



**U. S. TOOL & DIE, INC.**

ATTACHMENT  
ST-HL-AE-2754  
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4030 ROUTE 8 • ALLISON PARK, PENNSYLVANIA 15101

RACK HANDLING AND INSTALLATION INSTRUCTIONS

SOUTH TEXAS PROJECT SPENT FUEL STORAGE RACKS  
UNITS 1 & 2  
HOUSTON LIGHTING & POWER COMPANY

8709-00-0500

PREPARED FOR  
BECHTEL ENERGY CORPORATION  
HOUSTON, TEXAS  
P. O. #14926-4480/8480  
SPECIFICATION NO. 3F239NS1007

REVISION 0, MAY, 1988  
REVISION 1, JULY, 1988

PREPARED BY: *Ray Linder 7/28/88*

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PDR ADDCK 05000498  
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## SOUTH TEXAS PROJECT SPENT FUEL STORAGE RACKS

### RACK HANDLING AND INSTALLATION INSTRUCTIONS

#### 1.0 RACK HANDLING

On-site handling consists of removal of a rack horizontally from the shipping truck, upending to vertical, and vertical lifting. The necessary equipment will be shipped with the first rack. The maximum estimated weight of the heaviest rack is not more than 15 tons.

Three reduced size drawings are included here, showing rack handling and equipment for UST&D racks on another project. The same type of drawings will be furnished for the South Texas racks, i.e. 8709-46, Region 1 and 8709-47, Region 2.

- 1.0.1 Horizontal lift is accomplished with a pair of nylon straps slung around the rack and attached to a spreader bar. The spreader bar is rigged with a two-leg sling hung on the lifting crane hook.
- 1.0.2 Upending is accomplished by using two of four vertical lifting adapters and attaching them to a pair of cables hung from a spreader bar. The spreader bar is rigged to a two-leg sling hung on the upending crane hook at the top end of the rack. Two brackets are bolted through bottom plates at the bottom end of the rack. The horizontal lift nylon straps are looped through these brackets and hung on a second crane hook which provides stability as the top end is raised. If the second crane hook is not available the upending operation can be accomplished by carefully rolling the rack about its bottom edge using the crane at the top end.
- 1.0.3 Vertical lift is accomplished by using the four vertical lifting adapters which have a bayonet end at the bottom and extend full length into storage cells which have a bayonet slot in the bottom plate. The top ends of the adapters are pinned to rotatable ends of a pair of spreader bars to which is attached a four-leg sling hung on the lifting crane hook. The pair of spreader bars provide the required lift redundancy in accordance with NUREG-0612.

## 2.0 INSTALLATION

There are three phases of rack installation. These phases are defined below:

Phase I (Unit 2 only) - Region 1 racks (6 racks) installed to store new fuel dry (Ref. Dwg 8709-59, Rev. 0)

Phase II (Units 1 and 2) - Region 1 and 2 wet spent fuel and consolidated fuel storage without a three rack row at the south end of the spent fuel pool (Ref. Dwg 8709-60, Rev. 0)

Phase III (Units 1 and 2) - Region 1 and 2 wet spent fuel and consolidated fuel storage, full pool (Ref. Dwg. 8709-1, Rev. 1)

### 2.1 PHASE I INSTALLATION

2.1.1 Place Rack #1 (dwg. 8709-2) in the pool, dimensionally spaced from the north and west walls as shown on the plan arrangement for Phase I rack installation (dwg. 8709-59). Level the rack by using a six to eight foot long spirit level across the top of the rack. Leveling requires that the rack be lifted clear off the floor while using the pedestal adjusting screw tool down through the appropriate cell over the screw. Level the rack to  $\pm 1/16$  inch.

2.1.2 Place Rack #2 (dwg. 8709-3) in the pool, dimensionally spaced from the west wall and Rack #1 as shown on the plan arrangement for Phase I rack installation (dwg. 8709-59). Place Rack #3 (dwg. 8709-4) in the pool, dimensionally spaced from the north wall and Rack #1; place Rack #4 (dwg. 8709-5) in the pool, dimensionally spaced from Rack #2 and Rack #3; place Rack #5 (dwg. 8709-6) in the pool, dimensionally spaced from the north wall and Rack #3; and place Rack #6 (dwg. 8709-7) in the pool, dimensionally spaced from Rack #4 and Rack #5 as shown on the plan arrangement for Phase I rack installation (dwg. 8709-59).

For Rack #5 and Rack #6 confirm that the minimum dimensions from the east wall are met. Racks #2,

#3, #4, #5, and #6 shall be leveled as described in Section 2.1.1.

## 2.2 PHASE II INSTALLATION

- 2.2.1 Place Rack #1 (dwg. 8709-2) in the pool, dimensionally spaced from the north and west walls as shown on the plan arrangement for Phase II rack installation (dwg. 8709-60). This placement will be accomplished by measuring or using gage blocks if available. Level the rack, if the installation is dry, or diver assisted if wet, by using a six to eight foot long spirit level across the top of the rack. Leveling requires that the rack be lifted clear off the floor while using the pedestal adjusting screw tool down through the appropriate cell over the screw. Level the rack to  $\pm 1/16"$ .
- 2.2.2 Place Rack #2 (dwg. 8709-3) alongside Rack #1 in contact with Rack #1 and dimensionally spaced from the west wall as required on the plan arrangement for Phase II rack installation (dwg. 8709-60). Place Rack #3 (dwg. 8709-4) alongside and in contact with Rack #1 at the same dimension from the north wall. Place Rack #4 (dwg. 8709-5) in contact with Rack #3 and #2. Place Rack #5 (dwg. 8709-6) in contact with Rack #3 and at the same dimension from the north wall. Place Rack #6 (dwg. 8709-7) in contact with Rack #5 and #4. Level each rack as it is installed as described in Section 2.2.1. The south face line-up of Racks #2, #4 and #6 shall be perpendicular to the west wall. The north face line-up of Racks #1, #3 and #5 shall be parallel to the north wall.
- 2.2.3 Place Rack #7 (dwg. 8709-8) alongside Rack #5 in contact with the east face of Rack #5 and dimensionally spaced from the north wall as shown on the plan arrangement for Phase II rack installation (dwg. 8709-60). Place Rack #8 (dwg. 8709-9) alongside Rack #7 in contact with the south face of Rack #7. Line-up the east face of Rack #8 with the east face of Rack #7. In sequence, install Racks #9, #10, #11 (dwgs. 8709-10, -11, -12, respectively), in contact with the previously installed rack south face. The east face of these five racks are to be in-line and parallel to the

east wall. Each rack shall be leveled as it is installed as described in Section 2.2.1.

2.2.4 Place Rack #13 (dwg. 8709-14) in contact with Racks #6 and #9. The first row of storage cells in Rack #13 in the east-west direction shall be in-line with the last row of storage cells in Rack #8 in the east-west direction. Place Rack #14 (dwg. 8709-15) in contact with Rack #13 and Rack #10. Place Rack #15 (dwg. 8709-16) in contact with Rack #14 and Rack #11. Each rack shall be leveled as it is installed as described in Section 2.2.1.

2.2.5 Place Rack #17 (dwg. 8709-18) in contact with Rack #2 and Rack #13. Place Rack #18 (dwg. 8709-19) in contact with Rack #17 and Rack #14. Place Rack #19 (dwg. 8709-32) in contact with Rack #18 and Rack #15.

Each rack shall be leveled as it is installed as described in Section 2.2.1.

2.2.6 No-gap installation is UST&D standard practice because the very strong hydrodynamic coupling forces between racks causes them to move together even when an empty and full rack are adjacent to each other.

### 2.3 PHASE III INSTALLATION

Phase III rack installation (dwg. 8709-1) is identical to Phase II rack installation (dwg. 8709-60) with the addition of three racks at the south end of the spent fuel pool. Specifically, Racks #12, #16, and #20 will be installed adjacent to Racks #11, #15, and #19.

2.3.1 Place Rack #12 (dwg. 8709-13) in contact with the south face of Rack #11 and in-line with the east face of Racks #7, #8, #9, #10 and #11 as shown on the plan arrangement for Phase III rack installation (dwg. 8709-1). The east face of Racks #7, #8, #9, #10, #11 and #12 shall be parallel to the east wall. Rack #12 shall be leveled as described in Section 2.2.1.

2.3.2 Place Rack #16 (dwg. 8709-17) in contact with the south face of Rack #15 and the west face of Rack #12 as shown on the plan arrangement for Phase III rack installation (dwg. 8709-1). Rack #16 shall be leveled



as described in Section 2.2.1.

- 2.3.3 Place Rack #20 (dwg. 8709-33) in contact with the south face of Rack #19 and the west face of Rack #16 as shown on the plan arrangement for Phase III rack installation (dwg. 8709-1). The west face of Racks #17, #18, #19, and #20 shall be in-line and parallel to the east wall. The south face of Racks #12, #16, and #20 shall be in-line and parallel to the south wall. Rack #20 shall be leveled as described in Section 2.2.1.

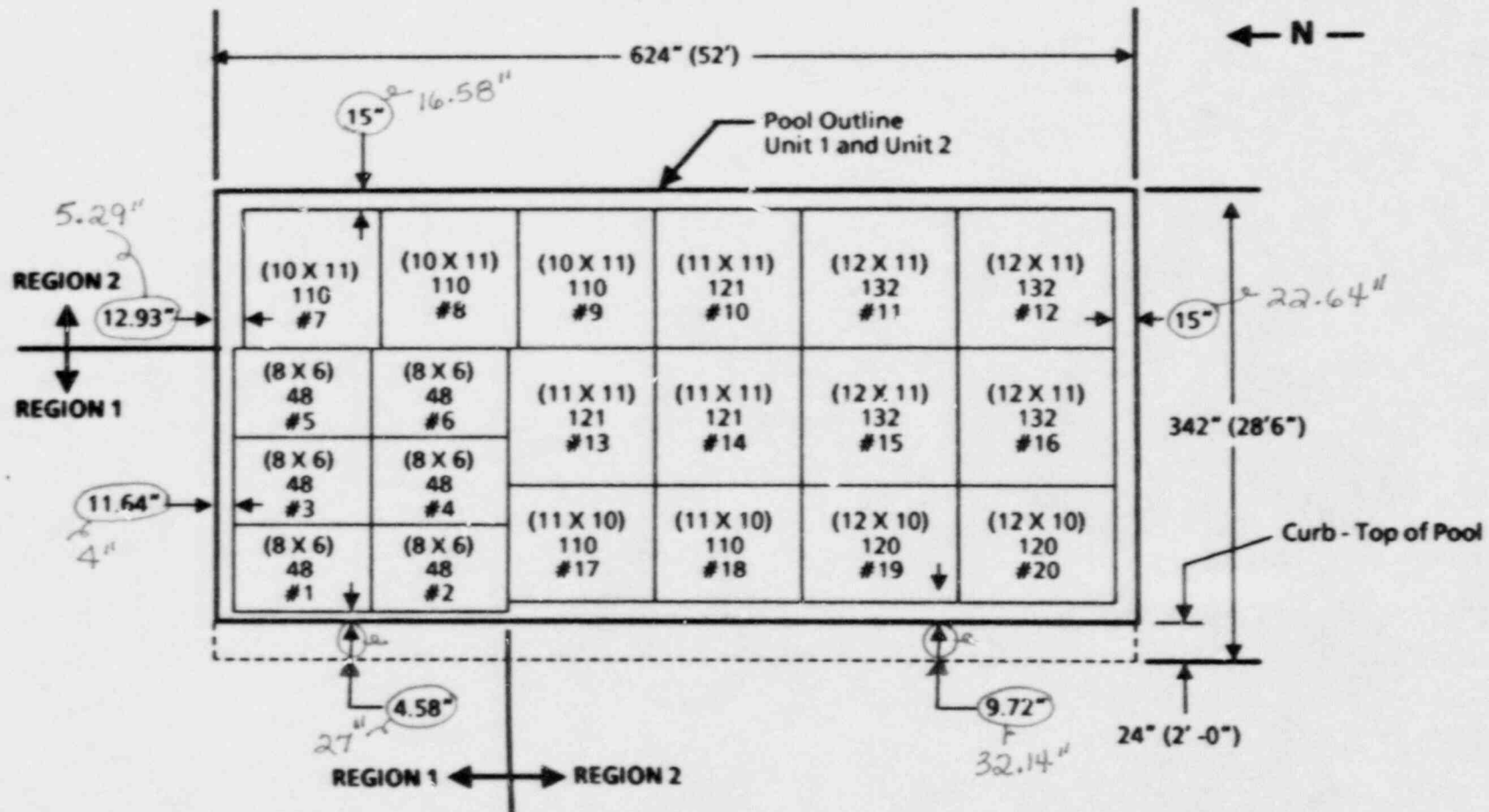
2.4 SPECIAL TOOLS

- (a) Horizontal Lift Spreader Bar & Cable Rigging
- (b) 2 Horizontal Lift Nylon Straps
- (c) 4 Vertical Lift Adapters
- (d) Upending Spreader Bar & Cable Rigging
- (e) 2 Upending Bottom-Side Brackets
- (f) 2 Vertical Lift Spreader Bars & Cable Rigging
- (g) Pedestal Adjusting Tool
- (h) 3 Gage Blocks, Wall-To-Rack (if required)
- (i) Handling Tool, Portable Lead-In Funnel
- (j) Handling Tool, Region 1 Removable Poison

ATTACHMENT # 4

ANNOTATED REVISIONS TO THE HIGH  
DENSITY SPENT FUEL RACK SAFETY  
ANALYSIS REPORT AND THE STP FSAR

High Density Spent Fuel Storage Racks  
 South Texas Electric Generating Station  
 Houston Lighting & Power Company



Region 1 F.A. Storage = 288  
 Region 2 F.A. Storage = 1681  
 Total F.A. Storage = 1969

Figure 3-1

SPENT FUEL POOL RACK LAYOUT  
 (TYPICAL UNIT 1 OR UNIT 2)

(Reference FSAR Figure 9.1.2-2)



PEDESTAL FORCES

The maximum forces on one pedestal for the seismic disturbances are for the 132-cell rack. The following values are SRSS values taken from Table 6.4, Set #4:

	<u>Vertical (Lbs)</u>	<u>Horizontal (Lbs)</u>
OBE	263265	84039
SSE	441129	141937

MOVEMENT AT BASE

The maximum values for other outputs from Table 6.4, Set #5 are:

SSE

Elastic Displacement: 0.5609 in. 132-cell rack east-west

Sliding Displacement: 0.9638 in. 132-cell rack north-south

Lift-off: 0.1310 in. 132-cell rack east-west

OBE

Elastic Displacement: 0.3494 in. 132-cell rack east-west

Sliding Displacement: 0.1803 in. 132-cell rack north-south

Lift-off: 0.0 in. 132-cell rack east-west and north-south

ALLOWABLE DISPLACEMENT

The maximum displacement,  $\delta$ , consisting of the rack displacement associated with five OBE events plus one SSE event was calculated. The total calculated displacement is 5 (0.1803) inches + 1(0.9638) inches = 1.8653 inches. The calculated maximum displacement (1.8653 inches) is less than the 11.64 inches minimum rack-to-wall gap provided at the north end of the pool, the minimum separation between the pool and the rack (Figure 3-1).

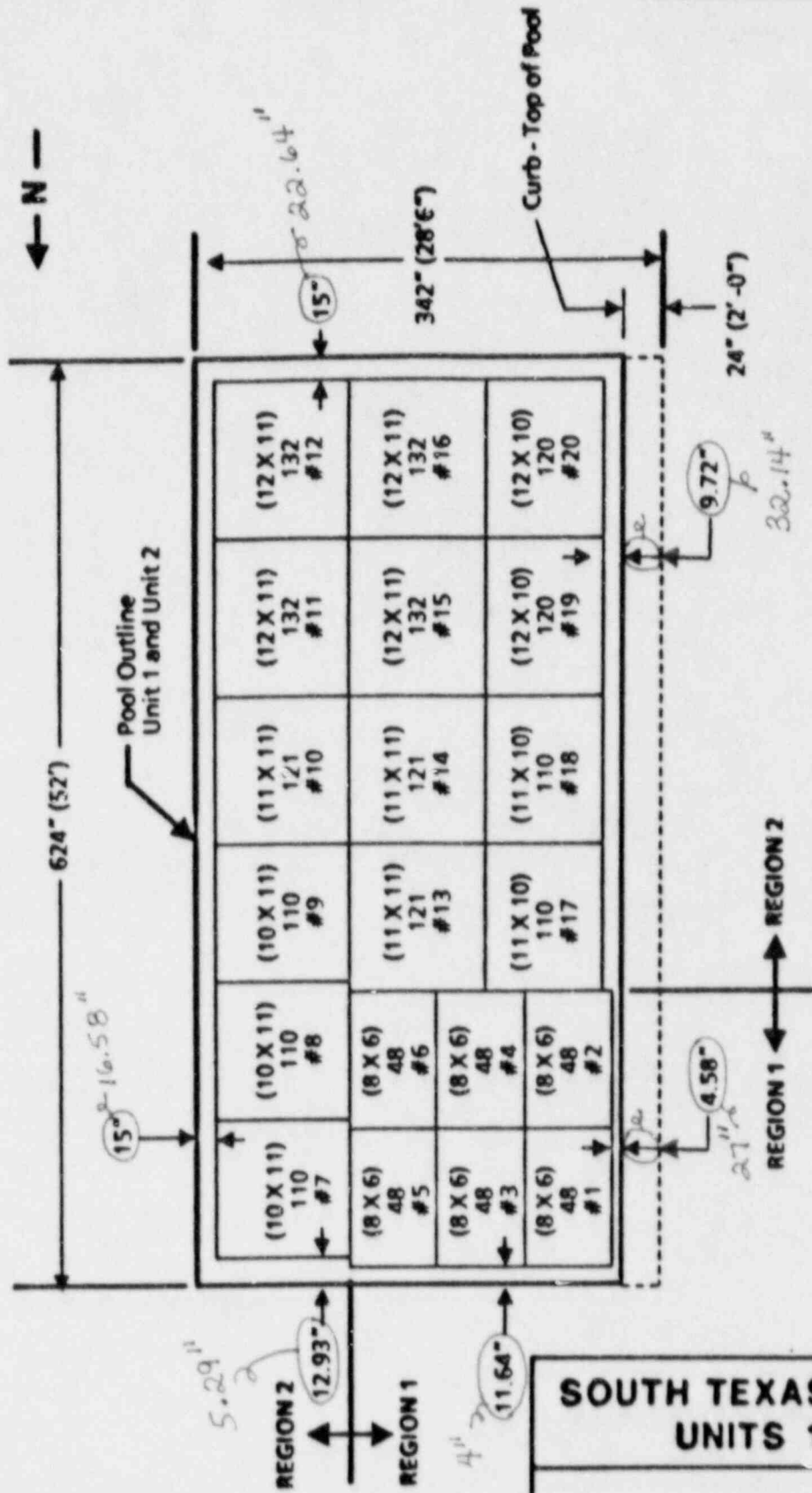
DRY STORAGE

4"

Tabulated results for dry storage of new fuel in the Region 1 spent fuel storage rack seismic analysis are grouped and identified by "Sets" numbered 1 through 5 as shown on Table 6.5.

6.6.2.4.2 Mechanical Analysis of Rack Structural Adequacy for Seismic Loads

Stresses in the internal rack welds are computed due to both deadweight and seismic loads. Seismic loads are the maximum reactions from Seismic Analysis, Section 6.6, for a Region 2, 132-cell rack. Seismic stresses are calculated using the SRSS method and are combined with the submerged weight stresses.



Region 1	F.A. Storage = 288
Region 2	F.A. Storage = 1681
Total	F.A. Storage = 1969

**SOUTH TEXAS PROJECT  
 UNITS 1 & 2**

**HIGH DENSITY  
 SPENT FUEL RACKS**

Figure 9.1.2-2

ATTACHMENT # 2

UST&D DRAWINGS 8709-59 (REV. 0),  
8709-60 (REV. 0) & 8709-01 (REV. 1)

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DOCUMENT  
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# The Light company

Houston Lighting & Power

P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

August 19, 1988

ST-HL-AE-2756

File No.: G20.02.01, M20.1,  
10CFR50

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project Electric Generating Station  
Units 1 and 2  
Docket Nos. STN 50-498, STN 50-499  
Response to NRC Questions Regarding the  
Use of High Density Spent Fuel Racks

- Reference (1): HL&P Letter to USNRC, G.E. Vaughn to Document Control Desk, ST-HL-AE-2417 dated March 8, 1988.
- (2): HL&P Letter to USNRC, ST-HL-AE-2738; Summary of Meeting on July 11 & 12 to discuss High Density Spent Fuel Racks.

On July 11 & 12, 1988, personnel from Houston Lighting & Power Company (HL&P), Bechtel Energy Corporation (BEC) and U.S. Tool & Die, Inc. (UST&D) met with members of the NRC Staff to discuss the proposed license amendment regarding expansion of the spent fuel pool storage capacity using high density spent fuel racks that was submitted to the NRC via letter dated March 8, 1988 (reference 1). Minutes of the meeting are documented in reference 2.

As a result of the meeting, HL&P committed to provide additional information for some of the questions discussed during the meeting. Attached are revised responses to questions 2, 6, 7, 8, 9, 15, 16, 17 and 18. This information should close these items.

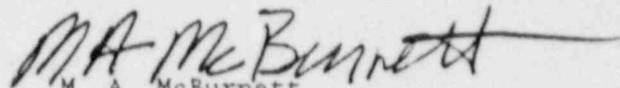


L4/NRC/bt

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*Proprietary  
Drawings  
Box 11  
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If you should have any questions regarding this matter, please contact  
Mr. A. W. Harrison at (512) 972-7298.



M. A. McBurnett  
Manager,  
Operations Support Licensing

MEP/hg

- Attachment:
- (1) Revised Responses to Questions 2,6,7,8,9,15,16,17 & 18.
  - (2) UST&D Drawing 8709-59 (Rev. 0)  
UST&D Drawing 8709-60 (Rev. 0)  
UST&D Drawing 8709-01 (Rev. 1)
  - (3) Spent Fuel Rack Handling and Installation Instructions
  - (4) Annotated revisions to the High Density Spent Fuel Rack  
Safety Analysis Report and the STP FSAR.