



**Millstone Unit 3  
Surveillance Procedure**

**Spent Fuel Pool Criticality Requirements**

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## 1. PURPOSE

### 1.1 Objective

Provide steps required to ensure Spent Fuel Pool Keff remains less than or equal to 0.95 at all times by performing the following:

- Qualify fuel assemblies for Storage in Region II of the Spent Fuel Pool (Section 4.1)
- Verify cell blocking device locations in the STORAGE PATTERN prior to storing fuel assemblies (Section 4.2)
- Verify there are no fuel assemblies stored in the STORAGE PATTERN prior to installing or removing a cell blocking device (Section 4.3)

Satisfy the surveillance requirements of Technical Specifications 4.9.13 and 4.9.14.

### 1.2 Discussion

There are 2 unique storage regions in the Spent Fuel Pool. Reference Figure – 1.

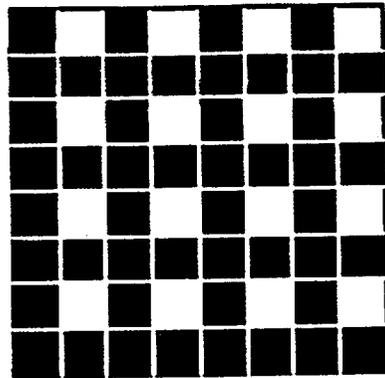
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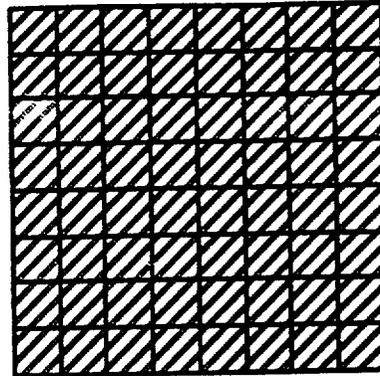
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Figure - 1

**SCHEMATIC FOR SPENT FUEL STORAGE CONFIGURATIONS**



REGION I  
STORAGE CONFIGURATION



REGION II  
STORAGE CONFIGURATION

-  FRESH FUEL
-  EMPTY CELL WITH BLOCKING DEVICE
-  REGION II BURNED FUEL

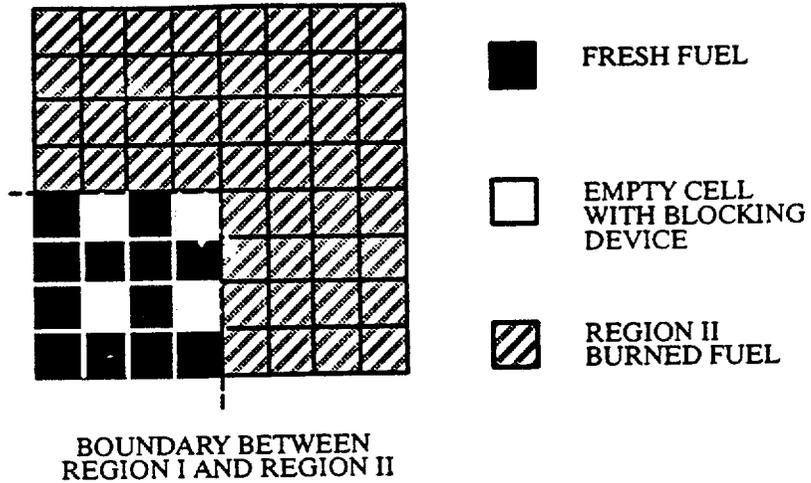
- Region I contains fresh fuel assemblies with nominal enrichments up to 5.00 w/o stored in a 3 out of 4 arrangement, with a cell blocking device in the remaining cell.
- Region II contains fresh fuel assemblies with nominal enrichments up to 3.85 w/o stored in all available storage cells. Burned fuel assemblies with nominal enrichments greater than 3.85 w/o but less than 5.00 w/o can also be stored in Region II, provided they meet the nominal enrichment/burnup requirements of Attachment 1.

The interface boundary configuration is shown in Figure - 2.

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**Figure - 2**  
**SCHEMATIC FOR INTERFACE BOUNDARIES BETWEEN**  
**STORAGE REGIONS**



No fuel assembly shall be placed in Region I of the Spent Fuel Pool until the cell blocking device STORAGE PATTERN has been verified.

No fuel assembly shall be placed in Region II of the Spent Fuel Pool unless it is listed on Attachment 5.

No cell blocking device shall be installed or removed until all 8 surrounding locations in the STORAGE PATTERN are verified empty.

Only the applicable procedure section(s) for Technical Specification surveillance requirement to be satisfied, needs to be performed.

**1.3 Frequency**

Qualification of fuel assemblies is performed as required and directed by the Reactor Engineering Supervisor.

Blocking device storage pattern of Region I of the spent fuel racks is verified to conform to the pattern shown in Figure – 1 by completing Attachment 3 at the following times:

- Prior to placing a shipment of new fuel into Spent Fuel Pool
- Prior to start of a refueling
- When installing or removing a blocking device
- At completion of a refueling or any other significant work activity involving fuel in the Spent Fuel Pool Region I area

## 2. PREREQUISITES

### 2.1 General

- 2.1.1 Current EN 31001, "Supplemental SNM Inventory and Control" Attachment 2, which shows Region I/Region II boundary and location of cell blocking devices has been reviewed.
- 2.1.2 The STORAGE PATTERN has been verified as empty of fuel assemblies prior to installing or removing a cell blocking device.

### 2.2 Documents

- 2.2.1 EN 31001, "Supplemental SNM Inventory and Control"
- 2.2.2 EN 31007, "Refueling Operations"
- 2.2.3 RP-4, "Corrective Action Program"

### 2.3 Definitions

- 2.3.1 QUALIFY – To meet burnup and enrichment criteria of Tech Spec 3/4.9.13.
- 2.3.2 Nominal – The standard DOE enrichment tolerance of plus or minus 0.05 w/o U<sup>235</sup>.

## 3. PRECAUTIONS

- 3.1 Fuel not qualified for Region II per this procedure shall not be placed into Region II under any circumstances.

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- 3.2 Fuel assemblies not qualified for Region II should not be moved *over* Region II.
- 3.3 No cell blocking device shall be removed from its location unless all 8 locations around the blocking device are empty.
- 3.4 No blocking device shall be inserted into the Spent Fuel Pool until all 8 locations around the proposed blocking device location are empty and the affected cell location is empty.
- 3.5 Fuel with initial nominal enrichments of greater than 5.00 w/o is not allowed into the Spent Fuel Pool or New Fuel Storage Vault at any time.
- 3.6 Only one fuel assembly at a time may be moved in Unit 3 Spent Fuel Pool.

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### NOTE

1. Region II of Spent Fuel Pool is defined by EN 31001, "Supplemental SNM Inventory and Control," Attachment 2.
2. Groups of fuel assemblies may be qualified at one time provided the combination of highest initial enrichment, and lowest burnups are used in the qualification process.
3. Fuel assemblies not qualified for Region II must be placed in Region I after verification of storage pattern.

#### 4. INSTRUCTIONS

##### 4.1 **Qualifying Fuel Assemblies for Placement into Region II of Spent Fuel Pool**

4.1.1 COMPLETE Attachment 2.

4.1.2 SEND completed copy of Attachment 2 to Reactor Engineering Supervisor for review and approval.

– End of Section 4.1 –

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STOP

THINK

ACT

REVIEW

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4.2 **Verifying Region I Cell Blocking Device STORAGE PATTERN**

- 4.2.1 **COMPLETE** Attachment 3 by marking cell blocking device locations.
- 4.2.2 **OBTAIN** a copy of EN 31001 "Supplemental SNM Inventory and Control," Attachment 2.
- 4.2.3 Refer To EN 31001 "Supplemental SNM Inventory and Control," Attachment 2 and **PERFORM** the following:
  - a. **VERIFY** that "As Found" cell blocking device locations are as shown on Attachment 2.
  - b. **IF** "As Found" cell blocking device locations *do not* agree with Attachment 2, Refer To RP-4, "Corrective Action Program" and **INITIATE CR**.

- End of Section 4.2 -

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### 4.3 Installing or Removing Region I Cell Blocking Devices

#### NOTE

No blocking device shall be inserted into or removed from the Spent Fuel Pool until all 8 locations around the proposed cell blocking device location are empty.

- 4.3.1 MARK affected cell blocking device location(s) on Attachment 4.
- 4.3.2 VERIFY there is no fuel in the 8 locations surrounding cell blocking device to be removed or installed.
- 4.3.3 VERIFY there is no fuel in affected cell location if blocking device is to be installed.
- 4.3.4 IF fuel surrounding OR in cell blocking device location is to be moved, Refer To EN 31001, "Supplemental SNM Inventory and Control" or EN 31007, "Refueling Operations" and MOVE fuel assemblies.
- 4.3.5 PREPARE a work order to install or remove cell blocking device.
- 4.3.6 INSTALL or REMOVE cell blocking device.
- 4.3.7 REVISE EN 31001, "Supplemental SNM Inventory and Control," Attachment 2 to show cell blocking device addition or removal.
- 4.3.8 WHEN installation or removal of cell blocking device is complete, Go To step 4.2.

– End of Section 4.3 –

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5. REVIEW AND SIGNOFF

5.1 Review and signoff for this procedure is located in Attachments 2 through 4, as applicable.

6. REFERENCES

6.1 Technical Specification Definitions 1.40 and 1.41, "Spent Fuel Pool Storage Patterns"

6.2 Technical Specification LCO 3.9.13, "Spent Fuel Pool Reactivity"

6.3 Technical Specification LCO 3.9.14, "Spent Fuel Pool Storage Pattern"

6.4 93-NU-BI-0070, "Millstone Unit 3 Spent Fuel Rack Criticality Analysis with Boraflex Shrinkage & Gaps," Westinghouse

6.5 <sup>MC 5</sup> ~~ACP-QA~~ 4.10, "Special Nuclear Material Inventory and Control" | Ch\*  
✓

6.6 EN 31001, "Supplemental SNM Inventory and Control"

6.7 EN 31007, "Refueling Operations"

6.8 <sup>EN 31013</sup> ~~OP 3271~~, "Spent Fuel Pool Operations" | Ch\*  
✓

6.9 RP-4, "Corrective Action Program" |

7. SUMMARY OF CHANGES

7.1 The change transfers the subject matter expert from J. Beaupre to K. Emmons.

7.2 Split procedure into three sections to clarify.

7.3 Added clarification to Section 1.3, fourth bullet concerning work in SFP.

7.4 Added definition for Nominal at 2.3.2.

7.5 Moved Note from prior to step 4.1.1 to prior to Instructions Section 4. and added item 3. to Note for clarification.

7.6 Moved step 4.3.7 from its former position at 4.6.5.

7.7 Split step 4.2.3 into step and substeps and added 4.2.3 b. for tie to RP-4.

7.8 Typo in Acceptance Criteria on Attachment 2.

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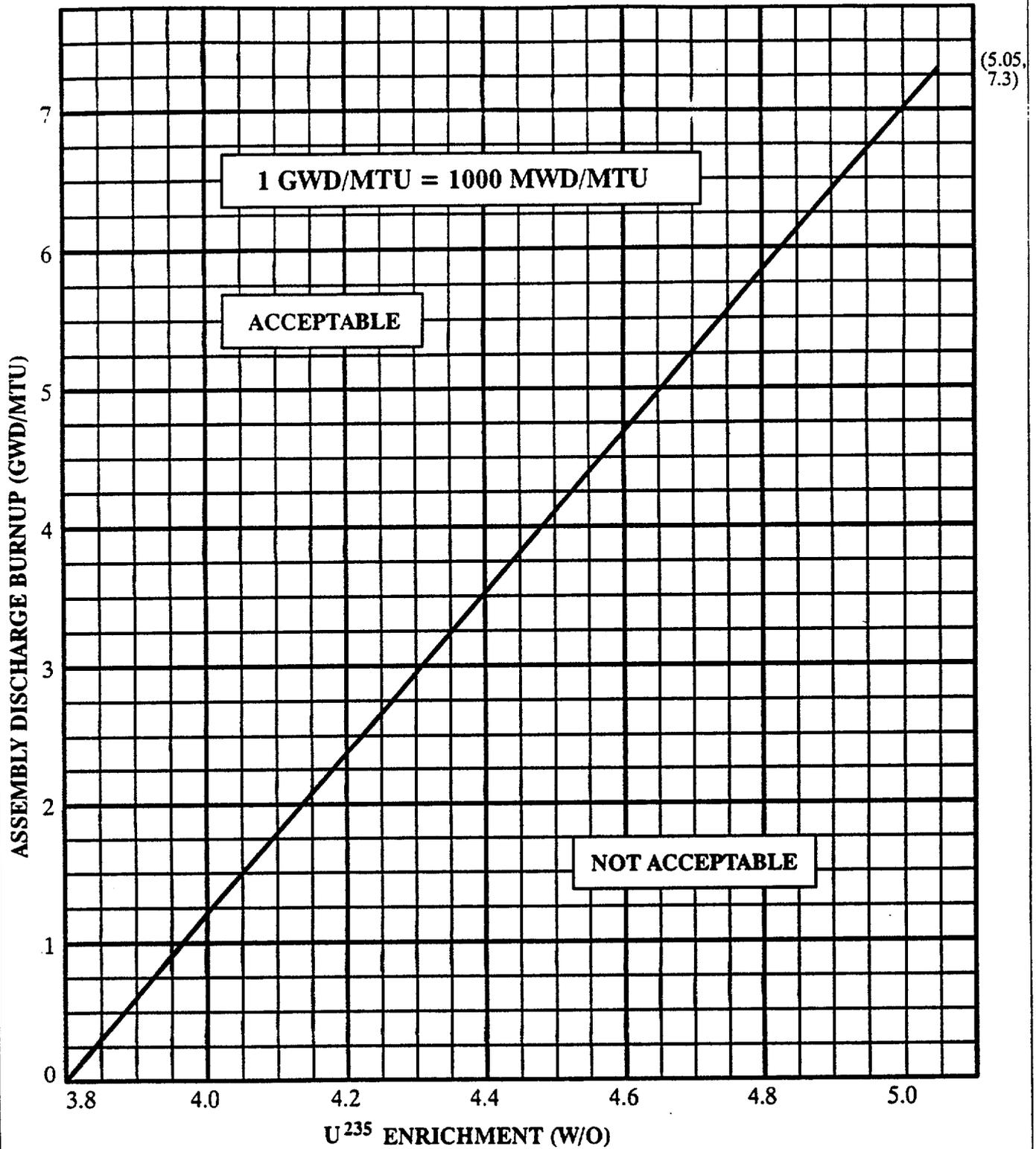
- 7.9 Incorporate qualification of H Fuel Assemblies in Attachment 5.
- 7.10 Add step 4.3.3 to verify no fuel in location where cell blocking device to be installed, and renumber steps in Section 4.
- 7.11 Added reference 6.9,RP-4, "Corrective Action Program."
- 7.12 Attachment 4, sheet 1 added "...and the affected cell location." to Acceptance Criteria for installation.
- 7.13 Attachment 2 and 3, added (N/A) to section for "Test Authorized By (SM/US)" per discussion with Shift Manager and Procedures Group. Performance of these Attachments have no affect on plant operations or conditions.

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**Attachment 1**  
**Region II Spent Fuel Enrichment/Burnup Requirements**  
 (Sheet 1 of 1)



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**Attachment 2**  
**Region II Fuel Assembly Qualification Process**  
 (Sheet 1 of 2)

**Surveillance Cover Sheet**

REFERENCE TECH. SPEC. 3/4.9.13	REFERENCE PROCEDURE SP 31022	PAGE 1 OF 2
SCHEDULE DATE	APPLICABLE MODE ALL	FREQUENCY AR
TEST AUTHORIZED BY (SM/JS) (N/A)	DATE	ACCEPTANCE CRITERIA MET:  <input type="checkbox"/> YES  <input type="checkbox"/> NO
COMPLETED BY	DATE	
ACCEPTED BY	DATE	
APPROVED BY (DEPARTMENT HEAD OR DESIGNEE)	DATE	

- TECH SPEC SURVEILLANCE    
  MAINTENANCE RESTORATION    
  SYSTEM ALIGNMENT    
  NON-TECH SPEC SURVEILLANCE    
  ISI TESTING

TEST EQUIPMENT	QA NUMBER	CAL DUE DATE

**ACCEPTANCE CRITERIA**

SP 31022, Attachment 5 is updated to reflect fuel assemblies qualified for Region II storage.

IN ACCORDANCE WITH REFERENCE PROCEDURE	INITIALS
1. PREREQUISITES/INITIAL CONDITIONS COMPLETED	
2. PRECAUTIONS NOTED	
3. COMMENTS: (IF MAINTENANCE RESTORATION, INDICATE BELOW WORK ORDER #, ETC.)	

Shift Manager notified of failed surveillance: \_\_\_\_\_ Initials

4. DATA

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**Attachment 2**  
**Region II Fuel Assembly Qualification Process**  
(Sheet 2 of 2)

1. Fuel Assembly ID #(s) \_\_\_\_\_
2. Initial Fuel Assembly(s) Enrichment \_\_\_\_\_ w/o U-235  
(If qualifying a group, the highest nominal enrichment should be used)
3. Is initial enrichment  $\leq 3.8\%$  w/o U-235. If yes, proceed to step 6.  

YES \_\_\_\_\_ NO \_\_\_\_\_

4. Fuel Assembly Burnup

Obtain integrated fuel assembly burnup from NUSCO Nuclear Fuels.

Assembly Burnup \_\_\_\_\_ MWD/MTU  
(If qualifying a group, use the lowest burnup)

5. Reduce the Measured Burnup by 10% to allow for uncertainty.

$$\frac{\text{Measured BU}}{\text{Measured BU}} \times 0.9 = \text{_____ MWD/MTU}$$

6. If the combination of reduced fuel assembly burnup and initial enrichment places the fuel assembly to the left of the line on Attachment 1, then revise Attachment 5. The fuel assembly may then be placed in Region II.

Completed By: \_\_\_\_\_ Date: \_\_\_\_\_

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

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**Attachment 3**  
**Region I Storage Pattern Verification**  
(Sheet 1 of 3)

**Surveillance Cover Sheet**

REFERENCE SPEC. 3/4.9.14	REFERENCE PROCEDURE SP 31022	PAGE 1 OF 3
SCHEDULE DATE	APPLICABLE MODE ALL	FREQUENCY AR
TEST AUTHORIZED BY (SMAJS) (N/A)	DATE	ACCEPTANCE CRITERIA MET:  <input type="checkbox"/> YES  <input type="checkbox"/> NO
COMPLETED BY	DATE	
ACCEPTED BY	DATE	
APPROVED BY (DEPARTMENT HEAD OR DESIGNEE)	DATE	

- TECH SPEC SURVEILLANCE    
 MAINTENANCE RESTORATION    
 SYSTEM ALIGNMENT    
 NON-TECH SPEC SURVEILLANCE    
 ISI TESTING

TEST EQUIPMENT	QA NUMBER	CAL DUE DATE

**ACCEPTANCE CRITERIA**

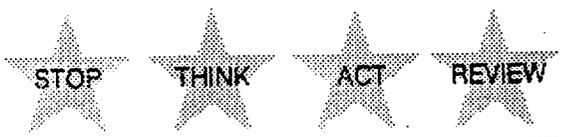
Blocking Devices located as shown on EN 31001, "Supplemental SNM Inventory and Control," Attachment 2.

IN ACCORDANCE WITH REFERENCE PROCEDURE	INITIALS
1. PREREQUISITES/INITIAL CONDITIONS COMPLETED	
2. PRECAUTIONS NOTED	
3. COMMENTS: (IF MAINTENANCE RESTORATION, INDICATE BELOW WORK ORDER #, ETC.)	

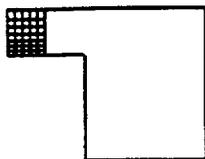
Shift Manager notified of failed surveillance: \_\_\_\_\_ Initials

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**Attachment 3**  
**Region I Storage Pattern Verification**  
 (Sheet 2 of 3)



SPENT FUEL POOL

NORTH →

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
A																			A
B																			B
C																			C
D																			D
E																			E
F																			F
G																			G
H																			H
J																			J
K																			K
L																			L
M																			M
N																			N
P																			P
R																			R
S																			S
T																			T
U																			U
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

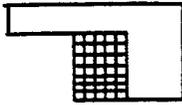
X - CELL BLOCKING DEVICE

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**Attachment 3**  
**Region I Storage Pattern Verification**  
 (Sheet 3 of 3)



SPENT FUEL POOL

NORTH →

	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
V																			V
W																			W
X																			X
Y																			Y
Z																			Z
AA																			AA
AB																			AB
AC																			AC
AD																			AD
AE																			AE
AF																			AF
AG																			AG
AH																			AH
AJ																			AJ
AK																			AK
AL																			AL
AM																			AM
AN																			AN
AP																			AP
AR																			AR
AS																			AS
AT																			AT
AU																			AU
AV																			AV
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	

**X** - CELL BLOCKING DEVICE

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**Attachment 4**  
**Cell Blocking Device Installation/Removal Surveillance**  
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**Surveillance Cover Sheet**

REFERENCE TECH. SPEC. 3/4.9.14	REFERENCE PROCEDURE SP 31022	PAGE 1 OF 3
SCHEDULE DATE	APPLICABLE MODE All	FREQUENCY AR
TEST AUTHORIZED BY (SMAJ/S)	DATE	ACCEPTANCE CRITERIA MET:  <input type="checkbox"/> YES  <input type="checkbox"/> NO
COMPLETED BY	DATE	
ACCEPTED BY	DATE	
APPROVED BY (DEPARTMENT HEAD)	DATE	

- TECH SPEC SURVEILLANCE    
  MAINTENANCE RESTORATION    
  SYSTEM ALIGNMENT    
  NON-TECH SPEC SURVEILLANCE    
  ISI TESTING

TEST EQUIPMENT	QA NUMBER	CAL DUE DATE

**ACCEPTANCE CRITERIA**

**For Installation:**

- All fuel is removed from the 8 locations around the proposed blocking device location and the affected cell location.

**For Removal:**

- All fuel is removed from the 8 locations around the blocking device to be removed.

IN ACCORDANCE WITH REFERENCE PROCEDURE	INITIALS
1. PREREQUISITES/INITIAL CONDITIONS COMPLETED	
2. PRECAUTIONS NOTED	
3. COMMENTS: (IF MAINTENANCE RESTORATION, INDICATE BELOW WORK ORDER #, ETC.)	

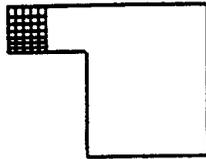
Shift Manager notified of failed surveillance: \_\_\_\_\_ Initials

4. DATA	
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**Attachment 4**  
**Cell Blocking Device Installation/Removal Surveillance**  
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SPENT FUEL POOL  
 REGION I STORAGE PATTERN

NORTH →

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
A																			A
B																			B
C																			C
D																			D
E																			E
F																			F
G																			G
H																			H
J																			J
K																			K
L																			L
M																			M
N																			N
P																			P
R																			R
S																			S
T																			T
U																			U

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

X - CELL BLOCKING DEVICE       - EMPTY LOCATION  
 F - FUEL ASSEMBLY

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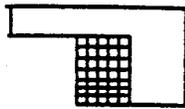


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# Attachment 4

## Cell Blocking Device Installation/Removal Surveillance

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### SPENT FUEL POOL REGION I STORAGE PATTERN

**NORTH** →

	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	
V																			V
W																			W
X																			X
Y																			Y
Z																			Z
AA																			AA
AB																			AB
AC																			AC
AD																			AD
AE																			AE
AF																			AF
AG																			AG
AH																			AH
AJ																			AJ
AK																			AK
AL																			AL
AM																			AM
AN																			AN
AP																			AP
AR																			AR
AS																			AS
AT																			AT
AU																			AU
AV																			AV

X - CELL BLOCKING DEVICE       - EMPTY LOCATION  
 F - FUEL ASSEMBLY

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**Attachment 5**  
**Region II Qualified Fuel Assemblies**  
(Sheet 1 of 1)

A Assemblies	All A assemblies are qualified for Region II Storage Rack Installation.
B Assemblies	All B assemblies are qualified for Region II Storage Rack Installation.
C Assemblies	All C assemblies are qualified for Region II Storage Rack Installation.
D Assemblies	All D assemblies are qualified for Region II Storage Rack Installation.
E Assemblies	All E assemblies are qualified for Region II Storage Rack Installation.
F Assemblies	All F assemblies are qualified for Region II Storage Rack Installation.
G Assemblies	All G assemblies are qualified for Region II Storage Rack Installation.
H Assemblies	All H assemblies are qualified for Region II Storage Rack Installation.

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