



**Florida
Power**
CORPORATION

Crystal River Unit 3
Docket No. 50-302

November 28, 1990
3F1190-14

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

Subject: Technical Specification Change Request No. 175,
Spent Fuel Pool Rerack

Dear Sir:

Florida Power Corporation (FPC) is formally docketing the attached information as requested by the NRC on November 20, 1990. The information was informally transmitted October 30, 1990 as requested during a telephone call on October 25, 1990. The information relates to the increased load on the spent fuel pool floor from the new racks and the associated stresses and allowable margin.

Attachments 1 and 2 are excerpts from Westinghouse Electric Corporation calculations supplied to FPC in support of the rerack. Attachment 1 provides calculations for standard fuel which FPC will be using and Attachment 2 provides calculations for consolidated fuel. Appropriate proprietary information has been omitted. The "margin to allowable" in the attachments is comparing the Westinghouse stresses to allowable stresses obtained from the Gilbert Project Specification. The stresses in the Gilbert Project Specification were developed from various rack vendor information and Gilbert Report 1949 previously submitted on FPC's docket on January 9, 1978.

Sincerely,

P. M. Beard, Jr.
Senior Vice President
Nuclear Operations

PMB:GMF

Attachments

xc: Regional Administrator, Region II
Senior Resident Inspector

*Pool
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Crystal River Floor Loads - Standard Fuel

There are three different floor local bearing limits. These are for OBE, SSE and Fuel Drop accident. Note that the deadweight limit is the same as the OBE limit and since the OBE load is higher than the deadweight load, the deadweight stress is not limiting. The maximum pad loads for these conditions are shown below.

<u>Condition</u>	<u>Maximum Load</u>	<u>(Proprietary Information)</u>
OBE	39100	
SSE	73000	
Fuel Drop	200580	

The support pad is 6.0" diameter and the liner plate is 3/16" thick. Using a 2:1 slope for the load spread through the liner gives a concrete load diameter of $6+4(3/16) = 6.75"$. This gives an area of $A = \pi/4 (6.75)^2 = 35.78 \text{ in}^2$. Dividing the loads above by this area gives an applied stress which is compared to the allowable stress.

<u>Condition</u>	<u>Applied Stress</u>	<u>Allowable Stress</u>	<u>Margin to Allowable</u>
OBE	1093	1800	.65
SSE	2040	2400	.18
Fuel Drop	5606	5950*	.06

* Using actual concrete strength of 5000 psi

There are three different total pool floor vertical load limits. These are for Deadweight, OBE and SSE. There is also a limit for fuel drop accident with the same allowable as SSE. The maximum vertical loads per storage location for the three conditions are shown below.

<u>Condition</u>	<u>Region 1 Load (lbs)</u>	<u>Region 2 Load (lbs)</u>
DW	1703	1590
OBE	1850	1732
SSE	1971	1848

These loads are for each storage location in the rack storing standard fuel.

There are 174 Region 1 and 641 Region 2 storage locations in the pool. To get total pool loads, multiply Region 1 loads above by 174 and Region 2 loads above by 641. This is shown in the table below along with the allowable load and margin to allowable. (Loads in kips)

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
DW	1316	2700	1.05
OBE	1432	3600	1.51
SSE	1528	5700	2.73

Crystal River Floor Loads - Standard Fuel

For the fuel drop condition the pool floor load is the DW Total Pool Load plus 2,0580 lbs. (Proprietary Information).

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
Fuel Drop	1516	5700	2.76

There are also two different total pool floor horizontal load limits. These are for OBE and SSE. The maximum horizontal loads per storage location for the two conditions are shown below.

<u>Condition</u>	<u>Region 1 Load (lbs)</u>	<u>Region 2 Loads (lbs)</u>
OBE	504	493
SSE	917	896

* Loads (Proprietary Information) are shear loads per 9 x 12 rack assembly. To get loads per storage location, divide the loads (Proprietary Information) by 108.

The loads for both Region 1 and Region 2 are for standard fuel.

The horizontal total pool loads are determined in the same manner as the vertical total pool loads above. (Loads in kips)

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
OBE	404	900	1.23
SSE	734	1400	0.91

Thus, the pool meets all loading requirements when the racks are completely full.

Crystal River Floor Loads - Consolidated Fuel

There are three different floor local bearing limits. These are for OBE, SSE and Fuel Drop accident. Note that the deadweight limit is the same as the OBE limit and since the OBE load is higher than the deadweight load, the deadweight stress is not limiting. The maximum pad loads for these conditions are shown below.

<u>Condition</u>	<u>Maximum Load</u>	<u>(Proprietary Information)</u>
OBE	43000	
SSE	73000	
Fuel Drop	200580	

The support pad is 6.0" diameter and the liner plate is 3/16" thick. Using a 2:1 slope for the load spread through the liner gives a concrete load diameter of $6 + 4(3/16) = 6.75"$. This gives an area of $A = \pi/4 (6.75)^2 = 35.78 \text{ in}^2$. Dividing the loads above by this area gives an applied stress which is compared to the allowable stress.

<u>Condition</u>	<u>Applied Stress</u>	<u>Allowable Stress</u>	<u>Margin to Allowable</u>
OBE	1202	1800	.50
SSE	2040	2400	.18
Fuel Drop	5606	5950*	.06

* Using actual concrete strength of 5000 psi.

There are three different total pool floor vertical load limits. These are for Deadweight, OBE and SSE. There is also a limit for fuel drop accident with the same allowable as SSE. The maximum vertical loads per storage location for the three conditions are shown below.

<u>Condition</u>	<u>Region 1 Load (lbs)</u>	<u>Region 2 Load (lbs)</u>
DW	2876	2771
OBE	3097	2987
SSE	3277	3164

These loads are for each storage location in the rack storing consolidated fuel.

There are 174 Region 1 and 641 Region 2 storage locations in the pool. To get total pool loads, multiply Region 1 loads above by 174 and Region 2 loads above by 641. This is shown in the table below along with the allowable load and margin to allowable. (Loads in kips)

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
DW	2277	2700	0.19
OBE	2454	3600	0.47
SSE	2598	5700	1.19

Crystal River Floor Loads - Consolidated Fuel

For the fuel drop condition the pool floor load is the DW Total Pool Load plus 200580 lbs. (Proprietary Information)

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
Fuel Drop	2477	5700	1.30

There are also two different total pool floor horizontal load limits. These are for OBE and SSE. The maximum horizontal loads per storage location for the two conditions are shown below.

<u>Condition</u>	<u>Region 1 Load (lbs)</u>	<u>Region 2 Load (lbs)</u>
OBE	979	493
SSE	1780	896

* Loads (Proprietary Information) are shear loads per 9 x 12 rack assembly. To get loads per storage location, divide the loads (Proprietary Information) by 108.

The loads for Region 1 are for consolidated fuel and for Region 2 are for standard fuel. However, in the Region 2 rack the standard fuel horizontal loads are higher than the consolidated fuel horizontal loads, so the above loads are the limiting condition.

The horizontal total pool loads are determined in the same manner as the vertical total pool loads above. (Loads in kips)

<u>Condition</u>	<u>Total Pool Load</u>	<u>Allowable Load</u>	<u>Margin</u>
OBE	486	900	0.85
SSE	884	1400	0.58

Thus, the pool meets all loading requirements when the racks are completely full. Consolidated fuel may be stored in every location.