** catch an adjacent CEA while being raised. **[B0207]**

23. **IF** the spreader was used,
THEN RAISE the spreader **AND OBSERVE** spreader retraction.
24. **IF** used,
THEN PLACE the TV Camera in the vertical position **AND OBSERVE** the camera is vertical.
25. **ENSURE** the following:
 - Fuel is fully retracted into the fuel hoist box (as indicated by hoist load)
 - The Hoist Load Bypass light is **NOT** flashing

6.4.D Core to Core Movement Sequence (Continued)**NOTE**

- The Down Stop Bypass Zone starts at approximately 128.00 inches, and is indicated by the HOIST LOAD BYPASS light automatically flashing.
- The Fuel plus Hoist overload is expected when initially picking up the hoist box at approximately 126.56 inches.

26. **IF** it is desired,
THEN RAISE the hoist to the Hoist Up Limit.
 - a. **IF** the hoist stops on overload,
THEN PERFORM the following:
 - (1) **CHECK** the load cell indication.
 - (2) **NOTIFY** the FHS **AND** NFM for further direction.
27. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

28. **WHEN** Spotter has given permission to move,
THEN POSITION the RFM over the core coordinates specified on the SNM Transfer Form 2:
 - a. **ROTATE** the mast to the orientation specified on the SNM Transfer Form 2.
 - b. **COMPARE** the digital and pointer coordinates with those specified on the SNM Transfer Form 2.
 - c. **COORDINATE** with the spotter to ensure that the position is empty and in agreement with the specified coordinates.
29. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, core coordinates, and mast orientation.
 - a. **RECEIVE** confirmation from the RCRO that the step number, core coordinates, and mast orientation are correct.
 - b. **RECEIVE** permission from the RCRO to continue the move.

6.4.D Core to Core Movement Sequence (Continued)**CAUTION**

Just prior to the fuel hoist box being fully extended (nominal hoist coordinate 126.56) hoist speed shall be reduced to slow speed to prevent bump at the down stop.

30. **IF** the hoist is above the Down Stop Bypass Zone, **THEN LOWER** the hoist until the hoist box is at the mechanical down stop (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).
31. **CHECK** the alignment of the mast and designated core location.

NOTE

- The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.
- Steps 32 and 33 may be performed concurrently.

32. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
33. **IF** spreader operation is directed by the FHS, **THEN LOWER** the spreader.

NOTE

Step 34 is to be performed concurrently with Steps 35 through 37.

34. **INSERT** the fuel into the core, **AND USE** the audible counter **AND REPORT** any abnormally rising count rate to the FHS and RCRO.

6.4.D Core to Core Movement Sequence (Continued)

35. Lower the hoist to insert the fuel assembly into the designated core location, observing hoist load indication during insertion:
- IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 36.
 - IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** insertion with caution.

NOTE

- At the direction of the FHS, the actions of Step 35.c may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 35.c are to be documented in the applicable Fuel Handling Procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, **MANUAL OPERATION OF THE REFUELING MACHINE**.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- IF** the deviation increases to 100 lbs or greater,
THEN STOP insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - **RAISE** the assembly until fully clear of the core support alignment pins **AND HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction
 - **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (partially inserted)

6.4.D.35 Core to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE (FLEX)** the hoist cable to free the fuel assembly from potential grid interferences
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference
 - **LOWER** the assembly into the core in line with the "To" location of the SNM Transfer Form 2 and away from any other fuel assembly to a position just above the core support plate alignment pins **AND** **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM coordinates to those of the SNM Transfer Form 2
- d. **REPEAT** Step 35, as necessary to insert the fuel assembly.
- e. **IF** the hang-up persists **AND** the NFM-lead engineer, with the concurrence of the FHS, directs a modification to the fuel move sequence be initiated to temporarily relocate the assembly to a different approved location, **THEN PERFORM** the following:
- (1) **RAISE** the hoist until the assembly is fully clear of the core support alignment pins.
 - (2) **RETURN** to Step 21, using the new coordinates given by the NFM-Lead engineer, as applicable, for the new destination.

6.4.D Core to Core Movement Sequence (Continued)

36. **LOWER** the hoist until the fuel assembly is seated in the core, as indicated by load decreasing **AND** a HOIST UNDERLOAD condition occurring as the weight of the fuel assembly is taken up by the fuel alignment pins (hoist index of approximately 297 inches).
37. **CONTINUE** lowering the hoist until the Hoist Lower Limit is reached, CABLE SLACK is indicated on the CRT **AND** the hoist stops automatically (nominal hoist coordinates of 298.00).
38. **NOTIFY** the RCRO the assembly is fully inserted.
 - a. **RECEIVE** permission from the RCRO to ungrapple the assembly.
 - (1) The RCRO shall check the 1/m count is acceptable prior to giving permission. **[B0270]**
39. **ENSURE** the assembly is properly aligned with the core.
40. **UNGRAPPLE** the assembly as follows:
 - a. **IF** CABLE SLACK is indicated on the CRT, **THEN RAISE** the grapple until the Cable Slack indication goes away **AND** GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

CAUTION

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

41. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight documented on the SNM Transfer Form 2.
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2.
42. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.

6.4.D Core to Core Movement Sequence (Continued)

43. **CHECK** there is an assembly present in the core location listed on the SNM Transfer Form 2 "To" location by using Figure 1A or 1B, as applicable, and looking at the core.
 - a. **NOTIFY** the RCRO that the "TO" location contains an assembly.
44. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, final location, mast orientation, and empty grapple weight.

NOTE

Steps 45, 46, 47 and 48 may be performed concurrently.

CAUTION

- The spotter shall observe retraction of the spreader to verify that it does **NOT** catch on an adjacent CEA while being raised. **[B0207]**
- The Spreader shall **NOT** be operated while the Hoist Box is in motion.

45. **IF** the spreader was used,
THEN RAISE the spreader **AND OBSERVE** retraction.
46. **ENSURE** the TV camera is vertical.
47. **IF** continuing with core to core movement,
THEN RAISE the hoist to above the UGOZ (above hoist index of 268 inches).
48. **IF** additional moves other than core to core are to be performed,
THEN RAISE the hoist to the Hoist Up Limit.
49. **IF** additional core to core moves are to be performed,
THEN RETURN to the beginning of Subsection 6.4.D.
50. **IF** additional moves other than core to core are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
51. **IF** fuel movement is complete,
THEN PROCEED to Section 6.5, **SECURING THE REFUELING MACHINE**, to secure the RFM.

**6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)****6.4.E Upender to Temporary Storage Rack Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is over the upender
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions has been completed)
 - A spotter is available to observe movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the up limit **AND** the grapple is empty
2. **RECEIVE** notification of the fuel move step number, mast orientation, upender location, and the required FUEL SELECTOR switch position, if applicable.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, upender cavity location, and FUEL SELECTOR switch position, if applicable.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired upender location **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct RFM position **AND** the grapple is directly above the upender.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct, if applicable, **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

Steps 9 and 10 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
11. **LOWER** the grapple until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate is 178.00)
 - The grapple weight should now be partially supported by the fuel assembly top plate or top of the object
 - The fuel assembly top plate webs (or lifting bails of the object) should be in the grapple "entrance" slots
12. **GRAPPLE** the object as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment of the object.

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grappling.
- The weight of a fuel assembly or a dummy fuel assembly should be between the over and under load limits as shown on the analog load display on the CRT.

13. **RAISE** the hoist approximately three inches to verify load increases.
14. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists,
THEN RAISE the grapple to the UGOZ, **AND OPEN** the grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND ADJUST** as required to index the grapple over the object.
 - b. **REPEAT** Steps 11 through 13.
15. **NOTIFY** the RCRO when the object is grappled, if applicable:
 - a. **PROVIDE** the weight of the object and whether the assembly is shiny or dark (if a fuel assembly).
 - b. **RECEIVE** notification of the mast orientation and storage rack coordinates, **AND** that the move may continue.
16. **RECORD** the weight of the object on the SNM Transfer Form 2 for the correct step, if applicable.

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)**CAUTION**

Hoist load indication shall be carefully observed during withdrawal when the HOIST LOAD BYPASS is ON since the load system interlocks are bypassed.

17. **RAISE** the hoist to the up limit **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the object is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the LGOZ
 - Speed is restricted to slow speed until the object is raised above the low zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the UGOZ

NOTE

- Any actions taken in Step 17.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

6.4.E.17 Upender to Temporary Storage Rack Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
- c. **WHEN** the rubbing has been alleviated in Step 17.b, if required, **THEN CONTINUE** raising the hoist to the up limit.
- 18. **IF** used, **THEN PLACE** the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
- 19. **IF** necessary, **THEN ROTATE** the mast to the orientation specified on the SNM Transfer Form 2.
- 20. Spotter **CHECK** equipment **PER APPENDIX B, FUEL SPOTTER RESPONSIBILITIES** to ensure safe passage of any fuel and equipment.
- 21. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the Refuel Pool storage rack coordinates specified on the SNM Transfer Form 2:
 - a. **COMPARE** the digital coordinates for the storage rack with those specified on the SNM Transfer Form 2.
 - b. **COORDINATE** with the spotter to ensure the following:
 - The position is in agreement with the specified coordinates
 - The specified location is empty
 - The grapple is directly above the desired location

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)

22. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, storage rack coordinates, and mast orientation, if applicable.
 - a. **RECEIVE** confirmation from the RCRO that the step number, storage rack coordinates, and mast orientation are correct.
 - b. **RECEIVE** permission from the RCRO to continue the move.

NOTE

Steps 23 and 24 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

23. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21").
 - The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

24. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)

25. **LOWER** the hoist to insert the assembly into the storage rack, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 25.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs, **THEN STOP** insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:

- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

CAUTION

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
26. **LOWER** the hoist to insert the object into the storage rack until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the object is taken up by the storage rack:
- The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
27. **CONTINUE** lowering the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, **AND** the hoist stops automatically (nominal hoist coordinate of 178.00).

6.4.E Upender to Temporary Storage Rack Movement Sequence (Continued)

28. **NOTIFY** the RCRO the object is fully inserted into the temporary storage rack.
29. **UNGRAPPLE** the object as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

30. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight of the object (documented on the SNM Transfer Form 2, if applicable).
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
31. **RAISE** the grapple to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
32. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed, if applicable. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, storage rack coordinates, mast orientation, and empty grapple weight, if applicable.

NOTE

Steps 33 and 34 may be performed concurrently.

33. **ENSURE** the TV camera is vertical.
34. **RAISE** the hoist to the Hoist Up Limit.

6.4.E Uponder to Temporary Storage Rack Movement Sequence (Continued)

35. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.

36. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.F Temporary Storage Rack to Core Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions has been completed)
 - A spotter is available to observe movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the Hoist Up Limit **AND** the grapple is empty
2. **RECEIVE** notification of the fuel move step number, mast orientation, storage rack coordinates, and required FUEL SELECTOR switch position from the RCRO.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, storage rack coordinates, and FUEL SELECTOR switch position.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired storage rack coordinates **PER** the SNM Transfer Form 2:
 - a. **COORDINATE** with the spotter to verify correct storage rack coordinates **AND** the grapple is directly above the storage rack cavity.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

NOTE

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)**NOTE**

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
11. **LOWER** the grapple until both the LOWER GRAPPLE OPERATE ZONE **AND** a CABLE SLACK are indicated on the CRT.
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate is 178.00)
 - The grapple weight should now be partially supported by the top of the assembly
 - The fuel assembly top plate webs should be in the grapple "entrance" slots
12. **GRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes away **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grappling.
- The weight of the assembly should be between the over and under load limits as shown on the analog load display on the CRT.

13. **RAISE** the hoist approximately three inches to verify load increases.
14. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists, **THEN RAISE** the grapple to the UGOZ, **AND OPEN** the grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 13.

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)

15. **NOTIFY** the RCRO when the assembly is grappled:
 - a. **PROVIDE** the weight of the assembly and whether the assembly is shiny or dark.
 - b. **RECEIVE** RCRO notification of the mast orientation and core location and permission for the move to continue.
 - c. **ACKNOWLEDGE** the RCRO notification of the mast orientation and core location.
16. **RECORD** the weight of the assembly on the SNM Transfer Form 2 for the applicable step.
17. **RAISE** the hoist to the up limit **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the assembly is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the Lower Grapple Operate Zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is raised above the low zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the object is raised approximately 18 inches **AND** remain on until the object is raised above the UGOZ

NOTE

- Any actions taken in Step 17.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - **HAND-CRANK OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

6.4.F.17 Temporary Storage Rack to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
 - c. **WHEN** the rubbing has been alleviated in Step 17.b, if required, **THEN CONTINUE** raising the hoist to the up limit.
18. **IF** used, **THEN PLACE** the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
 19. **IF** necessary, **THEN ROTATE** the mast to the orientation specified on the SNM Transfer Form 2.
 20. Spotter **CHECK** equipment **PER APPENDIX B, FUEL SPOTTER RESPONSIBILITIES** to ensure safe passage of any fuel and equipment.
 21. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the core coordinates specified on the SNM Transfer Form 2.
 - a. **COMPARE** the digital and pointer coordinates with those specified on the SNM Transfer Form 2.
 - b. **COORDINATE** with the spotter to ensure that the RFM position is empty and in agreement with the specified coordinates.
 22. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, core coordinates, and mast orientation.
 - a. **RECEIVE** confirmation from the RCRO that the step number, core coordinates, and mast orientation are correct.
 - b. **RECEIVE** permission from the RCRO to continue the move.

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)**CAUTION**

Just prior to the fuel hoist box being fully extended (nominal hoist coordinate 126.56) hoist speed shall be reduced to slow speed to prevent bump at the down stop.

23. **LOWER** the hoist until the hoist box is at the Down Stop Bypass Zone (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).
24. **CHECK** the alignment of the mast and designated core location.

NOTE

Steps 25 and 26 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

25. **IF** spreader operation is directed by the FHS,
THEN LOWER the spreader.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

26. **IF** camera operation is directed by the FHS,
THEN TILT the camera.

NOTE

Step 27 is to be performed concurrently with Steps 28 through 30.

27. **INSERT** the fuel into the core, **AND USE** the audible counter **AND REPORT** any abnormally rising count rate to the FHS and RCRO. **[B0270]**

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)

28. **LOWER** the hoist to insert the fuel assembly into the designated core location, observing hoist load indication during insertion:
- IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 29.
 - IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** insertion with caution.

NOTE

- At the direction of the FHS, the actions of Step 28.c may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 28.c are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, **MANUAL OPERATION OF THE REFUELING MACHINE**.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- IF** the deviation increases to 100 lbs or greater,
THEN STOP insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - **RAISE** the assembly until fully clear of the core support alignment pins **AND HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction
 - **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (partially inserted)

6.4.F.28 Temporary Storage Rack to Core Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE (FLEX)** the hoist cable to free the fuel assembly from potential grid interferences
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference
 - **LOWER** the assembly into the core in line with the "To" location of the SNM Transfer Form 2 and away from any other fuel assembly to a position just above the core support plate alignment pins **AND** **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM coordinates to those of the SNM Transfer Form 2
- d. **REPEAT** Step 28, as necessary to insert the fuel assembly.
- e. **IF** the hang-up persists **AND** the NFM-lead engineer, with the concurrence of the FHS, directs a modification to the fuel move sequence be initiated to temporarily relocate the assembly to a different approved location, **THEN PERFORM** the following:
- (1) **RAISE** the hoist until the assembly is fully clear of the core support alignment pins.
 - (2) **RETURN** to Step 17 **AND USE** the new coordinates given by the NFM-Lead engineer, as applicable, for the new destination.

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)

29. **LOWER** the hoist until the fuel assembly is seated in the core, as indicated by load decreasing **AND** a HOIST UNDERLOAD condition occurring as the weight of the fuel assembly is taken up by the fuel alignment pins (hoist index of approximately 297 inches).
30. **CONTINUE** lowering the hoist until the Hoist Lower Limit is reached, CABLE SLACK is indicated on the CRT, and the hoist stops automatically (nominal hoist coordinate of 298.00)
31. **NOTIFY** the RCRO the assembly is fully inserted.
 - a. **RECEIVE** permission from the RCRO to ungrapple the assembly:
 - (1) The RCRO shall check the 1/m count is acceptable prior to giving permission. **[B0270]**
32. **ENSURE** the assembly is properly aligned with the core.
33. **UNGRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until the Cable Slack indication goes away **AND** GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

34. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight documented on the SNM Transfer Form 2.
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2.
35. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.

6.4.F Temporary Storage Rack to Core Movement Sequence (Continued)

36. **CHECK** there is an assembly present in the core location listed on the SNM Transfer Form 2 "To" location by using Figure 1A or 1B, as applicable, and looking at the core.
 - a. **NOTIFY** the RCRO that the "TO" location contains an assembly.
37. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, final location, mast orientation, and empty grapple weight.

NOTE

Steps 38, 39, 40 and 41 may be performed concurrently.

CAUTION

- The spotter shall observe retraction of the spreader to verify that it does **NOT** catch on an adjacent CEA while being raised. **[B0207]**
- The Spreader shall **NOT** be operated while the Hoist Box is in motion.

38. **IF** the spreader was used,
THEN RAISE the spreader **AND OBSERVE** retraction.
39. **ENSURE** the TV camera is vertical.
40. **IF** continuing movement **AND** the next location is within the core,
THEN RAISE the hoist to above the UGOZ (above hoist index of 268 inches).
41. **IF** additional moves other than core to core are to be performed,
THEN RAISE the hoist to the Hoist Up Limit.
42. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
43. **IF** fuel movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

**6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)****6.4.G Core to Temporary Storage Rack Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, has been completed)
 - A spotter is available to observe fuel movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is above 268 inches **AND** the grapple is empty
2. **RECEIVE** notification of the fuel move step number, mast orientation, core location, and FUEL SELECTOR switch position from the RCRO.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, core location, and FUEL SELECTOR switch position.
4. **ENSURE** the FUEL SELECTOR switch is in the correct position.
5. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
6. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

NOTE

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

7. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired core location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct core coordinates **AND** the grapple is centered above the location.
8. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column of the SNM Transfer Form 2. (N/A if NO SNM form on machine)
9. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

Just prior to the fuel hoist box being fully extended (supported by down stop: nominal hoist coordinate 126.56) hoist speed will be automatically reduced to slow speed to prevent bump at down stop.

10. **LOWER** the hoist until the hoist box is at the mechanical down stop (hoist load indication will show weight decrease as hoist box weight is taken up by mechanical stop).

NOTE

Steps 11, 12 and 13 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

11. **IF** spreader operation is directed by the FHS,
THEN LOWER the spreader.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

12. **IF** camera operation is directed by the FHS,
THEN TILT the camera.
13. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE (UGOZ) is indicated (~277 inches).
14. **OPEN** the grapple.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

Movement should be stopped **AND** the FHS informed, if during the process of lowering it appears that the assembly cannot be grappled on the center guide post.

15. **LOWER** the grapple until the Hoist Lower Limit is reached **OR** CABLE SLACK is indicated on the CRT.
 - The LOWER GRAPPLE OPERATE ZONE (LGOZ) indication will come on first
 - The hoist is automatically stopped when the Hoist Lower Limit occurs (nominal hoist coordinate for this position is 298.00)
 - The top plate webs should be in the grapple "entrance" slots
16. **GRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes away **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment (center post of fuel assembly).
17. **ENSURE** HOIST LOAD BYPASS is OFF.

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grapping.
- The weight of the assembly should be between the over and under load limits as shown on the analog load display on the CRT.

18. **RAISE** the hoist approximately three inches to verify load increases.
19. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists, **THEN** RAISE the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 15 through 18.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)

20. **NOTIFY** the RCRO when the assembly is grappled **AND PROVIDE** the weight of the assembly.
 - a. **RECEIVE** notification of the mast orientation and storage rack cavity coordinates, and that the move may continue.
21. **RECORD** the weight of the assembly on the SNM Transfer Form 2 for the applicable step.
22. **RAISE** the hoist **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the assembly is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the LGOZ
 - Speed is restricted to slow speed until the fuel assembly is fully raised into the hoist box
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches **AND** remain on until the assembly is raised above the UGOZ (approximately 277.00)
 - b. **IF** no deviation from expected load cell indication occurs **OR** the deviation is less than 50 lbs,
THEN PROCEED to Step 23.
 - c. **IF** a deviation of more than 50 lbs from the expected load cell indication occurs,
THEN NOTIFY the RCRO **AND CONTINUE** withdrawal with caution.

6.4.G.22 Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

- At the direction of the FHS, the actions of Step 22.d may be performed in anticipation of interference due to bowed or twisted assemblies.
- Any actions taken in Step 22.d are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 268" when above the core.

- d. **IF** the deviation increases to 100 lbs or greater, **THEN STOP** withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- **RETURN** the fuel assembly to the fully inserted position **AND** either HAND-CRANK **OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction
 - HAND-CRANK **OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.2 inches in any direction with the assembly at other elevations (than fully inserted)

6.4.G.22 Core to Temporary Storage Rack Movement Sequence (Continued)**CAUTION**

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from potential grid interferences
 - With the concurrence of the NFM-Lead engineer **HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction of any obstacle (an adjacent assembly or the shroud), provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs.
 - **IF** the direction of travel is clear (no adjacent assemblies or shroud wall) **AND** provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs **AND** with specific FHS authorization, **THEN HAND-CRANK OR** use the Travel Override pushbutton (below 268", max speed 1 fpm) to move the RFM as necessary to clear the interference
- e. **REPEAT** Step 22, as necessary to remove the fuel assembly.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

- The HOIST LOAD BYPASS light indicates that the FUEL ONLY overload is bypassed. The FUEL PLUS HOIST overload is still active.
- The Load Transition Zone starts at approximately 128.00 inches, and is indicated by the Hoist Load Bypass light automatically coming on.

23. **CONTINUE** raising the hoist until the fuel assembly is fully raised into the hoist box (at 126.56 inches as the weight of the hoist box is picked up by the grapple).

a. **RELEASE** the HOIST control switch when the Hoist Box weight is picked up:

- The HOIST LOAD BYPASS light should start flashing at approximately 3 inches before the weighing meter indicates the load has increased due to the hoist pick up
- The HOIST LOAD BYPASS light will continue flashing for a short period of raising (approximately 6 inches), so it is possible to raise the hoist slightly above this point

NOTE

Steps 24 and 25 may be performed concurrently.

CAUTION

The spotter shall observe the retraction of the spreader to ensure that it does **NOT** catch an adjacent CEA while being raised. **[B0207]**

24. **IF** the spreader was used,
THEN RAISE the spreader **AND OBSERVE** spreader retraction.
25. **IF** used,
THEN PLACE the TV camera in the vertical position **AND OBSERVE** the camera is vertical.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

- The Down Stop Bypass Zone starts at approximately 128.00 inches, and is indicated by the HOIST LOAD BYPASS light automatically flashing.
- The Fuel plus Hoist overload is expected when initially picking up the hoist box at approximately 126.56 inches.

26. **RAISE** the hoist to the Hoist Up Limit **AND IF** the hoist stops on overload, **THEN PERFORM** the following:
 - a. **CHECK** the load cell indication.
 - b. **NOTIFY** the FHS **AND** NFM for further direction.
27. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
28. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the specified temporary storage rack coordinates.
 - a. **COORDINATE** with the spotter to verify correct RFM position, the specified storage rack cavity is empty, and the grapple is directly above the cavity.
29. **ENSURE** the mast orientation agrees with the SNM Transfer Form 2.
30. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, mast orientation and storage rack coordinates.
 - a. **RECEIVE** confirmation from the RCRO that the step number, mast orientation and storage rack location are correct.

NOTE

Steps 31 and 32 may be performed concurrently.

31. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21"):
 - The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

32. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
33. **LOWER** the hoist to insert the assembly into the storage rack, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 33.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, **MANUAL OPERATION OF THE REFUELING MACHINE**.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs, **THEN STOP** insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - HAND-CRANK **OR** use the TRAVEL OVERRIDE pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

CAUTION

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE (FLEX)** the hoist cable to free the fuel assembly from interference

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)

34. **LOWER** the hoist to insert the assembly into the storage rack until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the fuel assembly is taken up by the storage rack:
 - The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
35. **CONTINUE** lowering the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, and the hoist stops automatically (nominal hoist index of approximately 178 inches).
36. **NOTIFY** the RCRO the assembly is fully inserted.
37. **UNGRAPPLE** the assembly as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

38. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight documented on the SNM Transfer Form 2.
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2.
39. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
40. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, storage rack coordinates, and empty grapple weight.

6.4.G Core to Temporary Storage Rack Movement Sequence (Continued)**NOTE**

Steps 41 and 42 may be performed concurrently.

41. **ENSURE** the TV camera is vertical.
42. **RAISE** the hoist to the Hoist Up Limit.
43. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
44. **IF** fuel movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.H Temporary Storage Rack to Upender Movement Sequence**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, has been completed)
 - A spotter is available to observe fuel movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the Hoist Up Limit **AND** the grapple is empty
2. **RECEIVE** notification of the fuel move step number, mast orientation, storage rack coordinates, and required FUEL SELECTOR switch position from the RCRO, if applicable.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, storage rack coordinates, and required FUEL SELECTOR switch position, if applicable.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired temporary storage rack location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct storage rack coordinates and the grapple is directly above the location.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

NOTE

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)**NOTE**

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
11. **LOWER** the hoist until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate for this position is 178.00)
 - The grapple weight should now be partially supported by the top of the object
 - The fuel assembly top plate webs (or object lifting bail) should be in the grapple "entrance" slots
12. **GRAPPLE** the object as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment of the object.

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grappling.
- The weight of a fuel assembly or a dummy fuel assembly should be between the over and under load limits as shown on the analog load display on the CRT.

13. **RAISE** the hoist approximately three inches to verify load increases.
14. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists, **THEN RAISE** the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 13.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)

15. **NOTIFY** the RCRO when the object is grappled, if applicable:
 - a. **PROVIDE** the weight of the object.
 - b. **RECEIVE** notification of the mast orientation and upender cavity coordinates, **AND** that the move may continue.
16. **RECORD** the weight of the object on the SNM Transfer Form 2 for the correct step, if applicable.

CAUTION

Hoist load indication shall be carefully observed during withdrawal when the HOIST LOAD BYPASS is ON since the load system interlocks are bypassed.

17. **RAISE** the hoist to the up limit **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the object is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the object is raised above the LGOZ
 - Speed is restricted to slow speed until the object is raised above the low zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the object is raised approximately 18 inches **AND** remain on until the object is raised above the UGOZ

6.4.H.17 Temporary Storage Rack to Upender Movement Sequence (Continued)**NOTE**

- Any actions taken in Step 17.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

CAUTION

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
- c. **WHEN** the rubbing has been alleviated in Step 17.b, if required,
THEN CONTINUE raising the hoist to the up limit.
18. **IF** used,
THEN PLACE the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
19. **ENSURE** the mast orientation agrees with the SNM Transfer Form 2.
20. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)**NOTE**

Automatic positioning of the RFM is performed per Section 6.3.B.9 or 6.3.B.10.

21. **WHEN** Spotter has given permission to move,
THEN POSITION the RFM over the specified upender cavity.
 - a. **COORDINATE** with the spotter to verify correct RFM position, the specified upender cavity is empty, and the grapple is directly above the cavity.
22. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, mast orientation and upender cavity, if applicable.
 - a. **RECEIVE** confirmation from the RCRO that the step number, mast orientation and upender cavity location are correct.

NOTE

Steps 23 and 24 may be performed concurrently.

23. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21").
 - The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication.

NOTE

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

24. **IF** camera operation is directed by the FHS,
THEN TILT the camera.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)

25. **LOWER** the hoist to insert the assembly into the fuel carrier, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 25.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs, **THEN STOP** insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the TRAVEL OVERRIDE pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

CAUTION

The differential force registered on the load cell indication shall **NOT** be allowed to exceed 100 lbs when exercising the hoist cables to prevent damage to the fuel assembly grids. Even a momentary deviation of greater than 350 lbs can damage fuel assembly grids.

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
26. **LOWER** the hoist to insert the assembly into the fuel carrier until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the fuel assembly is taken up by the fuel carrier:
- The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
27. **CONTINUE** to lower the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, and the hoist stops automatically.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)

28. **NOTIFY** the RCRO the object is fully inserted.
29. **UNGRAPPLE** the object as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled CEA.

30. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight of the object (documented on the SNM Transfer Form 2, if applicable).
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
31. **RAISE** the grapple to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
32. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed, if applicable. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, upender location, mast orientation, and empty grapple weight, if applicable.

NOTE

Steps 33 and 34 may be performed concurrently.

33. **ENSURE** the TV camera is vertical.
34. **RAISE** the hoist to the Hoist Up Limit.

6.4.H Temporary Storage Rack to Upender Movement Sequence (Continued)

35. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.

36. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.I Upender to Temporary Storage Rack Movement Sequence with a Trash Can**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, Initial Conditions has been completed)
 - A spotter is available to observe movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the up limit **AND** the grapple is empty
2. **RECEIVE** notification of the trash can move step number, ID of the object to be moved, mast orientation and upender location from the RCRO, if applicable.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, object ID, mast orientation, and upender cavity coordinates, if applicable.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired upender location **PER** the SNM Transfer Form 2:
 - a. **COORDINATE** with the spotter to verify correct RFM position and the grapple is directly above the upender.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch position are correct, if applicable **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

NOTE

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

6.4.I Uperder to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)**NOTE**

The Spotter may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the Spotter,
THEN TILT the camera.

CAUTION

Grapple should be lowered at a slow rate onto the trash can lid. Weight of grapple could compress lid springs and cause the lid to come loose.

11. **LOWER** the grapple until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT.
- The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate is 178.00)
 - The grapple weight should now be partially supported by the top of the trash can
 - The trash can top plate pins (or object lifting bail) should be in the grapple "entrance" slots
12. **GRAPPLE** the object as follows:
- a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment of the trash can (trash can lid pins must point towards the corners).
13. **VERIFY** the HOIST LOAD BYPASS is OFF.
14. **RAISE** the hoist approximately five inches to verify load increases.

6.4.I Upender to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)

15. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.

IF no load condition exists, **THEN** RAISE the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 14.
16. **NOTIFY** the RCRO when the object is grappled, if applicable:
 - a. **PROVIDE** the weight of the object.
 - b. **RECEIVE** notification of the mast orientation and upender cavity coordinates, **AND** that the move may continue.
17. **RECORD** the weight of the object on the SNM Transfer Form 2 for the correct step, if applicable **AND PERFORM** the following:

NOTE

The following steps will provide automatic overload protection while moving trash cans with the RFM in manual-electric mode. Since the weight of a trash can varies with its contents, a load simulator will be used to bias the trash can's actual weight as necessary to bring it within 140lbs of an automatic hoist overload limit approximately middle of overload/underload setpoint band shown on hoist load scale.

- a. **POSITION** Fuel Selector switch to **POSITION 2**.
- b. With the Load Simulator turned off, **CONNECT** the Load Simulator to the RFM console. The Load Simulator may already be connected if this step is being repeated for more than one trash can.
- c. **ADJUST** the Load Simulator for a Load Indication of 1340 lbs. **VERIFY** that the HOIST UNDERLOAD condition is clear.

6.4.I Upender to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)

18. **RAISE** the hoist to the up limit **AND PERFORM** the following:
- a. **CHECK** load as the trash can is raised.
- The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the Lower Grapple Operate Zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is raised above the Hoist Slow Zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the UGOZ

NOTE

- Any actions taken in Step 18.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the trash can from interference
- c. **WHEN** the rubbing has been alleviated in Step 18.b, if required, **THEN CONTINUE** raising the hoist to the Hoist Up Limit.

6.4.I Uperder to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)

19. **IF** used,
THEN PLACE the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
20. **ENSURE** the mast orientation agrees with the SNM Transfer Form 2.
21. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
22. **WHEN** Spotter has given permission to move,
THEN POSITION the RFM over the Refuel Pool storage rack coordinates specified on the SNM Transfer Form 2:
 - a. **COMPARE** the digital coordinates for the storage rack with those specified on the SNM Transfer Form 2.
 - b. **COORDINATE** with the spotter to ensure the following:
 - The position is in agreement with the specified coordinates
 - The specified location is empty
 - The mast is directly above the desired location
23. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, storage rack coordinates, and mast orientation, if applicable.
 - a. **RECEIVE** confirmation from the RCRO that the step number, storage rack coordinates, and mast orientation are correct.
 - b. **RECEIVE** permission from the RCRO to continue the move.

NOTE

Steps 24 and 25 may be performed concurrently.

24. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21").

NOTE

The Spotter may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

25. **IF** camera operation is directed by the Spotter,
THEN TILT the camera.

6.4.I Upender to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)

26. **LOWER** the hoist to insert the trash can into the fuel carrier, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 26.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:

- HAND-CRANK **OR** use the TRAVEL OVERRIDE pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the trash can from interference

CAUTION

Hoist should be lowered at a slow rate during the last few inches of travel. Weight of grapple could compress lid springs and cause the lid to come loose.

27. **LOWER** the hoist to insert the trash can into the fuel carrier until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the trash can is taken up by the fuel carrier:
- The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
28. **TURN OFF** the load simulator.

6.4.I Uperder to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)

29. **CONTINUE** to lower the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, and the hoist stops automatically.
30. **NOTIFY** the RCRO the object is fully inserted, if applicable.
31. **UNGRAPPLE** the object as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple **AND CHECK** that the trash can lid pins point towards the corners.
32. **VERIFY** the HOIST LOAD BYPASS is OFF.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled trash can.

33. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight of the object (documented on the SNM Transfer Form 2, if applicable).
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
34. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
35. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed, if applicable. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, object ID number (if fuel transfer), storage rack coordinates, mast orientation, **AND** empty grapple weight, if applicable.

6.4.I Uperder to Temporary Storage Rack Movement Sequence with a Trash Can (Continued)**NOTE**

Steps 36 and 37 may be performed concurrently.

36. **ENSURE** the TV camera is vertical.
37. **RAISE** the hoist to the Hoist Up Limit.
38. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
39. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.
40. **REMOVE** the Load Simulator from the RFM console.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, has been completed)
 - A spotter is available to observe movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the up limit **AND** the grapple is empty
2. **RECEIVE** notification of the trash can move step number, object ID, mast orientation, and storage rack coordinates from the RCRO, if applicable.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, object ID, mast orientation, and storage rack coordinates, if applicable.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired temporary storage rack location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct storage rack coordinates and the grapple is directly above the location.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch position are correct, if applicable **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

NOTE

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)**NOTE**

The Spotter may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the Spotter, **THEN TILT** the camera.

CAUTION

Grapple should be lowered at a slow rate onto the trash can lid. Weight of grapple could compress lid springs and cause the lid to come loose.

11. **LOWER** the hoist until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate for this position is 178.00)
 - The grapple weight should now be partially supported by the top of the trash can
 - The trash can top plate pins (or object lifting bail) should be in the grapple "entrance" slots
12. **GRAPPLE** the object as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment of the trash can (trash can lid pins must point towards the corners).
13. **ENSURE** the HOIST LOAD BYPASS is OFF
14. **RAISE** the hoist approximately five inches to verify load increases.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)

15. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.

IF no load condition exists, **THEN** RAISE the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 14.
16. **NOTIFY** the RCRO when the object is grappled, if applicable:
 - a. **PROVIDE** the weight of the object.
 - b. **RECEIVE** notification of the mast orientation and upender cavity coordinates, **AND** that the move may continue.
17. **RECORD** the weight of the object on the SNM Transfer Form 2 for the correct step, if applicable **AND PERFORM** the following:

NOTE

The following steps will provide automatic overload protection while moving trash cans with the RFM in manual-electric mode. Since the weight of a trash can varies with its contents, a load simulator will be used to bias the trash can's actual weight as necessary to bring it within 140lbs of an automatic hoist overload limit approximately middle of overload/underload setpoint band shown on hoist load scale.

- a. **POSITION** Fuel Selector switch to **POSITION 2**.
- b. With the Load Simulator turned off, **CONNECT** the Load Simulator to the RFM console. The Load Simulator may already be connected if this step is being repeated for more than one trash can.
- c. **ADJUST** the Load Simulator for a Load Indication of 1340 lbs. **VERIFY** that the HOIST UNDERLOAD condition clears.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)

18. **RAISE** the hoist to the up limit **AND PERFORM** the following:
- a. **CHECK** load as the trash can is raised.
- The LOWER GRAPPLE OPERATE ZONE indication should go off after the assembly is raised above the Lower Grapple Operate Zone (LGOZ)
 - Speed is restricted to slow speed until the fuel assembly is raised above the Hoist Slow Zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the assembly is raised approximately 18 inches and remain on until the assembly is raised above the UGOZ

NOTE

- Any actions taken in Step 18.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the trash can from interference
- c. **WHEN** the rubbing has been alleviated in Step 18.b, if required, **THEN CONTINUE** raising the hoist to the Hoist Up Limit.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)

19. **IF** used,
THEN PLACE the TV camera in the vertical position **AND OBSERVE** the camera is vertical.
20. **ENSURE** the mast orientation agrees with the SNM Transfer Form 2.
21. Spotter **CHECK** equipment **PER** APPENDIX B, **FUEL SPOTTER RESPONSIBILITIES** to ensure safe passage of any fuel and equipment.
22. **WHEN** Spotter has given permission to move,
THEN POSITION the RFM over the specified upender cavity.
 - a. **COORDINATE** with the spotter to verify correct RFM position, the specified upender cavity is empty, and the mast is directly above the cavity.
23. **NOTIFY** the RCRO of the SNM Transfer Form 2 step number, mast orientation and upender cavity, if applicable.
 - a. **RECEIVE** confirmation from the RCRO that the step number, mast orientation and upender cavity location are correct.

NOTE

Steps 24 and 25 may be performed concurrently.

24. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21"):
 - The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication.

NOTE

The Spotter may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

25. **IF** camera operation is directed by the Spotter,
THEN TILT the camera.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)

26. **LOWER** the hoist to insert the trash can into the fuel carrier, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 26.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, MANUAL OPERATION OF THE REFUELING MACHINE.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the upender.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:

- HAND-CRANK **OR** use the TRAVEL OVERRIDE pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the trash can from interference

CAUTION

Hoist should be lowered at a slow rate during the last few inches of travel. Weight of grapple could compress lid springs and cause the lid to come loose.

27. **LOWER** the hoist to insert the trash can into the fuel carrier until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the trash can is taken up by the fuel carrier:
- The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area
28. **TURN OFF** the load simulator.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)

29. **CONTINUE** to lower the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, and the hoist stops automatically.
30. **NOTIFY** the RCRO the object is fully inserted, if applicable.
31. **UNGRAPPLE** the object as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple **AND CHECK** that the trash can lid pins point towards the corners.
32. **ENSURE** the HOIST LOAD BYPASS is OFF.

NOTE

The weight of an empty grapple is about 218 lbs. A weight of about 300 lbs may indicate an inadvertently grappled trash can.

33. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight of the object (documented on the SNM Transfer Form 2, if applicable).
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
34. **RAISE** the hoist to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
35. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed, if applicable.
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, object ID number (if a fuel assembly), upender location, mast orientation, and empty grapple weight, if applicable.

6.4.J Temporary Storage Rack to Upender Movement Sequence with a Trash Can (Continued)**NOTE**

Steps 36 and 37 may be performed concurrently.

36. **ENSURE** the TV camera is vertical.
37. **RAISE** the hoist to the Hoist Up Limit.
38. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.
39. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.
40. **REMOVE** the Load Simulator from the RFM console.

6.4 ELECTRICAL MANUAL MODE OF OPERATION [B0154] [REFERENCE USE]
(Continued)**6.4.K Purging the Mast**

1. **ENSURE** the following conditions have been established:
 - The RFM is ready for normal operation (Section 6.4.A, Initial Conditions, has been completed)
 - A spotter is available to observe fuel movement **[B0167]**
 - The Fuel Transfer Machine is energized
 - The hoist is at the Hoist Up Limit **AND** the grapple is empty
2. **RECEIVE** notification of the fuel move step number, mast orientation, storage rack coordinates, and required FUEL SELECTOR switch position from the RCRO, if applicable.
3. **ACKNOWLEDGE** the RCRO notification of the SNM Transfer Form 2 step number, mast orientation, storage rack coordinates, and required FUEL SELECTOR switch position, if applicable.
4. **ENSURE** the mast is rotated to the specified orientation of the SNM Transfer Form 2.
5. Spotter **CHECK** equipment **PER** APPENDIX B, FUEL SPOTTER RESPONSIBILITIES to ensure safe passage of any fuel and equipment.
6. **WHEN** Spotter has given permission to move, **THEN POSITION** the RFM over the desired temporary storage rack location as directed **PER** the SNM Transfer Form 2.
 - a. **COORDINATE** with the spotter to verify correct storage rack coordinates and the grapple is directly above the location.
7. **CONFIRM** with the RCRO that the coordinates, detent, and FUEL SELECTOR switch are correct **AND INITIAL** the "VER" column on the SNM Transfer Form 2. (N/A if NO SNM form on machine)
8. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

NOTE

Steps 9 and 10 may be performed concurrently.

9. **LOWER** the hoist until the UPPER GRAPPLE OPERATE ZONE indication comes on.
 - a. **OPEN** the grapple.

6.4.K Purging the Mast (Continued)**NOTE**

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

10. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
11. **LOWER** the hoist until both the LOWER GRAPPLE OPERATE ZONE and CABLE SLACK are indicated on the CRT:
 - The LOWER GRAPPLE OPERATE ZONE indication will come on first
 - The hoist is automatically stopped when the Cable Slack occurs (nominal hoist coordinate for this position is 178.00)
 - The grapple weight should now be partially supported by the top of the object
 - The fuel assembly top plate webs (or object lifting bail) should be in the grapple "entrance" slots
12. **GRAPPLE** the object as follows:
 - a. **RAISE** the grapple until the CABLE SLACK indication goes out **AND** GRAPPLE WEIGHT ONLY is indicated.
 - b. **CLOSE** the grapple **AND CHECK** proper grapple alignment of the object.

NOTE

- There should be approximately one inch of rise before load is observed. This would be one indication of proper grappling.
- The weight of a fuel assembly or a dummy fuel assembly should be between the over and under load limits as shown on the analog load display on the CRT.

13. **RAISE** the hoist approximately three inches to verify load increases.
14. **IF** no load is observed after approximately three inches of travel, **THEN** the spotter should visually **INSPECT** the grapple either by camera or binoculars to verify the no load condition.
IF no load condition exists, **THEN RAISE** the grapple to the UGOZ, **AND OPEN** grapple.
 - a. **VERIFY** the bridge and trolley coordinates **AND** ADJUST as required to index the grapple over the fuel assembly.
 - b. **REPEAT** Steps 11 through 13.

6.4.K Purging the Mast (Continued)

15. **NOTIFY** the RCRO when the object is grappled, if applicable:
 - a. **PROVIDE** the weight of the object.
 - b. **RECEIVE** notification of the mast orientation and upender cavity coordinates, **AND** that the move may continue.
16. **RECORD** the weight of the object on the SNM Transfer Form 2 for the correct step, if applicable.

CAUTION

Hoist load indication shall be carefully observed during withdrawal when the HOIST LOAD BYPASS is ON since the load system interlocks are bypassed.

17. **RAISE** the hoist to the up limit **AND PERFORM** the following, observing hoist load indication during hoisting:
 - a. **CHECK** load increases as the object is picked up.
 - The LOWER GRAPPLE OPERATE ZONE indication should go off after the object is raised above the LGOZ
 - Speed is restricted to slow speed until the object is raised above the low zone
 - The UPPER GRAPPLE OPERATE ZONE indication should come on after the object is raised approximately 18 inches **AND** remain on until the object is raised above the UGOZ

6.4.K.17 Purging the Mast (Continued)**NOTE**

- Any actions taken in Step 17.b are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, **MANUAL OPERATION OF THE REFUELING MACHINE**.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- b. **IF** a deviation of more than 100 lbs from expected load cell indication occurs,
THEN STOP withdrawal, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
- HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
- c. **WHEN** the rubbing has been alleviated in Step 17.b, if required,
THEN CONTINUE raising the hoist to the up limit.

NOTE

Steps 18 and 19 may be performed concurrently.

CAUTION

The Spreader shall **NOT** be operated while the Hoist Box is in motion.

18. **LOWER** the hoist until the HOIST BOX LATCHED indication comes on the CRT (~5.21").
- The HOIST LOAD BYPASS indication should come on prior to the HOIST BOX LATCHED indication

6.4.K Purging the Mast (Continued)**NOTE**

The FHS may determine an alternate means of observing components if at any time the TV monitor or camera becomes inoperable.

19. **IF** camera operation is directed by the FHS, **THEN TILT** the camera.
20. **LOWER** the hoist to insert the assembly into the storage rack, observing hoist load indication during insertion:

NOTE

- Any actions taken in Step 20.a are to be documented in the applicable Fuel Handling procedure.
- Any HAND-CRANKING evolutions shall be performed **PER** Section 6.2, **MANUAL OPERATION OF THE REFUELING MACHINE**.
- The Travel Override pushbutton limits RFM speed to 1 foot per minute **AND** can only be used with the Hoist lower than 150" when above the storage racks.

- a. **IF** a deviation of more than 100 lbs from expected load cell indication occurs, **THEN STOP** insertion, **NOTIFY** the FHS, **AND PERFORM** any or all of the following as directed by the FHS:
 - HAND-CRANK **OR** use the Travel Override pushbutton (below 150", max speed 1 fpm) to move the RFM up to 0.5 inches in the direction necessary to alleviate the rubbing, provided the differential force registered on the load cell indication does **NOT** exceed 300 lbs

WARNING

The hoist cable is potentially highly contaminated. Concurrence of the Radiation Safety Technician shall be obtained prior to handling the hoist cable to prevent the spread of contamination.

- **EXERCISE** (FLEX) the hoist cable to free the fuel assembly from interference
21. **LOWER** the hoist to insert the object into the storage rack until the hoist index indicates approximately 176 inches **AND** a HOIST UNDERLOAD condition is indicated as the weight of the object is taken up by the storage rack:
 - The UPPER GRAPPLE OPERATE ZONE indication should come on as the grapple passes through this area

6.4.K Purging the Mast (Continued)

22. **CONTINUE** lowering the hoist until the LOWER GRAPPLE OPERATE ZONE indication comes on, CABLE SLACK is indicated on the CRT, **AND** the hoist stops automatically (nominal hoist coordinate of 178.00).
23. **NOTIFY** the RCRO the object is fully inserted into the temporary storage rack.
24. **REPEAT** Steps 17 through 23 as necessary to purge the mast.
25. **UNGRAPPLE** the object as follows:
 - a. **RAISE** the grapple until just after the CABLE SLACK indication goes away and GRAPPLE WEIGHT ONLY indication appears.
 - b. **OPEN** the grapple.
26. **RAISE** the grapple approximately 3 inches **AND PERFORM** the following:
 - a. **COMPARE** the weight indicated on the load cell with the weight of the object (documented on the SNM Transfer Form 2, if applicable).
 - (1) **IF** the load cell indicates that the grapple is **NOT** empty, **THEN STOP** withdrawal **AND CONSULT** with the RCRO and FHS before continuing.
 - b. **RECORD** the empty grapple weight on the SNM Transfer Form 2, if applicable.
27. **RAISE** the grapple to the UGOZ.

NOTE

The hoist will **NOT** raise above the UGOZ with the grapple open.

- a. **CLOSE** the grapple.
28. **INITIAL** the SNM Transfer Form 2 "Initial Complete" column corresponding to the move just completed, if applicable. (N/A if NO SNM form on machine)
 - a. **NOTIFY** the RCRO of the completion of the step giving the step number, storage rack coordinates, mast orientation, and empty grapple weight, if applicable.

NOTE

Steps 29 and 30 may be performed concurrently.

29. **ENSURE** the TV camera is vertical.
30. **RAISE** the hoist to the Hoist Up Limit.

6.4.K Purging the Mast (Continued)

31. **IF** additional moves are to be performed,
THEN PROCEED to the applicable move sequence of this section 6.4 for the next move.

32. **IF** movement is complete,
THEN PROCEED to Section 6.5, SECURING THE REFUELING MACHINE, to secure the RFM.

6.5 SECURING THE REFUELING MACHINE [CONTINUOUS USE]**A. Initial Conditions**

1. The Refueling Machine is to be secured.

B. Procedure

1. **MOVE** the RFM to its storage location, South Pool on U-1 or North Pool on U-2.
2. **LOWER** the hoist onto the up latch.
3. **LOG OFF** of the CRT.
4. **DEPRESS** the SHUTDOWN bar displayed on the CRT.
5. **DEPRESS** the POWER OFF pushbutton.
6. **PLACE** the MAIN BREAKER to OFF. (located on back of RFM Console.)
7. **ENSURE** the HEATER ON light is illuminated.
8. **IF** desired to place the Refueling Machine in a long term shutdown (shutdown for longer than 90 days),
THEN PERFORM the following:

NOTE

Refer to FIGURE 3 for step B.8.a.

- a. **PLACE** the pins for both spreader arms in the MAINTENANCE position.
- b. **SHUT** the individual air supply valves to the pressure regulators, on the pneumatic control panel:
 - U-1(2) RFM CAMERA TILT 1(2)SV0517/CT ISOL, 1(2)-IA-1628
 - U-1(2) RFM FUEL SPREADER 1(2)SV0517/FS ISOL, 1(2)-IA-1629
 - U-1(2) RFM GRAPPLE OPEN/CLOSE 1(2)SV0517/GO/GC ISOL, 1(2)-IA-1630
 - U-1(2) RFM HOIST LATCH 1(2)SV0517/HLA ISOL, 1(2)-IA-1631
 - U-1(2) RFM MAST DETENT 1(2)SV0517/MDD ISOL, 1(2)-IA-1632
- c. **SHUT** U-1(2) RFM AIR CONTROL PANEL ISOL, 1(2)-IA-1637.
- d. **SHUT** REFUELING MACHINE ISOL, 1-IA-431(2-IA-449).

6.5.B.8 Procedure (Continued)

- e. **NOTIFY** E&C to remove the RFM Console from the containment.

****** END ******

6.6 OPERATION OF THE REFUELING MACHINE WITH THE FESTOON CABLE EXTENSION INSTALLED**A. Initial Conditions**

1. All manual handwheels are removed from their extension shafts.
2. Power is available to the RFM.

NOTE

Instrument Air will not be available to the Refueling Machine while the festoon cable is installed.

CAUTION

- The Refueling Machine shall **NOT** be used for fuel handling with the festoon cable extension installed.
- A festoon cable tender is required anytime the Refueling Machine bridge is moved with the festoon cable extension installed.
- A Refueling Machine spotter is required anytime the Refueling Machine is moved.

B. Procedure

1. **ENSURE** the pins for both spreader arms are in the MAINTENANCE position.

NOTE

The pins for the spreader arms shall be in the Maintenance position prior to isolating Instrument Air.

2. **ENSURE** Electrical Maintenance has PERFORMED the following Refueling Machine festoon system alterations:
 - a. INSTALLED the RFM festoon cable extensions.(power, control and phone cables)
 - b. Disconnected the Instrument Air tubing and two coaxial cables.

6.6.B Procedure (Continued)

3. **ENERGIZE** the Refueling Machine as follows:
 - a. **PLACE** the MAIN BREAKER to ON. (located on back of RFM Console.)
 - b. **DEPRESS** the POWER ON pushbutton on the console panel.
 - c. **ENSURE** the HEATER ON light is extinguished.
 - d. **ENSURE** the PLC ACTIVE light is flashing. (Located on the right side of the RFM Console.)
 - e. **IF** the computer is available,
THEN log on to the computer as follows:
 - (1) **TOUCH** the LOG ON touch pad.
 - (2) **TOUCH** in the user name ("FHS") **AND TOUCH** the ENTER touch pad.
 - (3) **TOUCH** the ENTER PASSWORD touch pad.
 - (4) **TOUCH** in the password ("FHS") **AND TOUCH** the ENTER touch pad.
 - (5) **TOUCH** the PRESS FOR OPERATION touch pad.
4. **ENSURE** the hoist is in the Hoist Up Limit position.
(HOIST UP LIMIT light on)

CAUTION

Placing the COMPUTER OVERRIDE Keyswitch in OVERRIDE will override ALL interlocks.

5. **PLACE** the key-operated COMPUTER OVERRIDE switch to OVERRIDE.
6. **OPERATE** the bridge as follows:
 - a. **MOVE** the control lever toward the direction of desired travel (LEFT or RIGHT). Speed is proportional to switch displacement from the neutral position. (Maximum speed is 50 feet per minute.)
 - b. **SLOWLY RELEASE** the control lever to stop the bridge.
7. **OPERATE** the trolley as follows:
 - a. **MOVE** the control lever toward the direction of desired travel (FORWARD or REVERSE). Speed is proportional to switch displacement from the neutral position. (Maximum speed is 50 feet per minute.)
 - b. **SLOWLY RELEASE** the control lever to stop the trolley.
8. **PLACE** the key-operated COMPUTER OVERRIDE switch to normal.

6.6.B Procedure (Continued)

9. **DE ENERGIZE** the Refueling Machine as follows:
 - a. **LOG OFF** of the CRT.
 - b. **DEPRESS** the SHUTDOWN bar displayed on the CRT.
 - c. **DEPRESS** the POWER OFF pushbutton.
 - d. **PLACE** the MAIN BREAKER to OFF. (located on back of RFM Console.)
 - e. **ENSURE** the HEATER ON light is illuminated.
10. **WHEN** the Refueling Machine has been moved to within its normal operating range (Bridge coordinates of less than 890) **AND** the festoon cable extension is no longer needed **THEN NOTIFY** maintenance to restore the Refueling Machine to its normal operating conditions including:
 - a. Festoon cable extension removed.
 - b. Instrument Air tubing re-connected.
 - c. Two coaxial cables connected.

NOTE

ENSURE Instrument Air is RESTORED to the Refueling Machine **PRIOR** to placing spreader arm pins in the OPERATE position.

11. **ENSURE** the pins for both spreader arms are in the OPERATE position.

**** END ****

7.0 POST-PERFORMANCE ACTIVITIES

- A. Upon completion of attachments, forward the original(s) to the Operations Senior Administrative Assistant for retention **PER** PR-3-100, Records Management.

8.0 BASES

[B0135] Commitment to verify Repetitive Tasks for periodic inspection of the Spent Fuel Handling Machine and Refueling Machine brakes are performed prior to using the fuel handling machines to reduce the possibility of accidents as contained in INPO SER 3-91.

[B0154] AOP/EOP cross reference **PER** NUREG 1358:

1. AOP 6D, FUEL HANDLING INCIDENT, refers to this OI for placing fuel in a safe location during a Fuel Handling Incident. The applicable sections of this OI are 6.1 and 6.3.

[B0167] Memo NFM 92-365 (NEU 92-365) dated 10/6/92: Use of spotters help minimize the chance of fuel handling incidents.

[B0207] Response to PDR 93042 and RCAR 9308 recommendations, to verify adjacent CEAs are not lifted during spreader retraction.

[B0212] Response to INPO SER 30-85. An operator was fatally injured while attempting to board a moving Refueling Machine. The operator's head was caught between the moving bridge and a stationary electrical panel mounted on the wall.

[B0270] Contains the operations Reactivity Management Procedure Review Guidelines, and letter from B. Shick to M. Navin, 9/22/95.

[B0376] NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management. Establishes a minimum temperature for SFP and RCS/RFP to ensure proper SDM.

[B0408] Recommendations from task force in response to Fuel Handling Incident dated April, 1997.

[B0629] License Renewal Aging Management Basis Document: Fuel Handling Equipment & Other Heavy Load Handling Cranes, AMDB-0030.

[M0002] A page check of attachments is performed **PER** a corrective action of LER 89-01.

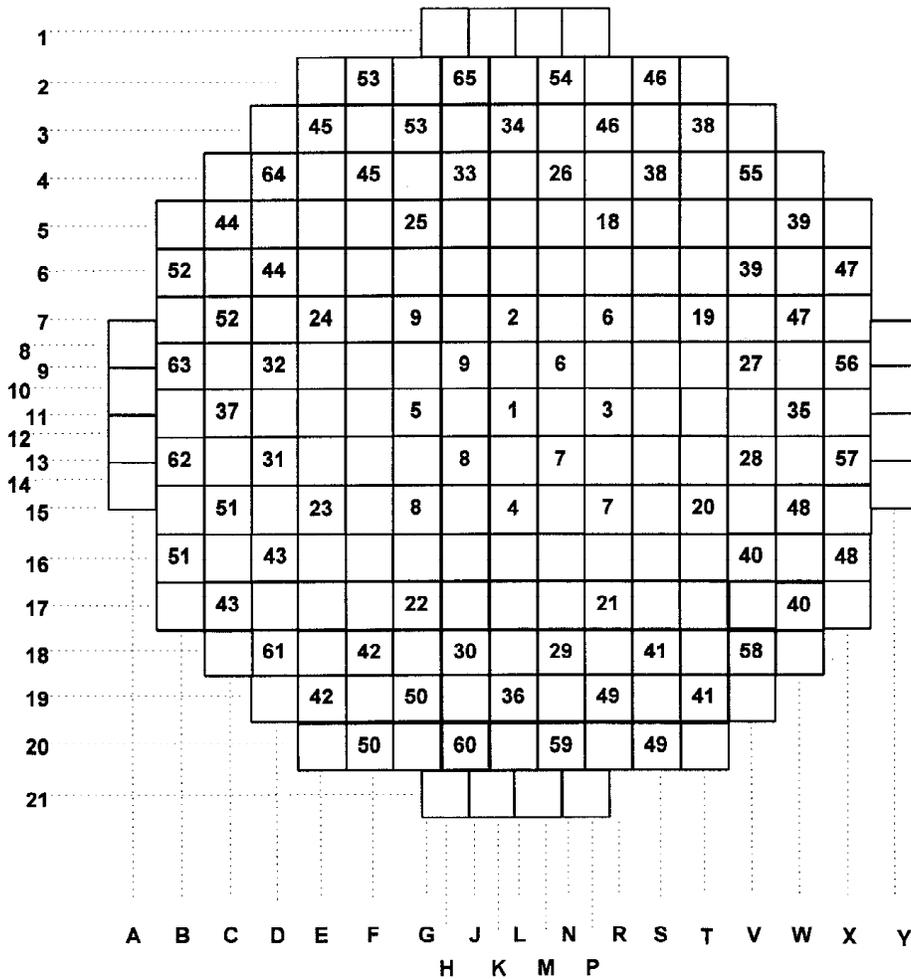
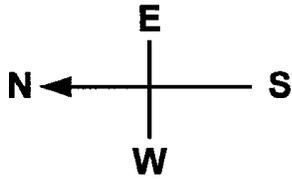
9.0 RECORDS

- A. Records generated by this procedure shall be transferred to Records Management, **PER** PR-3-100, Records Management.

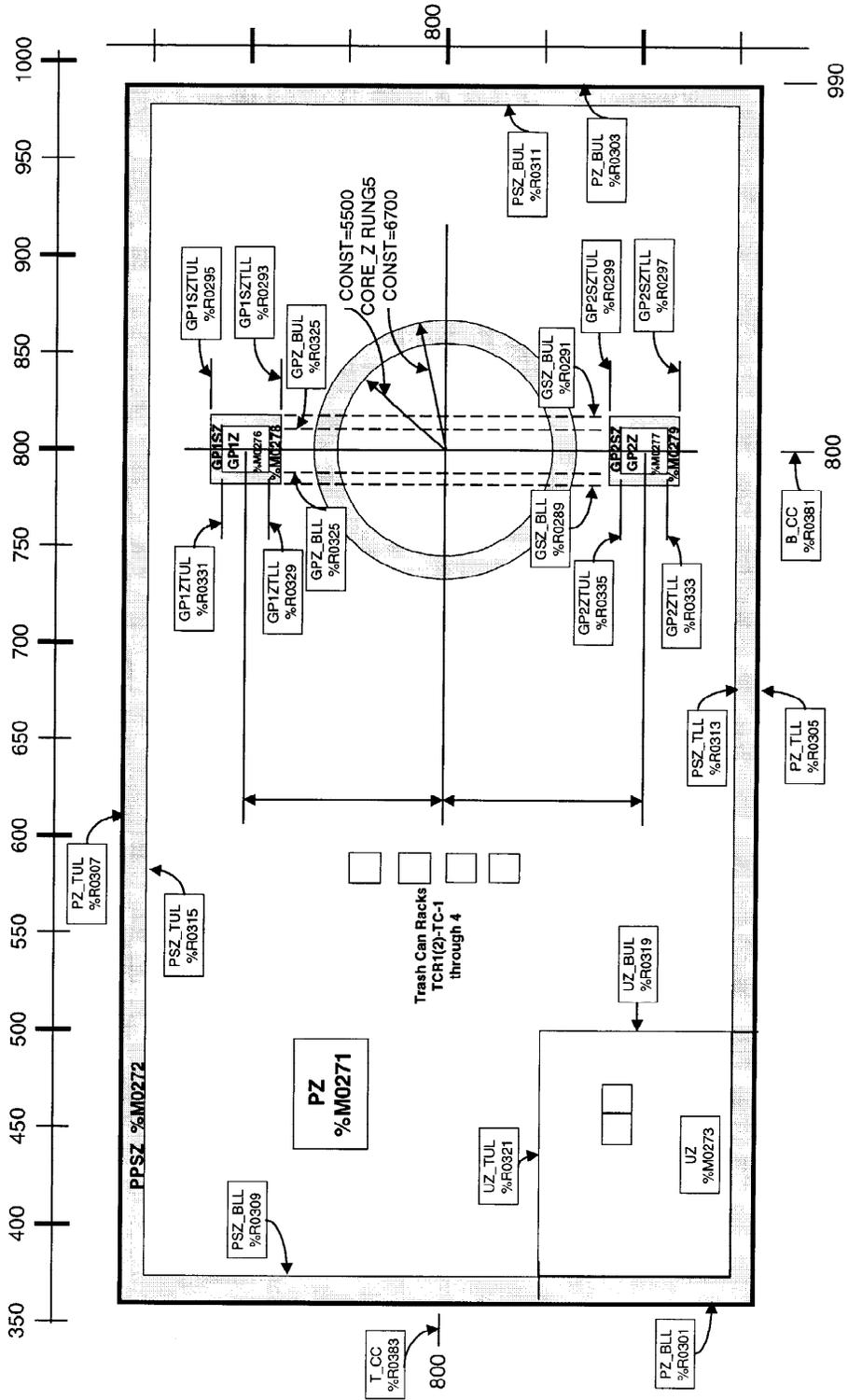
10.0 ATTACHMENTS

- A. FIGURE 1A, UNIT 1 CORE BRIDGE AND TROLLEY COORDINATES
- B. FIGURE 1B, UNIT 2 CORE BRIDGE AND TROLLEY COORDINATES
- C. FIGURE 2, REFUELING INTERLOCKS DIAGRAM
- D. FIGURE 3, RFM SPREADER ARM
- E. APPENDIX A, REFUELING MACHINE CHECK OUT
- F. APPENDIX B, FUEL SPOTTER RESPONSIBILITIES
- G. APPENDIX C, REFUELING OPERATIONS CHECKLIST

UNIT 2 CORE BRIDGE AND TROLLEY COORDINATES



REFUELING INTERLOCKS DIAGRAM



RFM SPREADER ARM

NOTE

Pin shown in the **OPERATE** position.



REFUELING MACHINE CHECK OUT

- A. This appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____/_____
Init Date

NOTE

If possible this appendix should be coordinated with Maintenance Procedure I-24, REFUELING MACHINE LOAD WEIGHING SYSTEM ALIGNMENT TEST/ADJUSTMENT.

- B. Initial Conditions

NOTE

If the refueling machine will only be used as a working platform to uncouple CEAs, **ONLY** Initial Condition 1 applies.

1. Use of Refueling Machine is anticipated.
2. Refueling Machine Load Simulator is available for use.
3. I&C has initially adjusted RFM setpoints to allow full mast and grapple movement. This initial adjustment will be followed by a calibration (I-24) later with the dummy assembly.

REFUELING MACHINE CHECK OUT

C. Refueling Machine Startup and Interlock Check Out Procedure

NOTE

- Initialing a step indicates that it was performed satisfactorily.
- Steps C.1 through C.6 may be performed in any order.
- If the refueling machine will only be used as a working platform to uncouple CEAs, ONLY steps C.1 through C.14 of this section need to be performed **AND** the hoist must be maintained in the full up position.

1. **ENSURE** all manual handwheels are removed from their extension shafts.

_____/_____
Init Date

2. **CHECK** for lubricant leakage from the following oil lubricated components.

- Bridge Drive
- Trolley Drive
- Hoist Drive
- Mast Rotate Gear Motor

_____/_____
Init Date

3. Visually **CHECK** equipment for damaged, corroded, or deteriorated parts. **[B0629]**

_____/_____
Init Date

4. Visually **CHECK** rail surfaces and gear rack teeth are clean and free of obstructions.

_____/_____
Init Date

5. Visually **CHECK** the festoon cable and track for damage and obstructions which could prevent free mechanical operation.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

6. **ENSURE** E & C has installed the RFM Console.

_____/_____
Init Date

7. **ENSURE** Bridge, Trolley, and Hoist Encoder assemblies are installed **AND** tested (procedure I-17 REFUELING MACHINE POSITION ENCODER INSTALLATION AND TESTING):

_____/_____
Init Date

8. **ALIGN** Instrument Air to the RFM as follows:

- a. **OPEN** REFUELING MACHINE ISOL, 1-IA-431(2-IA-449)

_____/_____
Init Date

- b. **OPEN** U-1(2) RFM AIR CONTROL PANEL ISOL, 1(2)-IA-1637

_____/_____
Init Date

9. **ENSURE OPEN** the individual air supply valves to the pressure regulators on the pneumatic control panel, **AND ADJUST** the air regulators as necessary to maintain the following pressures:

- U-1(2) RFM CAMERA TILT 1(2)SV0517/CT ISOL, 1(2)-IA-1628: 50 +/- 5 PSIG

_____/_____
Init Date

- U-1(2) RFM FUEL SPREADER 1(2)SV0517/FS ISOL, 1(2)-IA-1629: 70 +/- 5 PSIG

_____/_____
Init Date

- U-1(2) RFM GRAPPLE OPEN/CLOSE 1(2)SV0517/GO/GC ISOL, 1(2)-IA-1630: 50 +/- 10 PSIG

_____/_____
Init Date

- U-1(2) RFM HOIST LATCH 1(2)SV0517/HLA ISOL, 1(2)-IA-1631: 70 +/- 5 PSIG

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

- U-1(2) RFM MAST DETENT 1(2)SV0517/MDD ISOL,
1(2)-IA-1632: 70 +/- 5 PSIG

_____/_____
Init Date

10. **ENERGIZE** the RFM Console as follows:

- a. **PLACE** the MAIN BREAKER to ON. (located on back of RFM Console.)

_____/_____
Init Date

- b. **DEPRESS** the POWER ON pushbutton on the console panel.

_____/_____
Init Date

- c. **ENSURE** the HEATER ON light is extinguished.

_____/_____
Init Date

- d. **ENSURE** the PLC ACTIVE light is flashing. (Located on the right side of the RFM Console.)

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

e. **IF** the computer is available,
THEN log on to the computer as follows:

(1) **TOUCH** the LOG ON touch pad.

_____/_____
Init Date

(2) **TOUCH** in the user name ("FHS") **AND TOUCH** the ENTER touch pad.

_____/_____
Init Date

(3) **TOUCH** the ENTER PASSWORD touch pad.

_____/_____
Init Date

(4) **TOUCH** in the password ("FHS") **AND TOUCH** the ENTER touch pad.

_____/_____
Init Date

(5) **CHECK** computer indicates that it is connected to the proper unit.

_____/_____
Init Date

(6) **TOUCH** the PRESS FOR OPERATION touch pad.

_____/_____
Init Date

f. **CHECK** the following:

- Various indicator lights are energized

_____/_____
Init Date

- Position readouts and the load indicator are energized

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

11. **ENSURE** the hoist is in the Hoist Up Limit position.
(HOIST UP LIMIT light on)

_____/_____
Init Date

NOTE

Bridge and trolley full speed operation is approximately 50 FPM.

12. **ACTUATE** separately each of the following control switches
AND CHECK variable speed up to full speed operation in each direction
(hoist last):

- Bridge control switch

_____/_____
Init Date

- Trolley control switch

_____/_____
Init Date

- Hoist control switch (Due to an underload condition, to lower an empty hoist, HOIST LOAD BYPASS must be set by momentarily pulling out the HOIST LOAD BYPASS pushbutton.)

_____/_____
Init Date

13. **CHECK** bridge and trolley can be operated simultaneously.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

14. **CHECK** mast rotate interlocks as follows:
- a. **CHECK** the area surrounding the mast is clear of obstructions permitting full rotation of the mast and TV camera without interference.

_____/_____
Init Date

NOTE
Steps C.14.b and C.14.c may be performed in either order.

- b. **SELECT** MAST DETENT position for 270°.CHECK mast rotation stops at 270°.

_____/_____
Init Date

- c. **SELECT** MAST DETENT position for 0°.CHECK mast rotation stops at 0°.

_____/_____
Init Date

- d. **ENSURE** the Mast Detent is Engaged **AND** the MAST DETENT DISENGAGED indicator light is extinguished.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

15. **CHECK** hoist operation and interlocks and TV camera operation as follows:

- a. **ENSURE** the Hoist Box is raised to the HOIST UP LIMIT.

_____/_____
Init Date

NOTE

Refer to FIGURE 3, RFM SPREADER ARM.

- b. **ENSURE** the pins for both spreader arms are in the OPERATE position.

_____/_____
Init Date

NOTE

Step C.15.c is to be performed concurrently while performing Steps C.15.d through C.15.v.

- c. **INSPECT** the hoist cable while running hoist through the full length of travel.

_____/_____
Init Date

CAUTION

The spotter shall observe hoist operation **AND** shall notify the operator to stop lowering the hoist if it appears that any equipment may interfere with the hoist operation.

- d. **SET** the Hoist Load Bypass by pulling-out the HOIST LOAD BYPASS button **AND VERIFY** the HOIST LOAD BYPASS light is flashing.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

NOTE

If not over the core, it is necessary to manually unlatch the hoist to move the hoist box below the latch position.

- e. **HOLD** the HOIST Latch lever in the UNLATCH position while performing the following:

- (1) **LOWER** the hoist box, **AND VERIFY** the hoist operates in slow speed until below the LATCH BYPASS ZONE (approximately 12.5 inch hoist position).

_____/_____
Init Date

- f. **RELEASE** the HOIST LATCH lever.

_____/_____
Init Date

- g. **CONTINUE** lowering the hoist **AND CHECK** hoist operation is in fast speed (approx 18 FPM) until approximately hoist position 125.00 (just prior to fuel hoist box being fully extended), at which time it shifts to slow speed (approx 5 FPM).

_____/_____
Init Date

- h. **WHEN** the grapple reaches the UPPER GRAPPLE OPERATE ZONE (Upper Grapple Operate Zone is indicated; hoist position of approximately 277 inches), **THEN STOP** hoist movement.

_____/_____
Init Date

- i. **OPEN** the grapple, **AND CHECK** GRAPPLE OPEN light illuminates.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

j. **LOWER** the hoist:

- (1) **WHEN** grapple reaches the LOWER GRAPPLE OPERATE ZONE (Lower Grapple Operate Zone is indicated; hoist position of approximately 295 inches), **THEN STOP** hoist movement.

_____/_____
Init Date

k. **CLOSE** the grapple,
AND CHECK GRAPPLE CLOSED light illuminates.

_____/_____
Init Date

l. **OPEN** the grapple,
AND CHECK GRAPPLE OPEN light illuminates.

_____/_____
Init Date

m. **RAISE** the hoist,
AND CHECK operation is in slow speed (observe hoist load indication to ensure no equipment is snagged).

_____/_____
Init Date

n. **ENSURE** the HOIST LOAD BYPASS goes OFF when raising the hoist.

_____/_____
Init Date

o. **CHECK** hoist movement stops when Upper Operate Zone light illuminates (grapple open).

_____/_____
Init Date

p. **CLOSE** the grapple,
AND CHECK GRAPPLE CLOSED light illuminates.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

- q. **DEPRESS** the CAMERA TILT pushbutton, **AND CHECK** tilted view on TV monitor and CAMERA TILT light illuminates.
(N/A if camera is not available)

_____/_____
Init Date

- r. **PULL-OUT** the CAMERA TILT pushbutton, **AND CHECK** vertical view on TV monitor and CAMERA TILT light extinguishes.
(N/A if camera is not available)

_____/_____
Init Date

- s. **PLACE** the FUEL SPREADER selector switch to the EXTEND position, **AND VERIFY** the FUEL SPREADER RETRACTED light extinguishes and FUEL SPREADER EXTENDED is indicated on the CRT.

_____/_____
Init Date

- t. **PLACE** the FUEL SPREADER selector switch to the RETRACT position, **AND VERIFY** the FUEL SPREADER RETRACTED light illuminates and FUEL SPREADER RETRACTED is indicated on the CRT.

_____/_____
Init Date

- u. **RAISE** the hoist to the up limit, **AND CHECK** for shift to high speed at approximately hoist position 123.56 (approximate position when a fuel assembly would be fully raised into the hoist box).

_____/_____
Init Date

- v. **CHECK** hoist movement stops when reaching the Hoist Up Limit (HOIST UP LIMIT light illuminates).

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

NOTE

For the hoist latch operation and interlock checks the RFM can **NOT** be over the core.

16. **CHECK** hoist latch operation and interlocks as follows:

- a. **LOWER** the hoist,
AND CHECK HOIST BOX LATCHED indication illuminates
(at approximate hoist position 5.21)

_____/_____
Init Date

- b. **RAISE** the hoist to the HOIST UP-LIMIT.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

D. Hoist Load System Check Out Procedure:

1. **ENSURE** the following Repetitive Task is current on the applicable Unit:

- Unit-1
 - (encoder alignment 2yr) 10811001

_____/_____
Init Date

- Unit-2
 - (encoder alignment 2yr) 20811001

_____/_____
Init Date

NOTE

- STP-0-59-1(2) Section 6.1, Refueling Machine Hoist Overload limit test, may be performed concurrently with this section.
- With the load simulator connected and turned on, it will override the transducer weight indication. By turning the box switch off, the load simulator is removed from the circuit.

2. **CONNECT** the load simulator to the RFM Console.

_____/_____
Init Date

3. **PERFORM** I-24, REFUELING MACHINE LOAD WEIGHING SYSTEM ALIGNMENT TEST/ADJUSTMENT.

_____/_____
Init Date

4. **ENSURE** I-24, REFUELING MACHINE LOAD WEIGHING SYSTEM ALIGNMENT TEST/ADJUSTMENT is completed SAT.

_____/_____
Init Date

5. **REMOVE** the simulator from the load weighing system by placing its toggle switch in OFF.

_____/_____
Init Date

REFUELING MACHINE CHECK OUT

G. The Refueling Machine is : OPERABLE / OUT OF SERVICE
(circle one)

SM

_____/_____
Init Date

H. **IF** desired PLACE the Refueling Machine in a short term shutdown (shutdown 90 days or less) **PER** Section 6.5, SECURING THE REFUELING MACHINE.
(N/A if **NOT** performed)

_____/_____
Init Date

I. **IF** Refueling Operations will begin,
THEN PERFORM APPENDIX C, REFUELING OPERATIONS CHECKLIST
[B0408]. (N/A if **NOT** performed)

_____/_____
Init Date

J. This appendix has been page checked against the LIST OF
EFFECTIVE PAGES. **[M0002]**

_____/_____
Init Date

FUEL SPOTTER RESPONSIBILITIES

NOTE

- The responsibilities listed are **NOT** all-inclusive. The Fuel Handling Supervisor may add or delete responsibilities as conditions warrant. This is merely a guideline of the types of responsibilities expected of the spotter.
- A fuel spotter shall be used anytime the RFM is being moved. Spotter shall be proficient **PER** NO-1-200, Control of Shift Activities. **[B0167]**

A. Responsibilities

1. The primary responsibility of the spotter is watch the movement of fuel to ensure that there is a clear pathway for the fuel (grapple, hoist, bridge, trolley) without danger of collision. This provides additional protection for the fuel, as well as the fuel handling equipment.
 - a. In addition, during upward movement of the grapple or retraction of the spreader, the spotter shall observe to check for an inadvertently snagged CEA or fuel assembly being lifted out of position. **[B0207]**
2. Some of the secondary responsibilities are:
 - a. Ensure the rails of the bridge and trolley are free of obstructions each time prior to movement of either one.
 - b. Assist the RFM operator in determining the correct location required by the SNM Transfer Form 2.
 - c. Check the hoist is centered above the object prior to lowering to grapple the object.
 - d. Check the mast detent is in the position called for on the SNM Transfer Form 2 prior to lowering the object into the desired location.
 - e. Check for proper grappling when picking up an object.
 - f. Watch for equipment such as hoses, cords and pool lights that may interfere with RFM operation prior to and during operation of the of the RFM.
 - g. Check that assemblies placed into the core are properly aligned with the core and adjacent assemblies.

REFUELING OPERATIONS CHECKLIST [B0408]

1. This appendix has been page checked against the LIST OF EFFECTIVE PAGES. [M0002]

_____/_____
Init Date

NOTE
Steps 2 - 16 may be performed in any order.

2. A SWP is approved for the refueling activities to be performed within this procedure. _____
3. The RCSS has been notified of the activities to be performed within this procedure. _____
4. **IF** uncoupling/coupling CEAs,
THEN VERIFY RFP level is greater than 56.7 ft. _____
5. **IF** moving Fuel assemblies **OR** CEAs,
THEN VERIFY RFP level greater than 65 ft (normally 67 feet) prior to moving Fuel or CEAs. _____
6. **ENSURE** at least one Containment Iodine Filter is available for service. _____
7. **ENSURE** CREVS operable per Tech Spec 3.7.8. _____
8. **ENSURE** CRETS operable per Tech Spec 3.7.9. _____
9. The RFP clarity and lighting are adequate to see the assemblies and details of the lower core support (for onloads only). _____
10. **IF** moving Fuel Assemblies,
THEN an approved set of fuel moves is present and notification has been received from Nuclear Fuel Management of the step number to start on. _____
11. **VERIFY** 2 WRNIs Operable, each with continuous visual indication in the Control Room **AND** one with audible indication in the Containment and Control Room. (Tech Spec 3.9.2) _____
12. Sections 5.0 **AND** 6.3 of this OI have been reviewed. _____
13. Prior to core alterations, **VERIFY** a visual inspection has been completed of all equipment paths for foreign material interference within the last 72 hrs. _____

REFUELING OPERATIONS CHECKLIST [B0408]

- 14. **VERIFY** the following STPs have been completed within the required time requirements:
 - STP 0-92 _____
 - STP 0-59 _____

- 15. **IF** moving irradiated fuel assemblies within containment, **THEN VERIFY** the following STPs have been completed within the required time requirements:
 - STP 0-55A _____
 - STP 0-60 _____

- 16. **VERIFY** the following Radiation Monitors required for movement of irradiated fuel assemblies within containment, are in service:
 - **IF** Cntmt Purge is in service, **THEN** 69 ft Elevation Containment Area Radiation Monitors, RI-5316A thru D, are operable **PER** Tech Spec 3.3.7. _____
 - **IF** Cntmt Purge is secured, **THEN** at least one of the 69 ft Elevation Containment Area Radiation Monitors, RI-5316A thru D _____

- 17. This appendix has been page checked against the LIST OF EFFECTIVE PAGES. **[M0002]**

_____/_____
Init Date

NOTE
The signatures below indicate that the appendix has been completed and reviewed.

FHS/CRS DATE

SM DATE

CALVERT CLIFFS NUCLEAR POWER PLANT

UNIT ONE AND TWO

OI-36

CONTAINMENT PURGE SYSTEM

REVISION 29

SAFETY RELATED

CONTINUOUS USE

Approval Authority: Kent Mills

Effective Date: 2/16/2005

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REVISION/CHANGE

2903

1.0 PURPOSE

- A. The purpose of this procedure is to give a detailed description of the operation of the Units 1 and 2 Containment Purge System. **[B0154]**

2.0 APPLICABILITY/SCOPE

- A. This procedure places the system in service in preparation for purging, and removes it from service prior to Mode 4 entry.
- B. This procedure covers venting of Units 1 and 2 Containment under both positive and negative pressure conditions.
- C. This procedure covers both normal purging and purging at reduced flow rates.

3.0 REFERENCES AND DEFINITIONS

3.1 DEVELOPMENTAL REFERENCES

- A. Technical Procedure Writers Manual.
- B. PR-1-101, Preparation and Control of Calvert Cliffs Technical Procedures.
- C. System Description 11, Containment Purge System.
- D. System Description 15, Radiation Monitoring System.
- E. E-26-1(2), Removal and Installation of #11(#21) Purge Air Supply and Exhaust Fan Motor Starter Heaters.
- F. HE-46, Equipment Access Door Removal and Installation.
- G. CCNPP Technical Specifications.
- H. P&IDs
 - 1. OM-65 (60-723-E), Ventilation Systems, Containment, Turbine, and Penetration Rm. (Sheet 1)

3.2 PERFORMANCE REFERENCES

- A. STP-O-60-1(2), Containment Purge Isolation System Functional Test.
- B. OI-40, Plant Heating System.
- C. MN-3-100, Painting And Other Protective Coatings.
- D. NO-1-205, Locked Valves.

3.3 DEFINITIONS

None

4.0 PREREQUISITES

- A. Prerequisites will vary depending on which section of the procedure is being performed. Prerequisites for each section will be listed as Initial Conditions at the beginning of the applicable section.

5.0 PRECAUTIONS

- A. Do **NOT** operate the Containment Purge System in Modes 1 through 4. During these modes, Technical Specifications require the purge supply and exhaust Blank Flanges be installed.
- B. Whenever purging or venting via this system, ODCM Controls 3.3.3.9 requires **ONE** of the following:
- Main Vent Gaseous Radiation Monitor RI-5415 shall be in operation on the affected unit.
 - An equivalent monitor shall be provided, or grab samples taken every 24 hours and analyzed for gross activity.
- C. Purge operation must be stopped immediately if either:
- The Main Vent Gaseous Radiation Monitor RI-5415 reaches the high alarm point while purging, **UNLESS** the expected release values are greater than the fixed high alarm setpoint **AND** this has been evaluated by Plant Chemistry
- OR**
- Plant Computer point R5415A! (R5415B! U-2) exceeds the Critical High limit specified on the purge permit
- D. Containment Radiation Signal (CRS) operability requires all four channels of Containment Area Radiation Monitors RI-5316A, B, C, and D to be operable during the movement of irradiated fuel assemblies within the containment. If CRS becomes inoperable, purging and venting must be secured, and the purge valves must be closed, **PER** Tech Specs 3.9.3 and 3.3.7.
- E. If fire dampers in the Containment Purge Supply and Exhaust Ducts actuate while the fans are in operation, damage to the dampers or ductwork may result.
- F. **IF** the Transfer Tube Isolation Valve is open, **THEN MONITOR** Refueling Pool and Spent Fuel Pool levels closely when performing any evolution that may create or change differential pressure between the Containment and Auxiliary Buildings. Unanticipated changes in Refueling Pool and Spent Fuel Pool water levels can occur following such evolutions. **[B0055]**
- G. Radiation Safety Supervision should be notified of any pending containment purge or vent, since this may cause a change in radiological conditions in containment.

5.0 PRECAUTIONS (Continued)

- H. The Purge Exhaust line contains roughing and HEPA filters. Flow should not be run through this line when painting in the Containment, if there is any possibility that paint fumes could reach the filters. Observe the requirements of MN-3-100, Painting And Protective Coating, regarding filter operation while painting.
- I. An issue report should be submitted to have filters replaced whenever ΔP reaches 2.5 inches H₂O. Roughing-HEPA filter ΔP can be read using a local ΔP gauge. Panel 1C34 (window U-05 for Unit 1 filters **OR** U-07 for Unit 2 filters) will alarm if ΔP reaches 2.7 inches H₂O.
- J. The sample pumps for Containment Radiation Monitoring System (RMS) must be secured prior to purging, to prevent clogging of the Containment RMS Filter. The monitors served are required operable only in Modes 1 through 4.
- K. Do **NOT** operate the containment purge valves with a differential (containment pressure) pressure greater than 0.30 PSI. **[B0200]**
- L. To ensure SFP ventilation is operable, when the PAL interlocks are defeated with either the Containment equipment hatch installed **OR** the Containment Outage Door (COD) shut, the following lineup is required: **[B0390]**
- The Containment Purge Supply **AND** Exhaust fans must be running
- OR**
- Containment Purge must be secured
- M. When the outside air temperature is less than or equal to 45° F **AND** plant heating is not in operation, the Purge Supply fan coils should be isolated and drained.
- N. **IF** Containment Average air temperature is less than or equal to 45° F, **THEN** place Plant Heating in service to maintain Containment temperatures greater than 45° F **OR** Secure Containment Purge. **IF** Containment Average air temperature can **NOT** be maintained greater than 45° F, **THEN** Containment Purge shall be secured. **IF** the RCS in Mode 6 or defueled and does **NOT** have at least a 8 inch² vent path, then the minimum temperature of 45° F is raised to 60° F. **[B0782]**
- O. **IF** operation of the Containment Purge Supply fan is desired with the COD and Equipment hatch open, **THEN** approval from Plant Chemistry must be obtained prior to operation due to ODCM restrictions.

6.0 SYSTEM OPERATION**6.1 SYSTEM STARTUP****A. Initial Conditions**

1. RCS temperature is less than 200° F on the unit to be readied for service.
2. Purging or venting of containment on the affected unit is anticipated prior to the next Mode 4 entry on that unit.
3. Containment Purge System on the affected unit is aligned to the STARTUP positions of the following attachments:
 - For Unit 1, use ATTACHMENT 1A, ATTACHMENT 1C.
 - For Unit 2, use ATTACHMENT 1B, ATTACHMENT 1D.

NOTE

Only the subsection of 6.1 which applies to the affected unit is to be performed.

B. Unit 1 System Startup

1. **ENSURE** blank flanges removed **AND** spoolpieces installed on Containment Supply and Return ducting.
2. **IF** Unit 1 is to be placed in Mode 6,
THEN:
 - **COMPLETE** STP O-60-1, Containment Purge Isolation System Functional Test.

OR

- **PLACE** a note on the Shift Turnover Information Sheet to **ENSURE** STP O-60-1, Containment Purge Isolation System Functional Test, is performed **PRIOR** to movement of irradiated fuel assemblies within containment with Containment Purge valves open.

**** END ****

C. Unit 2 System Startup

1. **ENSURE** blank flanges removed **AND** spoolpieces installed on Containment Supply and Return ducting.

6.1.C Unit 2 System Startup (Continued)

2. **IF** Unit 2 is to be placed in Mode 6,
THEN:

- **COMPLETE** STP O-60-2, Containment Purge Isolation System Functional Test.

OR

- **PLACE** a note on the Shift Turnover Information Sheet to **ENSURE** STP O-60-2, Containment Purge Isolation System Functional Test, is performed **PRIOR** to movement of irradiated fuel assemblies within containment with Containment Purge valves open.

****** END ******

6.2 STARTING A NORMAL PURGE OF CONTAINMENT**A. Initial Conditions**

1. RCS temperature is less than 200° F on the unit to be purged.
2. Section 6.1 has been completed for the unit to be purged.
3. One Main Exhaust Fan is in operation on the unit to be purged.
4. Main Vent Gaseous Radiation Monitor RI-5415 is in operation on the unit to be purged, **OR** appropriate compensatory action has been taken **PER** ODCM Controls 3.3.3.9.
5. An approved Gaseous Waste Release Permit for containment purge has been received from Chemistry.
6. Radiation Safety Supervision has been notified of pending containment purge.
7. **IF** moving irradiated fuel assemblies within the containment, **THEN** all four channels of Containment Area Radiation Monitors RI-5316A, B, C, and D are operable on the unit to be purged. (Tech Spec 3.3.7)

NOTE

If Containment pressure is greater than 0.30 PSIG or less than (-)0.30 PSIG, then the H₂ Purge system must be used.

8. Containment pressure is no less than (-)0.30 PSIG and no greater than 0.30 PSIG on the unit to be purged. **[B0200]**
9. Containment Radiation Monitoring System Sample Pumps are secured. (OI-35)
10. Key for the Purge Supp Fan Test/Alt Purge handswitch is available.
11. General Precaution 5.0.O has been reviewed.

B. Procedure

1. **IF** starting Containment Purge after it was temporarily secured, **THEN CONTACT** Chemistry to ensure Gaseous Waste Release Permit criteria is still valid.

6.2.B Procedure (Continued)

2. **IF** the Equipment Hatch is shut **OR** if installed, the Containment Outage Door is shut,
THEN PERFORM the following:
- NOTIFY** Radiation Safety Supervision that the PAL screen door will be maintained open during containment purge operation.
 - ENSURE** the PAL screen door is secured in the full open position **OR** is **NOT** installed.
 - IF** the PAL screen door is installed,
THEN ENSURE a DANGER sign is posted to maintain the PAL screen door open.
 - The sign shall warn that differential pressures caused by Containment Purge may cause personnel injury while shutting the door, if shut the door may not be able to be reopened for personnel access.

02903

NOTE

APPENDIX 1, NORMAL CONTAINMENT PURGE INITIATION FLOWPATH may be used as an aid when aligning containment purge.

NOTE

All steps in this subsection apply only to controls and equipment on the unit to be purged.

3. **PLACE** the following handswitches in OPEN, to open Containment Purge Supply and Exhaust Valves:
- CNTMT PURGE SUPP CPA-1410-CV.....1(2)-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....1(2)-HS-1412

CAUTION

When purging with the Equipment Hatch open **AND** if installed, the Containment Outage Door (COD) open, the Butler Building rolling door must be open at least 2 feet before starting the Purge Exhaust Fan, to prevent collapse of the door.

- IF** the Equipment Hatch is open **AND** if installed, the Containment Outage Door is open,
THEN ENSURE that the Butler Building rolling door is open at least two feet.
- NOTIFY** Radiation Safety Supervision that the plant will be initiating a containment purge.
- ENTER** Containment Purge alarm values from the Gaseous Waste Release Permit in the Plant Computer.

6.2.B Procedure (Continued)**NOTE**

- If the PAL interlocks are defeated with the Equipment Hatch installed **OR** if installed, the Containment Outage Door is shut, then SFP Ventilation is inoperable when the Purge Exhaust fan is started. SFP Ventilation will be inoperable until the Purge Supply fan is started.
- Containment Purge Exhaust Fan will trip if purge air supply temperature lowers to 40° F. The Containment Purge Supply Fan will trip when the Containment Purge Exhaust Fan trips.

7. **PLACE** CNTMT PURGE EXH FAN, 1(2)-HS-5289 in START to start Containment Purge Exhaust Fan and begin purging.
8. **CHECK** Purge Exhaust roughing-HEPA filter combined ΔP less than 2.5 inches H₂O using local gauge PDIS-5289.
9. **IF** filter ΔP is 2.5 inches H₂O or more, **THEN SUBMIT** an issue report to have filters replaced, **AND CONSIDER** securing flow through the purge exhaust line.
10. Locally **VERIFY** CNTMT PURGE EXH AIR OPERATED DAMPER, 1(2)-CPA-5289-DAMP, is **FULL OPEN** by verifying the piston operator is fully extended (~3.5 in.).

6.2.B Procedure (Continued)

11. **IF** the Equipment Hatch is shut **OR** if installed, the Containment Outage Door is shut,
THEN PERFORM the following:
- a. **IF** Containment Closure **IS** to be maintained **OR** it is desired to run the Purge Supply Fan,
THEN PERFORM the following:
- (1) **IF** Containment Average air temperature is less than or equal to 45° F,
THEN ENSURE plant heating is aligned to Purge Supply Fan **PER** APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE. **[B0782]**
- (a) **IF** plant heating is **NOT** available,
THEN Purge operation is not allowable.

NOTE

The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

- (2) **ENSURE** Purge Supp Fan TEST/ALT PURGE, 1(2)-HS-5290A, is in NORMAL.
- (3) **PLACE** CNTMT PURGE SUPP FAN, 1(2)-HS-5290, to START.
- (4) Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORs, are fully extended (~3.5 in.).
- 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
- (5) Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORs are fully extended (~3.5 in.).
- 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO

6.2.B.11 Procedure (Continued)

- b. **IF** desired to align air flow thru the supply duct without the Supply Fan running,
THEN PERFORM the following:
- (1) **IF** Containment Average air temperature is less than or equal to 45° F,
THEN ENSURE plant heating is aligned to Purge Supply Fan **PER**
APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE. **[B0782]**
 - (a) **IF** plant heating is **NOT** available,
THEN Purge operation is not allowable.

NOTE

- The key will be captured in the Test/Alt Purge position.
- The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

- (2) **PLACE** Purge Supp Fan TEST/ALT PURGE, 1(2)-HS-5290A, in TEST/ALT PURGE.
- (3) **PLACE** CNTMT PURGE SUPP FAN, 1(2)-HS-5290, in START **AND** **PERFORM** the following:
 - Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORs, are fully extended (~3.5 in.).
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORs are fully extended (~3.5 in.).
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO
- (4) **CHECK** the TEST/ALT PURGE amber light is illuminated.

6.2.B Procedure (Continued)

12. **IF** the Equipment Hatch is open **AND** if installed, the Containment Outage Door is open,
THEN PERFORM the following:
- a. **IF** Containment Average air temperature is less than or equal to 45° F,
THEN ENSURE plant heating is aligned to Purge Supply Fan **PER** APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE. [B0782]
- (1) **IF** plant heating is **NOT** available,
THEN Purge operation is not allowable.

NOTE

To maintain a negative pressure in the containment, the Purge Supply fan is not normally operated with an air path out of the containment.

- b. **IF** desired to run the CNTMT Purge Supply Fan,
THEN PERFORM the following:
- (1) **VERIFY** Radiation Safety Supervisor and Chemistry are informed and concur that Purge Supply Fan is to be started.
- (2) **PLACE** CNTMT PURGE SUPP FAN, 1(2)-HS-5290, to START.
- (3) Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORs, are fully extended (~3.5 in.).
- 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
- (4) Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORs are fully extended (~3.5 in.).
- 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO

6.2.B.12 Procedure (Continued)

- c. **IF** desired to align air flow thru the supply duct without the Supply Fan running,
THEN PERFORM the following:

NOTE

- The key will be captured in the Test/Alt Purge position.
- The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

- (1) **PLACE** Purge Supp Fan TEST/ALT PURGE, 1(2)-HS-5290A, in TEST/ALT PURGE.

- (2) **PLACE** CNTMT PURGE SUPP FAN, 1(2)-HS-5290 in START **AND PERFORM** the following:

- Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORs, are fully extended (~3.5 in.).
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
- Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORs are fully extended (~3.5 in.).
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO

- (3) **CHECK** the TEST/ALT PURGE amber light is illuminated.

- d. **IF** air flow will **NOT** be aligned thru the supply duct,
THEN PERFORM the following:

- (1) **ENSURE** that the Butler Building Door is open at least 2 feet.

- (2) **TAG** the following on the affected Unit:

- Butler Building Door handswitch to prevent inadvertent operation of the door
- Butler Building Door breaker OPEN

13. **ENSURE** keys are controlled **PER** NO-1-110, CALVERT CLIFFS KEY AND LOCK CONTROL.

6.2.B Procedure (Continued)

14. **UPDATE** Discharge permit.

****** END ******

6.3 STARTING A POSITIVE PRESSURE VENT OF CONTAINMENT**A. Initial Conditions**

1. RCS temperature is less than 200° F on the unit to be vented.
2. Section 6.1 has been completed for the unit to be vented.
3. One Main Exhaust Fan is in operation on the unit to be vented.
4. Main Vent Gaseous Radiation Monitor RI-5415 is in operation on the unit to be vented, **OR** appropriate compensatory action has been taken **PER** ODCM Controls 3.3.3.9. (OI-35)
5. An approved Gaseous Waste Release Permit for containment purge has been received from Chemistry.
6. Radiation Safety Supervision has been notified of pending containment vent.
7. **IF** moving irradiated fuel assemblies within the containment, **THEN** all four channels of Containment Area Radiation Monitors RI-5316A, B, C, and D are operable on the unit to be purged. (Tech Spec 3.3.7)
8. Containment pressure is greater than 0.10 and less than 0.30 PSIG on the unit to be vented. **[B0200]**
9. Containment Radiation Monitoring System Sample Pumps are secured. (OI-35)
10. Key for the Purge Exh Fan Test/Alt Purge handswitch has been obtained.

B. Procedure**NOTE**

All steps in this subsection apply only to controls and equipment on the unit to be vented.

1. **IF** available, **THEN PLACE** Containment Pressure (P5308) on a computer pen recorder.
2. **NOTIFY** Radiation Safety Supervision that the plant will be initiating a containment vent.

NOTE

- The key will be captured in the Test/Alt Purge position.
- The Purge Exh Fan Test/Alt Purge handswitch is located on breaker 52-10311 (52-20311).

3. **PLACE** Purge Exh Fan TEST/ALT PURGE handswitch, 1(2)-HS-5289A, in TEST/ALT PURGE.

6.3.B Procedure (Continued)

4. **PLACE** handswitch CNTMT PURGE EXH FAN, 1(2)-HS-5289, in START **AND** Locally **VERIFY** CNTMT PURGE EXH AIR OPERATED DAMPER, 1(2)-CPA-5289-DAMP, is **FULL OPEN** by verifying the piston operator is fully extended (~3.5 in.).
 - a. **CHECK** the TEST/ALT PURGE amber light is illuminated.
5. **PLACE** the following handswitch in OPEN, to open Containment Purge Exhaust Valve and begin venting.
 - CNTMT PURGE EXH CPA-1412-CV.....1(2)-HS-1412
6. **CHECK** Purge Exhaust roughing-HEPA filter combined ΔP less than 2.5 inches H₂O using local gauge PDIS-5289.
7. **IF** filter ΔP is 2.5 inches H₂O or more, **THEN SUBMIT** an issue report to have filters replaced, **AND CONSIDER** securing flow through the purge exhaust line.
8. **ENSURE** keys are controlled **PER** NO-1-110, CALVERT CLIFFS KEY AND LOCK CONTROL.
9. **WHEN** containment pressure lowers to 0.10 PSIG, **THEN STOP** venting **PER** Section 6.5.
10. **UPDATE** Discharge permit.

**** END ****

6.4 STARTING A NEGATIVE PRESSURE VENT OF CONTAINMENT**A. Initial Conditions**

1. RCS temperature is less than 200° F on the unit to be vented.
2. Section 6.1 has been completed for the unit to be vented.
3. Radiation Safety Supervision has been notified of pending containment vent.
4. **IF** moving irradiated fuel assemblies within the containment, **THEN** all four channels of Containment Area Radiation Monitors RI-5316A, B, C, and D are operable on the unit to be purged. (Tech Spec 3.3.7)
5. Containment pressure is between (-)0.10 and (-)0.30 PSIG on the unit to be vented. **[B0200]**
6. Keys for the Purge Supp & Exh Fans Test/Alt Purge handswitches have been obtained.

NOTE

A Gaseous Waste Release Permit is not required for a negative pressure vent of containment. To prevent activity release, venting is stopped when containment pressure rises to (-)0.1 PSIG, to keep containment pressure negative.

B. Procedure

1. **IF** available, **THEN PLACE** Containment Pressure (P5308) on a computer pen recorder.
2. **NOTIFY** Radiation Safety Supervision that the plant will be initiating a containment vent.

NOTE

- The key will be captured in the Test/Alt Purge position.
- The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

3. **PLACE** Purge Supp Fan TEST/ALT PURGE handswitch, 1(2)-HS-5290A, in TEST/ALT PURGE.

6.4.B Procedure (Continued)**NOTE**

- The key will be captured in the Test/Alt Purge position.
- The Purge Exh Fan Test/Alt Purge handswitch is located on breaker 52-10311 (52-20311).

4. **PLACE** Purge Exh Fan TEST/ALT PURGE handswitch, 1(2)-HS-5289A, in TEST/ALT PURGE.

NOTE

The Containment Purge Exhaust Fan handswitch is placed in START to satisfy the interlock between the Supply and Exhaust Fans.

5. **PLACE** handswitch CNTMT PURGE EXH FAN, 1(2)-HS-5289, in START.
 - a. **CHECK** the TEST/ALT PURGE amber light is illuminated.
6. **PLACE** handswitch CNTMT PURGE SUPP FAN, 1(2)-HS-5290, in START **AND PERFORM** the following:
 - a. Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORS, are fully extended (~3.5 in.).
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - b. Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORS are fully extended (~3.5 in.).
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO
 - c. **CHECK** the TEST/ALT PURGE amber light is illuminated.
7. **PLACE** the following handswitch in OPEN, to open Containment Purge Supply Valve and begin venting:
 - CNTMT PURGE SUPP CPA-1410-CV.....1(2)-HS-1410
8. **ENSURE** keys are controlled **PER** NO-1-110, CALVERT CLIFFS KEY AND LOCK CONTROL.

6.4.B Procedure (Continued)

9. **WHEN** containment pressure rises to (-)0.10 PSIG,
THEN STOP venting **PER** Section 6.5.

****** END ******

6.5 SECURING PURGING OR VENTING**A. Initial Conditions**

None

B. Procedure**NOTE**

All steps in this subsection apply only to controls and equipment on the unit being purged or vented.

1. **NOTIFY** Radiation Safety Supervision and Chemistry that purging and venting of containment will be secured.

NOTE

If the PAL interlocks are defeated and the CNTMT Equipment hatch is installed **OR** if installed, the Containment Outage Door is shut, then SFP Ventilation is inoperable when the Purge Supply fan is secured. SFP Ventilation will be inoperable until the Purge Exhaust fan is secured.

2. **IF** CNTMT PURGE SUPP FAN, 1(2)-HS-5290, is in START, **THEN PERFORM** the following:
 - a. **PLACE** 1(2)-HS-5290 in STOP.

NOTE

The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

- b. **IF** the Purge Supp Fan TEST/ALT PURGE handswitch, 1(2)-HS-5290A, is in TEST/ALT PURGE, **THEN PERFORM** the following:
 - (1) **PLACE** TEST/ALT PURGE handswitch, 1(2)-HS-5290A, in NORMAL.

6.5.B Procedure (Continued)

3. **IF** CNTMT PURGE EXH FAN, 1(2)-HS-5289, is in START, **THEN PERFORM** the following:
 - a. **PLACE** 1(2)-HS-5289 in STOP.

NOTE

The Purge Exh Fan Test/Alt Purge handswitch is located on breaker 52-10311 (52-20311).

- b. **IF** the Purge Exh Fan TEST/ALT PURGE handswitch, 1(2)-HS-5289A, is in TEST/ALT PURGE, **THEN PERFORM** the following:
 - (1) **PLACE** TEST/ALT PURGE handswitch, 1(2)-HS-5289A, in NORMAL.
4. **ENSURE** keys are controlled **PER** NO-1-110, CALVERT CLIFFS KEY AND LOCK CONTROL.
5. **IF** Containment Purge Supply Fan was running, **THEN ENSURE** fan is stopped.
 - a. Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL SHUT** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORS, are fully retracted.
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - b. Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL SHUT** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORS are fully retracted.
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO
6. **IF** Containment Purge Exhaust Fan was running, **THEN ENSURE** fan is stopped.
 - a. Locally **VERIFY** CNTMT PURGE EXH AIR OPERATED DAMPER, 1(2)-CPA-5289-DAMP, is **FULL SHUT** by verifying the piston operator is fully retracted.

6.5.B Procedure (Continued)

7. **IF** any of the following handswitches are in OPEN,
THEN PLACE them in CLOSE, to shut Containment Purge Supply and Exhaust Valves:
 - CNTMT PURGE SUPP CPA-1410-CV.....1(2)-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....1(2)-HS-1412
8. **IF** plant heating is in service to Purge Supply Fan **AND** Purge is being secured (end of outage),
THEN SECURE plant heating to the fan **PER** APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE (N/A if Purge is temporarily secured).
9. **UPDATE** Discharge permit.

**** END ****

6.6 CONTAINMENT POSITIVE PRESSURE VENT VIA THE NORMAL SUMP**A. Initial Conditions**

1. Containment purge permit approved by Chemistry.
2. Containment purge is **NOT** available to perform a positive vent.
3. Movement of irradiated fuel assemblies within the containment are **NOT** being performed.
4. Unit is in Mode 5 or 6.
5. Tech Specs **AND** NO-1-114 allow containment closure deviations.
6. Radiation Safety Supervision has evaluated venting containment to the ECCS Pump Room for radiological concerns.
7. Approved Contingency Plan with Radiation Safety Supervision to enter the ECCS Pump Room if necessary to restore the plant to normal operating conditions, such as restoring SDC to operation. Plan should include time to boil calculations versus estimated time to enter room.
8. Opposite train LPSI Pump is available when SDC is in operation, if the ECCS Pump Room doors will be locked shut.

B. Procedure

1. **IF DIRECTED** by Radiation Safety Supervision, **THEN PERFORM** the following:
 - a. **CHECK** the temporary duct has been installed from the ECCS Pump Room sump cover to the inlet of the ECCS Pump Room ventilation system.
 - b. **VERIFY** ECCS Pump Room ventilation system is in service **PER** OI-22C.
 - c. **PLACE** the ECCS Pump Room charcoal filter in service **PER** OI-22C
 - d. **NOTIFY** Radiation Safety Supervision to **SHUT AND LOCK BOTH** doors on affected U-1 (U-2) West ECCS Pump Room until air is sampled after venting.
 - e. **VERIFY** affected doors are **LOCKED SHUT**.
2. **OBTAIN** key **AND OPEN** the following valves:
 - CONTAINMENT NORMAL SUMP DRAIN, 1-EAD-5462
 - CONTAINMENT NORMAL SUMP DRAIN, 1-EAD-5463

6.6.B Procedure (Continued)

3. **WHEN** the desired Containment pressure has been obtained,
THEN SHUT the following valves:
 - CONTAINMENT NORMAL SUMP DRAIN, 1-EAD-5462
 - CONTAINMENT NORMAL SUMP DRAIN, 1-EAD-5463
4. **NOTIFY** Chemistry that the Containment Vent is secured.
5. **ENSURE** keys are controlled **PER** NO-1-110, CALVERT CLIFFS
KEY AND LOCK CONTROL.
6. **APPROXIMATELY** four hours after securing the vent,
OR when the respective ECCS Pump Room RMS levels are normal,
THEN NOTIFY Radiation Safety Supervision to sample the respective ECCS
Pump Room for activity.
7. **WHEN** notified by Radiation Safety Supervision that normal access is allowed,
THEN:
 - a. **BYPASS** the respective ECCS Charcoal Filter **AND LOG** run times in the
Charcoal Filter log.
 - b. **DIRECT** Radiation Safety Supervision to UNLOCK the ECCS Pump Room
doors.
 - c. **VERIFY** ECCS Pump Room doors are UNLOCKED.

**** END ****

6.7 STARTING AN ALTERNATE PURGE OF CONTAINMENT**A. Initial Conditions**

1. RCS temperature is less than 200° F on the unit to be purged.
2. Section 6.1 has been completed for the unit to be purged.
3. One Main Exhaust Fan is in operation on the unit to be purged.
4. Main Vent Gaseous Radiation Monitor RI-5415 is in operation on the unit to be purged, **OR** appropriate compensatory action has been taken **PER** ODCM Controls 3.3.3.9.
5. An approved Gaseous Waste Release Permit for containment purge has been received from Chemistry.
6. Radiation Safety Supervision has been notified of pending containment purge.
7. **IF** performing movement of irradiated fuel assemblies within the containment, **THEN** all four channels of Containment Area Radiation Monitors RI-5316A, B, C, and D are operable on the unit to be purged. (Tech Spec 3.3.7)

NOTE

If Containment pressure is greater than 0.30 PSIG or less than (-)0.30 PSIG, then the H₂ Purge system must be used.

8. Containment pressure is no less than (-)0.30 PSIG and no greater than 0.30 PSIG on the unit to be purged. **[B0200]**
9. Containment Radiation Monitoring System Sample Pumps are secured. (OI-35)
10. Keys for the Purge Supp & Exh Fans Test/Alt Purge handswitches have been obtained.

B. Procedure**NOTE**

- All steps in this subsection apply only to controls and equipment on the unit to be vented.
- The key will be captured in the Test/Alt Purge position.
- The Purge Supp Fan Test/Alt Purge handswitch is located on breaker 52-10231 (52-20231).

1. **PLACE** Purge Supp Fan TEST/ALT PURGE handswitch, 1(2)-HS-5290A, in TEST/ALT PURGE.

6.7.B Procedure (Continued)**NOTE**

- The key will be captured in the Test/Alt Purge position.
- The Purge Exh Fan Test/Alt Purge handswitch is located on breaker 52-10311 (52-20311).

2. **PLACE** Purge Exh Fan TEST/ALT PURGE handswitch, 1(2)-HS-5289A, in TEST/ALT PURGE.
3. **NOTIFY** Radiation Safety Supervision that the plant will be initiating an alternate purge of containment.
4. **ENTER** Containment Purge alarm values from the Gaseous Waste Release Permit in the Plant Computer. (R5415A! U-1, R5415B! U-2)
5. **IF** Containment Average air temperature is less than or equal to 45° F, **THEN ENSURE** plant heating is aligned to Purge Supply Fan **PER APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE. [B0782]**
 - a. **IF** plant heating is **NOT** available, **THEN** Purge operation is not allowable.
6. **PLACE** handswitch CNTMT PURGE EXH FAN, 1(2)-HS-5289, in START **AND** Locally **VERIFY** CNTMT PURGE EXH AIR OPERATED DAMPER, 1(2)-CPA-5289-DAMP, is **FULL OPEN** by verifying the piston operator is fully extended (~3.5 in.).
 - a. **CHECK** the TEST/ALT PURGE amber light is illuminated.

6.7.B Procedure (Continued)

7. **PLACE** handswitch CNTMT PURGE SUPP FAN, 1(2)-HS-5290, in START **AND PERFORM** the following:
 - a. Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORS, are fully extended (~3.5 in.).
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - b. Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORS are fully extended (~3.5 in.).
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO
 - c. **CHECK** the TEST/ALT PURGE amber light is illuminated.
8. **PLACE** the following handswitches in OPEN, to open Containment Purge Supply and Exhaust Valves:
 - CNTMT PURGE SUPP CPA-1410-CV.....1(2)-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....1(2)-HS-1412
9. **WHEN** desired,
THEN STOP the Purge **PER** Section 6.5, SECURING PURGING OR VENTING.
10. **UPDATE** Discharge permit.

**** END ****

6.8 STARTING/STOPPING THE PURGE SUPPLY FAN WHILE PURGE IS IN OPERATION**A. Initial Conditions**

1. An approved Gaseous Waste Release Permit for containment purge alignment has been received from Chemistry.
2. Radiation Safety Supervision has been notified of pending containment purge alignment.
3. General Precautions have been reviewed.
4. Containment Purge is in operation.

B. Procedure

1. **IF** desired to run the CNTMT Purge Supply Fan, **THEN PERFORM** the following:
 - a. **VERIFY** Radiation Safety Supervisor and Chemistry are informed and concur that Purge Supply Fan is to be started.
 - b. **IF** Containment Average air temperature is less than or equal to 45° F, **THEN ENSURE** plant heating is aligned to Purge Supply Fan **PER** APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE. [B0782]
 - (1) **IF** plant heating is **NOT** available, **THEN** Purge operation is not allowable.
 - c. **VERIFY** the following handswitch CNTMT PURGE SUPP CPA-1410-CV 1(2)-HS-1410 in OPEN.
 - d. **PLACE** CNTMT PURGE SUPP FAN, 1(2)-HS-5290, to START.
 - e. Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL OPEN** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORS, are fully extended (~3.5 in.).
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - f. Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL OPEN** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORS are fully extended (~3.5 in.).
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO

6.8.B Procedure (Continued)**NOTE**

- If the PAL interlocks are defeated and the CNTMT Equipment hatch is installed **OR** if installed, the Containment Outage Door is shut, then SFP Ventilation is inoperable when the Purge Supply fan is secured. SFP Ventilation will be inoperable until the Purge Exhaust fan is secured.
- Another suction flow path must be established if the Purge Supply fan was the only flow path.

2. **IF** it is desired to stop the CNTMT PURGE SUPP FAN,
THEN PERFORM the following:
 - a. **IF** air flow will **NOT** be aligned thru the supply duct,
THEN PERFORM the following:(N/A if **NOT** using as a flow path)
 - (1) **ENSURE** that the Butler Building Door is open at least 2 feet.
 - (2) **TAG** the following on the affected Unit:
 - Butler Building Door handswitch to prevent inadvertent operation of the door
 - Butler Building Door breaker OPEN
 - b. **PLACE** 1(2)-HS-5290 in STOP.
 - c. **ENSURE** fan is stopped.
 - d. Locally **VERIFY** CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER, 1(2)-CPA-5290-DAMP, is **FULL SHUT** by verifying the following piston operators, CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATORS, are fully retracted.
 - 1(2)-CPA-5291-PO
 - 1(2)-CPA-5292-PO
 - 1(2)-CPA-5293-PO
 - 1(2)-CPA-5294-PO
 - e. Locally **VERIFY** CNTMT PURGE SUPP AIR OPERATED DAMPER, 1(2)-CPA-5290A-DAMP (above inlet plenum box), is **FULL SHUT** by verifying the following CNTMT PURGE SUPP DAMPER PISTON OPERATORS are fully retracted.
 - 1(2)-CPA-5290A-PO
 - 1(2)-CPA-5290B-PO
 - f. **IF** desired,
THEN PLACE, CNTMT PURGE SUPP CPA-1410-CV 1(2)-HS-1410 in **CLOSE**.

6.8.B Procedure (Continued)

3. **NOTIFY** Radiation Safety Supervision and Chemistry what the purge alignment is currently.
4. **UPDATE** Discharge permit.

****** END ******

**6.9 CYCLE CONTAINMENT PURGE CVs TO CHECK OPERATION OF SVs
(PE 1/2-60-01-O-SA)**

A. Initial Conditions

1. Power is aligned to the SVs.
2. Containment Purge is **NOT** in operation.

B. Procedure

NOTE

Verification of Flanges may be an administrative verification unless condition of Blank Flange is uncertain. If uncertain, confirmation of its condition shall be performed locally.

1. **IF** the Unit is in Modes 1-4,
THEN VERIFY the Containment Purge Blank Flanges are installed to maintain closure **PER** STP 0-55.
2. **IF** the Unit is in Modes 5-6,
THEN VERIFY the following:
 - **IF** Containment Closure is required,
THEN VERIFY that Containment Closure will be met during the CV strokes
OR
a Containment Closure deviation is allowed **AND** tracked **PER** NO-1-114.
 - **IF** Tech Spec 3.9.3, Containment Penetrations is applicable,
THEN VERIFY that necessary Tech Spec conditions are met.

NOTE

The Containment Purge CVs are stroked for 2 reasons.

First; To periodically cycle the SVs associated with the CVs. These SVs have periodically had issues with binding because they have previously remained in the same position for two years.

Second; To confirm their status prior to outage use.

3. **OPEN** Containment Purge Supply and Exhaust Valves by placing the desired Unit handswitches in open:
 - CNTMT PURGE SUPP CPA-1410-CV.....1-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....1-HS-1412
 - CNTMT PURGE SUPP CPA-1410-CV.....2-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....2-HS-1412

6.9.B Procedure (Continued)

4. **CHECK** for full open indication.
5. **CLOSE** the Containment Purge Supply and Exhaust Valves by placing the desired Unit handswitches to shut:
 - CNTMT PURGE SUPP CPA-1410-CV.....1-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....1-HS-1412
 - CNTMT PURGE SUPP CPA-1410-CV.....2-HS-1410
 - CNTMT PURGE EXH CPA-1412-CV.....2-HS-1412
6. **CHECK** for full closed indication.
7. **IF** full open **OR** full closed indication is **NOT** received, **THEN SUBMIT** an Issue Report.

**** END ****

6.10 POSITIVE PRESSURE VENT OF UNIT-1 CONTAINMENT VIA UNMONITORED RELEASE PATHS**A. Initial Conditions**

1. Unit-1 is in Mode 5, 6 or Defueled.
2. Containment purge is **NOT** available to perform a positive vent.
3. **IF** using ILRT Pressurization penetration 50,
THEN Unit-1 ILRT valve indications are energized at panel in Cable Spreading Room
4. Containment pressure between 0 and +2.0 psig.
5. Radiation Safety Supervision has been notified of pending positive pressure vent alignment.
6. An approved Gaseous Waste Release Permit for containment vent via desired Penetration(s) has been received from Chemistry.
7. Movement of irradiated fuel assemblies within the containment are **NOT** being performed.
8. Tech Specs **AND** NO-1-114 allow containment closure deviations.

B. Procedure

1. **IF** desired to vent via ILRT Pressurization penetration 50,
THEN PERFORM the following:
 - a. **VERIFY** the following from inside Containment:
 - (1) Blank Flange removed from Penetration 50 **AND** open to Containment atmosphere.
 - (2) **NO** debris in the area surrounding the vent opening.
 - b. **VERIFY** the following valves are shut:
 - UNIT-1 CONTAINMENT ILRT PRESSURIZATION HEADER DRAIN VLV, 1-ILRT-8
 - UNIT-1 CONTAINMENT ILRT CONTAINMENT ISOL MOV, 1-ILRT-5524-MOV
 - UNIT-1 CONTAINMENT ILRT SKID ISOL MOV, 1-ILRT-5527-MOV
 - UNIT-1 CONTAINMENT ILRT MUFFLER ISOL MOV, 1-ILRT-5528-MOV
 - c. **VERIFY** LOCKED SHUT UNIT-1 CONTAINMENT ILRT CONTAINMENT ISOL TEST CONNECTION, 1-ILRT-7.
 - d. **VERIFY** Penetration 50 Outside Containment Blank Flange removed **AND** Spool Piece installed.

6.10.B.1 Procedure (Continued)

- e. **VERIFY** Blank Flange removed downstream of UNIT-1 CONTAINMENT ILRT MUFFLER ISOL MOV, 1-ILRT-5528-MOV.
- f. **VERIFY** Blank Flange removed downstream of UNIT-1 CONTAINMENT ILRT MUFFLER ISOL MOV, 1-ILRT-5528-MOV.
- g. **FLAG-OFF** area surrounding Vent for personnel protection.
- h. **OPEN** UNIT-1 CONTAINMENT ILRT CONTAINMENT ISOL MOV, 1-ILRT-5524-MOV.
- i. **OPEN** UNIT-1 CONTAINMENT ILRT MUFFLER ISOL MOV, 1-ILRT-5528-MOV.
- j. **UPDATE** Discharge permit.
- k. **WHEN** Containment Pressure is approximately 0 psig, **OR** as desired, **THEN PERFORM** the following:
 - (1) **SHUT** UNIT-1 CONTAINMENT ILRT MUFFLER ISOL MOV, 1-ILRT-5528-MOV.
 - (2) **SHUT** UNIT-1 CONTAINMENT ILRT CONTAINMENT ISOL MOV, 1-ILRT-5524-MOV.
 - (3) **NOTIFY** Chemistry that the Containment Vent is secured **AND** **UPDATE** Discharge permit.
- l. **RESTORE** Penetration 50 as desired.

6.10.B Procedure (Continued)

2. **IF** desired to vent via Containment Outage Door penetration(s), **THEN PERFORM** the following:
 - a. **VERIFY** the following:
 - (1) **NO** debris in the area surrounding the vent(s) opening.
 - (2) **FLAG-OFF** area surrounding Vent(s) for personnel protection.
 - (3) **PERFORM** the following to ensure a proper discharge path:
 - (a) **ENSURE** that the Butler Building Door is open at least 2 feet.
 - (b) **TAG** the following on the affected Unit:
 - Butler Building Door handswitch to prevent inadvertent operation of the door
 - Butler Building Door breaker OPEN

NOTE

Locked Valves are controlled **PER** NO-1-205.

- b. **COMMENCE** venting by performing the desired steps:
 - (1) **SLOWLY OPEN** the following valves for COD penetration #3:
 - CONTAINMENT OUTAGE DOOR SLUICE RIG PENETRATION #3 ISOLATION VALVE, 1-CPI-1003.
 - CONTAINMENT OUTAGE DOOR SLUICE RIG PENETRATION #3 ISOLATION VALVE, 1-CPI-1004.
 - (2) **SLOWLY OPEN** the following valves for COD penetration #6:
 - CONTAINMENT OUTAGE DOOR SLUDGE LANCE RETURN PENETRATION #6 ISOLATION VALVE, 1-CPI-1010.
 - CONTAINMENT OUTAGE DOOR SLUDGE LANCE RETURN PENETRATION #6 ISOLATION VALVE, 1-CPI-1009.
 - (3) **SLOWLY OPEN** the following valves for COD penetration #12:
 - CONTAINMENT OUTAGE DOOR MISC SUPPLY PENETRATION #12 ISOLATION VALVE, 1-CPI-1015.
 - CONTAINMENT OUTAGE DOOR MISC SUPPLY PENETRATION #12 DRAIN VALVE, 1-CPI-1017.

6.10.B.2.b Procedure (Continued)

- (4) SLOWLY **OPEN** the following valves for COD penetration #13:
- CONTAINMENT OUTAGE DOOR SLUDGE LANCE SUPPLY PENET #13 ISOLATION VALVE, 1-CPI-1018.
 - CONTAINMENT OUTAGE DOOR SLUDGE LANCE SUPPLY PENET #13 DRAIN VALVE, 1-CPI-1020.
- c. **UPDATE** Discharge permit.
- d. **WHEN** Containment Pressure is approximately 0 psig, **OR** as desired, **THEN LOCK SHUT** the open penetrations:
- (1) COD penetration #3:
- CONTAINMENT OUTAGE DOOR SLUICE RIG PENETRATION #3 ISOLATION VALVE, 1-CPI-1003.
 - CONTAINMENT OUTAGE DOOR SLUICE RIG PENETRATION #3 ISOLATION VALVE, 1-CPI-1004.
- (2) COD penetration #6:
- CONTAINMENT OUTAGE DOOR SLUDGE LANCE RETURN PENETRATION #6 ISOLATION VALVE, 1-CPI-1010.
 - CONTAINMENT OUTAGE DOOR SLUDGE LANCE RETURN PENETRATION #6 ISOLATION VALVE, 1-CPI-1009.
- (3) COD penetration #12:
- CONTAINMENT OUTAGE DOOR MISC SUPPLY PENETRATION #12 ISOLATION VALVE, 1-CPI-1015.
 - CONTAINMENT OUTAGE DOOR MISC SUPPLY PENETRATION #12 DRAIN VALVE, 1-CPI-1017.
- (4) COD penetration #13:
- CONTAINMENT OUTAGE DOOR SLUDGE LANCE SUPPLY PENET #13 ISOLATION VALVE, 1-CPI-1018.
 - CONTAINMENT OUTAGE DOOR SLUDGE LANCE SUPPLY PENET #13 DRAIN VALVE, 1-CPI-1020.
- e. **NOTIFY** Chemistry that the Containment Vent is secured **AND UPDATE** Discharge permit.

6.10.B.2 Procedure (Continued)

- f. **IF** no longer needed as a proper discharge path:
- (1) Clear the Tagout for the following on the affected Unit:
- Butler Building Door handswitch.
 - Butler Building Door breaker.

****** END ******

7.0 POST PERFORMANCE ACTIVITIES

- A. Upon completion of attachments, forward the original(s) to the Operations Senior Administrative Assistant for retention **PER** PR-3-100, Records Management.

8.0 BASES

[B0055] 6/13/90 Letter - INPO Nuclear Network OE-3989 - Containment pressure changes can affect Spent Fuel Pool and Refueling Pool levels during refueling.

[B0154] AOP/EOP cross reference **PER** NUREG 1358:

1. AOP-7I, LOSS OF 4KV, 480 VOLT **OR** 208/120 VOLT INSTRUMENT BUS POWER, Section titled FUEL AREA MCC 102F, refer to this OI for instruction on restoring Containment Purge System to normal.

[B0200] 9/28/93 Memo from T. Delaney, Plant Systems Engineering-recommends a maximum differential pressure of +/- 0.30 PSI for operating the containment purge valves.

[B0390] Memo dated 3/19/97: Results from ETP 97-014, which identifies a CNTMT Purge lineup that causes SFP Ventilation to be inoperable.

[B0782] ES200200008 evaluated lowering Containment Average Temperature to 45° F. 45° F is applicable only when Unit is in Modes 5, 6, or defueled. When in Mode 6 or defueled, applicable with an RCS vent path of at least 8 inch² available.

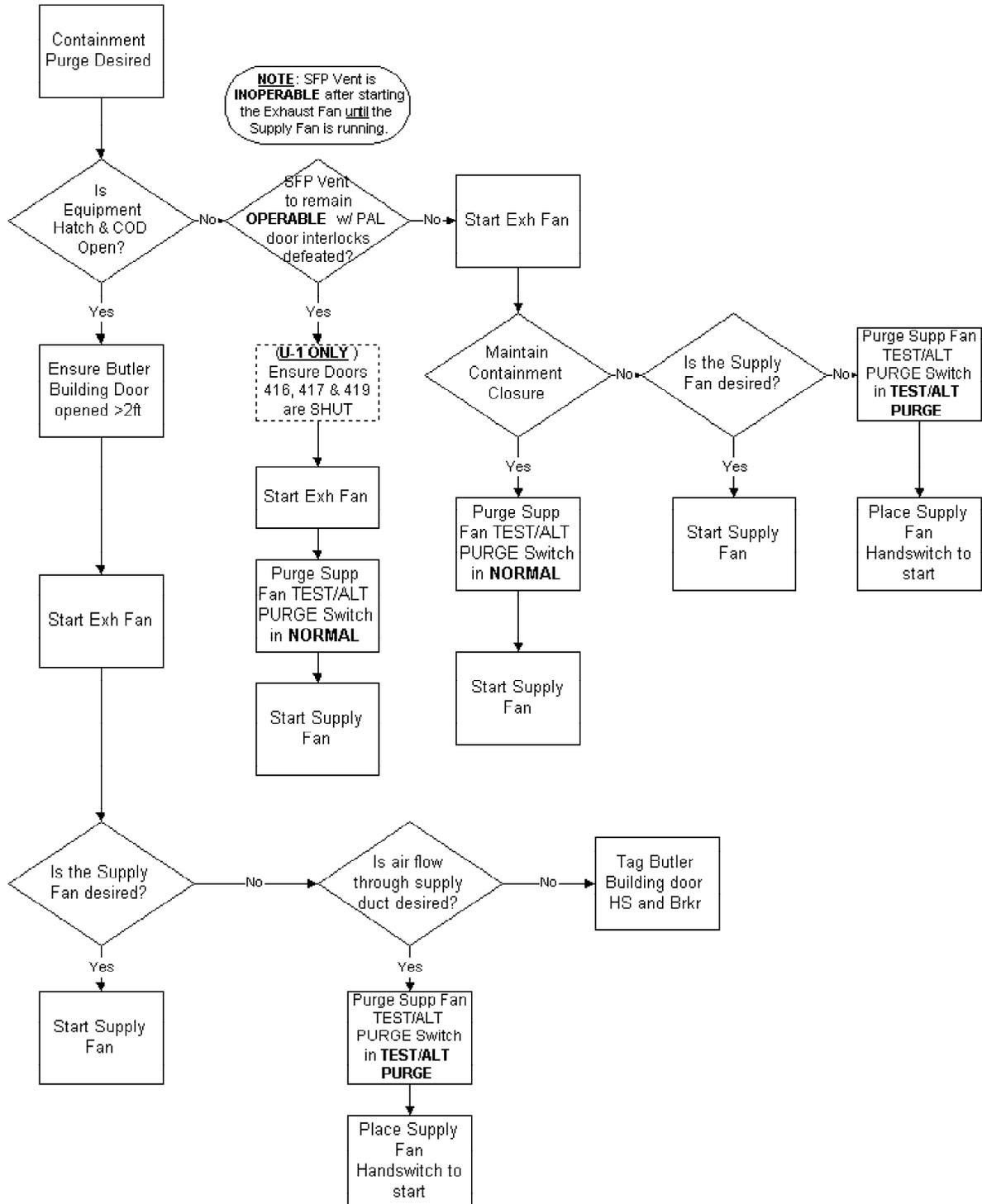
9.0 RECORDS

- A. Records generated by this procedure shall be transferred to Records Management **PER** PR-3-100, Records Management.

10.0 ATTACHMENTS

- A. APPENDIX 1, NORMAL CONTAINMENT PURGE INITIATION FLOWPATH
- B. APPENDIX 2, PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE
- C. ATTACHMENT 1A, CPA SYSTEM (UNIT 1)
- D. ATTACHMENT 1B, CPA SYSTEM (UNIT 2)
- E. ATTACHMENT 1C, CPA SYSTEM - U-1 CONTAINMENT VALVE ALIGNMENT
- F. ATTACHMENT 1D, CPA SYSTEM - U-2 CONTAINMENT VALVE ALIGNMENT

NORMAL CONTAINMENT PURGE INITIATION FLOWPATH



PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE

1. **IF** it is desired to align Plant heating to Unit One Purge Supply fan, **THEN PERFORM** the following: (N/A if not applicable)
 - a. **ENSURE** Plant Heating is operating **PER** OI-40.
 - b. **VERIFY** the following valves are SHUT:
 - 11 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-679.
 - 11 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-680.
 - c. **VERIFY** 11 CNTMT PURGE SUPP HTG COIL REG OUTLET VLV, 0-PH-228, is OPEN.
 - d. **VERIFY** 11 CNTMT PURGE SUPP HTG COIL REG BYPASS VLV, 0-PH-227, is OPEN.
 - e. **VERIFY** 11 CNTMT PURGE SUPP HOT WATER CIRCULATING PP DISCH VLV, 0-PH-226, is OPEN.
 - f. **VERIFY** 11 CNTMT PURGE SUPP HOT WATER CIRCULATING PP SUCT VLV, 0-PH-224, is OPEN.

WARNING

Plant Heating is maintained at temperatures of 150° -200° F. Caution must be taken when venting coils of hot water.

- g. **IF** needed to vent coils, **THEN** slowly **OPERATE** 11 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-680, until properly vented.
- h. **START** PURGE AIR SUPPLY UNIT 11, using 1-HS-6574.
- i. **CHECK** for any System leakage.
- j. **ADJUST** 1TC6574 to a desired temperature setting between 60° -75° F.

PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE**NOTE**

Containment Purge Exhaust Fan will trip if purge air supply temperature lowers to 40° F. The Containment Purge Supply Fan will trip when the Containment Purge Exhaust Fan trips.

2. **IF** it is desired to Secure Plant heating to Unit One Purge Supply fan, **THEN PERFORM** the following:(N/A if not applicable)
 - a. **STOP** PURGE AIR SUPPLY UNIT 11, using 1-HS-6574.
 - b. **SHUT** 11 CNTMT PURGE SUPP HOT WATER CIRCULATING PP SUCT VLV, 0-PH-224.
 - c. **SHUT** 11 CNTMT PURGE SUPP HTG COIL REG OUTLET VLV, 0-PH-228.

WARNING

Plant Heating is maintained at temperatures of 150° -200° F. Caution must be taken when draining coils of hot water.

- d. **IF** desired to drain coils, **THEN PERFORM** the following:
 - (1) **CRACK OPEN** 11 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-679.
 - (2) Slowly **OPEN** 11 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-680.
 - (3) Slowly **OPEN** 11 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-679.

PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE

3. **IF** it is desired to align Plant heating to Unit Two Purge Supply fan, **THEN PERFORM** the following:(N/A if not applicable)
 - a. **ENSURE** Plant Heating is operating **PER** OI-40.
 - b. **VERIFY** the following valves are SHUT:
 - 21 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-674.
 - 21 CNTMT PURGE AIR HTG COIL INLET VENT VLV, 0-PH-673.
 - c. **VERIFY** 21 CNTMT PURGE SUPP HTG COIL REG OUTLET VLV, 0-PH-272, is OPEN.
 - d. **VERIFY** 21 CNTMT PURGE SUPP HTG COIL REG BYPASS VLV, 0-PH-271, is OPEN.
 - e. **VERIFY** 21 CNTMT PURGE SUPP HOT WATER CIRCULATING PP DISCH VLV, 0-PH-270, is OPEN.
 - f. **VERIFY** 21 CNTMT PURGE SUPP HOT WATER CIRCULATING PP SUCT VLV, 0-PH-268, is OPEN.

WARNING

Plant Heating is maintained at temperatures of 150° -200° F. Caution must be taken when venting coils of hot water.

- g. **IF** needed to vent coils, **THEN** slowly **OPERATE** the following valves until properly vented.
 - 21 CNTMT PURGE AIR HTG COIL INLET VENT VLV, 0-PH-673.
 - 21 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-675.
- h. **START** PURGE AIR SUPPLY UNIT 21, using 2-HS-6574.
- i. **CHECK** for any System leakage.
- j. **ADJUST** 2TC6574 to a desired temperature setting between 60° -75° F.

PLANT HEATING ALIGNMENT TO CONTAINMENT PURGE**NOTE**

Containment Purge Exhaust Fan will trip if purge air supply temperature lowers to 40° F. The Containment Purge Supply Fan will trip when the Containment Purge Exhaust Fan trips.

4. **IF** it is desired to Secure Plant heating to Unit Two Purge Supply fan, **THEN PERFORM** the following:(N/A if not applicable)
 - a. **STOP** PURGE AIR SUPPLY UNIT 21, using 2-HS-6574.
 - b. **SHUT** 21 CNTMT PURGE SUPP HOT WATER CIRCULATING PP SUCT VLV, 0-PH-268.
 - c. **SHUT** 21 CNTMT PURGE SUPP HTG COIL REG OUTLET VLV, 0-PH-272.

WARNING

Plant Heating is maintained at temperatures of 150° -200° F. Caution must be taken when draining coils of hot water.

- d. **IF** desired to drain coils, **THEN PERFORM** the following:
 - (1) **CRACK OPEN** 21 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-674.
 - (2) Slowly **OPEN** 21 CNTMT PURGE AIR HTG COIL INLET VENT VLV, 0-PH-673.
 - (3) Slowly **OPEN** 21 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-675.
 - (4) Slowly **OPEN** 21 CNTMT PURGE AIR HOT WATER PP OUTLET DRAIN VLV, 0-PH-674.
 - (5) **WHEN** the coils are drained, **THEN SHUT** 21 CNTMT PURGE AIR HTG COIL OUTLET VENT VLV, 0-PH-675.

**ATTACHMENT 1A
CPA SYSTEM (UNIT 1)**

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
1-CPA-5289-DAMP	SHUT OPEN	CNTMT PURGE EXH AIR OPERATED DAMPER	5 ft FAN RM ABOVE 11 FAN		
1-CPA-5289-PCV	----	IA SUPP TO CNTMT PURGE EXH DAMPER PRESS CONTROL VLV	5 ft FAN RM N WALL		
1-CPA-5289-RV	----	IA SUPP TO CNTMT PURGE EXH DAMPER RELIEF VLV	5 ft FAN RM N WALL		
1-CPA-5289-SV	----	CNTMT PURGE EXH DAMPER SOLENOID VLV	5 ft FAN RM N WALL		
1-CPA-5290-DAMP	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER	27' SWGR CNTMT PURGE SUPPLY FAN RM		
1-CPA-5290-PCV	----	IA SUPP TO CNTMT PURGE SUPP DAMPERS & TCV PRESS CONTROL VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM S WALL		
1-CPA-5290-RV	----	IA SUPP TO CNTMT PURGE SUPP DAMPERS & TCV RELIEF VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM S WALL		
1-CPA-5290-SV	----	CNTMT PURGE SUPP DAMPERS SOLENOID VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM S WALL		

**ATTACHMENT 1A
CPA SYSTEM (UNIT 1)**

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
1-CPA-5290A-DAMP	SHUT OPEN	CNTMT PURGE SUPP AIR OPERATED DAMPER	27' SWGR CNTMT PURGE SUPPLY FAN RM OVHD E		
1-CPA-5290A-PO	SHUT OPEN	CNTMT PURGE SUPP DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM OVHD E		
1-CPA-5290B-PO	SHUT OPEN	CNTMT PURGE SUPP DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM OVHD E		
1-CPA-5291-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM S SIDE		
1-CPA-5292-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM S SIDE		
1-CPA-5293-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM N SIDE		

ATTACHMENT 1A
CPA SYSTEM (UNIT 1)

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
1-CPA-5294-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM N SIDE		
1-CPA-101	LOCKED SHUT	CPA SUPP TEST CONN	28 ft E PEN RM		
1-CPA-102	LOCKED SHUT	CPA EXH TEST CONN	28 ft E PEN RM		
1-CPA-103	OPEN	1-CPA-5289-PDIS ROOT	5 ft FAN RM		
1-CPA-104	OPEN	1-CPA-5289-PDIS ROOT	5 ft FAN RM		
1-CPA-105	SHUT	1-CPA-5289-PDIS EQU L VLV	5 ft FAN RM		

**ATTACHMENT 1B
CPA SYSTEM (UNIT 2)**

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
2-CPA-5289-DAMP	SHUT OPEN	CNTMT PURGE EXH AIR OPERATED DAMPER	5 ft FAN RM S WALL		
2-CPA-5289-PCV	----	IA SUPP TO CNTMT PURGE EXH DAMPER PRESS CONTROL VLV	5 ft FAN RM S WALL		
2-CPA-5289-RV	----	IA SUPP TO CNTMT PURGE EXH DAMPER RELIEF VLV	5 ft FAN RM S WALL		
2-CPA-5289-SV	----	CNTMT PURGE EXH DAMPER SOLENOID VLV	5 ft FAN RM S WALL		
2-CPA-5290-DAMP	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET AIR OPERATED DAMPER	27' SWGR CNTMT PURGE SUPPLY FAN RM		
2-CPA-5290-PCV	----	IA SUPP TO CNTMT PURGE SUPP DAMPERS & TCV PRESS CONTROL VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM N WALL		
2-CPA-5290-RV	----	IA SUPP TO CNTMT PURGE SUPP DAMPERS & TCV RELIEF VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM N WALL		
2-CPA-5290-SV	----	CNTMT PURGE SUPP DAMPERS SOLENOID VLV	27' SWGR CNTMT PURGE SUPPLY FAN RM N WALL		

ATTACHMENT 1B
CPA SYSTEM (UNIT 2)

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
2-CPA-5290A-DAMP	SHUT OPEN	CNTMT PURGE SUPP AIR OPERATED DAMPER	27' SWGR CNTMT PURGE SUPPLY FAN RM OVHD E SIDE		
2-CPA-5290A-PO	SHUT OPEN	CNTMT PURGE SUPP DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM OVHD E SIDE		
2-CPA-5290B-PO	SHUT OPEN	CNTMT PURGE SUPP DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM SW OVHD W SIDE		
2-CPA-5291-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM N SIDE		
2-CPA-5292-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM N SIDE		
2-CPA-5293-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM S SIDE		

ATTACHMENT 1B
CPA SYSTEM (UNIT 2)

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
2-CPA-5294-PO	SHUT OPEN	CNTMT PURGE SUPP HEATING COIL INLET DAMPER PISTON OPERATOR	27' SWGR CNTMT PURGE SUPPLY FAN RM S SIDE		
2-CPA-101	LOCKED SHUT	CPA SUPP TEST CONN	28 ft E PEN RM		
2-CPA-102	LOCKED SHUT	CPA EXH TEST CONN	28 ft E PEN RM		
2-CPA-103	OPEN	2-CPA-5289-PDIS ROOT	5 ft FAN RM		
2-CPA-104	OPEN	2-CPA-5289-PDIS ROOT	5 ft FAN RM		
2-CPA-105	SHUT	2-CPA-5289-PDIS EQU L VLV	5 ft FAN RM		

ATTACHMENT 1C
CPA SYSTEM - U-1 CONTAINMENT VALVE ALIGNMENT

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
1-CPA-1410-CV	SHUT OPEN (1)	CNTMT PURGE SUPP	NE WALL 28 ft CNTMT		
1-CPA-1412-CV	SHUT OPEN (1)	CNTMT PURGE EXH	SE WALL 28 ft CNTMT		
1-CPA-1410-SV	-----	CPA SUPP ISOL CV CONT	NE WALL 28 ft CNTMT		
1-CPA-1412-SV	-----	CPA EXH ISOL CV CONT	SE WALL 28 ft CNTMT		

(1) POSITION OF THIS VALVE SHALL BE ADMINISTRATIVELY CONTROLLED IN ACCORDANCE WITH THE REQUIREMENTS OF NO-1-205.

ATTACHMENT 1D
CPA SYSTEM - U-2 CONTAINMENT VALVE ALIGNMENT

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VALVE NUMBER	STARTUP/ NORMAL OP. POS	DESCRIPTION	LOCATION	INIT/ DATE	COMMENTS
2-CPA-1410-CV	SHUT OPEN (1)	CNTMT PURGE SUPP	SE WALL 28 ft CNTMT		
2-CPA-1412-CV	SHUT OPEN (1)	CNTMT PURGE EXH	NE WALL 28 ft CNTMT		
2-CPA-1410-SV	-----	CPA SUPP ISOL CV CONT	SE WALL 28 ft CNTMT		
2-CPA-1412-SV	-----	CPA EXH ISOL CV CONT	NE WALL 28 ft CNTMT		

(1) POSITION OF THIS VALVE SHALL BE ADMINISTRATIVELY CONTROLLED IN ACCORDANCE WITH THE REQUIREMENTS OF NO-1-205.