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20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



20<sup>TH</sup>YEAR

#### I. SURVEILLANCE PROCEDURES

Volume 2, Section 9, Appendix F of the 20th Year Physical Surveillance Report contains the detailed procedures for conducting the tendon surveillance. The surveillance consists of the following steps:

- 1. Visual examination of casing filler grease.
- 2. Analytical testing of casing filler grease samples.

Inspection of the anchor assembly of each of the surveillance tendon ends for deleterious conditions such as corrosion, cracks, broken or missing buttonheads.

- 4. Inspection of concrete surrounding the bearing plate.
- 5. Measurement of the liftoff force for each of the surveillance tendons.

Removal of one wire from the surveillance tendons which are detensioned for examination and testing.

- 7. Retensioning of the detensioned tendons and measuring the corresponding tendon elongation.
- 8. Visual inspection for corrosion, pitting, or any significant physical change of wires removed from the tendons.
- 9. Testing of wires removed from tendons for yield strength, ultimate strength, and percentage elongation at failure.
- 10. Resealing tendon cans and replacement of lost sheathing filler into the tendon duct and grease can.
- 11. Evaluation of test and inspection results to assess the general condition of the post tensioning system.



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#### II. SHEATHING FILLER ANALYSIS

A sample of sheathing filler (grease) was removed from each end of the surveillance tendons. Chemical tests were performed on each sample by Suburban Laboratories, Inc., the results are presented in Appendix B and are summarized in Table I.

The maximum acceptable limits are 10 percent by weight for water content and 10 parts per million for water-soluble chlorides, nitrates and sulfides. All samples met the acceptance criteria as stated above in all respects except 51H25 field end which had a water content result of 14.9%. As there is a limited amount of grease available for testing in this grease cans, due to the large shim volume, and a leaking gasket. The small quantity of grease did not allow for additional samples and the water penetration was in the area of gasket failure. This result is not necessarily indicative of the tendon grease condition throughout the tendon. Inspection of the tendon end anchorage, shims, and buttonheads showed no abnormal corrosion which would indicate a moisture problem. The gasket was replaced and the anchorage refilled with new grease.

Tendon 53H2 samples were unavailable for testing.

Also included was the report of the neutralization number of each grease sample. This test is generally performed by grease manufacturers on new batches of the product. It is a method of determining the overbase additives in the grease. Degradation of the sheathing filler will yield a change in the acidity of the filler material as well as an increase in the ion content. The required neutralization number is >3mg KOH/g and has been achieved by all samples in this test.

The large range in the neutralization numbers found between various tendons is indicative of different types of grease, such as P2 and P4, where P2 was originally installed and P4 added during latter work. This is not a sign of grease or system degradation.



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### TABLE I: LABORATORY ANALYSIS OF SHEATHING FILLER

TENDON	END	ION CON	CENTRATIO	N (PPM)	% WATER	NEUTRAL No.
		CHLORIDE	NITRATE	SULFIDE	CONTENT	mg KOH/g
12V1	SHOP/ TOP	<0.50	1.24	<0.50	0.1	42.1
	FIELD/ BOTT.	<0.50	1.02	<0.50	0.4	42.1
23V2	SHOP/ TOP	<0.50	1.46	<0.50	0.2	46.6
	FIELD/ BOTT.	<0.50	2.02	<0.50	0.1	47.1
61V21	SHOP/ TOP	<0.50	1.02	<0.50	0.2	50.5
	FIELD/ BOTT.	<0.50	1.46	<0.50	<0.1	24.1
D113	SHOP/ NEAR 2	<0.50	0.79	<0.50	<0.1	36.5
	FIELD/ NEAR 6	<0.50	1.13	<0.50	0.1	39.3
15	SHOP/ NEAR 2	<0.50	1.68	<0.50	0.2	40.9
	FIELD/ NEAR 6	<0.50	1.13	<0.50	0.2	43.2
D212	SHOP/ NEAR 1	<0.50	1.13	<0.50	0.1	26.4
	FIELD/ NEAR 3	<0.50	0.68	<0.50	0.1	40.9
D304	SHOP/NEAR 4	<0.50	0.79	<0.50	0.3	40.9
	FIELD/ NEAR 2	<0.50	0.68	<0.50	0.1	33.7
D311	SHOP/NEAR 4	<0.50	1.02	<0.50	0.3	47.7
	FIELD/ NEAR 2	<0.50	0.68	<0.50	0.1	33.7

#### Acceptance Limits

<u>Test</u> Water Soluble Chloride Water Soluble Nitrates Water Soluble Sulfides Water Content Neutralization No. Limits Less than 10.0 ppm Less than 10.0 ppm Less than 10.0 ppm Less than 10% Dry Weight Greater than 3 mg KOH/g



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



### TABLE I: LABORATORY ANALYSIS OF SHEATHING FILLER

TENDON	END	ION CON	CENTRATIC	ON (PPM)	% WATER	NEUTRAL No.
		CHLORIDE	NITRATE	SULFIDE	CONTENT	mg KOH/g
42H18	SHOP/ BUTT 4	<0.50	1.02	<0.50	0.1	11.8
	FIELD/ BUTT 2	<0.50	1.02	<0.50	0.1	41.5
42H32	SHOP/ BUTT 4	<0.50	0.68	<0.50	0.1	33.7
	FIELD/ BUTT 2	<0.50	0.79	<0.50	<0.1	42.1
42H44	SHOP/ BUTT 4	<0.50	0.68	<0.50	<0.1	42.1
	FIELD/ BUTT 2	<0.50	2.13	<0.50	<0.1	21.3
51H25	FIELD/BUTT 5	<0.50	3.25	<0.50	14.9	30.8
51H26	SHOP/BUTT 1	<0.50	3.58	<0.50	0.1	11.2
<u> </u>	FIELD/ BUTT 5	<0.50	1.02	<0.50	<0.1	42.1
53H46	SHOP/ BUTT 5	<0.50	0.68	<0.50	<0.1	36.5
	FIELD/ BUTT 3	<0.50	1.13	<0.50	<0.1	4.49
62H41	SHOP/ BUTT 2	<0.50	1.24	<0.50	<0.1	40.9
	FIELD/ BUTT 6	<0.50	2.69	<0.50	<0.1	28.0
62H46	SHOP/ BUTT 2	<0.50	1.35	<0.50	0.2	38.7
	FIELD/ BUTT 6	<0.50	0.90	<0.50	<0.1	6.17

#### Acceptance Limits

Test Water Soluble Chloride Water Soluble Nitrates Water Soluble Sulfides Water Content Neutralization No. Limits Less than 10.0 ppm Less than 10.0 ppm Less than 10.0 ppm Less than 10% Dry Weight Greater than 3 mg KOH/g



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#### III. ANCHORAGE COMPONENTS

In the following discussion, all procedures referred to are included in Volume 2, Section 9, Appendix F of the 20th Year Physical Report while all data sheets are included in Section 4, Appendix A.

Inspection of the anchorage components began with the removal of the grease can (PSC Procedure SQ 6.0). Complete grease coating (100%) was found on all surveillance tendons except 42H18 field end with 70% of grease can coated, 42H32 field end with 60% of the grease can coated, 62H41 shop end with 60% of the grease can coated and 62H41 field end with 70% of the grease can coated. The percentage of grease coverage was recorded on Data Sheet SQ 6.0 with the results tabulated in Table II.

During removal of the grease can and physical inspections of the anchorage assemblies water was detected during removal of a can, or inside it, on only one tendon end. Tendon 51H25 field end exhibited drops of water in the grease can. No water was detected in any other surveillance or grease repair tendon. Water Inspections were recorded on Data Sheet SQ 6.1 and are summarized in Table III.

The anchorage components (anchorhead, bushing, shims, buttonhead and bearing plate) were inspected for corrosion level and cracks per PSC Procedure SQ 8.0. The results were recorded on Data Sheet SQ 8.0 and are summarized in Table IV. Corrosion levels on all items was either level 1 - "bright metal, no visible oxidation", or level 2 - "reddish brown color, no pitting". No evidence of cracking was observed in any of the anchorage components.



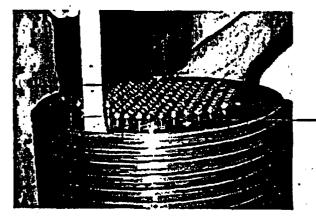
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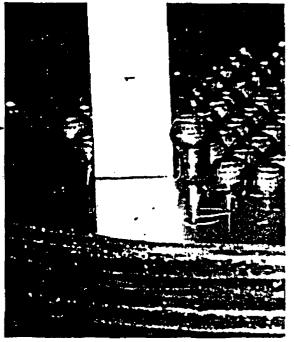


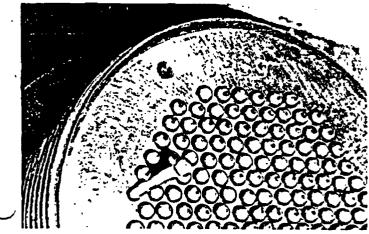
#### III. ANCHORAGE COMPONENTS

The buttonheads were inspected for their physical condition and a count was made of protruding or missing buttonheads per PSC Procedure SQ 8.0. The results of these inspections are also recorded on Data Sheet SQ 8.0, and summarized in Table V.



Tendon 12V1 shop end was found to have one wire protruding 0.6" and NCR No. FN604-001 was written to address this.





Tendon 51H26 (field end shown) was found to have one broken wire 6.05" long after initial liftoff was performed. NCR No. FN604-003 was generated to document this finding and the broken section was later removed during detensioning.

A continuity test was conducted and all remaining wire were found to be continuous



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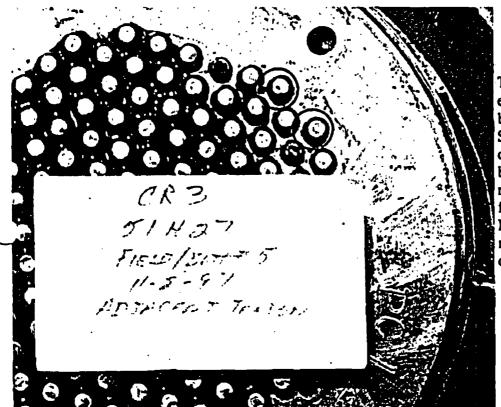
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



III. ANCHORAGE COMPONENTS



This picture of 51H27 field end shows the two small buttonheads reported on Data Sheet SQ 8.0 in red. The wires circled in green were found to be protruding after liftoff and removed. The pieces were found to be 6.15" long and NCR No. FN604-007 was raised to document this occurrence.

Tendon 62H41 was also found to have two broken wires after detensioning, NCR No. FN604-015 recorded this finding.

No other missing or protruding wires not previously reported were found.

Cans were also removed to the shop end of 43V4 and the field end of 51H41 where "domed" or bulging can ends were found. Inspection revealed no apparent abnormalities and the anchorage, shims and buttonheads were found to be acceptable in all respect.



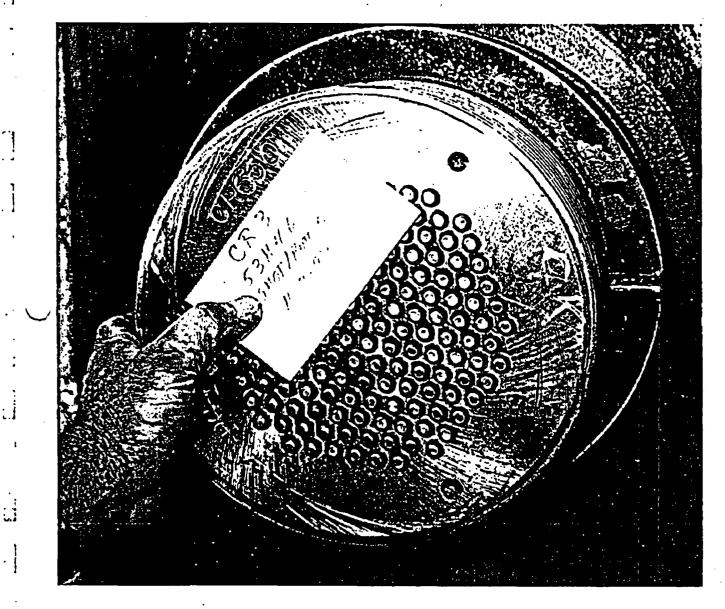
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# **20TH YEAR SURVEILLANCE OF THE** POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### **ANCHORAGE COMPONENTS** III.



Scratches found on the face of the anchorhead on 52H46 shop end were reported on Data Sheet SQ 8.0



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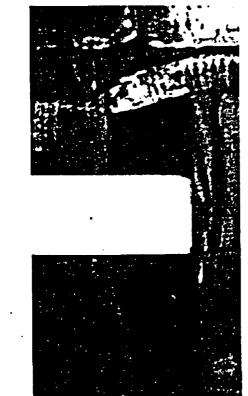
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



III. ANCHORAGE COMPONENTS







The above 3/8" shim on tendon 51H27 field end was found to be deformed at the shim gap which was 0.8" wide. This shim was replaced and the shim gap closed up during liftoff.



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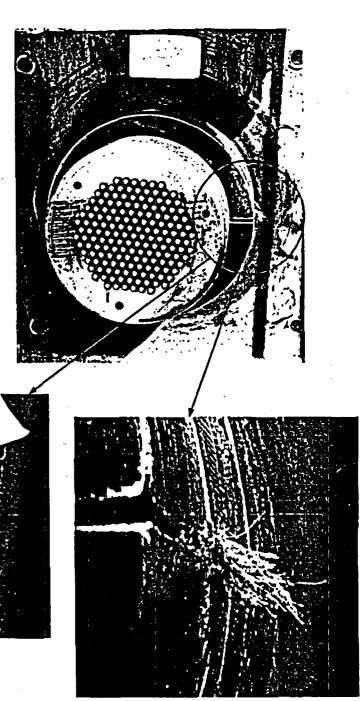
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### III. ANCHORAGE COMPONENTS

Pieces of rope found protruding from shim gap on tendon 51H28 field end.





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#### III. ANCHORAGE COMPONENTS

The concrete was inspected around the bearing plates for cracks per PSC Procedure SQ 8.3 with the results being recorded on Data Sheet SQ 8.3 and summarized in Table VI. Two tendons exhibited cracks exceeding 0.010", D311 and 51H26 (shown on the next two pages). No cracks that had a width in excess of 0.010" were found to any other inspection tendon. Data Sheets SQ 8.4 detail the general containment exterior concrete inspection and at the time of the surveillance a contractor was on site making concrete repairs to the containment buttresses.

Bearing plate ID's were either illegible or not found on several tendon ends.

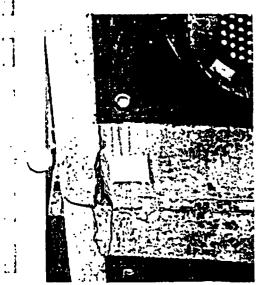


#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



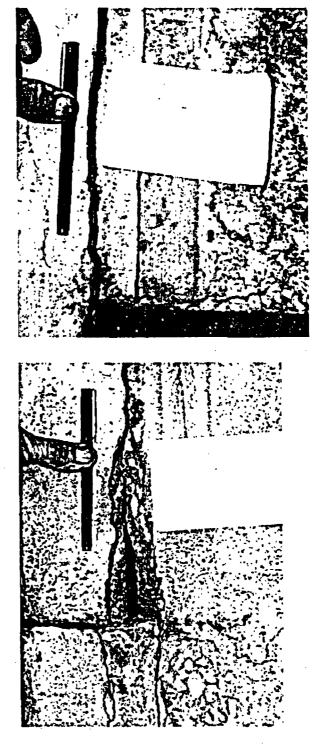
#### III. ANCHORAGE COMPONENTS

Crack found around the bearing plate at 51H26 shop end. See NCR No. FN604-004



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



III. ANCHORAGE COMPONENTS



Cracks found on tendon 52H26 field end.

See NCR No. FN604-002





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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



# TABLE II: SUMMARY OF DATA SHEETS SQ 6.0GREASE CAN REMOVAL.

TENDON	END		GREA	ASE COATING	(%)	
		GREASE CAN	BUTTON- HEADS	ANCHOR- HEADS	SHIMS	BEARING PLATE
12V1	SHOP/TOP	100	100	100	100	100
	FIELD/BOT.	100	100	100	100	100
23V2	SHOP/TOP	100	100	100	100	100
	FIELD/BOT.	100	100	100	100	100
61V21	SHOP/TOP	100	100	100	100	100
	FIELD/BOT.	100	100	100	100	100
.V4	SHOP/TOP	100	100	100	100	100
D113	SHOP/NEAR 2	100	100	100	100	100
	FIELD/ NEAR 6	100	100	100	100	100
D115	SHOP/NEAR 2	100	100 ·	100	100	100
	FIELD/ NEAR 6	100	100	100	100	100
D212	SHOP/ NEAR 1	100	100	100	100	100
	FIELD/ NEAR 3	100	100	100	100	100
D304	SHOP/NEAR 4	100	100	100	100	100
	FIELD/ NEAR 2	100	100	100	100	100
D311	SHOP/NEAR 4	100	100	100	100	100
. `	FIELD/ NEAR 2	100	100	100	100	100



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#### **20TH YEAR SURVEILLANCE OF THE** POST-TENSIONING SYSTEM AT THE **CRYSTAL RIVER NUCLEAR PLANT** UNIT 3



#### TABLE II: SUMMARY OF DATA SHEETS SQ 6.0 **GREASE CAN REMOVAL**

TENDON	END	GREASE COATING (%)					
		GREASE CAN	BUTTON- HEADS	ANCHOR- HEADS	SHIMS	BEARING PLATE	
42H18	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	70	100	100	100	100	
42H29	SHOP/BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	
42H30	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	
42H31	SHOP/ BUTT 4	100	100	100	100	100	
$\sim$	FIELD/ BUTT 2	100	100	100	100	100	
42H32	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	60	100	100	100	100	
42H33	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	
421134	SHOP/ BUTT 4	100	100	100	100	100	
. x	FIELD/ BUTT 2	100	100	100	100	100	
42H35	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	
42H36	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	
42H37	SHOP/ BUTT 4	100	100	100	100	100	
	FIELD/ BUTT 2	100	100	100	100	100	



#### **20TH YEAR SURVEILLANCE OF THE** POST-TENSIONING SYSTEM AT THE **CRYSTAL RIVER NUCLEAR PLANT** UNIT 3



#### TABLE II: SUMMARY OF DATA SHEETS SQ 6.0 **GREASE CAN REMOVAL**

TENDON	END		GRE	<b>SE COATING</b>	(%)	
		GREASE CAN	BUTTON- HEADS	ANCHOR- HEADS	SHIMS	BEARING PLATE
42H44	SHOP/ BUTT 4	100	100	100	100	100
	FIELD/ BUTT 2	100	100	100	100	100
51H25	SHOP/ BUTT 1	100	100	100	100	100
	FIELD/ BUTT 5	100	100	100	100	100
51H26	SHOP/ BUTT 1	100	100	100	100	100
	FIELD/ BUTT 5	100	100	100	100	100
51H27	SHOP/ BUTT 1	100	100	. 100	100	100
<u> </u>	FIELD/ BUTT 5	100	100	100	100	100
51H28	SHOP/ BUTT 1	100	100	100	100	100
· .	FIELD/ BUTT 5	100	100	100	100	100
53H2	SHOP/ BUTT 5	100	100	100	100	100
6	FIELD/ BUTT 3	100	100	100	100	100
53H46	SHOP/ BUTT 5	100	100	100	100	100
	FIELD/ BUTT 3	100	100	100	100	100
62H41	SHOP/ BUTT 2	60	100	100	100	100
	FIELD/ BUTT 6	70	100	100	100	100
621146	SHOP/ BUTT 2	100	100	100	100	100
	FIELD/BUTT 6	100	- 100	100	100	100
51H41	FIELD/ BUTT 5	100	100	100	100	100

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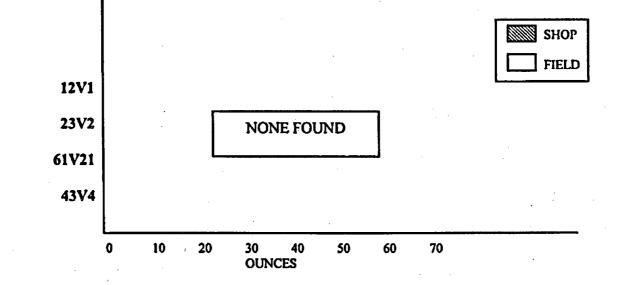
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 INSPECT FOR WATER

TENDON	END	WATER QUANTITY
12V1	SHOP/TOP	NONE
	FIELD/BOT.	NONE
23V2	SHOP/TOP	NONE
	FIELD/BOT.	NONE
61V21	SHOP/TOP	NONE
	FIELD/BOT.	NONE
43V4	SHOP/TOP	NONE





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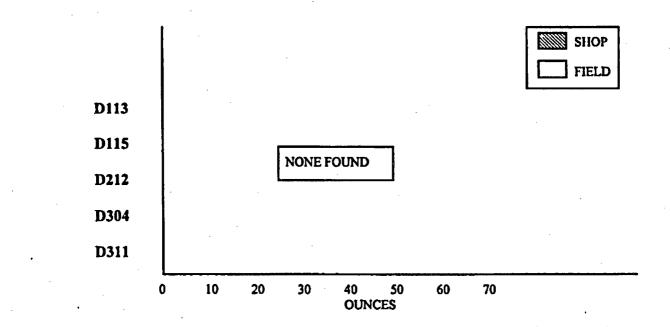
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#### **20TH YEAR SURVEILLANCE OF THE** POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT **UNIT 3**



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 **INSPECT FOR WATER.**

0115 0212	END	WATER QUANTITY
D113	SHOP/ NEAR 2	NONE
	FIELD/ NEAR 6	NONE
D115	SHOP/ NEAR 2	NONE
	FIELD/ NEAR 6	NONE
D212	SHOP/ NEAR 1	NONE
•	FIELD/ NEAR 3	NONE
D304	SHOP/ NEAR 4	NONE
l · ·	FIELD/ NEAR 2	NONE
311	SHOP/ NEAR 4	NONE
	FIELD/NEAR 2	NONE





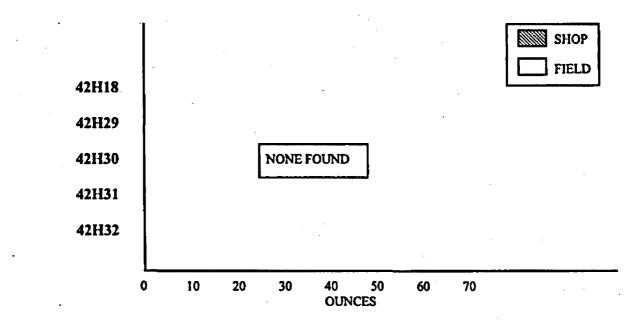
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 INSPECT FOR WATER.

TENDON	END	WATER QUANTITY
ز . 		· · ·
42H18	SHOP/ BUTT 4	NONE
·	FIELD/ BUTT 2	NONE
42H29	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
42H30	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
421131	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
1132	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE





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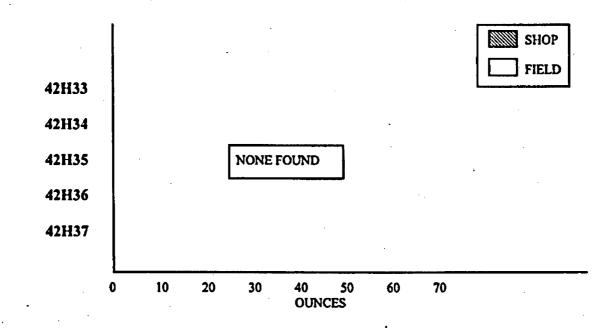
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 INSPECT FOR WATER.

TENDON	END	WATER QUANTITY
42H33	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
42H34	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
42H35	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
42H36	SHOP/ BUTT 4	NONE
	FIELD/ BUTT 2	NONE
_2H37	SHOP/ BUTT 4	NONE
r,	FIELD/ BUTT 2	NONE



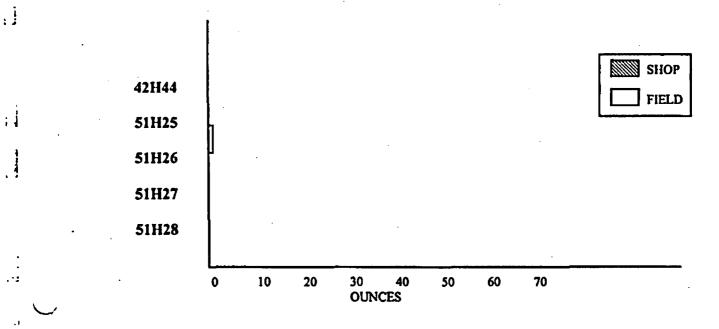


#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 INSPECT FOR WATER

TENDON	END	WATER QUANTITY	
42H44	SHOP/ BUTT 4	NONE	
•	FIELD/ BUTT 2	NONE	
51H25	SHOP/ BUTT 1	NONE	
	FIELD/ BUTT 5	DROPS	
51H26	SHOP/ BUTT 1	NONE	
•	FIELD/ BUTT 5	NONE	
51H27	SHOP/ BUTT 1	NONE	
	FIELD/ BUTT 5	NONE	
H28	SHOP/ BUTT 1	NONE	
	FIELD/ BUTT 5	NONE	





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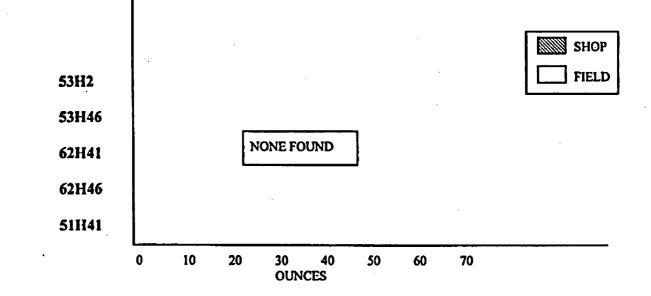
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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE III: SUMMARY OF DATA SHEETS SQ 6.1 INSPECT FOR WATER

TENDON	END	WATER QUANTITY
53H2	SHOP/ BUTT 5	NONE
	FIELD/ BUTT 3	NONE
531146	SHOP/ BUTT 5	NONE
	FIELD/ BUTT 3	NONE
62H41	SHOP/ BUTT 2	NONE
	FIELD/ BUTT 6	NONE
62H46	SHOP/ BUTT 2	NONE
	FIELD/ BUTT 6	NONE
,H41	FIELD/ BUTT 5	NONE





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#### **20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3**



#### TABLE IV: SUMMARY OF DATA SHEETS SQ 8.0 **ANCHORAGE CORROSION CONDITION**

TENDON	END	ANCHOR	BUTTONHEAD	CORROSI	ON LEVEL, C	CRACKS
		I.D.	CORROSION	ANCHOR-	SHIMS	BEARING
			CONDITION	HEAD		PLATE
12V1	SHOP/TOP	CR650/PC121	1	1, NONE	2, NONE	2, NONE
	FIELD/BOT.	NOT FOUND	1	2, NONE	2, NONE	2, NONE
23V2	SHOP/TOP	CR736/PC121	1	2, NONE	2, NONE	2, NONE
	FIELD/BOT.	CR239/PC120	1	2, NONE	2, NONE	2, NONE
61V21	SHOP/TOP	CR957/PC121	1	2, NONE	1, NONE	2, NONE
	FIELD/BOT.	CR189/PC120	1	1, NONE	1, NONE	1, NONE
43V4	SHOP/TOP	CR788/PC121	N/A	NONE	. NONE	NONE
113	SHOP/ NEAR 2	CR411/PC121	. 1	2, NONE	1, NONE	1, NONE
	FIELD/ NEAR 6	CR1075/PC121	1	2, NONE	2, NONE	2, NONE
D115	SHOP/ NEAR 2	CR675/PC121	1	2, NONE	1, NONE	2, NONE
	FIELD/ NEAR 6	CR1231/PC122	1 .	2, NONE	1, NONE	1, NONE
D212	SHOP/ NEAR 1	CR1032/PC121	. 1	1, NONE	1, NONE	2, NONE
	FIELD/ NEAR 3	CR1214/PC122	1	1, NONE	1, NONE	1, NONE
D304	SHOP/ NEAR 4	CR479/PC121	1	2, NONE	1, NONE	1, NONE
	FIELD/ NEAR 2	CR696/PC121	- 1	1, NONE	1, NONE	2, NONE
D311	SHOP/ NEAR 4	CR1040/PC121	1	1, NONE	1, NONE	2, NONE
	FIELD/ NEAR 2	CR636/PC121	1	1, NONE	1, NONE	2, NONE

Bright metal; no visible oxidation.
 Metal redish brown color; no pitting
 Patches of red oxide, no visible pits.



#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



# TABLE IV: SUMMARY OF DATA SHEETS SQ 8.0ANCHORAGE CORROSION CONDITION

TENDON	END	ANCHOR	BUTTONHEAD	CORROSI	CORROSION LEVEL, CRACKS			
		<b>I.D.</b>	CORROSION	ANCHOR-	SHIMS	BEARING		
			CONDITION	IIEAD		PLATE		
42H18	SHOP/BUTT 4	CR615/PC121	2	2, NONE	2, NONE	2, NONE		
	FIELD/ BUTT 2	CR906/PC121	1	2, NONE	1, NONE	2, NONE		
42H29	SHOP/ BUTT 4	CR606/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1208/PC122	N/A	NONE	NONE	NONE		
42H30	SHOP/ BUTT 4	CR569/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1143/PC122	N/A	NONE	NONE	NONE		
42H31	SHOP/ BUTT 4	CR368/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1233/PC122	. N/A	NONE	NONE	NONE		
42H32	SHOP/ BUTT 4	CR564/PC121	1	2, NONE	2, NONE	2, NONE		
	FIELD/ BUTT 2	CR123/PC120	1	2, NONE	1, NONE	1, NONE		
42H33	SHOP/ BUTT 4	CR546/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR934/PC121	N/A	NONE	NONE	NONE		
42H34	SHOP/ BUTT 4	CR525/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1207/PC122	N/A	NONE	NONE	NONE		
42H35	SHOP/ BUTT 4	CR547/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1229/PC122	N/A	NONE	NONE	NONE		
42H36	SHOP/ BUTT 4	CR522/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1174/PC122	N/A	NONE	NONE	NONE		
42H37	SHOP/ BUTT 4	CR559/PC121	N/A	NONE	NONE	NONE		
	FIELD/ BUTT 2	CR1175/PC122	N/A	NONE	NONE	NONE		

1 Bright metal; no visible oxidation.

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2 Metal redish brown color; no pitting

3 Patches of red oxide, no visible pits.



#### **20TH YEAR SURVEILLANCE OF THE** POST-TENSIONING SYSTEM AT THE **CRYSTAL RIVER NUCLEAR PLANT** UNIT 3

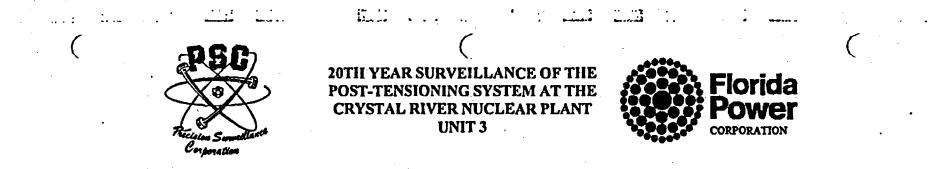


#### TABLE IV: SUMMARY OF DATA SHEETS SQ 8.0 **ANCHORAGE CORROSION CONDITION**

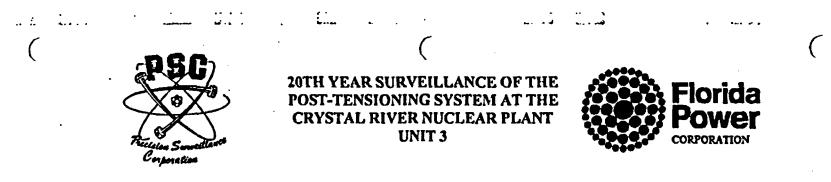
TENDON	END	ANCHOR	BUTTONHEAD	CORROSI	ON LEVEL, C	CRACKS
		I.D.	CORROSION	ANCHOR-	SHIMS	BEARING
			CONDITION	HEAD		PLATE
42H44	SHOP/ BUTT 4	CR572/PC121	1	1, NONE	2, NONE	2, NONE
	FIELD/ BUTT 2	CR1230/PC122	1	1, NONE	2, NONE	1, NONE
51H25	SHOP/ BUTT 1	CR26/PC120	N/A	NONE	NONE	NONE
	FIELD/ BUTT 5	CR1126/PC122	1	1, NONE	2, NONE	2, NONE
51H26	SHOP/ BUTT 1	CR384/PC121	1	2, NONE	1, NONE	1, NONE
	FIELD/ BUTT 5	CR897/PC121	· · · · · · · · · · · · · · · · · · ·	1, NONE	1, NONE	1, NONE
51H27	SHOP/ BUTT 1	CR366/PC121	N/A	NONE	NONE	NONE
, ,	FIELD/ BUTT 5	CR1088/PC121	. N/A	NONE	NONE	NONE
51H28	SHOP/ BUTT 1	CR49/PC120	N/A	NONE	NONE	NONE
	FIELD/ BUTT 5	CR1173/PC122	N/A	NONE	NONE	NONE
53H2	SHOP/ BUTT 5	CR135/PC120	1	2, NONE	1, NONE	1, NONE
	FIELD/ BUTT 3	CR646/PC121	· 1	2, NONE	2, NONE	1, NONE
53H46	SHOP/ BUTT 5	CR660/PC121	1	2, NONE	1, NONE	2, NONE
•	FIELD/ BUTT 3	CR1197/PC122	1	1, NONE	1, NONE	2, NONE
62H41	SHOP/ BUTT 2	CR355/PC120	1	1, NONE	1, NONE	2, NONE
· · · · · · · · · · · · · · · · · · ·	FIELD/ BUTT 6	CR454/PC121	1	1, NONE	1, NONE	1, NONE
62H46	SHOP/ BUTT 2	CR156/PC120	2	2, NONE	2, NONE	1, NONE
	FIELD/ BUTT 6	CR979/PC121	1	1, NONE	1, NONE	1, NONE
51H41	FIELD/ BUTT 5	CR1222/PC122	N/A	NONE	NONE	NONE

Bright metal; no visible oxidation.
 Metal redish brown color; no pitting

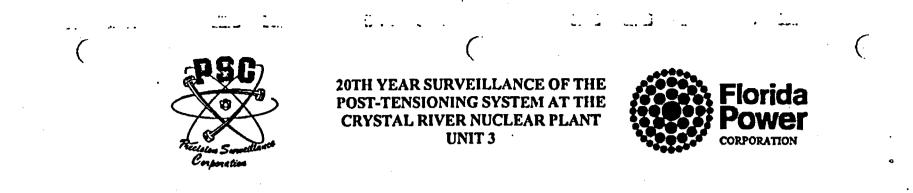
3 Patches of red oxide, no visible pits.



TENDON	END	ORIG	INAL	AS FO	UND	AS+L	EFT	REMOVED	TOTAL	EFFECTIVE	EFFECTIVE
		PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	FOR		WIRES	WIRES
			MISSING		MISSING		MISSING	TESTING		AS FOUND	AS LEFT
12VI	SHOP/TOP	1	0.	1	0	1	0	0	1	162	162
	FIELD/BOT.	0	1	0	1	0	1	0	1	162	162
23V2	SHOP/TOP	0	0	0	0	0	0	0	0	163	163
	FIELD/BOT.	0	0	0	0	0	.0	0	0	163	163
61V21	SHOP/TOP	0	0	0	0	0	0	1	1	163	162
	FIELD/BOT.	· 0	0	0	. O ·	0	. 0	1	1	163	162
43V4	SHOP/TOP	0	0	0	0	0	0	0	0	163	163
D113	SHOP/ NEAR 2	0	0	0	Ő	0	0	0	0	163	163
	FIELD/ NEAR 6	0	0	0	0	0	0.	0	0	163	163
D115	SHOP/NEAR 2	0	0	0	0	0	0	0	0	163	163
	FIELD/ NEAR 6	.0	0	0	0	0	0	0	0	163	163
D212	SHOP/ NEAR 1	0	1.2	0	1	0	1	0	1	162	162
	FIELD/ NEAR 3	0	1	0	1	0	· 1	0	1	162	162
D304	SHOP/ NEAR 4	0	0	0	0	0	0	0	1	163	162
-	FIELD/ NEAR 2	0	0	0	Ó	0	0	0	1	163	162
D311	SHOP/ NEAR 4	0	0	. 0	0	0	0	0	0	163	163
	FIELD/ NEAR 2	0	0 ·	0	· 0	. 0	0	0	0	163	163

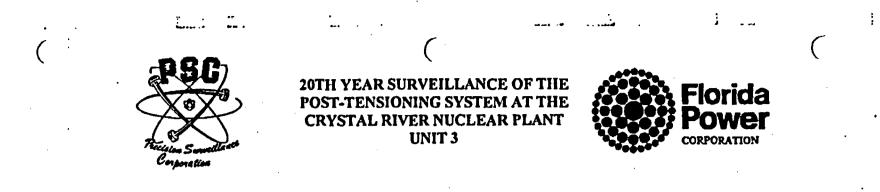


TENDON	END	ORIG	INAL	AS FO	UND	AS LI	EFT	REMOVED	TOTAL	EFFECTIVE	EFFECTIVE
		PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	FOR		WIRES	WIRES
			MISSING		MISSING		MISSING	TESTING		AS FOUND	AS LEFT
42H18	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	163
42H29	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0.	163	163
42H30	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	163
42H31	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	. 0	0	163	163
42H32	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	163
421133	SHOP/ BUTT 4	0	0	0	0	0	0	0	0 .	163	163
	FIELD/ BUTT 2	0	0	- 0	0	0	0	0	0	163	163



TENDON	END	ORIG	NAL	AS FO	UND	AS LI	EFT	REMOVED	TOTAL	EFFECTIVE	EFFECTIVE
		PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	FOR		WIRES	WIRES
			MISSING		MISSING		MISSING	TESTING		AS FOUND	AS LEFT
421134	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	163
42H35	SHOP/ BUTT 4	0	0	0	0	0	0	1	1	163	162
	FIELD/ BUTT 2	0	0	0	0	0	0	1	1	163	162
42H36	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	<b>163</b> .
42H37	SHOP/ BUTT 4	0	0	0	0	0	0	0	Ð	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	. 163
42H44	SHOP/ BUTT 4	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 2	0	0	0	0	0	0	0	0	163	163
511125	SHOP/ BUTT 1	0	0	0	0	0	0	. 0	0	163	163
	FIELD/ BUTT 5	0	0	0	0	0	0	0	0	163	163
511126	SHOP/ BUTT I	0	0	0	0	0	1*	2	-2	163	161
	FIELD/ BUTT 5	0	0	0	0	0	1*	2	2	163	161

• FOUND BROKEN AFTER LIFTOFF



TENDON	END	ORIG	NAL	AS FO	UND	AS LI	EFT	REMOVED	TOTAL	EFFECTIVE	EFFECTIVE
		PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	PROTRUDE	BROKEN/	FOR		WIRES	WIRES
	}		MISSING		MISSING		MISSING	TESTING		AS FOUND	AS LEFT
51H27	SHOP/ BUTT 1	0	0	0	0	0	2 **	2	2	163	161
	FIELD/ BUTT 5	0	0	0	0	0	2 **	2	2	163	161
51H28	SHOP/ BUTT 1	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 5	0	0	0	0	0	0	0	0	163	163
53H2	SHOP/ BUTT 5	0	0	0	0	0	0	0	0	163	163
	FIELD/ BUTT 3	0	0	. 0	0	0	0	0	0	163	163 .
53H46	SHOP/ BUTT 5	0	0	0	0 '	0	0	0	0	163	163
	FIELD/ BUTT 3	0	0	0	· 0	0	0	0	0	163	. 163
621141	SHOP/ BUTT 2	0	0	0	2 *	0	3	3	3	163	160
	FIELD/ BUTT 6	0	0	0	2 *	0	3	3	3	163	160
621146	SHOP/ BUTT 2	0	0	0	0	0	0	0	·0	163	163
	FIELD/ BUTT 6	0	0	0	0	0	0	0	0	163	163
511141	FIELD/ BUTT 5	0	0	0	0	0	0	0	0	163	163

\* FOUND BROKEN AFTER LIFTOFF

\*\* FOUND BROKEN AFTER DETENSIONING



#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



# TABLE VI: SUMMARY OF DATA SHEETS SQ 8.3CONCRETE INSPECTION.

TENDON	END	BEARING	CRACK	S WITH WIDTH	5 >0.010"
		PLATE ID	QUANTITY	MAX. LENGTH (IN)	MAX. WIDTH (IN)
12V1	SHOP/TOP	CR973	NONE	N/A	N/A
	FIELD/BOT.	CR118/PC58	NONE	N/A	N/A
23V2	SHOP/TOP	NOT FOUND	NONE	N/A	N/A
	FIELD/BOT.	CR114/PC58	NONE	N/A	N/A
61V21	SHOP/TOP	NOT FOUND	NONE	N/A	N/A
	FIELD/BOT.	NOT FOUND	NONE	N/A	N/A
D113	SHOP/NEAR 2	NOT FOUND	NONE	N/A	N/A
า	FIELD/ NEAR 6	NOT FOUND	NONE	N/A	N/A
D115	SHOP/NEAR 2	NOT FOUND	NONE	N/A	N/A
	FIELD/NEAR 6	CR919/PC91	NONE	N/A	N/A
D212	SHOP/NEAR 1	CR910/PC88	NONE	N/A	N/A
	FIELD/NEAR 3	CR764/PC91	NONE	N/A	N/A
D304	SHOP/NEAR 4	NOT FOUND	NONE	N/A	N/A
	FIELD/ NEAR 2	NOT FOUND	NONE	N/A	N/A
D311	SHOP/NEAR 4	CR846/PC91	NONE	N/A	N/A
**	FIELD/ NEAR 2	NOT FOUND	TWO	24"	<0.050

SEE NCR# FN604-016



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#### **20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT** UNIT 3



#### TABLE VI: SUMMARY OF DATA SHEETS SQ 8.3 **CONCRETE INSPECTION.**

TENDON	END	BEARING	CRACK	S WITH WIDTH	S >0.010"
		PLATE ID	QUANTITY	MAX. LENGTH (IN)	MAX. WIDTH (IN)
42H18	SHOP/ BUTT 4	CR300/PC87	NONE	N/A	N/A
	FIELD/ BUTT 2	CR373/PC87	NONE	N/A	N/A
42H32	SHOP/ BUTT 4	CR254/PC88	NONE	N/A	N/A
,	FIELD/ BUTT 2	CP654/PC76	NONE	N/A	N/A
42H44	SHOP/ BUTT 4	CR689/PC77	NONE	N/A	N/A
	FIELD/ BUTT 2	CR163/PC77	NONE	N/A	N/A
51H26 *	SHOP/ BUTT 1	CR217/PC77	TWO	15"	0.30"
T **	FIELD/ BUTT 5	CR616/PC77	ONE	15"	0.10"
53112	SHOP/ BUTT 5	CR511/PC76	NONE	N/A	N/A
	FIELD/ BUTT 3	CR539/PC76	NONE	N/A	N/A
53H46	SHOP/ BUTT 5	CR705/PC77	NONE	N/A	N/A
	FIELD/ BUTT 3	CR439/PC76	NONE	N/A	N/A
62H41	SHOP/ BUTT 2	CR202/PC76	NONE	N/A ·	N/A
	FIELD/BUTT 6	CR187/76	NONE	N/A	N/A
62H46	SHOP/ BUTT 2	NOT FOUND	NONE	N/A	N/A
	FIELD/ BUTT 6	CR549/PC76	NONE	N/A	N/A

SEE NCR# FN604-004
 SEE NCR# FN604-002



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



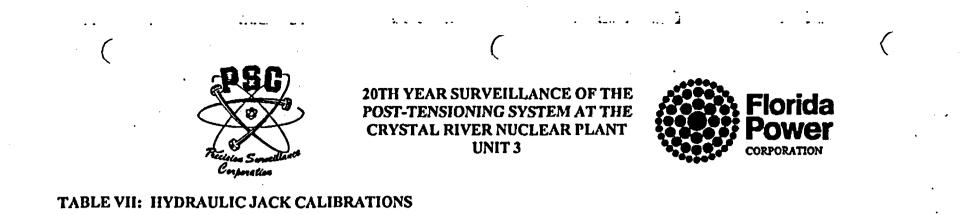
#### IV. HYDRAULIC JACK CALIBRATIONS

Precision Surveillance has developed a program for calibrating hydraulic jacks utilizing regression analysis (PSC Procedure QA 12.8.G-W). This is a process where a straight line is mathematically best fitted to a set of data points (in this case, force verses gauge pressure). This results in calculating ram area (slope) and constant (y-intercept) for each jack calibration. Completed calibrations for all of the hydraulic jacks used are contained in Appendix C and are summarized in Table VII.

A before and after comparison of the stressing jacks' ram areas revealed that none of the jacks' calibrations varied by more than 0.77% indicating that they were in a properly calibrated status.

Note that the force exerted by a jack can be calculated as follows:

Force = Area x Pressure + Constant (F)  $(in^2)$  (KSI) (K)



JACK	BEFO	RE SURVEI	LLANCE	FORCE	AFTI	ER SURVEI	LLANCE	FORCE (Ff)	MAX PRESSURE	VARI %
ID	DATE	AREA (in <sup>2</sup> )	CONSTANT (kips)	(Fi)	DATE	AREA (in <sup>2</sup> )	CONSTANT (kips)			
8778	10/9/97	333.423	1.640	1835466.5	1/20/98	333.564	-7.497	1827105	5500	0.46
8833	10/9/97	335.178	-0.321	1843158	1/20/98.	335.008	-3.148	1839396	5500	0.20
9501	12/11/97	368.689	1.554	1918736.8	1/20/98	372.715	-4.549	1933569	5200	0.77
7702	2/17/98	1.542	0.120	13227	3/23/98	1.552	0.068	13260	8500	0.25

RAM 7702 USED FOR WIRE TESTING



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### V. TENDON LIFTOFFS AND DETENSIONING

A liftoff is performed on each surveillance tendon to monitor the force exerted by the tendon onto the structure. PSC Procedure SQ 9.0 (Volume 2, Section 9, Appendix F) details the steps to be taken to perform a liftoff. The results are documented on Data Sheet SQ 9.0 and are summarized in Table VIII.

It should be noted that performing a liftoff has only a localized effect on a tendon; therefore, it is acceptable to use the same jacks for both ends of a tendon by executing the liftoff on separate occasions.

Vertical tendon liftoffs were found to be above the base value except for 12V1 which was above 95% of base, and all dome liftoff averages were above the base value.

Horizontal liftoffs revealed two isolated areas 42H30 to 42H36 inclusive and 51H26, 51H27 where average tendon liftoffs were between 90% and 95% of base value. Two tendons, 42H35 and 51H26, were found to be below 90% of base value and detensioned for continuity test per FPC requirement. This continuity test revealed that all of the wires were continuous, one wire was removed from each tendon for testing and one broken wire removed from 51H26 was also tested. After testing the tendons were restored to base value -0% + 6%. All other tendons found between 90 and 95% of base value were subsequently restored per procedure to base value -0% + 6%.

These low liftoff results were documented on NCR's -010, 011, 012, 013, and 014 for 42H30 - 36 and NCR 005 for 51H26.

All other tendon liftoffs were either above base value or 95% of base value and therefore acceptable.

The average normalized liftoff for each group, vertical, dome and horizontal, exceeded the minimum required and is acceptable.

After completion of liftoffs, protruding wires were found to tendons 51H26(1), 51H27(2) and 62H46(2). These wires, once removed, were found to have broken behind the anchorhead. No corrosion was found to indicate wire failure due to deterioration and it is suspected that slight tendon head rotation while setting back down sheared the wires against the shims. In all cases the broken wires were on the outer corner edge of the tendon bundle and no gauge movement was noted to indicate failures during liftoff. These wires were probable "pinched" during original installation and additional work on these tendons has broken the wires. NCR's FN604-003,007 and 015 recorded these occurrences.



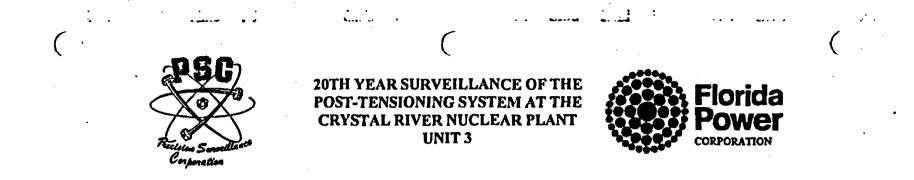
20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE VIII: SUMMARY OF DATA SHEETS SQ 9.0 TENDON LIFTOFFS

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TENDON	END	EFFECT. WIRES	JACK No.	PRESS.	LIFTOFF	AVE. LIFTOFF	BASE VALUE	95% BASE	90% BASE	NORMALIZING FACTOR	АССЕРТ
12V1	SHOP/TOP	162	8833	4390	1471	1471	1530	1453	1377	-9	YES
23V2	SHOP/TOP	163	8778	4820	1609	1609	1482	1408	1333	37	YES
61V21	SHOP/TOP	163	8833	4550	1525	.1525	1482	1408	1334	38	YES
D113	SHOP/2	163	8778	4267.5	1424.7	1427	1369	1301	1232	-35	YES
	FIELD/6	163	8833	4265	1429						YES
D115	SHOP/ 2	163	8778	4062.5	1356	1380	1347	1280	1213	-12	YES
•	FIELD/6	163	8833	4190	1404		:				YES
D212	SHOP/1	162	8833	3820	1280	1335	1317	1252	1186	15	YES
	FIELD/ 3	162	8778	4160	1389					1	YES
D304	SHOP/ 4	163	8778	4810	1605	1598	1397	1327	1258	-64	YES
	FIELD/ 2	162	8833	4748	1591			· .			YES
D311	SHOP/4	163	8778	4220	1409.5	1408	1335	1269	1202	0	YES
1	FIELD/ 2	163	8833	4200	1407						YES



### TABLE VIII: SUMMARY OF DATA SHEETS SQ 9.0 - TENDON LIFTOFFS

TENDON	END	EFFECT. WIRES	JACK No.	PRESS.	LIFTOFF	AVE. LIFTOFF	BASE VALUE	95% BASE	90% BASE	NORMALIZING FACTOR	ACCEPT
42H18	SHOP/4	163	8778	4690	1565	1476	1495	1420	1346	-56	YES
	FIELD/2	163	8833	4137	1386.5						YES
42H29	SHOP/4	163	8778	4500	1502	1448	1445	1373	1300	-7	YES
	FIELD/2	163	8833	4160	1394						YES
421130	SHOP/4	163	8778	4355	1454	1389	1469	1396	1322	-32	NO
	FIELD/2	163	8833	3950	1324						NO
42H31	SHOP/4	163	8778	4100	1369	1338	1460	1387	1314	-21	NO
	FIELD/2	163	8833	3900	1307						NO
421132	SHOP/4	163	8778	4320	1442	1355.5	1452	1380	1307	-15	NO
	FIELD/2	163	8833	3785	1269						NO
421133	SHOP/4	163	8778	4490	1499	1361	1474	1400	1326	-35	NO
	FIELD/2	163	8833	3650 <sup>°</sup>	1223						NO
42H34	SHOP/4	163	8778	4240	1415	1377.5	1452	1380	1307		NO
	FIELD/2	163	8833	4000	1340						NO

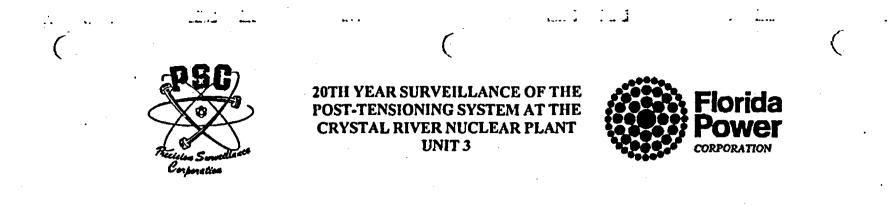


20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



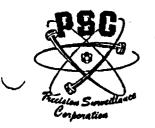
#### TABLE VIII: SUMMARY OF DATA SHEETS SQ 9.0 - TENDON LIFTOFFS

TENDON	END	EFFECT. WIRES	JACK No.	PRESS.	LIFTOFF	AVE. LIFTOFF	BASE VALUE	95% BASE	90% BASE	NORMALIZING FACTOR	АССЕРТ
421135	SHOP/4	163	8778	4110	1372	1296.5	1455	1382	1309	-17	NO
	FIELD/2	163	8833	3693	1221						NO
421136	SHOP/4	163	8778	4490	1499	1408	1503	1428	1353	-65	NO
	FIELD/2	163	8833	3930	1317						NO
42H37	SHOP/4	163	8778	4310	1439	1401.5	1452	1379	1306	-14	YES
	FIELD/2	163	8833	4070	1364						YES
421144	SHOP/4	163	8778	4510	1505	1471.5	1427	1356	1285	10	YES
	FIELD/2	163	8833	4291	1438						YES
511125	SHOP/ 1	163	8833	4090	1370.5	1363	1401	1331	1261	38	YES
	FIELD/5	163	8778	4060	1355.5						YES
511126	SHOP/1	163	8833	4190	1403.5	1320	1514	1438	1363	-75	NO
•	FIELD/ 5	163	8778	3705	1237						NO
511127	SHOP/ 1	163	8833	3787	1269	1265.5	1368	1300	1231	71	NO
	FIELD/ 5	163	8778	3780	1262						NO



#### TABLE VIII: SUMMARY OF DATA SHEETS SQ 9.0 - TENDON LIFTOFFS

TENDON	END	EFFECT. WIRES	JACK No.	PRESS.	LIFTOFF	AVE. LIFTOFF	BASE VALUE	95% BASE	90% BASE	NORMALIZING FACTOR	ACCEPT
511128	SHOP/ 1	163	8833	4445	1489.5	1450.5	1518	1442	1367	80	YES
	FIELD/ 5	163	8778	4230	1412						YES
53H2	SHOP/ 5	163	9501	4400	1624	1611	1424	1353	1281	12	YES
	FIELD/3	163	9501	4330	1598						YES
53H46	SHOP/ 5	163	8833	4340	1454	1459.5	1472	1399	1325	-35	YES
	FIELD/ 3	163	8778	4390	1465						YES
62H41	SHOP/2	163	8778	4230	1412	1426	1422	1351	1280	16	YES
	FIELD/6	163	8833	4297.5	1440						YES
62H46	SHOP/2	163	8778	4280	1429	1485	1465	1392	1318	-27	YES
	FIELD/6	163	8833	4600	1541						YES



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### VI. WIRE INSPECTION AND TESTING

One wire was scheduled for removal from each detensioned tendon for visual inspection and tensile testing. PSC Procedure SQ 10.3 outlines the details involved with the wire testing and the data was recorded on Data Sheets SQ 10.2 and SQ 10.3 with the results summarized in Table X.

All wire diameters were within the acceptance criteria of  $0.27559 \pm 0.002^{\circ}$ . The corrosion condition of all samples was level 1 - "bright metal; no visible oxidation" and the Ultimate Strength exceeded the minimum strength criteria of 240,000 psi (240 ksi) for all wire samples tested.

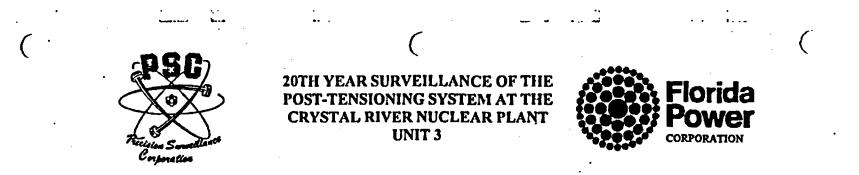
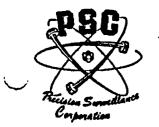


TABLE X: SUMMARY OF DATA SHEETS SQ 10.2 & 10.3 - VISUAL INSPECTION AND TENSILE TESTING OF WIRE

TENDON	SAMPLE No.	CORROSION LEVEL	SAMPLE LOCATION (FT)	DIAMETER (IN)	YIELD STRENGTH (PSI)	ULTIMATE STRENGTH (PSI)	ACCEPTABLE
61V21	· 1 ·	1	20 - 29	0.275	210,770	249,197	YES
	2	1	90 - 99	0.275	210,251	251,793	YES
	3	1	170 - 179	0.275	209,212	242,966	YES
D304	1	1	20 - 29	0.2755	213,614	244,138	YES
	2	. 1 .	60 - 69	· 0.2755	213,614	241,552	YES
	3	1	100 - 109	0.2755	217,236	250,864	YES
421135	1	1	20 - 29	0.276	210,286	241,219	YES
	2	1	70 - 79	0.276	210,802	246,375	YES
	3	1	140 - 149	0.276	212,864	253,077	YES
51H26	1	1	10 - 19	0.2745	210,512	254,293	YES
	2	1	70 - 79	0.2745	209,990	248,560	YES
	3	I	140 - 149	0.2745	216,766	243,869	YES
51H26	1A _	1	10 - 19	0.2745	215,202	250,645	YES
	2A	I	70 - 79	0.2745	214,160	253,251	YES
	3A	1	146 - 155	0.2745	220,415	257,942	YES
621141	1	1	20 - 29	0.2755	211,545	247,760	YES
	2	1	70 - 79	0.2755	213,614	245,173	YES
	3	1	140 - 149	0.2755	214,390	241,552	YES



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### VII. TENDON RETENSIONING AND RESEALING

Those scheduled tendons that had previously been detensioned for wire removal, (61V21, D304 and 62H41) along with additional detensioned tendons 42H35 and 51H26 were retensioned per PSC Procedure SQ 11.0 (Volume 2, Section 9, Appendix F). The results of the retensioning process were recorded on Data Sheets SQ 11.0 and the results are summarized in Table XI.

All new elongations were compared to original elongations and found to be acceptable (within  $\pm$  10%) except tendon 51H26 whose elongation was -11.6%, NCR No. FN604-009 was raised to record this. All tendons were locked off at forces greater than those initially found or above base value whichever was higher, and all liftoffs were within -0% +6%.

After completion of all inspections, the anchorage components were hand coated with cold grease to ensure complete coverage, the cans were reinstalled with new gaskets, torqued to the required value, and the necessary amount of sheathing filler (grease) was added. In all cases, the same amount or more grease was added than removed. Results of the grease replacement were recorded on Data Sheets SQ 12.1 and are summarized in Table XII.

A greater amount than 5% of the duct volume was added to dome tendons D212 (12.12%), D304(18.3%), D311(19.1%) and horizontal tendons42H30(6.58%) and 42H34(5.53%). NCR's FN604-018, 019, 020, and 021 were written to record this. All other tendons took an amount less than 5% of the tendon duct volume.

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20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



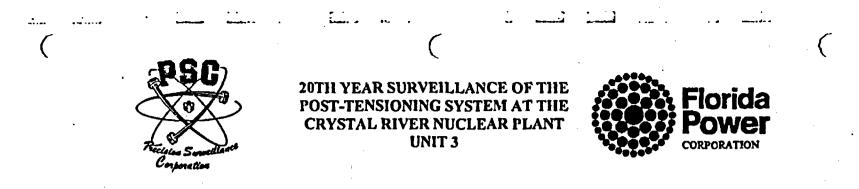
# TABLE XI:SUMMARY OF DATA SHEETS SQ 11.0TENDON RETENSIONING

TENDON	END		GINAL GATION	_	RVED GATION	% VARI.	ACCEPT	LIFTOFF BEFORE	RE	TENSION	ING	% VARI.	ACCEPT
		EACH	TOTAL	ЕЛСН	TOTAL		Í	RETEN.	JACK	PRESS.	L/OFF		
61V21	SHOP		12.125		11.3	-6.80	YES	1525	8833	4740	1588	+4.13	YES
D304	SHOP	_	8.125	3.55	7.95	-2.15	YES	1605	8778	4860	1622	+1.06	YES
	FIELD		— .	4.40				1591	8833	4837.5	1621	+1.89	YES
62H41	SHOP	· _	10.25	4.75	9.40	-8.29	YES	1412	8778	4460	1489	+5.45	YES
	FIELD		—	4.65				1440	8833	4380	1468	+1.94	YES

TENDONS RETENSIONED AFTER WIRE REMOVAL

TENDON	END		GINAL GATION	OBSE ELONC	RVED SATION	% VARI.	ACCEPT	BASE	1	RETENSI	ONING	}	% VARI.	ACCEPT
		EACH	TOTAL	EACH	TOTAL			VALUE	JACK	PRESS.	L/OFF	AVE.		
421135	SHOP		10.25	4.80	9.80	-4.40	YES	1455	8778	4597	1534	1539	+5.77	YES
	FIELD		_	<b>5.0</b> 0	—			_	8833	4610	1545	_		
511126	SHOP		10.75	4.70	9.50	-11.6	NO *	1514	8833	4703	1576	1589	+4.59	YES
	FIELD		—	4.80	—		—	_	8778	4800	1602	—	_	

\* SEE NCR No. FN604-009



#### TABLE XI: SUMMARY OF DATA SHEETS SQ 11.0 - TENDON RETENSIONING

TENDON	END	LIFTOFF I	BEFORE RETE	NSIONING	AVERAGE	BASE	1	RETENSIONI	NG OV	AVERAGE	% ABOVE	ACCEPT
		ЈАСК	PRESSURE	LIFTOFF	LIFTOFF	VALUE	ЈЛСК	PRESSURE	LIFTOFF	LIFTOFF	BASE	
421129	SHOP	8778	4500	1502	1448	1445	8778	4500	1502	1493	+3.32	YES
	FIELD	8833	4160	1394	·		8833	4430	1484.5	·		
421130	SHOP	8778	4355	1454	1389	1469	8778	4560	1522	1520	+3.47	YES
	FIELD	8833	3950	1324			8833	4530	1518	<u> </u>		
42II31	SHOP	8778	4100	1369	1338	1460	8778	4605	1537	1547.5	+5.99	YES
	FIELD	8833	3900	1307			8833	4650	1558			
421132	SHOP	8778	4320	1442	1355.5	1452	8778	4540	1515	1506.5	+3.75	YES
	FIELD	8833	3785	1269		·	8833	4470	1498			
42H33	SHOP	8778	4490	1499	1361	1474	8778	4490	1499	1513.5	+2.68	YES
	FIELD	8833	3650	1223		·	8833	4560	1528			
421134	SHOP	8778	4240	1415	1377.5	1452	8778	4520	1509	1512.5	+4.17	YES
	FIELD	8833	4000	1340			8833	4525	1516			
421136	SHOP	8778	4490	1499	1408	1503	8778	4700	1569	1572	+4.59	YES
	FIELD	8833	3930	1317			8833	4700	1575	. ——		
421137	SHOP	8778	4310	1439	1401.5	1452	8778	4570	1525	1521.5	+4.79	YES
	FIELD	8833	4070	1364			8833	4530	1518			

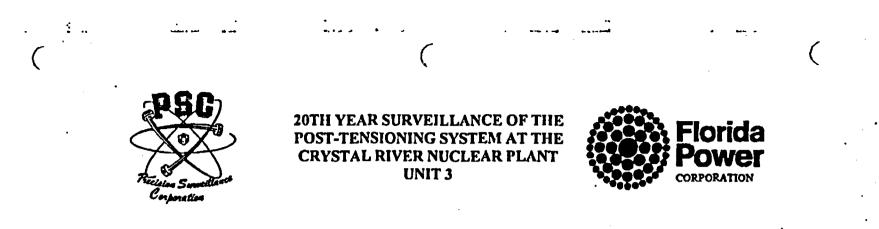


TABLE XI: SUMMARY OF DATA SHEETS SQ 11.0 - TENDON RETENSIONING

TENDON	END	LIFTOFF	<b>BEFORE RETE</b>	NSIONING	AVERAGE	BASE		RETENSIONI	NG	AVERAGE	% ABOVE	АССЕРТ
		JACK	PRESSURE	LIFTOFF	LIFTOFF	VALUE	JACK	PRESSURE	LIFTOFF	LIFTOFF	BASE	
511125	SHOP	8833	4090	1370.5	1363	1401	8833	4250	1425	1442	+2.93	YES
	FIELD	8778	4060	1355.5		<u></u>	8778	4370	1459			
511127	SHOP	8833	3787	1269	1265.5	1368	8833	4145	1389	1399	+2.27	YES
	FIELD	8778	3780	1262			8778	4220	1409			
51H28	SHOP	8833	4445	1489.5	1450.5	1518	8833	4645	1557	1563	+2.96	YES
	FIELD	8778	4230	1412			8778	4700	1569		· · · ·	



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE XII: SUMMARY OF DATA SHEETS SQ 12.1 GREASE LOSS Vs GREASE REPLACEMENT

	TENDON	GREA	SE REM	OVED	GREA	SE REPL	ACED	DIFF.	NET	%
3		SHOP	FIELD	TOTAL (GAL.)	SHOP	FIELD	TOTAL (GAL.)	(GAL.)	VOLUME	
	12V1	2.00	36.75	38.75	40.75	0.75	41.50	+2.75	143.46	1.91
i	23V2	0.75	9.75	10.50	11.50	0.00	11.50	+1.00	142.52	0.70
•	61V21	0.75	88.50	89.25	20.25	72.50	92.75	+3.50	144.03	2.43
	43V04	0.50	0.00	0.50	7.50	0.00	7.50	+7.00	N/A	N/A
	D113	4.50	4.00	8.50	6.20	3.50	9.70	+1.20	115.11	1.04
	-D115	4.50	4.50	9.00	7.00	4.00	11.00	+2.00	117.17	1.71
:	D212	6.50	4.00	10.50	20.00	4.50	24.50	+14.00	115.55	12.12 +
	D304	12.00	7.25	19.25	38.20	0.00	38.20	+18.95	103.68	18.30+
÷	D311	24.00	4.00	28.00	46.50	3.50	50.00	+22.00	115.12	19.10 •

• SEE NCR No. FN604-018, 019, 020

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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### TABLE XII: SUMMARY OF DATA SHEETS SQ 12.1 GREASE LOSS Vs GREASE REPLACEMENT

·	TENDON	GREA	SE REMO	OVED	GREA	SE REPL	ACED	DIFF.	NET	%
		SHOP	FIELD	TOTAL (GAL.)	SHOP	FIELD	TOTAL (GAL.)	(GAL.)	VOLUME	
	42H18	3.75	2.00	5.75	5.25	5.25	10.50	+4.75	121.40	3.91
*	42H29	3.50	3.25	6.75	5.25	6.25	11.50	+4.75	121.48	3.91
	42H30	3.00	3.00	6.00	7.00	7.00	14.00	+8.00	121.59	6.58 +
- 4	42H31	2.50	3.00	5.50	5.25	5.75	11.00	+5.50	121.84	4.51
}	42H32	3.75	2.50	6.25	6.25	4.75	11.00	+4.75	121.36	3.90
	42H33	3.00	3.00	6.00	6.25	4.75	11.00	+5.00	120.38	4.15
	42H34	3.00	3.00	6.00	6.50	6.25	12.75	+6.75	121.99	5.53 +
•	42H35	3.25	4.50	7.75	4.90	5.30	10.20	+2.45	121.27	2.02
	<b>42H36</b>	4.00	4.00	8.00	4.00	5.75	9.75	+1.75	121.62	1.44
•	42H37	4.50	4.50	9.00	6.20	5.00	11.20	+2.20	120.44	1.83
•	42H44	4.75	3.50	8.25	5.30	4.90	10.20	+1.95	121.08	1.61
• •	51H25 *	3.50	3.50	7.00	8.00	4.50	12.50	+5.50	120.73	4.56
i.i	51H25 **	3.00	4.00	7.00	4.50	4.00	8.50	+1.50	120.73	1.24
	51H26	4.50	3.75	8.25	5.25	4.50	9.75	+1.50	121.43	1.24
	51H27	3.50	3.25	6.75	5.30	5.70	11.00	+4.25	121.60	3.50
	51H28 *	3.50	4.00	7.50	4.50	4.75	9.25	+1.75	120.46	1.45
. 1	51H28 **	4.00	4.00	8.00	4.50	4.00	8.50	+0.50	120.46	0.42
	53H2	4.50	4.00	8.50	5.75	6.25	12.00	+3.50	121.32	2.88
	53H46	3.25	3.50	6.75	6.00	5.25	11.25	+5.25	121.60	4.32
••	62H41	4.00	4.00	8.00	7.10	5.30	12.40	+4.40	·121.37	3.63
	62H46	3.50	4.50	8.00	6.25	6.50	12.75	+4.75	121.11	3.92
1	51H41	N/A	3.50	3.50	N/A	4.00	4.00	+0.50	N/A	N/A

GREASED 11/18/97

◆ SEE NCR No. FN604-021



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3



#### VIII. COMPARISON WITH ORIGINAL INSTALLATION DATA

A comparison of the liftoff forces from this surveillance to the original installation lock-off forces is made in an effort to detect any evidence of system degradation. The lock-off forces are compared in order to detect any abnormal force loss which would possibly indicate an underestimation of the creep, shrinkage and/or elastic shortening effects in the Containment Building.

Three tendons were excluded from the results due to inconsistencies. Tendons 23V2 and 53H2 both reported higher liftoffs now than at installation. Both of the original reported liftoffs appear to be lower than the group average at installation, the horizontal by almost 5%, which could indicate an error in recording the original result. Tendon D304 lost only 12 kips from the original recorded liftoff. In no case were any conditions found that would indicate problems with the wire condition or forces found. These results are not considered detrimental to the structure.

Due to these results being inconsistent with the rest of the results they have been omitted from the group averages. The losses for the tendon groups were found to be 9.08% for the vertical tendons, 11.72% for the horizontal tendons and 16.63% for the dome tendons. Despite two of the horizontal tendons being below the expected base value at liftoff (subsequently retensioned to base -0% + 6%) these losses are as expected for a containment of this age and do not indicate any degradation of the system.

The following three pages show the graphs of the normalized average liftoffs taken from page 39 for each of the tendon groups. These trend graphs allow a high degree of confidence that the liftoff values will remain above the minimum requirement throughout the next surveillance.



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#### 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3

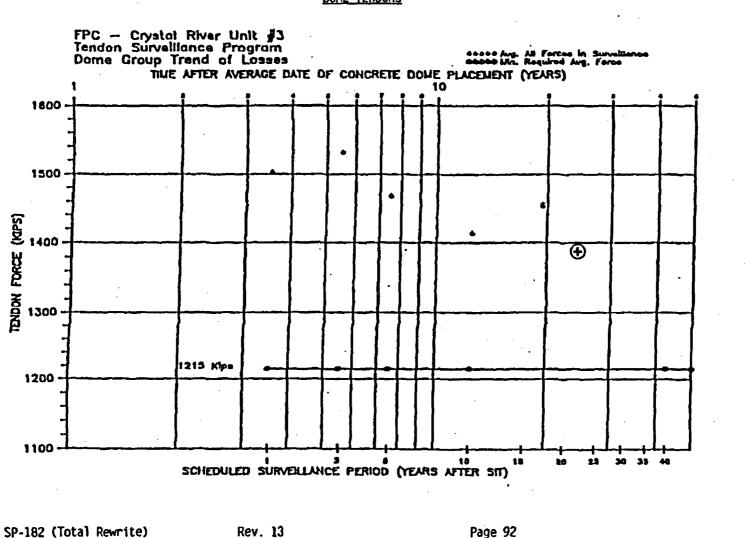


#### TABLE XIII: COMPARISON OF ORIGINAL LOCKOFF FORCES TO AS FOUND FORCES

TENDON	LIFTOF	F FORCE	LOSS	PERCENTAGE	AVERAGE
	ORIGINAL	@ 20 YEARS	(kips)	%	PERCENTAGE
12V1	1675	1471	204	12.18	
23V2	1598	1609	+11 *		9.08
61V21	1622	1525	97	5.98	
D113	1676	1427	249	14.86	
D115	1700	1380	320	18.82	
D212	1600	1335	265	16.56	16.63
D304	1610	1598	12 *		
D311	1682	1408	274	1629	
42H18	1664	1476	188	11.30	
421132	1626	1356 **	270	16.61	1
42H44	1605	1472	133	8.29	
51H26	1661	1320 **	341	20.53	11.72
53H2	1555	1611	+56 *		
53H46	1628	1560	68	4.18	]
62H41	1609	1426	183	11.37	
62H46	1645	1485	160	9.73	]

• REMOVED FROM THE AVERAGES DUE TO INCONSISTENCIES.

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#### TENDON HISTORICAL TRENDS DOME\_TENDONS

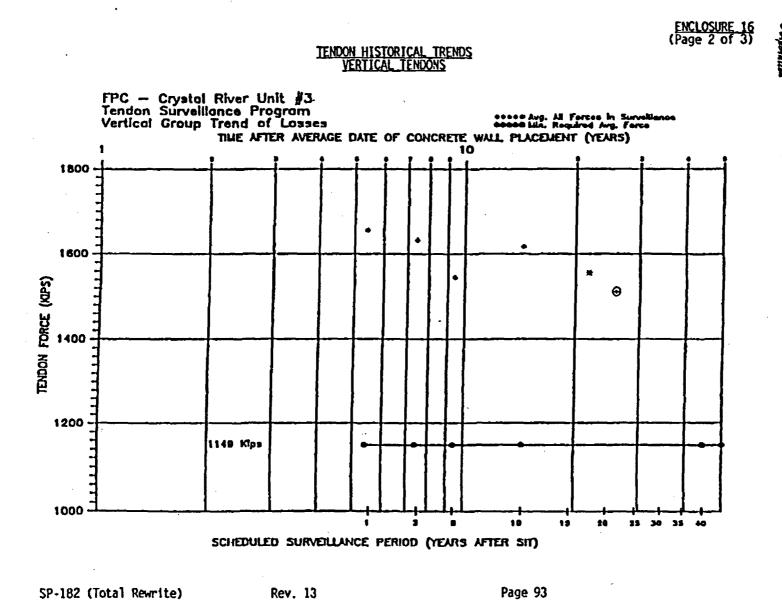
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ENCLOSURE 16 (Page 1 of 3)

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> 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3

Florida Power CORPORATION



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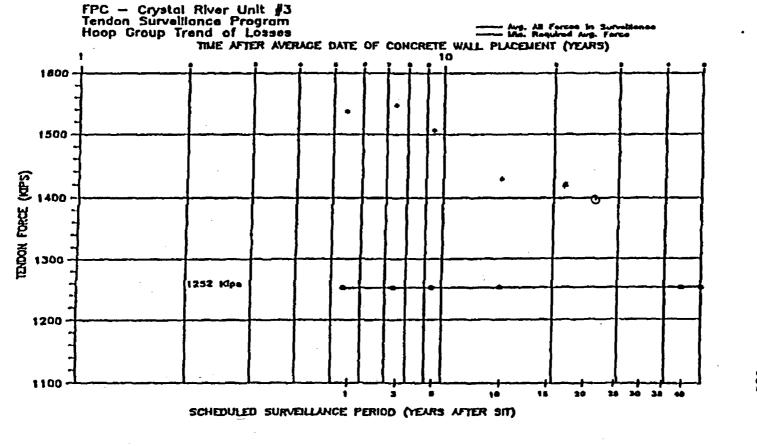
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# 20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT UNIT 3

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TENDON HISTORICAL TRENDS HOOP TENDONS

SP-182 (Total Rewrite)

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Page 94 (LAST PAGE)

20TH YEAR SURVEILLANCE OF THE POST-TENSIONING SYSTEM AT THE CRYSTAL RIVER NUCLEAR PLANT

UNIT 3

CORPORATION

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### INTEROFFICE CORRESPONDENCE

A-C-XMTL.FRM **Nuclear Engineering** 

NT6D

MAC

240-1511 Telephone

SUBJECT: Crystal River Unit 3

Quality Records Transmittal - Analysis/Calculation

**TO: Records Management - NR2A** 

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO IFPC DOCUMENT IDENTIFICATION NUMBERS	rev.	systemisi	TOTAL PAGES TRANSMITTED
\$ 95-0082	3	MX	68
TITLE			· · · · · · · · · · · · · · · · · · ·

Office

#### 6th Tendon Surveillance - Generation of Tendon Force Curves

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	• •	
VENDOR DOCUMENT	NUMBER (DXREF)	SUPERSEDED DOCUMENTS (DXREF)
	TAG	
	·	
	PART NO.	
	· · · · · · · · · · · · · · · · · · ·	
	VENDOR DOCUMENT	E FIRST) VENDOR DOCUMENT NUMBOR (DXREF) N/A

Revision by FPC to Parsons Power calculation (using FPC format).

#### NOTE:

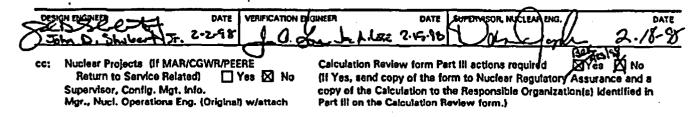
Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99), otherwise; use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

\*\*FOR RECORDS MANAGEMENT USE ONLY \*\*

Quality Record Transmittal received and Information entered into SEEK.

Entered by: Date

(Return copy of Quality Docment Transmittal to NOE Supprt Specialist.)



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# ANALYSIS/CALCULATION SUMMARY

DISCIPLINE CONTROL NO. REVISION LEVEL DOCUMENT IDENTIFICATION NUMBER S 95-0082 3 CLASSIFICATION ICHECK ONE TITLE Safety Related Non Safety Related MAR/SP/CGWR/PEERE NUMBER 6th Tendon Surveillance - Generation of Tendon Force Curves N/A VENDOR DOCUMENT NUMBER N/A PRINTED APPROVAL SIGNATURES NAME **Design Engineer** *SLL*S John D. Shubert, Jr. 2-2-98 Date A. Lozé Verification Engineer ¥. Ð Date 2.16.90 Dan Jopling Supervisor Date 'EMS REVISED (see "Revision Description Sheet" for revision 3) PURPOSE SUMMARY Determine Tendon Force losses and prepare Tendon Force Curves for additional Tendons required for the 6th Surveillance Inspection. The data for the following Tendon's is added by Revision 3: D111, D302, D306, 42H29, 42H30, 42H34, 42H35, 42H36, 42H37, 51H28, 51H29, 62H39, 62H43 and 62H44. RESULTS SUMMARY Additional Force Curves are plotted and attached.



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Page 1 of 2

			10901012				
CALCULATION NO JAE	v. S 95-0082 Re	vision 3					
PART I	DESIGN ASSUMPTION	INPUT REVIEW	APPLICABLE I Yes X No				
	The following organizations have reviewed and concur with the design assumptions and inputs identified for this calculation:						
	Nuclear Plant Technica	I Support	N/A				
	System Engr		Signetwar/Date				
	Nuclear Plant Operation	nş	N/ASignature/Date				
	•						
			ognaterose				
			_ <u>N/A</u>				
PART II -	RESULTS REVIEW: A		d and concur with the results of this calculation and				
			ations must take to implement the results.				
	Nuclear Plant Technica	al Support	N/A				
/	System Engr		Signeture/Date				
)							
	Nuclear Plant Operatio	ns	N/A				
			Signatura/Data				
	Nuclear Plant Mainten		N/A Sunstandurte				
,	Yes	⊠ N/A .					
	Nuclear Licensed Oper		N/A Bignatrure/Onte				
	L Yes	🖾 N/A					
		, <b>O</b> , <b>!</b>					
	Manager, Site Nucleer		N/A				
	Sr. Radiation Protection	n Engineer	N/A				
			Signature/Date				
	Nuclear Plant EOP Gro	·	••••				
	Yes	🛛 N/A	N/A Signeture/Dite				
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### **CALCULATION REVIEW**

Page 2 of 2

Florida Power

CALCULATION NO REV.

S 95-0082 Revision 3

#### PART III - CONFIGURATION CONTROL: APPLICABLE 🔲 Yes 🖾 No

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document	Date Regulred	Responsible Organization
	·	
		••••••••••••••••••••••••••••••••••••••
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Upon completion, forward a copy to the Manager, Nuclear Regulatory Assurance Group for tracking of actions if any items are identified in Part III. If calculations are listed, a copy shall be sent to the original file and the calculation log updated to reflect this impact.

#### PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorizations must be listed below and issued concurrently with the calculation.

Yes 🔯 No	สุรภ	Vendor Qualification Packa	re 🗋 Yes 🖾 No 🔽	<u>א</u>
Yes 🛛 No	(Letter#)	Topical Design Basis Doc.		n
Yes 🗹 No	(Lotter#)	E/SOPM	Yes No TC	n
Yes 🛛 No	(Latter#)	Other Documents reviewed	:	
	······································		Yes 🛄 No	
🗋 Yes 🖾 No	ncn		Yes No	(CHANGE DOC. REFERENCE)
🗌 Yes 🖾 No	πεη		Yes No	(CHANGE DOC, AFFERENCE)
🗋 Yee 🔀 No	<u>псл</u>		_[] Yes [] No	CHANGE DOC. REFERENCE
🗋 Yes 🖾 No	ncn	<u></u>	Yes 🛄 No	CHANGE DUC. REFERENCE
t 🔲 Yes 🖾 No	สตภ		Yes No	(CHANGE DOC. REFERENCE)
				rough the NEP 213
☐ Yes	No No	Ň/A		
		PRC Chairman	n	/Date
		N/A	Ç	· .
		DNPO		/Date
nos-1		DESIGN ENGINEER - PRINTED N	AME	
e v to	6-6-10	John D. Shubert, J	r.	
	Yes      No     Yes      No	Yes ⊠ No       Lattern         Yes ⊠ No       Lattern         Yes ⊠ No       Lattern         Yes ⊠ No       COPn         Yes ⊠ No       fcn         Yes<⊠ No	☐ Yes ⊠ No       Letter\$)       Topical Design Basis Doc.         ☐ Yes ⊠ No       Letter\$)       E/SQPM         ☐ Yes ⊠ No       Letter\$)       Other Documents reviewed         ☐ Yes ⊠ No       fCDP\$)	Yes       No       Senter#       Topical Design Basis Doc.       Yes       Yes       No       ftdddddddddddddddddddddddddddddddddd



# **CALCULATION VERIFICATION REPORT**

Crystal River Unit 3

Page 1 of 1

CALCULATION	~~~~		S 95-0082 Revision 3					
Bth Tendon Surveillance - Generation of Tendon Force Curves								
YES	NO	N/A						
1.			Are inputs, including codes, standards, regulatory requirements, procedures, data, and					
• 、			Engineering methodology correctly selected and applied?					
2. 🔲		X	Have assumptions been Identified? Are they reasonable and justified? (See NEP 101, V.c,					
			for discussion on references).					
з. 🔀			Are references properly identified, correct, and complete? (See NEP 101, V.c., for					
•			discussion on assumptions and justification.)					
4. 🕅			Have applicable construction and operating experiences been considered?					
5. 🗙			Was an appropriate Design Analysis/Calculation method used?					
6. 🔲		X	In cases where computer software was used, has the program been verified or reverified in					
			accordance with NEP 135 for safety related design applications and/or are inputs, formulas,					
			and outputs associated with spreadsheets accurate?					
7. 🗖		区	Is the output reasonable compared to inputs?					
8. 🗖		図	Has technical design information provided via letter, REA, IOC or telecon by other					
			disciplines or programs been verified by that discipline or program?					
9. 🗖		X	Has technical design information provided via letter or telecon from an external Engineering					
			Organization or vendor been confirmed and accepted by FPC?					
10. 🔲	X		Do the calculation results indicate a non-conforming condition exists? If "Yes," immediately					
			notify the responsible Supervisor.					
11. 🔲	図		Do the results require a change to other Engineering documents? If "Yes," have these					
			documents been identified for revision on the Calculation Review Form?					

I have performed a verification on the subject calculation package and find the results acceptable.





### **INTEROFFICE CORRESPONDENCE**

Nuclear Engineering

A-C-XMTLERM

NT6D

MAC

240-1511

Telephone

SUBJECT: Crystal River Unit 3

Quality Document Transmittal - Analysis/Calculation

**TO: Records Management - NR2A** 

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO JPC DOCUMENT IDENTIFICATION NUMBERS	<sup>riev.</sup> 2	systemis)	TOTAL PAGES TRANSMITTED
\$ 95-0082		MX	153
τπιτ 6th Tendon Surveillance -	Generation of Tendo	n Force Curves	

Office

KWOS FORMULY REYWORDS FOR LATER RETRIEVAL Tendon, Surveillance	<b>k</b>			
DXREF PAPERENCES OR FILES - UST PROMARY FILE I	(IRST)		,	
VEND (VENDOR NAME) FPC (from Parsons Power)	VENDOR DOCUMENT N	UMBER (DXREF) N/A		SUPERSEDED DOCUMENTS (DXREF)
		TAG		1
		PART NO.		
		-		

Revision by FPC to Parsons Power calculation (using FPC format)

#### NOTE:

Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99), otherwise; use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

DATE VERIFICATION EN 200 DATE NUC Sime Se AR E DATE 9.22.97 7-1547 PATRICK A. MCCARRANER Joh L Z

cc: Nuclear Projects (If MAR/CGWR/PEERE Return to Service Related) Yes X No Supervisor; Config. Mgt. Info. Mgr., Nucl. Operations Eng. (Original) w/attach Calculation Review form Part III actions regulatory Assurance and a copy of the form to Nuclear Regulatory Assurance and a copy of the Calculation to the Responsible Organization(s) Identified in Part III on the Calculation Review form.)





# ANALYSIS/CALCULATION SUMMARY

DOCUMENT IDENTIFICATION	NUMBER	discipline S	CONTROL	. NO. 95-0082	REVISION LEVEL 2
ne 6th Tendon Surv	CLASSIFICATION (CHECK ONE)				
•					MANSPACGWR/PEERE NUMBER
					VENDOR DOCUMENT NUMBER
· · · · · · · · · · · · · · · · · · ·		APPROVAL SIGNATURES			PRINTED NAME
Design Engineer	Der	seent		John	D. Shubert, Jr.
Date	0	9-15-97	2		
Verification Engineer	Patrice	a. Mc Canal	ly	PATRICK	A. McCARRANE
Date		1-72-97			••••••• <u>•</u> •••••••
Supervisor	1 Stall	Japak		D. Jor	2129
Date		9.22-91			ť
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			Page
ATION NO./FI	ev. S 95-0082 Revision	12	
1.	DESIGN ASSUMPTI	ON/INPUT REVIEW	: APPLICABLE I Yes X No
	The following organized and the following organized for this cale		ad and concur with the design assumptions and inputs
	Nuclear Plant Techn	ical Support	8-gneture/Dette
	System Engr		
	Nuclear Plant Opera	tions	Signature/Data
			Signature/Data
			Signatura/Data
-	RESULTS REVIEW:	_	
			ed and concur with the results of this calculation and zations must take to implement the results.
	Nuclear Plant Techn	ical Support	
	System Engr	-	8 igniture/Ditte
	Nuclear Plant Operations		
			Signatum/Oate
	Nuclear Plant Maint	9 <b>79769</b>	•
	Yes	N/A	Signature/Oete
	Nuclear Licensed Op	perator Training	
	Yes	□ N/A	Signatura/Cate
	Manager, Site Nucle	ar Services	
	🗌 Yes	□ N/A	Signatura/Data
	Sr. Radiation Protec	tion Engineer	
	TYes	🔲 N/A	SignMure/Dete
	OTHERS:		
			Signature/Dete
			Semanture Oute



CALCULATION NO JEEV.

### **CALCULATION REVIEW**

Page 2 of 2

#### S 95-0082 Revision 2

#### PART III - CONFIGURATION CONTROL: APPLICABLE 🛛 Yes 🔲 No

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document SP-182	<u>Date Required</u> 11-1-97	<u>Responsible Organization</u> Nuclear Engineering Programs		
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Upon completion, forward a copy to the Manager, Nuclear Regulatory Assurance Group for tracking of actions if any items are identified in Part III. If calculations are listed, a copy shall be sent to the original file and the calculation log updated to reflect this impact.

#### PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorizations must be listed below and issued concurrently with the calculation.

Enhanced Design Basis Document	🗋 Yes 🖾 No	ITĆ <b>I</b> I	Vendor Qualification Packag	a <u>(vo</u>	Pn
FSAR	Yes 🛛 No	gatter#)	Topical Design Basis Doc.	Yes No TC	n
Improved Tech. Specification	🗋 Yes 🔯 No	g.atter#)	e/sopm		n
Improved Tech. Spec. Bases	Yes 🛛 No	flatter#	Other Documents reviewed:		
Config. Mgmt. Info. System	🗋 Yes 🛛 No	(CIOP/I	1	Yes 🛄 No	·
Analysis Basis Document	🔲 Yes 🔀 No	(101)		Yes [No	CHANGE DOC. REFERENCE
Design Basis Document	Yes 🛛 No	(TCI)		Yes 🛄 No	ICHANGE DOC. REFERENCE
Appendix R Fire Study	Yes 🛛 No	(TCI)		 Yes (No	CHANGE DOC. REFERENCE
Fire Hazardous Analysis				Yes 🛄 No	(CHANGE DUC, REFERENCE)
NFPA Code Conformance Document				YesNo	CHANGE DOC. HIPSHENCE
PART V - PLANT REVIEW PRC/DNPO app process.			UMENT SETPOINT CHA s to be physically change		rough the NEP 213
PRC Review Required	Yes	🛛 No	PRC Chairman	i	/Date
DNPO Review Required	Yes	🛛 No	DNPO		/Date
DESIGN ENGINEERIDATE	+1_	9-15-97	DESIGN ENGINEER · PRINTED NA		



# **CALCULATION VERIFICATION REPORT**

Crystal River Unit 3

Page 1 of 1 CALCULATION NUMBER \$ 95-0082 Revision 2 PROJECT/TITLE 6th Tendon Surveillance - Generation of Tendon Force Curves

		YES	NO	N/A	
	1.	X			Are inputs, including codes, standards, regulatory requirements, procedures, data, and
					Engineering methodology correctly selected and applied?
	2.	X			Have assumptions been Identified? Are they reasonable and justified? (See NEP 101, V.c,
					for discussion on references}.
	3.	X			Are references properly identified, correct, and complete? [See NEP 101, V.c., for
					discussion on assumptions and justification.)
	4,	$\square$			Have applicable construction and operating experiences been considered?
	5.	$\boxtimes$			Was an appropriate Design Analysis/Calculation method used?
	6.			X	In cases where computer software was used, has the program been verified or reverified in
					accordance with NEP 135 for safety related design applications and/or are inputs,
					formulas, and outputs associated with spreadsheets accurate?
J	7.	囟			Is the output reasonable compared to inputs?
	8.	$\boxtimes$			Has technical design information provided via letter, REA, IOC or telecon by other
					disciplines or programs been verified by that discipline or program?
	9.	Ø			Has technical design information provided via letter or telecon from an external Engineering
					Organization or vendor been confirmed and accepted by FPC?
	10.		ম		Do the calculation results indicate a non-conforming condition exists? If "Yes,"
					immediately notify the responsible Supervisor.
	11.		$\mathbf{X}$		Do the results require a change to other Engineering documents? If "Yes," have these
					documents been identified for revision on the Calculation Review Form?

I have performed a verification on the subject calculation package and find the results acceptable.

VERIFICATION ENGINEER	DATE SUP	ERVISOR, MUCLEAR ENGINEERING	DATE
Patricka. Mc Canady	9-22-97	Jam Jul	9-22-97



### MAR 19 1907 INTEROFFICE CORRESPONDENCE

Nuclear Engineering Design Office

NAIE MAC

240-3568 Telephono

SUBJECT: Crystal River Unit 3 Quality Document Transmittal - Analysis/Calculation

TO: Records Management - NR2A

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The following analysis/calculation	package is submitted	as the QA Record cop	y:
DOCNO (FPC DOCUMENT IDENTIFICATION NUMBER	) REV.	BYSTEM(S)	TOTAL PAGES TRANSMITTED
S-95-0082	1	MX	
TITLE			139-158 \$
6th Tendon Surveillance -	Generation of Tendon	Force Curves	-1///
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KWDS (DENTIFY KEYWORDS FOR LATER RETRIEVA	<u> </u>		
Tendon Surveillance	•		
DRREF REFERENCES OR FILES - LIST PRIMARY FIL	l Firist)		
SP-182			
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VEND (VENDOR NAME)	VENDOR DOCUMENT NU	ABER (DXAEF)	SUPERSEDED DOCUMENTS (DXPLF)
FPC (from Parsons Power)	N/A	<u></u>	N/A
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ca MAR Office (M MAR Related) I Yes I No Mgr. Nucl. Config. Mgt.		atas Roquired II Yes Irm to Nuclear Licensing		
Mgr., Nucl. Eng. Design	the Responsible Organiz	zation(s) identified in Part 1	on the Calculation	n Review form.)
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	(if yes, Transmi	t w/attach)		



Florida

# ANALYSIS/CALCULATION SUMMARY

DOCUMENT IDENTIFICAT	ION NUMBER	DISCIPLINE	TURAL	CONTROL NO.		REVISION LEVEL
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Design Engineer	ign Engineer Rusha Cha		HEE Proce	l of T	Als Berkhor	for POTHIED LAT
Date	1/20	197	of CHARL	ez.		
Verification Engineer	Patric 2 a.Y	No Canala				
Date/Method*	2/5/	97 R	·		<u> </u>	
Supervisor	Samir J.	Serhan				
Date	10 Feb.	97				
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Pev. 6/95

PARSONS POWER GROUP INC. a tembination of Gilbert Commonwealth and Parsons Main

2475 Librantown Road • Reading: P4 19607 • (610) 835-2000 • Fex. (610) 855-2001

February 11, 1997

FCS-14771 Contract N00821AD, WA048

Mr. W. W. Nisula Contract Manager Florida Power Corporation (NA1B) 15760 West Power Line Street Crystal River, FL 34428-6708

Attention: Mr. J. Lese

Re: Crystal River Unit 3 6th Tendon Surveillance Force Curve Calculation

Dear Mr. Nisula:

Please find attached calculation S-95-0082 Revision 1, which documents the generation of the tendon force curves to accommodate the proposed inspection date of early March 1997.

Included are disks with related electronic files used in the preparation of the data and force curves.

Should there be any questions please feel free to contact Dr. Samir Serhan at (610) 855-3209.

Very truly yours,

Samir J. Serhan, Ph.D., P.E. Supervising Engineer

Roy W. Adler

Project Manager

RWA/SJS/bmb

PARSONS

Attachment

cc: W. W. Nisula (NA1B)
D. L. Jopling (NA1E)
J. A. Lese (NA1E)
R. E. Vaughn
FPC Records Management (CL Only)
R. W. Adler(2)
P. J. Hamilton
S. J. Serhan

5.15.000°C felision #1 Note LETTER 62



# INTEROFFICE CORRESPONDENCE

Nuclear Engineering Office

NA1E

MAC

240-3568 Telephone

SUBJECT: Crystal River Unit 3 Quality Document Transmittal - Analysis/Calculation

TO: Records Management - NR2A

DONO (FPC DOCUMENT IDENTIFICATION NUMBER)	REV.	SYSTEM(S)	TOTAL PAGES TRANSMITTED
S-95-0082	0	MX	383
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endon Surveillance	~~~		
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1. O. Jan 4.26. 30	Ŋ	A   /	a. (Intured 4/24
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Mgr., Nucl. Eng. Design	the Responsi	+ ./	in Part II on the Calculation Review form.)
(Original) w/attach	A/E		Yes B No

New Contraction	· ·	ATION REVIEW Page 1
ALOULATION NO./REV.	S-95-0082/Revision #0	
PARTI-	DESIGN ASSUMPTION/INPUTREVIEW	
	The following organizations have reviewed identified for this calculation:	and concur with the design assumptions and inputs $1 \leq 1 \leq 1$
	Nuclear Plant Technical Support System Engr	Bignature/Date
	Nuclear Plant Operations OTHERM	Bigneture/Delo
		Gignature/Dela
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PART II -	RESULTS REVIEW	
	The following organizations have reviewed understand the actions which the organiza	and concur with the results of this calculation and tions must take to implement the results.
	Nuclear Plant Technical Support System Engr	
•	Nuclear Plant Operations	Bigneture/Delo
·	Nuclear Plant Maintenance Yes X N/A	8ignatura/Dete
	Nuclear Licensed Operator Training	Signature/Osta
ς	Manager, Site Nuclear Services	- Bignebure/Date
	Sr. Radiation Protection Engineer	Signature/Date
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	is required if a full l be physically chan		valuation is performed.	DNPO approval is required
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ANALYSIS/CALCULATION SUMMARY

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					VENDOR DOCUMENT NUMBER
	PEV	SION DVALS		ITEMS REVISE	
Design Engineer			INITIAL	ISNE	
Dada	4/15/	16			
Verification Engineer	M.Mar				
Date/Method*	4/15	196 R			
Gupervisor		. Sorlan			•
VERIFICATION METHODS:	(R) Design Revie	w; A - Altern		Qualification Testing	
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VERIFICATION METHODS: ESCABLE BELOW IF METHOD OF	(A) Design Revie VERFICATION WAS OTHE	en truvi desion p		- Qualification Testing	TENDON FORCE
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VERFICATION METHODS XESCHERE BELOW & WETHOD OF UNPOSE BUMMARY DETERM CURVES SUPPORT	R Design Revie VERFICATION WAS OTHER UNIC TEXIL INIC TEXIL INIC CALL	SW; A - Altern ER THAN DESIGN P DOAN CULATION ALE	EVEW	E & PRESARE T CSURVERLANCE, SI-182 ENCLOSUR A TTACHED. CAU	ALSO PREPARE
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VERFICATION METHODS XESCHERE BELOW & WETHOD OF UNPOSE BUMMARY DETERM CURVES SUPPORT	R Design Revie VERFICATION WAS OTHER UNIC TEXIL INIC TEXIL INIC CALL	SW; A - Altern ER THAN DESIGN P DOAN CULATION ALE	EVEW	E & PRESARE T CSURVERLANCE, SI-182 ENCLOSUR A TTACHED. CAU	ALSO PREPARE
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Pev. 6/16



**Revision No.:** 

# **DESIGN ANALYSIS/CALCULATION**

Crystal River Unit 3.

Pag	0	1
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REVISION

DOCUMENT IDENTIFICATION NO. S-95-0082

3

#### This page followed by page 1A

Revised Pages	Affected Sections	Add	Replace	Remove	Description/Purpose of Revision
1		X			add "Revision Description Sheet" for revision 3
1V			x		change page number on revision 2 "Revision Description Sheet" from page 1 to page 1A and state that "page 1B follows"
18			x		change page number on revision 1 "Revision Description Sheet" from page 1A to page 1B and state that "page 1C follows"
10		_	x		change page number of Table of Contents from page 1B to page 1C and add item for Revision 3 Description Sheet
_11		-	x		change data input file names to correspond to current names (1.e. DOMER3.XLW, etc) and add note
20			x		change data input file name to correspond to current name (DOMER3.XLW), add data for Tendons D111, D302, D306 and state that "page 20A follows"
20A-20B		_ X			add spreadsheet and curve for Tendon D111
49			X		state that "page 49A follows"
49A-498		X			add spreadsheet and curve for Tendon D302
55			X		state that "page 55A follows"
55A-55B		×			add spreadsheet and curve for Tendon D306
63-64			x		change data input file name to correspond to current name (HOOPER3.XLW) and add data for Tendon: 42H29, 42H30, 42H34 thru 42H37, 51H28, 52H29, 62H39, 62H43 and 62H44
70			X		state that "page 70A follows"
70A-70D		X			add spreadsheets and curves for Tendons 42H29 and 42H30
76			X		state that "page 76A follows"
76A-76H		×			add spreadsheets and curves for Tendons 42H34 thru 42H37
94			X		state that "page 94A follows"
94A-94D		x			add spreadsheets and curves for Tendons 51H28 and 51H29
112			X		state that "page 112A follows"
112A-112B		x			add spreadsheet and curve for Tendon 62H39
118			X		state that "page 118A follows"
118A-118D		X			add spreadsheets and curves for Tendons 62H43 and 62H44
159			X		include "Original Stresses data" for Tendons D111, D302 and D306 and change data input file name to correspond to current name (DOMER3.XLW)
160			x		include "Original Stresses data" for Tendons 42H29 42H30, 42H34 thru 42H37, 51H28, 52H29, 62H39, 62H4 and 62H44 and change data input file name to correspond to current name (HOOPER3.XLW)
B94-B110		X			add Tendon History Sheets for Tendons D111, D302, D306, 421129, 42H30, 42H34 thru 42H37, 51H28, 52H29 62H39, 62H43 and 62H44
K2			X		change data input names to correspond to current names (i.e. DOMER3.XLW, etc) and add note

REVISION TYPE: (check one)

Superseded by Calculation Number \_\_\_\_\_
Full Revision



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#### This page followed by page 18

2 **Revision No.:** The following items have been revised in the current revision: Affected Add Replace Remove Description/Purpose of Revision Revised Pages Sections add "Revision Description Sheet" for revision 2 X 1 change page number on revision 1 "Revision Description Sheet" from page 1 to page 1A and state X 1A that "page 18 follows" change page number of Table of Contents from page 18 X 1A to page 1B and add item for Revision 2 Description Sheet 3 X change start date from Spring 1997 to Fall 1997 8 X change start date from Spring 1997 to Fall 1997 change reference to Enclosure 30 to just state "Original Stressing Data" X 9 change start date from March 1997 to November 1997 X and change numerical values to correspond to 10 November 1997 change data input file names to correspond to current names (i.e. DOMER2.XLW, etc...) 11 X revise the discussion about the interpolation 18 X between data on the spreadsheets 20 X change data input file name to correspond to current name (DOMER2,XLW) revise spreadsheet for November 1997 start date 21 X revise spreadsheets and curves for November 1997 start date 23-61 X change data input file name to correspond to 64 X current name (HOOPER2.XLW) revise spreadsheets and curves for November 1997 start date 65-124 X 126 Y change data input file name to correspond to current name (VERTR2.XLW) revise spreadsheets and curves for November 1997 start date 127-156 X change reference to Enclosure 30 to just state "Original Stressing Data" and Enclosure 29 to just 157 ¥ state "data sheets" change reference to Enclosure 30 to just state "Original Stressing Data" and change data input X 159-161 file names to correspond to current names (i.e. DOMERZ. XLW. etc ... ) change reference to Enclosure 30 to just state "Original Stressing Data" and Enclosure 29 to just X 162 state "data sheets" change data input file names to correspond to K2 X current names (i.e. DOMER2.XLW, etc...)

**REVISION TYPE:** (check one)

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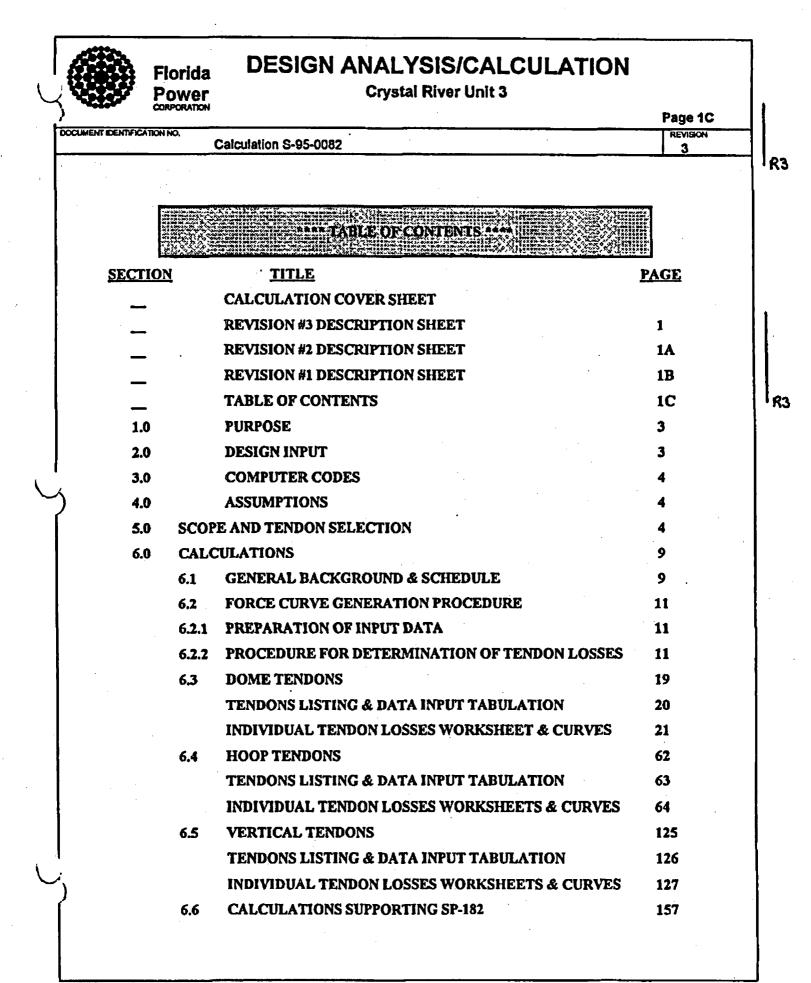
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This form shall be used to record the purpose or reason for the revision, indicate the revision pages and/or affected sections and give a short description of the revision. Check (X) the appropriate function to add. replace or remove the affected pages.

	Revised	Affected	Add	Replace	Remove	Description/Purpose of Revision
	Pages	Sections				÷
	1		x		 	Add revision description sheet.
	LA			x		Change page number from 1 to 1A. Add item for revision description sheet.
5	3		L	x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	10			x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	18			x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	21			x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	23-61			. x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	65-124			x		To change start date for the 6th surveillance inspection from March 1998 to March 1997
	127-156			×		To change start date for the 6th surveillance inspection from March 1993 to March 1997
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## **DESIGN ANALYSIS/CALCULATION**

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DOCUMENT IDENTIFICATION NO. REVISION Calculation S-95-0082 **SECTION** TITLE PAGE 7.0 CONCLUSIONS 162 REFERENCES 162 to 163 8.0 9.0 **ATTACHMENTS DESIGN INPUT FOR 6TH SURVEILLANCE A1 TO A18** A. **TENDON DATA HISTORY SHEETS B**. FOR 6TH SURVEILLANCE B1 TO B92 **TENDON STRESSING SEQUENCES** С. C1 TO C24 **EFFECTIVE WIRE SUMMARIES** D. AND TENDON WIRE DATA D1 TO D10 . E. ELASTIC SHORTENING REFERENCES DATA **E1 TO E9** F. WIRE STRESS RELAXATION REFERENCE DATA **F1 TO F8** G. CONCRETE CREEP REFERENCE DATA **G1 TO G14** Η. **CONCRETE SHRINKAGE REFERENCE DATA** H1 TO H8 I. NORMALIZING FACTOR REFERENCE DATA 11 TO 123 HOOP GROUP PLOT OF TENDONS J. **J1 TO J8** К. **ELECTRONIC FILES INFORMATION & DISKETTES K1 TO K2** 

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## **DESIGN ANALYSIS/CALCULATION**

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Page 3 DOCUMENT IDENTIFICATION NO. REVISION Calculation S-95-0082 2 PURPOSE AND OBJECTIVE File CR3C6TSP.DOC (Word 6.0) The purpose of this calculation is to provide tendon force curves for Florida Power Corporation for the Crystal River Unit 3 facility in support of the upcoming 6th tendon surveillance period scheduled for the Fall of 1997. Specific tasks to be performed as part of this scope include the following: lRZ A.) Determine the predicted tendon losses and develop force/time curves for each of the selected tendons for the upcoming sixth surveillance period. Generate the tendon force curves for the selected tendons, the tendons adjacent to the selected tendons, and alternate tendons. Alternate tendons are tendons not specifically scheduled for this surveillance but force curves are prepared to be available in case a substitute tendon should be required during the surveillance. In addition, force curves for a group of tendons deferred/exempted from the previous surveillance will also be prepared. These are discussed in detail in Section 5.0. B.) In addition to the force curve development, other calculations which are required to support Enclosures included within Surveillance Procedure SP-182 will also be prepared within this same calculation.

## 2.0 DESIGN INPUT

Design input information has been reviewed and is included as Attachment A to this calculation. Note that there are no significant changes to the basic criteria and related documentation which address the licensing of the CR3 plant with respect to the tendon surveillance program. The previous surveillance efforts completed various studies and addressed the CR3 tendon program and its' compliance with U.S. Regulatory Guide 1.35, Revision 3, since it was formally issued in July 1990. Based on FPC licensing efforts and Technical Specification revisions performed at the time of the last surveillance period, as well as recent discussions with the NRC, FPC has now committed the CR3 tendon surveillance program to be performed in accordance with U.S. NRC Regulatory Guide 1.35, Revision 3 (Reference 3).

U.S. Regulatory Guide 1.35.1, Revision 0 (Reference 4) is a daughter document referred to by the above Reg. Guide and deals specifically with the calculation of individual tendon losses and the generation of tendon force curves. While calculation efforts for the CR3 tendon force curves have followed closely with both of these Regulatory Guides as they evolved through the 1970's and 1980's, the format and current procedure for the preparation of the force curves is not in exact compliance with Regulatory Guide 1.35.1 Revision 0 as issued in 1990. The method and approach used in the generation of the CR3 force curves is superior to that of the Reg. Guide in that a specific curve is generated for each individual tendon. Based on the discussions held with the NRC and the results of their review, the method and approach used for these calculations shall be the same as used for previous surveillances. See the Attachment A information for further discussion and references to recent correspondence and documentation with the NRC on various issues related to the tendon surveillance program.

Applicable Technical Specification sections, as well as FSAR sections were also reviewed for this effort. They support the position noted above on the FPC commitment to R.G. 1.35, Rev. 3 and are discussed and referenced within the Attachment A information.



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### 3.0 COMPUTER CODES

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This calculation package is being prepared using Microsoft Word, Version 6.0 and Microsoft Excel, Version 5.0. Spreadsheets from earlier surveillance efforts were prepared using Lotus 123, Release 2.01 and 3.0 and were converted to Excel format for this calculation. All input and calculations are manually checked and verified, therefore, verification of computer programs is not applicable or necessary.

### 4.0 ASSUMPTIONS

Any assumptions made are noted and contained within the calculation package. None require future confirmation.

#### 5.0 SCOPE AND TENDON SELECTION

Tendons were selected for the sixth surveillance period in accordance with the requirements of Reg. Guide 1.35, Revision 3 and using the same methodology as was used in the past surveillance. Basically, a random but representative sample was selected and checked at the site for accessibility. Specific criteria used for this selection process is summarized as follows:

### **Tendon Selection Process**

The tendon selection process has remained the same as that completed for the last several surveillances where a random but representative sample is selected for inspection and testing. The intent is to get as many new and never tested tendons in the sample population, but still keeping one control tendon from each major tendon group to be investigated in each surveillance. Note that this current method differs from methods used during the early life of the plant where some tendons were repeated for inspection every third surveillance. Basically, the selection criteria and process used considers the following:

#### 1.) Select tendons based on Reg. Guide 1.35 Revision 3

Based on the good results of prior surveillances, the Reg. Guide requires a minimum of 11 tendons to be inspected, including 5 hoop, 3 vertical and 3 dome. Tendons should be selected which were never previously inspected or tested. Previously detensioned and retensioned tendons should not be included (unless there is a specific need to investigate the tendon per item 3 below). In addition to being selected at random, tendon selection should be representative of various areas and conditions. For example, the hoop tendons selection was based on random selection but also considered what tendons were inspected in the past and in what hoop area. A plot of previously inspected hoop tendons was prepared to track tendons inspected by grouping (i.e. 13's, 42's, 35's, 46's, 51's, and 62's). Therefore, the selection process considered those sections not equally represented by as many tendons as completed within other sections from prior surveillances. See Attachment J for various plots and information of the hoop group. The same procedure was applied to the dome group (i.e. 100's, 200's & 300's groups) and to the vertical group (i.e. 12's, 23's, 34's, 45's, 56's & 61's & quadrants). See Attachment D for groups information.



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2.) Maintain Control Tendons to be completed each surveillance.

The Reg. Guide also requires a control tendon from each group to be inspected every surveillance for comparative purposes. CR3 has not had control tendons since the first surveillance. The concept was introduced probably in the fourth surveillance. Tendons D212, 12V1 and 51H26 were probably the original control tendons since about the time of the fourth surveillance. They were intended to be inspected during the fifth surveillance but the group of tendons selected was based on the surveillance being performed during an outage. FPC decided to complete the 5th surveillance during normal plant operation and the original tendons selected were affected because many tendons were located within the area of the plant steam vent zone. This included the above three control tendons, and three new control tendons, D215, 34V6 and 46H29 were selected for completion of that surveillance. A problem with 46H29 during the 5th surveillance forced the selection of another control tendon, 46H21, for the hoop group. New control tendons may need to be selected periodically if the tendon has a problem and is ever detensioned and/or retensioned. As earlier surveillances on CR3 did repeat some tendons, the selection of these other control tendons was easily done from several good candidates. New control tendons should be selected from those previously inspected as far back as possible and cannot be one previously detensioned and/or retensioned. A tendon inspected in more than one prior surveillance is preferred. Based on the above, it is recommended that both of the above two sets of control tendons be used by FPC as control tendons, with one set of three to be utilized in the 6th surveillance during a plant outage, and for the other three to be used in any future inspections scheduled to be performed on-line.

- 3.) Consider any tendons with problems or abnormal conditions as reported by plant personnel. Any leaking tendons or tendons with any reported problems should be considered within the scope of the surveillance. Also, past inspection reports and records should be checked for open items, recommendations, or noted problem tendons.
- 4.) In the selection of tendons for detensioning, (one per group is required per R.G.) consider the number of effective wires as recorded in the tendon history sheets and summarized in the effective wire summary in Attachment D to this calculation. As any tendon is to be considered ineffective if it has less than 155 effective wires per the FSAR, it is therefore not desirable to select a tendon with many missing, cut or ineffective wires. Unless there was a specific need to detension that particular tendon, doing so could therefore render the entire tendon as out of service. Only a maximum of 3 tendons are allowed out of service at one time per criteria in the FSAR.
- 5.) The reduced force dome tendons are not normal candidates for normal liftoff testing per SP-182, Enclosure 8.
- 6.) Tendons adjacent to the selected tendon may require testing and should also be feasible to inspect and test. Adjacent tendons in the dome should not include any reduced force dome tendons. Jump to the next regular dome tendon for the required adjacent tendon. Also, adjacent tendons of the lowest hoop tendons (#1) shall be considered as the two directly above the selected tendon. Adjacent tendons of the highest hoop tendons (#47) shall be considered as the two directly below the selected tendon.
- 7.) One alternate tendon should be selected from each group, and the two adjacent tendons of these alternates at least considered for possible inclusion.



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In addition to the above selection criteria, there are several other factors which have influenced the scheduling of actual field inspection and testing. These include:

### A.) Steam Vent Zone -

Plant steam venting can impose a safety hazard to personnel during plant operation and early modes of shutdown. Tendon work in the range between 0 and 120 degrees is affected during plant operation by the potential steam venting of the plant. Tendon work in this area must be held off until the potential hazard is eliminated or other approval is obtained from plant operations. Note that for the fifth surveillance per FPC operations, this even includes the outside tendon caps of the affected butresses at 0 and at 120 degrees.

#### B.) Fuel Pool Area -

Work over the fuel pool can only be performed while missile shields are in place. (Nureg 0612 reqmt.)

#### C.) Plant Interior Work -

Work inside some plant areas is difficult due to access problems, high radiation areas, interferences, ram accessibility, etc.

### Deferred/Exempted Tendons

After the tendons were selected for the fifth surveillance for an outage surveillance, it was decided that the 5th surveillance would be completed during normal plant operation. A group of tendons originally selected for inspection during that surveillance had to be exempted from that surveillance due to their proximity to the main steam vent zone and the associated hazards with working in that area. FPC discussed this issue with the NRC and has documented the following 8 tendons as deferred tendons:



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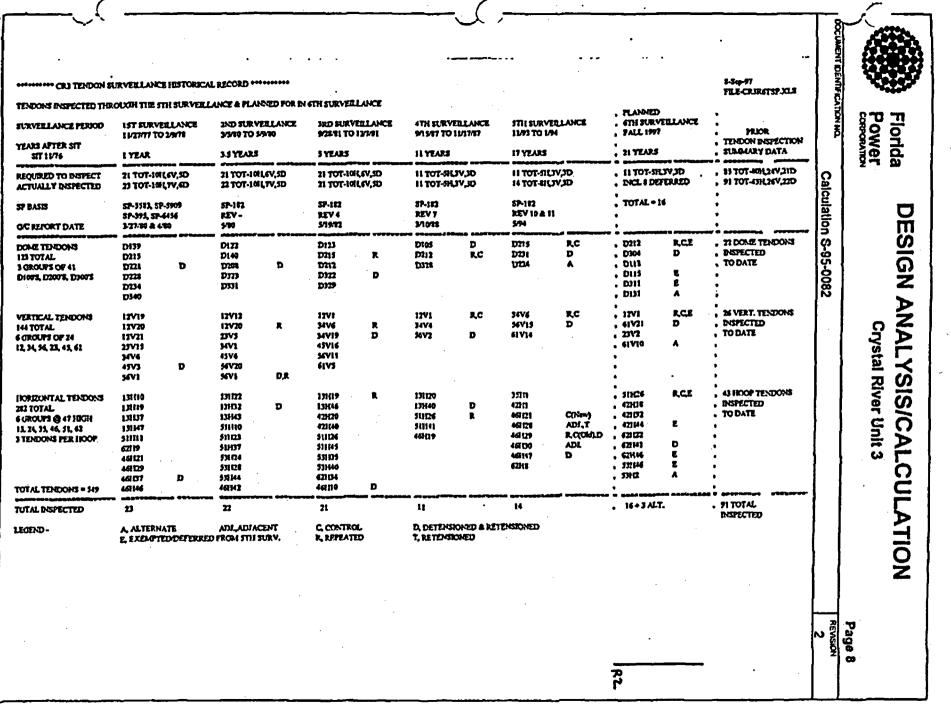
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	EXEMPTED TENDON	COMMENTS		
	D115	Never inspected in any surveillance.		
	D212	Inspected in Surveillance 3 and 4. Considered as Control Tendon for outage condition.		
	D311	Never inspected in any surveillance.		
	12V1	Previously included for liftoff testing in the 3rd and 4th surveillances. Considered as Control Tendon for outage condition.		
-	42H44	Never inspected in any surveillance.		
	51H26 Previously included for liftoff testing in the 3rd and 4th sur Considered as Control Tendon for outage condition.			
┢	53H46	Never inspected in any surveillance.		
┢╴	62H46	Never inspected in any surveillance.		

As FPC has committed to the NRC to address the above tendons within the upcoming 6th surveillance, these tendons were considered in the scope of this calculation. The 6th surveillance is scheduled to be completed during an outage. Since three of the above exempted tendons were also previous control tendons, it was considered that these tendons can again be used as control tendons for this surveillance instead of the 3 control tendons used in last surveillance (when the surveillance was done on-line). Therefore, the three exempted control tendons can be considered as three of the 11 tendons required per Reg. Guide. A total of 16 tendons should be inspected during the surveillance with three additional alternates selected. Note however that the scope of this calculation will include force curves to be regenerated for the other control tendons, D215, 34V6 and 46H21.

A complete historical record of all tendons included in all prior surveillances, along with the list of selected adjacent, exempted and alternate tendons which are planned for in the 6th surveillance is provided on the following Table.





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## 6.0 CALCULATIONS

### 6.1 General Background and Schedule Information

## General Background

Tendon forces curves are to be prepared for the upcoming 6th tendon surveillance period at CR3. From the basic criteria as presented in the Design Input Section, as well as from several discussions with Mr. Joe Lese of Florida Power & Light, it was determined that the criteria for this surveillance period has not changed since the last surveillance efforts. A review of Tech Spec and FSAR criteria confirms the FPC positions with respect to the tendon program. Supporting work for this surveillance period will be based on the same criteria that was used and accepted in the previous surveillance periods.

Tendon losses have been calculated in the past per the Reference 8, 9, 10 and 11 documentation. Individual tendon losses include the following:

- Force loss due to elastic shortening of the containment as a result of the prestressing process and the particular sequence of tendon stressing.
- Force loss due to the stress relaxation of the tendon wires.
- Loss of prestress force due to the creep characteristics of the concrete structure.
- Loss of prestress force due to the shrinkage of the concrete structure.

Based on some earlier calculations made for tendon losses per the Reference 11 document, Lotus spread sheet templates were prepared for tendon losses calculations for the 4th tendon surveillance calculations. See References 9 & 10. These templates were reran and tested for their accuracy and validity for the fifth surveillance. In addition, the procedure for the gathering of all input data was automated in the fifth surveillance to the format presented herein. Numerous test cases were ran to duplicate force curves prepared in the past. There were four master templates prepared for the fourth surveillance; one for the hoop tendons, one for the vertical tendons, and two for the dome tendons. The dome tendons are divided into two groups; one for tendons with an original stressing sequence below 27, and the other for tendons with stressing sequences above 27.

Based on the work previously accomplished in the prior surveillances, new spreadsheets were prepared this surveillance using Microsoft Excel for the collection of input data and for the calculation of tendon losses needed for generation of force curves. The generation of the force curves was also automated this surveillance by using Excel to plot the graphs. The organization of most data used for this calculation was setup into Excel workbooks with subfiles built and included in each workbook. There is a separate workbook for each of the three tendon groups and each one contains the following:

- Tabulated input data
- Original tendon stressing sequences.
- Effective wire summaries.
- "Original Stressing Data" calculations for SP-182.
- Separate files including each tendon loss spreadsheet, plot data and an individual force curve.

Additional information on electronic file names etc. used in this calculation is provided in Attachment K.



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Schedule Information

Procedure, SP-182.

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Page 10 REVISION Calculation S-95-0082 2 The expected timing for the sixth surveillance is Fall 1997. A date of November 1, 1997 will be used as a bases for determining the predicted values of base, 95% base and 90% base and labeling this information on the force curves. This allows for field use and decisions to be made based on the requirements of Surveillance The scales of the force curves are based upon previous surveillance efforts. The x axis is a log scale in time representing the time after average date of dome or wall concrete placement, in years. This scale is labeled at the top of each curve. Force curves are plotted using the actual log scale points for the x axis (not the scheduled surveillance years after SIT) versus the calculated tendon forces in kips on the y axis. The scale at the bottom of the curve for scheduled surveillance periods after SIT are for ease and readability relative to regular scheduled surveillances per Reg. Guide 1.35, Revision 3. Most of the CR3 surveillances were performed on the regularly scheduled years, however, the 5th surveillance was actually performed in the 17th year after SIT. Note that the containment Structural Integrity Test (SIT) was performed in November 1976.

For the dome tendons force curves, the point on the bottom scale at SIT corresponds to the log scale at the top of 2.5 years. Therefore, a corresponding log scale data point must be determined for curve plotting for the period of the 6th surveillance.

Based on a date of November 1, 1997 for the Fall 1997 surveillance, the length of time between November 1976 (@ SIT) and November 1, 1997 is 21 years. Since the dome group at SIT is at year 2.5 on the log scale, the 6th surveillance will correspond to (21.0 + 2.5) or 23.5 years on the log scale.

The same procedure must be performed for the hoop and vertical groups as they have different reference points on the log scale for time after concrete wall placement. Both hoop and vertical groups are the same with SIT corresponding to year 4.4 on the log scale. Therefore, the 6th surveillance period will correspond to  $(21.0 \pm 4.4)$  or 25.4 years on the log scale.

A vertical line will be shown on the force curves at the point of the next surveillance and the calculated values of base, 95% base and 90% base representing points on the curves at that time will be included on each of the CULTYCS.

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### 6.2 General Procedure for Force Curve Generation

The same procedure within the calculation for the preparation of the force curves for the fourth and fifth surveillance periods will be followed.

#### 6.2.1 Preparation of Data Input Spreadsheets

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In each of the Excel workbooks is a data input file where data from source calculations and current tendon history sheets has been tabulated. See DOMER3.XLW (DOMEINP), HOOPR3.XLW (HOOPINP) & VERTR2.XLW (VERTINP).

The compiled books of tendon surveillance historical information, as updated to include the results of the fifth surveillance, provide key input data for the development of force curves. See References 12, 13 & 14. The selected tendon history sheets related to this surveillance have been included herein as Attachment B of this calculation. The Reference 11 calculation is essentially a source calculation for this procedure with the Reference 8 & 10 calculations also providing information.

Notes and references related to the tabulation of the data on these spreadsheets are shown on the individual sheets. The data input tabulations are presented as the first sheet within the following Sections 6.3, 6.4 & 6.5.

#### 6.2.2 Procedure for Determination of Individual Tendon Losses

The procedure for the tendon loss calculations, as derived from the reference documentation, is as follows:

1.) Calculate original force in the tendons

The original force in the tendons is determined as follows:

$$ORIG.FORCE = 0.7 * Fulr * \left[\frac{ActualLiftoff Pressure}{PredictedLiftoff Pressure}\right] \times WireFactor$$

Where:

 $f_{ut} = 240$  Ksi, typical for all CR3 wires.

Wire area = 0.07685 in2 per Appendix F of the Reference 11 calculation.

 $F_{ut}$  (Kip Force)= Tendon Area (in2) x  $f_{ut}$  (Ksi) = 0.05985 \* 240

Tendon Area (in2) = Area/Wire (in2) x No. of Wires. (Considered by wire factor.)

Actual and predicted original liftoff pressures are obtained from Tendon History Sheets References 12, 13, 14, with those within the scope of this calculation attached in Attachment B.

Refer to the Appendix F part of the Reference 11 calculation, for source data of above formula. The above expression was used as the basis for the calculations for all the shop and field end forces calculated on the Data Input Spreadsheets. This procedure does not apply to retensioned tendons.



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Note that the wire factor as shown in the various spreadsheets is a value representing the tabulated number of effective wires over a total of 163. The number of wires is usually 163 unless cut, loose or considered ineffective. The number of effective wires as recorded from the original installation is documented on the tendon history sheets. The number of effective wires for each tendon has been updated, tabulated and presented in the Effective Wires Summary for each individual group within Attachment D. This tabulation was updated to include the results of all previous surveillances. It does not imply each of the tendons was specifically checked for the numbers of effective wires as presented in the table. It represents only data from the original records and as made available from surveillance records and subsequent inspections.

Note that the wire factor used is based on current information and is not based on the number of wires at the time of original installation, therefore the original Force calculated may not be the "original force" in the tendon back at that time. The effect of less effective wires lowers the curve vertically. This is insignificant at the current time as the curve of interest will be correct for use at this time. Another method would have been to plot the original value using the wire factor then and then to show a step down on the curve should a lower wire factor occur at some point later on the graph.

2.) Calculate Elastic Shortening Losses

The elastic shortening losses are a function of the stressing sequence number for the individual tendon. In addition, the tendon wire factors are also considered and used. The base expression used to calculate these forces is the same as used in previous calculations and is already built into the basic spreadsheet templates. All the equations for elastic shortening were confirmed as being the same as established in prior calculations. Based on the review of the procedure for calculating these losses, it is concluded that the existing templates are still appropriate and correct with the additional input of stressing sequence data and wire factors to be input for the current group of tendons for this surveillance.

Reference 10 & Reference 11 data and information on elastic shortening was included in Attachment E to these calculations. See Attachment C for original stressing sequences for all tendons and see the Data Input Worksbeets & Attachment D information for tendon wire factors and source data.

### Elastic Shortening Losses for Dome Tendons

Note there are two expressions used for elastic shortening for the dome tendons depending on the stress sequence numbers. For dome tendons in sequences 1 through 27, the Domelow template is used. For dome tendons in sequences 28 through 32, the Domehigh template is to be used. This is because of the two separate expressions used for the calculation.

### Elastic Shortening Losses-For Dome Tendons in Sequences 1 through 27-

N = 27 Total Sequences n = Sequence of particular tendon.



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Force Loss due to elastic shortening =  $F_{les}$ 

$$F_{\text{tur}} = \left[\frac{N-n}{N} \times 82.7 + 75\right] \times WireFactor$$

Elastic Shortening Losses-For Dome Tendons in Sequences 28 through 32-

N = 5 (Sequences 28 through 32) n =Sequence number less 27

i.e. for sequence 28, n = 1 for sequence 29, n = 2 for sequence 30, n = 3 for sequence 31, n = 4 for sequence 32, n = 5

$$Fles = \left[\frac{N-n}{N} \times 47.4 - 13.7\right] \times WireFactor$$

The value for elastic shortening in kips declines as the stressing sequence increases. A review of the data for the dome group shows that values for the dome group go from 154.6 kips for sequence 1 tendons down to 75 kips for sequence 27 tendons, and further going down to -13.7 kips for the last sequence, sequence 32. Note that wire factor differences between individual tendons will cause the calculated result to vary slightly for two tendons within the same stressing sequence.

Elastic Shortening Losses for Hoop Teadons -

N = 60 Total Sequences n =Sequence of particular tendon.

Force Loss due to elastic shortening =

$$Fles = \left[\frac{(N-n)}{N} \times 134.0\right] \times WireFactor$$

A review of the data for the hoop tendon group shows that the range of values for the calculated elastic shortening go from 127.3 kips for sequence 3 tendons down to 0 kips for the last tendon sequence, sequence 60.



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Elastic Shortening Losses for Vertical Tendons -

N = 31 Total Sequences n = Sequence of particular tendon.

Force Loss due to elastic shortening =

$$Fles = \left[\frac{(N-n)}{N} \times 73.5\right] \times WireFactor$$

A review of the data for the vertical tendon group shows that the range of values calculated for elastic shortening go from 71.1 kips for sequence 1 tendons down to 4.7 kips for sequence 29 tendons. There are a total of 31 stressing sequences for the vertical tendons.

3.) Calculate Wire Stress Relaxation Losses

Wire stress relaxation losses and the procedure for the determination of these losses for the 4th and 5th surveillances are addressed in the Reference 10 and 11 calculations. The original wire relaxation curve, as provided by test data from the wire vendor forms the bases for wire relaxation loss values (See also FSAR Figure 5-23). It was determined that the same procedures and figures as calculated in those prior calculations are still applicable for this surveillance. Applicable data from the reference sources was attached and included within this calculation as Attachment F.

Note that there were adjustments made to the original stress relaxation values from the vendor relaxation curve to allow for some conservatism and for temperature consideration of 100 degrees vs. 68 degrees F. Also, per the original design the wire factor or actual number of effective wires was considered as negligible for these losses and was not included. Note that values for stress relaxation range between 40 and 50 kips for the surveillance period for all three tendon groups.

4.) Calculate Creep Losses

Concrete creep calculations in the Reference 11 document are attached in Attachment G. The losses are based on the curve contained in the reference calculation. Creep values are different for each of the three groups of tendons. For the dome tendons in the coming surveillance period, creep values are the same and are about 152 to 158 kips, hoop values are between 79 and 83 kips, verticals are 36 to 38 kips.

5.) Calculate Shrinkage Losses

Attachment H contains source information for concrete shrinkage from Reference 10, pg. 11 and Reference 11, cover page & Pages 13 & 14. The straight line shrinkage losses in micro inches per inch as calculated in the above two references are still applicable for this surveillance period. Tabulated values from these references were input into the dome, hoop and vertical spreadsheets. There are no additional variables or considerations and the same values are to be used for this calculation. From a review of the output information, the dome values are constant at 8 to 9 kips, hoop values are above 5 kips, verticals are also slightly above 5 kips.



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## **DESIGN ANALYSIS/CALCULATION**

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6.) Total Losses

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Calculated force losses for elastic shortening, wire stress relaxation, creep and shrinkage are added for a total of all losses. Also, a percent of this total of all losses is calculated based on the original average force in the tendon.

7.) Determine Predicted Forces for Base, 95% Base and 90% Base values

The original force less the total of losses calculated yields the base predicted value for the subject period of surveillance inspection. The 95% and 90% values are then calculated based on the calculated predicted base value.

8.) Normalization Factors

Normalization factors are calculated based on the expressions and the source article contained in Attachment I of this calculation. This factor usually does not change much over the forty year time span of the calculation. The base expression for the dome normalization factor value is presented as follows:

$$(A-B) \times (1-C) + (D-97.7)$$

Where:

A = Average of all Domes group

B = Original average tendon force

C = Wire Stress Relaxation Percentage

D = Elastic Shortening

As an example, Dome tendon D112 calculates as follows:

NormalizationFactor =  $(1639 - 1676) \times (1 - 0.0257) + (D - 97.7)$  or

 $NF = (-37) \times (0.9743) + (-101.9)$  or

NF = -138 which matches the spreadsheet calculation.

Similar expressions are shown for the hoop and vertical tendons in the information in Attachment I.



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#### Calculation S-95-0082

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9.) Plotting of Data

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Only the data from Column B, L, M, & N are tabulated on a separate area on the side of the spreadsheet. See Columns R, S, T & U; Rows 40 through 50. Only these values are selected for plotting on the force curves. This is for ease of plotting and has no affect on the quality or accuracy of the plots. An example copy of this data immediately follows the first dome tendon.

The plots of all dome curves with all the data points showed the force curve plot line as slightly crooked from a true linear plot. The large scale used showed some inflection points slightly off of linear. After investigation, the condition was avoided by omitting data points at year 10 and 15 after SIT for the final plotted figures. This was done only for presentation purposes and there is no affect on the accuracy of the plot or the base values calculated and presented on each curve.

A column by column explanation of the losses calculation worksheet follows:



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## **DESIGN ANALYSIS/CALCULATION**

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#### INDIVIDUAL TENDON LOSSES LOSSES CALCULATION WORKSHEET NOTES AND LEGEND

Individual tendon losses are calculated based on the procedure presented in the preceding section. The following notes explain the spreadsheet process, input and calculations performed for each of the columns presented. The shaded values on the losses worksheet are extracted from the data input worksheet.

Column Description

A. Inspection Period after SIT

Scale based on years after SIT which is shown on the bottom scale of each individual plot. Note that this information is provided for easier readability with respect to SIT but is not the actual log scale used to construct the x axis of the plots.

#### B. Years after Concrete Placement

Scale of years after concrete placement as used for the x axis for plotting of the force curves and shown as the upper log scale at the top of each plot. Note that one year after SIT for the dome tendons is 3.5 years on the log scale and for the hoop and vertical tendons is 5.4 years. See Section 6.1 of this calculation for further information.

- C. Elastic Shortening Calculated based on formulas presented in Section 6.2.2 and Attachment E information.
- D. Stress Relaxation Percent Calculated based on original wire loss curve percentages modified per the information presented in Attachment F of this calculation.
- E. Stress Relaxation Forces Data input from the Reference 11 calculation page 12. See Attachment F.
- F. Creep Strain Strain value (x 0.0001Data input from the Reference 11 calculation. See Attachment G of this calculation for data.
- G. Creep Strain Force Data input from the Reference 11 calculation. See Attachment G of this calculation for data.
- H. Shrinkage Values Data input from the Reference 11 calculation based on the shrinkage curve. See Attachment H of this calculation for data.
- 1. Shrinkage Force Data input from the Reference 11 calculation. See Attachment H of this calculation for data.



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# **DESIGN ANALYSIS/CALCULATION**

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DOCUMENT	DENTIFICAT	Calculation S-95-0082	REVISION 2	
	J.	Total Force Loss Calculated value, Sum of columns C, E, G,& I.		
	К.	Total Percent Loss Total loss in percentage, Column J / Average of original forces for shop & field ends calc shown above on the spreadsheet.	ulated and	
	L.	Base The average original force for the tendon noted above on the spreadsheet, less the total loss calculated in Column J. Note that total losses were not calculated on the row for the 17 y the 21 year 3 month period, as well as the 21 year period after SIT. These rows represent the originally planned sixth and the current sixth surveillance periods and the values of B derived through linear interpolation of above and below data presented on the spreadsheet quality and accuracy is not affected by this procedure.	vear period, t the fifth, ase were	RZ
	M.	95% Base 0.95 x Column L for the same row.	•	
)	N.	90% Base 0.90 x Column L for the same row.		
	0.	Normalization Factor - Calculated based on formula presented in this calculation and in the information presente Attachment I.	d in	



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## DESIGN ANALYSIS/CALCULATION

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DOCUME	VT DENTIFICATION NO.	culation S-95-0082	REVISION 0
	Column H & I	Calculated force values in Kips which represent ram pressure @ 1500 psi. The represent a zero slack starting point for both shop and field ends of each tended provide a basis for the start of any retensioning effort. The following expression calculate these values:	n and
		0.7 * Tendon Ultimate Strength * 1500 / Predicted Lift-Off Pressure at 0 Ultimate Strength. See Reference 10 Calculation, page 34.	).7 Tendon
	Column J & K	Calculated force values in Kips which represent forces at 80% ultimate 1 following expression:	pased on the
		(Actual pressure @ 80% ultimate strength (Columns F or G) * 0.7 Tend Strength) / Predicted pressure @ 70% Ultimate Strength.	ion Ultimate
	Column L & M	Actual elongation data, repeated from columns B and C.	
	In addition, the fo	llowing calculations support the ultimate strength values provided on these	spreadsheets:
		nate strength = f <sub>ut</sub> for wire = 240 ksi Strength = F <sub>ut</sub> = [f <sub>ut</sub> for wire * Tendon wire area] = = 240 ksi * (0.05985 * 163 wires) = 2341.3 Kips	
		234).3 = 1638.9 Kips 2341.3 = 1873 Kips	
		· . •	

#### LORIDA POWER CORPORATION • CRYSTAL RIVER UNIT 3 BUL, REACTOR BUILDING PRESTRESSING SYSTEM IN ST 6th TENDON SURVEILLANCE

DOC ID:5-95-0082 REVISION 3 PAGE 159

CALCULATIONS SUPPORTING SP-182 "ORIGINAL STRESSING DATA" FOR THE DOME TENDONS GROUP

l.	Actu	1 1	Predicted L	In-on	\$0% U.	lante		For SP-182 '	<b>Original</b> Str	using Deta"		
Tendos	Elongati	00 (ln.)	Pressure (pst)		Pressure	Pressure (psi)		Row 1 (Kips)		(Kips)	Row 3 (fa.)	
D	Shop	Fleid	Shop	hed	Shop	Pield	Step	Field	Shop	Pield	Shop	Field
()	(8)	ŝ	(D)	(E)	(Ť)	(G)	(1)	0	ψ)	(K)	(L)	(M)
DUI	5	\$	6810	6810	7730	7760	361	361	1872	1872	5	5
D112	4-3/4	5	6800	6840	7770	1790	362	359	1873	1867	4-3/4	5
D113	4-7/8	4-3/4	0086	6840	7770	7790	362	359	1873	1867	4-7/8	4-3/4
D114	5-1/8	4-5/8	6800	6840	7770	7790	362	359	1873	1867	5-1/8	4-5/8
DIIS	5	5	6840	6600	7790	7770	359	362	1867	1873	5	5
D116	4-3/4	5-1/8	6760	6800	7720	7750	364	362	1872	1868	4-3/4	5-1/8
D130	5	3	6870	6810	7810	7780	358	361	1863	1872	5	5
D131	41/2	4-7/8	6710	6740	7660	7700	366	365	1871	1872	4-1/2	4-7/
D132	41/2	4-7/8	6760	6800	7720	7750	364	362	1872	1868	41/2	4-7/8
D211	5-1/4	51/2	6410	6870	7780	7810	361	354	1872	1863	5-1/4	5-1/2
D212	4-5/8	4-7/8	6770	6770	7730	7720	363	363	1871	1869	4-5/8	4-7/1
2020	4-3/4	4-3/4	6340	6800	7790	1770	1.59	362	1867	1873	4-3/4	4-3/4
D214	4-3/4	4-7/8	6670	6740	7600	7680	369	365	1868	1868	4-3/4	4-7/8
D215	41/2	5-1/8	6800	6870	7800	7810	362	358	1880	1863	41/2	5-1/1
D216	5	5	6800	6810	1770	7780	362	361	1873	1872	5	5
£0302	3-3/8	3-7/8	6530	6510	7450	7430	376	378	1870	L87L	3-5/8	3-7/8
D303	41/4	3-3/4	6760	6770	7720	7730	364	363	1872	1871	4-1/4	3-3/4
D304	41/8	4	6840	6800	17790	7770	359	362	1867	1873	4-1/8	4
D305	4-1/8	4-3/16	6700	6680	76.10	7620	367	368	1867	1870	4-1/8	4-3/1
D306	4-3/4	4-3/4	6810	6810	7780	7780	361	361	1872	1872	4-3/4	4-3/4
D310	5	41/2	6770	6170	7720	7730	363	363	1869	1871	. 5	41/1
D311	411/16	4-5/8	6800	6840	7770	7790	362	359	1873	1867	411/16	4-5/8
D312	4-7/8	4-7/1	6840	6800	7790	7770	359	362	1867	1873	4-7/8	4-7/1

Notes -

See the same calculations completed for the vertical group for notes and explanation of data & expressions used in Columna A through M.

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#### FLORIDA POWER CORPORATION - CRYSTAL RIVER UNIT 3 REACTOR BUILDING PRESTRESSING SYSTEM 6th TENDON SURVEILLANCE

DOC ID:S-85-0082 REVISION 3 PAGE 160

CALCULATIONS SUPPORTING SP-182 "ORIGINAL STRESSING DATA" FOR THE HOOP TENDONS GROUP

0.7 Tendon	Ultimate	Strength	
0.8 Tendon	Ultimate	Strength	-

1639 Kips 1873 Kips
------------------------

	Act	uui 👘	Predicted	UN-ON	80% Ultimate For SP-182 "Original Streaming Data"								
Tendon	Riongation (In.)		Pressure (pd)		Pressure (psl)		Row 1 (Kips)		Row 2 (Kips)		Row 3 (in.)		
D	Shop	<b>Meld</b>	Stop	Pield	Shop	Meld	Shop	Pield	Stop	Pield	Shop	Field	
(/)	(B)	(0)	(D)	(E)	(F)	(G)	(H)	()	(J)	(K)	(L)	(M)	
42H17	5-5/8	4-5/8	6870	6810	7810	7780	358	361	1863	1872	5-5/8	4-5/8	
42H18	5	5-3/8	6840	6799	7810	1750	359	362	1871	1868	5	5-3/8	
421119	5-1/4	\$	6870	6810	7810	7780	358	361	1863	1872	5-1/4	5	
421129	5-1/2	5-1/8	6870	6810	7810	7780	358	361	1863	1872	5-1/2	5-1/8	
42H30	4-7/8	5-3/4	6870	6790	7810	7750	358	362	1863	1871	4-7/8	5-3/4	
421131	5-1/4	4-7/8	6870	6810	7810	7780	358	361	1863	1872	5-1/4	4-7/8	
42HJ2	5-1/4	5-1/8	6870	6790	7810		358	362	1863	1871	5-1/4	5-1/8	
42H33	5-3/8	5-1/4	6870	0186	7810	7780	358	361	1863	1872	5-3/8	5-1/4	
42H34	5-1/2	5-3/8	6750	6660	7680	7600	364	369	1865	1870	5-1/2	5-3/8	
42H35	5	5-1/4	6830	6770	1760	7720	360	363	1862	1869	5	5-1/4	
421136	5-1/8	5-1/8	6870	6790	7810	7750	358	362	1863	1871	5-1/8	5-1/8	
421137	5-5/16	4-7/8	6870	6810	7810	7780	358	361	_1863	1872	5-5/16	4-7/8	
42H43	5-1/2	5-1/8	6870	6810	7810	7780	358	361	1863	1872	5-1/2	5-1/8	
421144	5-1/8	5	6790	6840	7750	7750	362	359	1871	1867	5-1/8	5	
421145	\$-7/16	5	6870	6810	7810	7780	358	361		1872	5-7/16	5	
461120	5-1/4	5-1/8	6640	6600	7700	7610	370	373	1901	1890	5-1/4	5-1/8	
461121	. 5-1/8	5-1/4	6720	6730	1700	7640	366	365	1878	1861	5-1/8	5-1/4	
46H22	5-5/8	5-1/4	6720	6730	7700	7640	366	363	1878	1861	5-5/8	5-1/4	
51H25	5	5-1/8	6770	6800	7720	7750	363	362	1869	1868	5	5-1/8	
51H26	5-1/2	5-1/4	6760	6760	_ 1750	7700	364	364	1879	1867	5-1/2	5-1/4	
51H27	5-1/8	4-7/8	6740	6670	7680	7600	365	369	1868	1868	5-1/8	4-7/8	
51H28	5-1/8	5	6760	6750	7750	7700	364	364	1879	1870	5-1/8	5	
51H29	S-1/2	4-3/4	6810	6750	7780	7700	361	364	1872	1870	5-1/2	4-3/4	
531(1	5-3/4	5-1/8	6700	6760	7650	7720	367	364	1871	1872	5-3/4	5-1/8	
53112	5-3/4	4-5/8	6800	7770	7760	7720	362	316	[870	1628	5-3/4	4-5/8	
53H3	5-3/8	4-1/8	6670	6710	7600	7660	369	366	1868	1871	5-3/8	4-1/8	
53H45	5-1/4	5-1/4	6840	6800	7790	7770	359	362	1867	1873	5-1/4	5-1/4	
531146	4-7/8	5-3/8	6760	6730	7750	7660	364	365	1879	1865	4-7/8	5-3/1	
53H47	4-3/4	5-1/2	6840	6800	7790	7770	359	362	1867	1873	4-3/4	5-1/2	
621121	5-1/8	4-3/4	6760	6700	7720	7650	364	367	1872	1871	5-1/8	4-3/4	
621122	5-5/16	5	6800	6750	7770	7700	362	364	1873	1870	5-5/16	5	
62H23	5-1/8	5-1/4	6800	6750	7770	7700	362	364	1873	1870	5-1/8	5-1/4	
621139	5-7/16	5-1/4	6800	6750	7770	7700	362	364	1873	1870	5-7/16	5-1/4	
62H40	5-3/8	4-7/8	6800	6750	7770	2700	362	364	1873	1870	5-3/8	4-7/8	
621(4)	5-1/4	5	6800	6750	7770	7700	362	364	1873	1870	5-1/4	5	
621142	5-3/8	5-1/16	6800	6750	7770	7700	362	364	1873	1870	5-3/8	5-1/1	
62H43	5-3/8	4-7/8	6710	6670	7660	7600	366	369	1871	1865	5-3/8	4-7/8	
621144	5-1/2	4-7/8	6800	6750	7770	7700	362	364	1873	1870	5-1/2	4-7/1	
621145	5-3/16	5-1/8	6760	6700	7770	7700	364	367	1884	1884	5-3/16	5-1/8	
62H46	5-1/8	5-3/8	6800	6750	7770	7700	362	364	1873	1870	5-1/8	5-3/1	
621147	5-5/8	4-1/2	6680	6640	7620	7550	368	370	1870	1864	5-5/8	4-1/2	

Notes -

See the same calculations completed the the vertical group for notes and explanation of data & expressions and in Columns & through M.

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#### FLORIDA POWER CORPORATION - CRYSTAL RIVER UNIT 3 REACTOR BUILDING PRESTRESSING SYSTEM 6th TENDON SURVEILLANCE

DDC ID:S 95-0082 REVISION 2 PAGE 161

### CALCULATIONS SUPPORTING SP-182 \*ORIGINAL STRESSING DATA\* FOR THE VERTICAL TENDONS GROUP

0.7 Tendon Ultimate Strength	1639 Kips
0.8 Tendon Ultimate Strength	1873 Kips

	Actual		Predicte	d Lift-Of	80%	Ultimate		For SP-18	2 "Origin	al Stressi	ng Data"	
Tendon	Elonga	tion (in.)	Press	ure (psl)	Press	ture (psi)	Row	1 (Kips	Row	2 (Kips)	Row	3 (ln.
D	Shop	Field	Shop	Field	Shop	Field	Shop	Field	Shop	Field	Shop	Field
(٨)	(B)	(C)	(0)	(E)	(F)	(G)	(H)	(1)	(J)	(K)	(L)	(M)
23V24	12-7/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-7/8	N/A
12 11	12-1/2	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/2	N/A
12V2	12-1/2	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/2	N/A
23∀1	12-1/4	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/4	N/A
2372	13-1/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	13-1/8	N/A
23V3	13	N/A	6760	N/A	7750	N/A	364	N/A	1879	N/A	13	N/A
34V5	12-5/8	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-5/8	N/A
3476	13	N/A	6810	N/A	7780	N/A	361	N/A	1872	N/A	13	N/A
3477	12-3/4	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-3/4	N//
6179	12-5/16	N/A	6860	N/A	7840	N/A	358	N/A	1873	N/A	12-5/16	N//
61V10	12-3/4	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-3/4	NI
61V11	12-5/8	N/A	6710	N/A	7660	N/A	366	N/A	1871	N/A	12-5/8	N//
61V20	12-1/2	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-1/2	N//
61721	12-1/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-1/8	N//
61V22	12-7/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-7/8	N//

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#### Notes -

Columns A through G are data input extracted from the tendon history books (applicable sheets contained in Attachment B). Columns H through M are calculated using the expressions noted below.

Column Tendons within the scope of this surveillance.

Col.B&C Actual elongation data taken from tendon history sheets for shop and field ends respectively.

For the vertical tendons, only the shop end applies.

Col.D&E Predicted Liftoff Pressures taken from tendon history sheets for shop and field ends respectively.

Col.F&G 80% Utimate pressures taken from tendon bisury sheets for shop and field ends respectively.

Col. H&1 Columns H & I - Calculated force values in Kips for "Original Snessing Data" Row 1 which represent ram pressure @ 1500 psi. These forces represent a zero slack starting point for both shop and field ends of each tendon and provide a basis for retensioning efforts. The following expression is used to exclusive the values for Row 1 data:

0.7 \* Tendon Ultimate Strength \* 1500 / Predicted Lift off Pressure at 0.7 tendon Ultimate Strength.

ie. for 23V24: 1639 \* 1500 / 6870 = 358

Col.J&K Calculated force values in Klps for Original Stress Data<sup>®</sup> Row 2 data which represent forces at 80% Ultimate based on the following expression: Actual pressure @ 80% Ultimate Strength (Cols. F or G) \* 0.7 Ultimate Strength / Predicted pressure @ 70% Ult. from Cols. D or E. ie. for 23V24: 7810 \* 1639 / 6870 = 1863

Col.L& Actual elongation values repeated from Columns B & C for Row 3 of "Original Stressing Data".

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DOCUMENT IDENTIFICATION NO.

## **DESIGN ANALYSIS/CALCULATION**

**Crystal River Unit 3** 

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2

Calculation S-95-0082

## 7.0 CONCLUSIONS

Florida

Power

Tendon Force/Time Curves have been generated from the results of this calculation. Final force curves are presented and attached in Section 6.0 of this calculation.

Force curves for the three control tendons were also generated by this calculation and were used for comparison and verification of data and spread sheets with the same curves generated previously for the same tendons. The comparison was completed and the data sheets and force curves were found to be the same as that previously generated.

Other calculations supporting the "Original Stressing Data" and "Data Sheets" in SP-182 were completed and are presented in Section 6.6 of this calculation.

### **8.0 REFERENCES**

The following references are used in the preparation of this calculation:

- 1. G/C Letter to FPC, FCS-14594, Scope Document, November 24, 1995, for Preparation of Tendon Force Curves for the 6th Surveillance and site trip to CR3.
- 2. G/C Letter to FPC, FCS-12439, August 13, 1991, Tendon Selection and Recommendations for the Fifth Surveillance.
- 3. Reg. Guide 1.35, Revision 3
- 4. Reg. Guide 1.35.1, Revision 0
- 5. CR3 FSAR, Section 5.2
- 6. Technical Specification, Section 3.6.1.6 & Section 4.6.1.6.
- 7. Design Input for the 5th Surveillance, DI-55220-152.0 SE, Revision 2.
- 8. G/C Calculation of Force curves for the 5th Surveillance for SP-182, Revision 11.
- 9. Design Input 5500-528-1, Revision to SP-182 Procedure for Tendons and Calculations for Force-Time Curves for Surveillance 4, Revisions 0 and 1, Jan.87 and Sept.87.
- 10. G/C Calculation 5500-528-1, Tendon Loss Calculations for Surveillance 4, Revisions 0 and 1, Jan.87 and Sept.87.
- 11. G/C Calculation 04-4762-099, Tendon Loss Calculations and Appendices for CR3 Tendons, J.Fulton and G.T.DeMoss, 3/6/87 and 1980 calculations.
- 12. Dome Tendon History Shects updated to the 5th surveillance.
- 13. Hoop Tendon History Shects updated to the 5th surveillance.



# DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

## DOCUMENT IDENTIFICATION NO.

### Calculation S-95-0082

- 14. Vertical Tendon History Sheets updated to the 5th surveillance.
- 15. Effective Wire Summary information, letter to FPC
- 16. Prescon Vendor Drawings
- 17. SP-182, Rev 11.

Florida

POWER CORPORATION

- 18. Surveillance Report for the Fifth Inspection Period, VSL.
- 19. Engineering Report for the Fifth Tendon Surveillance, G/C Letter to FPC, FCS 14401, 6/20/94.

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4/96

DOCUMENT IDENTIFICATION NO

## Florida Power

## **DESIGN ANALYSIS/CALCULATION**

**Crystal River Unit 3** 

Page A1

Calculation S-95-0082

## ATTACHMENT A

DESIGN INPUT DATA FOR 6TH SURVEILLANCE



## DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

Page A2

COCUMENT DENTIFICATION NO. Calculation S-95-0082

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Power

## Design Input Information for the 6th Surveillance

The Gilbert/Commonwealth Design Input document prepared for the 5th surveillance is still applicable since it was prepared at the time FPC addressed new licensing and Tech Spec revisions concerning the CR3 Tendon Surveillance Program. The document and some of it's attachments are attached herein. Also, correspondence from the NRC resulting from it's review of CR3 tendon program issues is attached for reference.

The following Tech Spec sections were reviewed and are applicable to the tendon surveillance program.

Section 3.6.1.2, Amendment 149 Section 5.6.2.7, Amendment 149

FSAR Sections applicable include: Sections 5.2 & 14.2.2 Figures 5-24 and 5-25 aus 09 '95 03:06pm Nuc Admin Bldg

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UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C. 2000-0001

July 28, 1995

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Mr. Percy M. Beard, Jr. Senior Vice President, Nuclear Operations (NA21) Florida Power Corporation ATTM: Manager, Ruclear Licensing 15760 W Power Line Strest Crystal River, Florida 34428-6708

BUBJECT: 11	DETENSION SURVEILLANCE
FILE NO .:	311679 3-11
FECENED:	B 107/95
1	LY. CECILIA
	T.8.4.

SUBJECT: REVIEW OF THE FIFTH TENDON SURVEILLANCE REPORT - CRYSTAL RIVER NUCLEAR GENERATING PLANT UNIT 3 (TAC NO. N90195)

Dear Mr. Beard:

By letter dated August 12, 1993, as supplemented December 15, 1994, and Hay 15, 1995, you submitted for staff raview a report on the results for the fifth (seventeenth year after structural integrity test (SIT)) physical surveillance of the Crystal River 3 (CR3) Plant containment building posttensioning system. You performed the surveillance in accordance with the requirements of the original plant technical specifications (TS) for tendon surveillance and Regulatory Guide (RG) 1.35 Revision 3. On the basis of your surveillance and inspection of the various elements of the post-tensioning system, you concluded that the surveillance results demonstrate the integrity of the containment tendon system.

We have completed our raview of your submittal and we concur with your conclusion with certain exceptions. Your surveillance ravealed grease leakage, corrosion of anchorheads and bearing plates and spalling and cracking of concrete, all of which could be detrimental to the containment tendon system. Please submit an action plan to rectify the undesirable conditions as identified and to implement appropriate actions to rectify them before the next scheduled inspection. Our evaluation is enclosed.

This completes our review under the TAC No. M90195 and, therefore, the TAC is closed.

This requirement affects nine or fewer respondents, and therefore, it is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerély. L. Raghavan, Project Hanager

Project Directorate II-1 Division of Reactor Projects - 1/11 Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: As stated

cc w/enclosure: See next page

#### AUG 39 '95 03:07PM NUC ADMIN BLDG

Hr. Percy M. Beard Florida Power Corporation

CC:

Mr. Gereld A. Williams Corporate Counsel Floride Power Corporation MAC-ASA P.O. Box 14042 St. Petersburg. Floride 33733

Mr. Bruce J. Hickle, Director Muclear Plant Operations (NA2C) Florida Power Corporation Crystal River Energy Complex 15760 W. Power Line Street Crystal River, Florida 34428-6708

Mr. Robert B. Borsum BAY Nuclear Technologies 1700 Rockville Pike, Suite 525 Rockville, Maryland 20852

Regional Administrator, Region II U.S. Nuclear Regulatory Commission 101 Marietta Street N.W., Suite 2900 Atlanta, Georgia 30323

Mr. Bill Passetti Office of Radiation Control Department of Health and Rehabilitative Services 1317 Winewood Blvd. Tallahassee, Florida 32399-0700

Attorney General Department of Legal Affairs The Capitol Tallahassee, Florida 32304 Calculation 5-95-0082 Attachasteri A Page A4

Crystal River Unit No. 3 Generating Plant

Nr. Joe Myers, Director Division of Emergency Preparedness Department of Community Affairs 2740 Centerview Drive Tellahasses, Florida 32399-2100

Chairman Board of County Compissioners Citrus County 110 North Apopka Avenue Inverness, Florida 32650

Mr. Larry C. Kelley, Director Nuclear Operations Site Support (SA2A) Floride Power Corporation Crystal River Energy Complex 15760 H Power Line Street Crystal River, Florida 36428-6708

Senior Resident Inspector Crystal River Unit 3 U.S. Nuclear Regulatory Commission 6741 N. Tallahassee Road Crystal River, Florida 34428

Mr. Cary Boldt, Vice President -Nuclear Production (SA2C) Florida Power Corporation Crystal River Energy Complex 15760 U Power Line Street Crystal River, Florida 34428-6708

Coloniation 5-95-0082 Attachment A Page A5

### Enclosure

The Crystal River 3 (CR3) plant technical specifications (T5) require performing pariodic tendon surveillance consisting of sheathing filler material inspection, tendon lift-off force measurement, anchorage component inspection, tendon wire inspection and tensile testing, grease leakage check, and tendon datensioning and retensioning and rescaling for a number of selected tendons. For the fifth surveillance, in addition to the three control tendons (one for each group), you randomly selected two dome, two vertical and four hoop tendens and subjected them to lift-offs, with one tendon in each group being detensioned and retensioned. You performed the surveillance in accordance with the requirements of the original plant TS for tendon surveillance and Regulatory Guide (R5) 1.35 Revision 3. On the basis of your surveillance and inspection of the various elements of the posttensioning system, you concluded that the surveillance results demonstrate the integrity of the containment tendon system.

On the basis of our raview of your submittal, we concur with your conclusion with certain exceptions. Your surveillance revealed grease laskage, corrosion of anchorheads and bearing plates and spailing and cracking of concrete, all of which could be detrimental to the containment tendon system. These conditions are evaluated below.

#### 1. Grease Vaids

From the data on grease removed from and grease replaced into the tendon sheathings, there appeared to be an unusually high amount of grease voids or leakage. The amount of grease added ranged from 9.5% to as high as 30.5%. In a letter dated September 22, 1994, we indicated that the loss of grease appears to be unusually high in comparison to other plants with similar prestressed concrete containments and post-tensioning systems. Your response indicated that the lesses closely match those of previous surveillances, and a thorough investigation had not determined a root cause for the abnormality. However, from the physical test of individual tendon wires, the chemical tests of the grease itself, and the lift-off tests, the tendon system is maintaining its integrity. Furthermore, there has been no grease leakage observed on the outside surface of the containment. On the basis of these observations, you reiterated that, in spite of the abnormally high amount of grease voids, the structural integrity of the tendons has not been affected.

We find your response to be reasonable. However, in view of the detrimental effects of potential grease leakage, you should monitor more closely the grease injection procedure in future surveillances and perform a thorough root cause investigation for grease loss.

2. Anchorage Assembly and Tendon Mire

Your surveillance revealed high levels of corrosion on the anchor heads on five of the tendons (three on the field and and two on both ends) under surveillance. A pitting condition existed on localized areas of these anchor heads, with no signs of active exidation or buildup of crust or rust. No free moisture was observed within the spaled caps of any terion. The bulk filler grease covered all tendon stressing anchor heads except for the top and of one

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Calculation S-95-0082 Attachment A Page A6

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vertical tendon. You believe that this condition has existed since original installation. You concluded that the observed conditions do not indicate abnormal degradation and will not affect the function of the anchor heads.

Your surveillance also discovered high levels of corrosion on bearing plates outside the sealed area of the tendon end caps of six tendons (on one end of three tendons and on both ends of another three). The corrosion occurred exterior to the D-ring seal and has not progressed to the point of breaching the integrity of the D-ring and affecting the tendon anchorage components. Repairs were made to the bearing plates to stop further degredation. The protection of the anchorage components is assured and the function and integrity of the bearing plates is maintained.

However, based on our review of tendon surveillance reports of a number of plants, we find that the types of corrosion of anchorage components have not been observed in other facilities and are unique to CR3. Therefore, we believe that it is necessary for you to expand the inspection to anchorage assemblies, especially the bearing plates, of other tendons not under surveillance to ensure timely repair of any adverse conditions.

You indicated that the cracking and spalling of concrete are insignificant. However, this requires repair before causing a further deterioration of concrete and reinforcement. It should also be also noted that your report provided only general statements regarding moisture content and the detrimantal chamical contents and does not give details of water content for each of the grease samples taken from the specific tendons and free water discovered at and anchorages and grease cans. RG 1.35 requires such detailed information and should be provided in future surveillance reports.

One wire from each of the detensioned done, hoop and vartical tendons was tested. In addition, ineffective wires and broken wires were removed for sample selection and testing. All of the tested samples exceeded the required minimum values for yield strength and elongation. All but one exceeded the required minimum ultimate strength. The cause for the broken wires was determined to be of a machanical nature not due to stress corrosion. The buttonheads were inspected for their physical condition and were found to be effective and acceptable.

3. Tendon Lift-off Forces

We have reviewed the lift-off forces of three dome, three vertical and five hoop tendons and also the information on the correlation of force and elongation of the three detensioned and retensioned tendons. With the exception of one hoop tendon (46H29) which had only 88.1% of the base value (less than the 90% of the base value as required), the lift-off forces of other tendons were above the lower bound values established for these tendons. Additional hoop tendons were lifted off to meet the requirements in RG 1.35 under such a situation. The forces and the corresponding elongations for the three detensioned and ratensioned tendons were reviewed, and for each tendon thore is no innearity sale ich between the tend. It appears to us that more

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careful elongation measurements could have provided the required correct information and assurance of the quality of the overall tendon surveillance performed.

The purpose of tendon surveillance is to determine if the time dependent prestress losses such as creep and shrinkage of concrete and relaxition of tendon wires are within the predicted range. The trend of such losses can be obtained by performing a regression analysis of the tendon lift-off forces for the tendons in a group from all the surveillances conducted to date after the SIT. Before performing the analysis it is necessary to correct the tendon seating force. This is because during tendon installation and tentioning it is not possible to anchor all the tendons in a group at the same force lawel and at the same time. The tendons are installed sequentially. When the containment is subjected to the tendon force, there will be elastic deformation. The tendon tensioned first will have lower force at completion of tensioning for the group than those tensioned last. Therefore, the seating force must be corrected to reflect the tendon anchor force for the elastic shortening, taking into consideration the tendon tensioning sequence. On the theory that the containment design is based on the average tendon force of the group, an average force by each individual corrected tendon force, a socalled normalizing factor (NF) is obtained. This NF is used to modify the lift-off force of the tendon force. The RF for each tendon force, a socalled normalizing factor (NF) is obtained. This NF is used to modify the informanizing the tendon to obtain the average force which should be compared with the required tendon force. The RF for each tendon is a constant and will be used throughout all the surveillances. This appears to be the procedure used by a number of utilities. Theoretically, after normalization, all tendons in a group should have the same average value. Due to the method used in establishing the NF and in obtaining the lift-off forces, the normalized tendon force is at best approximate; but it should not very appreciably from the average value for the group.

In contrast to the NF approach, the RG 1.35 approach to consider the prestress losses is through the use of upper bound and lower bound of tendon forces as discussed in RG 1.35.1 and shown in Fig.2 therein. The average of the tendon anchor forces which are the tendon seating forces corrected for elastic losses can be used as the initial prestressing force. A graph similar to that shown in Fig.2 of RG 1.35.1 should be first constructed. The lift-off force obtained for the group of tendons represented by the graph should be plotted on the graph without any correction. By plotting the lift-off forces from consecutive tendon surveillance of the group of tendons, it becomes pessible to perform a trending analysis of the tendon forces.

In response our request for additional information on normalization, you provided a formula for the NF, which is actually a tendon force correction and includes not only prestress loss due to elastic deformation, but also the relaxation of the tendon wire. In view of this, the NF will be different for each surveillance since it involves the time factor. This only complicates the normalization procedure and does not improve the accuracy. If the NF involves relaxation of tendon wire, it appears the other time-dependent prostress fors due to creep and shrinkage should also be included. It is to

Calculation S-95-0082 Attachment A Page AB

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be noted that correction is made to the seating force only for the elastic loss which is not time dependent and the normalization factor which is based on the corrected tendon anchor forces is used to modify the lift-off force to the average tendon force of the group. The NF procedure is based on the fact that after correction for elastic shortening loss each of the tendon forces and the average of these tendon forces for the group of tendons are large compared to the time-dependent prestress losses. Therefore, the ratio, i.e. the NF, between each tendon force and the average tendon force for the group after correction for elastic shortening loss will not vary significantly from that after correction for the time-dependent "used. The NF procedure is based on this premise.

In response to our concerns regarding your normalization procedure and use of the average of lift-off forces for the trend analysis, you performed analyses for each of the following cases for each group of tendons:

- 1) Using lift-off averages, normalized
- 2) Using all data points, normalized
- 3) Using lift-off averages, unnermalized
- 4) using all data points, unnormalized

The information for each case was plotted on a graph the same as that shown in fig. 2 of RG 1.39.1 and a regression analysis was performed for each case in each group. From the results of these analyses, we observed insignificant differences between the normalized cases (1) and (2) or the unnormalized cases (3) and (4), and appreciable differences between the normalized cases (3) and (4), and appreciable differences between the normalized cases (3) and (4), and appreciable differences between the normalized cases (3) and (4), and appreciable differences between the normalized and the unnormalized cases. However, based on the trend of all groups of tendons, no proup of tendons would be expected to go below its minimum required during the 40-year plant life.

In spite of the favorable outcome of the results as summarized above, we believe that for future survaillances, the lift-off forces should be used for the trend analysis without averaging and normalization. Each tendom lift-off force should be compared with the predatermined values of base, 95% base, and 90% base as required by RG 1.35.

In conclusion, we concur with your conclusion that the results of the surveillance demonstrated the integrity of the containment tendon system. However, before the next surveillance you should resolve the problem of missing grease and should undertake a program of inspection of the anchorage system which consists of the anchor heads and the bearing plates to assure that the pitting of the anchor heads and the corrosion of the bearing plates uncovered in the surveillance are not widespread and would not jeopardize the integrity of the tendon anchorage system. You should repair the cracking and spalling of concrete so that there will be no further deterioration of concrete or reinforcement. For future surveillances, the trend study of the tendor forces should be based on the lift-off forces without averaging and normalization. In retensioning tendons, the elongations corresponding to the forces should be carefully-measured so that thereity between the two is preserved. This can serve as annedditional check-on the accuracy of the measurements performed.

Joa .

Calculation S-95-0082 Attachment A Page A9

Their is a copy of the Electronic file from The NRC approval felles for postponament of The Eight exempted tondons. Just

Mr. Percy H. Beard, Jr. Senior Vice President, Muclear Operations (SAZA) Florida Power Corporation ATTN: Manager, Nuclear Licensing 15760 W Power Line Street Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER NUCLEAR GENERATING PLANT UNIT 3 - POSTPONEMENT OF SURVEILLANCE OF EIGHT TENDONS EXEMPTED FROM THE FIFTH TENDON SURVEILLANCE (TAC NO. M94056)

#### Dear Mr. Beard:

By letter dated October 23, 1995, you requested staff approval for postponing surveillance of eight tendons which were exempted from the fifth tendon surveillance performed in 1993 to the sixth tendon surveillance. You had committed to include the eight tendons in your sixth tendon surveillance which was originally scheduled to be performed in 1996. You now propose to perform the sixth tendon surveillance in 1998 which is less than 5 years from the fifth tendon surveillance which was performed in November 1993. Accordingly, you are requesting staff approval to postpone the surveillance of the eight tendons to the 1998 sixth tendon surveillance.

By letter dated May 15, 1995, you submitted results of your fifth tendon surveillance to demonstrate integrity of the containment tendon system. In a letter dated July 28, 1995, we forwarded our evaluation of the fifth Tendon Surveillance Report, and concluded that the trend of all groups of tendons is such that no group of tendons will go below its minimum required lift-off forces before the 40-year plant life. Our July 28, 1995 letter also identified certain undesirable conditions such as grease Teakage, anchorage bearing plate corrosion, cracking and spalling of concrete. In response to these concerns, you committed to perform, during Refuel 10 (in 1996), a complete walkdown of 549 tendons comprising the containment post-tensioning system. You also committed to perform visual inspection to monitor external corrosion, grease leakage, and monitor for spalling of concrete and take appropriate corrective actions where warranted.

On the basis of the fifth tendon surveillance results and your commitment to perform visual inspection during the Refuel 10, we find it acceptable to perform the surveillance of the eight tendons during the sixth tendon surveillance scheduled for Refuel 11 in 1998, which is within the 5 year surveillance frequency.

In this matter, we also would like to draw your attention to the following. In November 1976, you performed the structural integrity test (SIT) on the Crystal River 3 (CR3) prestressed concrete containment. Per Regulatory Guide MAR 27 '96 09:42PM NUC ADMIN BLDG

Calculation S-75-0082 Attachment A Page A10

Mr. Percy N. Seard, Jr.

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- 2 -

(RG) 1.35, the tendon surveillances are to be performed 1. 3, and 5 years after SIT and every 5 years thereafter. You have committed to follow the RG 1.35 criteria. However, a review of the history of your tendon surveillance indicates that your 3rd, 4th and 5th tendon surveillances have been performed on an approximately 6-year interval. While plant technical specifications allow schedule flexibility (a 25% inspection interval extansion for conducting surveillances), such a schedule extension should not be continued on a longterm basis. Also, the general industry practice has been a plus or minus 6 months schedule variance.

This completes our effort under TAC No. N94056 and the TAC is closed. If you have any questions, please call me at (301) 415-1471.

Sincerely,

L. Raghavan, Project Manager Project Directorate 11-1 Division of Reactor Projects - I/II Office of Muclear Reactor Regulation

Docket No. 50-302

cc: See next page

1

		Engineering instruction	Colcolution 8-95-6662 Attachment A Page A11		
2		PROJECT Crystal River Unit 3	w.o. 04-5520-152	IDENTIFIER DI-6520-152.0 SE	
	SUBJECT Tendon Sur of Misc. Calculations	varation we SP-182			
1		DISCIPLINE Structural 2241		PAGE 1 OF The	

REVISION	0	1	2	3
ITEM(S) REVISED		· ·		
ORIGINATOR	M. Marcellus	M. Marcellus	M. Marcillus	
DATE	8 Oct 93	2701793	17164,93	~~~~
REVIEW	SS Krause	XX Krause		
DATE	BOCT93	270ct 93	21 Nov 73	÷
APPROVAL (DCE)	M. Plateck	Ron Paral	M. Phendle	
DATE	10-8-93		YAU. 21, 1983	
FUTURE CONFIRMATION REQUIRED?	No	No	No	
MICROFILMED / DATE				•
INSTRUCTIONS - USE IN A FOR TELLS				

INSTRUCTIONS: USE "N/A" FOR ITEMS NOT APPLICABLE. IDENTIFY ITEMS REQUIRING FUTURE CONFIRMATION BY CIRCLE OR CLOUD. IDENTIFY REVISED INFORMATION BY VERTICAL LINE IN RIGHT MARGIN AND REVISION NUMBER. USE ADDITIONAL SHEETS AS NECESSARY.

REVISION 1-BEVISED TEXT AS NOTED, BEVISED ATTACHARTZ & ADDED ATTACHARTS 3,4. REVISION 2-REVISED TEXT AS NOTED, REVISED ATTACHARTY 2.

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Gibert/Commonwealth

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		Engineering Instruction No. 1	Attachment A Page A12
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	DESIGN INPUT FOR: CR3	PAGE: 2 of 6	
1		DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
			DATE: 17NOV93

# 1. SCOPE OF THIS DIR; BASIC FUNCTIONS OF SYSTEM, STRUCTURE, OR COMPONENT:

This DIR presents Design Input documentation related to the 5th Tendon Surveillance Program for Crystal River Unit 3. The scope of this DIR is for the preparation of Force/Time Curves for individual tendons, misc. calculations supporting surveillance activities, as well as for the revision of Surveillance Procedure, SP-182, for the performance of site inspection activities.

Revision 1 of this DIR will address the change in inputs required as a result of the NRC not accepting the FPC proposed Tech Spec revision for the CR3 Tendon Surveillance Program to comply with the requirements of ASME Section XI, Subsection IWL. FPC's discussions with the NRC concluded that the FPC program requirements should be based on Reg Guide 1.35, Revision 3, issued July 1990.

Revision 2 of this DIR will address the change in inputs required as a result of several meetings at the CR3 site. FPC's discussions with the NRC concluded that the new FPC Tech Spec Program may not be implemented as soon as expected and that the current Tech Spec requirements are to be be addressed for this surveillance within the acceptance criteria of SP-182, Revision 11.

### 2. CLASSIFICATION; DESIGN CODE(S) AND STANDARDS:

Nuclear Safety Related Classification Existing Tech Spec 3.6.1.6 and 4.6.1.6, Amendment 29 & 31, FSAR 5.2 Reg Guide 1.35, Revision 3, July 1990.

### 3. PERFORMANCE REQUIREMENTS AND SOURCE:

The Tendon Surveillance Program is controlled by Tech Spec Sections 3.6.1.6 and 4.6.1.6. However, FPC is currently going through a Tech Spec Improvement Program and will possibly be implementing this Program in mid November in the middle of the surveillance. The new Tech Spec (See Attachment 1) will commit the Surveillance Program to Regulatory Guide 1.35, Revision 3 criteria. FPC has discussed this with the NRC, and it was agreed that the new acceptance criteria is acceptable for use for this entire surveillance period. Therefore, the Reg. Guide criteria will be the basis for a revision to the existing Revision 10 of Surveillance Procedure SP-182. Per-FPC-direction, the requirements of the current existing Tech-Spee will not be included in the revision to SP-182-(See Attachment-2).- It was determined in mid November that the existing current Tech Spec requirements will have to be addressed in SP-182, Revision 11 until the actual implementation of the new Tech Spec program takes place. This acceptance criteria is to be worked into SP-182 in addition to the Reg. Guide 1.35 acceptance criteria already built into the draft version.

- Glibert/Commonwealth

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	Engineering instruction No. 1	Chirabasen S-95-8082 Attachment A Page A23	
	DESIGN INPUT RECORD	IDENTIFIER DI-5520-152.0 SE	
	DESIGN INPUT FOR: CR3	PAGE: 3 of 6	
	STH TENDON SURVEILLANCE PERIOD	REVISION: 2	
		DATE: 17NOV93	

## 4. DESIGN MARGINS OR SAFETY FACTORS:

Design margins and safety factors are as included in the above Codes and Standards.

## 5. DESIGN CONDITIONS AND SOURCE:

There are no design activities.

### 6. OPERATING CONDITIONS AND SOURCE:

This surveillance will be performed during normal plant operation. Tendons in the area between Buttresses 1 and 3, (0° to 120°) must be avoided due to the safety hazard of the main steam vents in that area. After numerous discussions with the site, it was determined that outside tendons with the following group/buttress numbers are to be considered inaccessible due to the steam venting problem: 13HXX, 42HXX, 51HXX, 53HXX, 62HXX. Inside tendons accessiblity must be individually confirmed through an FPC walkdown/concurrance. Radiological conditions, safety, and interference with safety related systems and components may affect the selection of tendons inside the plant. Adequate consideration must be given to the potential effects on safety related systems from any surveillance activity.

FPC has been informed by G/C that the tendon selection process can be successfully completed for this surveillance using the limitations on the tendon population as noted above, however, the next several surveillances <u>cannot</u> be performed during plant operation because of these effects on the random tendon selection process.

In addition, the exempted tendons from the selection process of this surveillance must be reviewed and considered for inclusion in the next surveillance. The exact position for the resolution of many exempted tendons will depend on the final accepted position taken by the NRC on the proposed Tech Spec position taken by FPC. See the Attachment 3 letter, Attachment 1. This position will not affect remaining work for this surveillance but will need to be considered in future work.

## 7. AMBIENT CONDITIONS AND SOURCE:

Ambient temperatures and pressures of the Reactor Building during normal operation of the plant are to be considered. Elevated temperature effects on the tendons may need to be considered.

### 8. MATERIAL(S):

Most tendon materials are replacement of original materials. A summary of tendon related materials can be found in FSAR Section 5.2.2.3.3 and in the CR3 Reactor Building Design Basis Document.

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		Engineering Instruction No. 1	Page Al4
ላ	. [	DESIGN INPUT RECORD	IDENTIFIER DI-5520-152.0 SE
)			PAGE: 4 of 6
	- 1	DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
	- 1		DATE: 17NOV93

## 9. OTHER REQUIREMENTS:

The requirements of Reg Guide 1.35, Revision 3, are essentially the same as the requirements of ASME Section XI, Subsection IWL. In many places, the ASME Code provides a greater level of detail than the requirements of the Reg Guide. The ASME Code document will be utilized as a reference in the interpretation of some Reg. Guide requirements and criteria.

FPC administrative procedures noted in References 16, 17, and 18 are to be followed for the revision of SP-182.

The normal 40 year plant life is to be considered. As yet, no consideration for plant life extension has been requested from FPC. Future retensioning or other tendons work may need to consider any FPC plant life extension plans or considerations.

### 10. **REFERENCES**:

- 1. Design Input 5500-528-1, Revision to SP-182 Procedure for Tendons and Calculations for Force-Time Curves for Surveillance 4, Revisions 0 and 1, Jan. 87 and Sept. 87.
- 2. Calculation 5500-528-1, Tendon Loss Calculations for Surveillance 4, Revisions 0 and 1 Jan. 87 and Sept. 87.
- 3. J. Fulton and G. T. DeMoss Calculation 04-4762-099, Tendon Loss Calculations and Appendices for CR3 Tendons, 3/6/87 and 1980 calculations.
- 4. Vertical Tendon History Sheets
- 5. Hoop Tendon History Sheets
- 6. Dome Tendon History Sheets
- 7. SP-182, Revision 10.
- 8. SP-182, Revision 7. (Last surveillance proven revision)
- 9. ASME B & PV Code, Section XI, Subsection IWL
- 10. Regulatory Guide 1.35, Revision 3, Issued July 1990.
- 11. Regulatory Guide 1.35.1, Revision 0, Issued July 1990.
- 12. G/C Engineering Study on the CR3 Tendon Surveillance Program, FCS-13670, March 5, 1993.

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		Engineering Instruction No. 1	Coloniation 8-75-0082 Attachment A Page A15
$\mathbf{\mathcal{G}}$		DESIGN INPUT RECORD	IDENTIFIER DI-5520-152.0 SE
)		DESIGN INPUT FOR: CR3	PAGE: 5 of 6
		STH TENDON SURVEILLANCE PERIOD	REVISION: 2
			DATE: 17NOV93
	13.	G/C Study of ASME Section XI, Subsection 1WL for the CR Program, FCS-13892, June 2, 1993.	3 tendon Surveillance
	14.	G/C Letter to FPC, FCS-12439, August 13, 1992, for Task 1 Selection, General Report and recommendations for the 5th	deliverables, Tendon Surveillance.
	15.	Prescon Vendor Drawings - G/C Vendor Code 4680, Drawing Numbers 52-0026-0001A through 52-0026-0043P.	
	16.	FPC Administrative Instructions, AI-402B, Procedure Writin (Except for EP/AP/VP), Revision 8, 10/25/91.	g
	17.	FPC Administrative Instructions, AI-400-C, Permanent Procedures Revisions, Revision 10, 11/19/92.	
	18.	FPC Administrative Instructions, AI-701, Conduct of Inservi Inspection, Revision 9, 7/11/91.	ce
5	19.	G/C Memo, 10/27/93, D.L. Keiser to M. Marcellus, Calculation references for minimum required prestress force	<b>:</b>
	20	Crystal River 3 Reactor Building Design Basis Document.	、 •
	21.	G/C Engineering Report for the 3rd Surveillance, By T.H. I	Noble, May 19, 1982.
	22.	G/C Engineering Report for the 4th Surveillance, By J. Her	r, March 10, 1988.
	23.	G/C Scope Document Letter to FPC, FCS-13766, 4/2/93.	
	ATTACHM	ents	
	1.	Proposed and submitted FPC Tech Spec showing compliand ASME Section XI, Subsection IWL, fax received from FPC on 9/24/93.	
	2.	G/C Letter to FPC, 10/8/93, FCS-14114, M. Marcellus to J. Mascoll/B.Crane/B. Gutherman, Summary of G/C Design Input positions.	
•	3.	FPC Letter to the NRC, October 25, 1993, Withdrawal of T Spec Change 197 with attached revised Tech Spec, Changin ASME IWL compliance to Reg Guide 1.35, Rev 3 complian	g from

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)		PAGE: 6 of 6
1	DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
1		DATE: 17NOV93

5. G/C Letter to FPC, 10/27/93, FCS-14158, M. Marcellus to J. Mascoll/B.Crane, with G/C comments on the proposed Tech Spec.

ONLY ATTACH MENT 4 WAS INCLUDED IN CALC 5 95-0082

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Calculation 5-75-0082 Attachment A Page A17

DI-6820-152.0 SE ATTACHMENT 4 Page 1



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Green Hills Corporate Center, RL 10 & Pheastant Ad., Rescong, PA 19607

ROY W. AOLER Project Manager Nuclear Services

October 12, 1993

 FCS-14119
 DI

 Work Order #04-5520-152
 DI

 Contract NPM00AD, WA 152
 Image: Contract NPM00AD, WA 152

Mr. R. T. Bowles Nuclear Project Management Engineer Florida Power Corporation P. O. Box 14042/C21 St. Petersburg, Florida 33733 Nore - THIS LETTER SUPERCEAS POSITION: 1,253 IN FES-1444, 13/8/93, ATTACHMIN THIS D.I.

Attention: J. O. Mascoll, B. Crane, B. Gutherman

'Re: **Crynul River 3** Tendon Surveillance Program

Ref: FCS-14114 Dated October 7, 1993

Action By: FPC - October 13, 1993 Review and Comments, Unless N/A

Dear Mr. Bowles:

Key issues and criteria for the tendon surveillance program were reviewed with you in the above referenced letter. Since then, the direction for implementation of our work has significantly changed based upon the NRC rejection of the Tech Spec for the Tendon Surveillance Program. Based on discussions with Bruce Crane, we will now perform all related tendon surveillance tasks based on the following:

- Revision 11 of SP-182 will now be performed to comply with Reg. Guide 1.35 Revision 3, not ASME Section XI, Subsection IWL. An earlier review of the Reg. Guide versus the CR3 program concluded there were no significant issues or disadvantages to committing to Reg. Guide, Revision 3. However, until our review and revision is complete, G/C is recommending that FPC consider that there are some exceptions likely to be taken against the full compliance to the Reg. Guide by FPC. G/C will notify FPC as any significant exception is identified.
- 2. The documentation of the above position, acceptance items and specific interpretations of the Reg. Guide acceptance criteria has not been decided at this time. It may be within CP-145. However, an interim place is to include these positions within SP-182. G/C will now include some of the general positions in the SP-182 document, but is uncertain whether all engineering/licensing positions and acceptance criteria can be properly placed in SP-182. SP-182 has basically addressed site inspection activities in the past and has not addressed engineering/licensing issues to any level of detail.

Halling Address: P.O. Box 1498, Resona. PA 19603-1498 + Telecroner: 215775-2600 + Far: 215775-2670 + Teles: 173-228

icultanest Regional Humanitaments: 1055 Continence Park Drive, Suite 200, Oak Ridget, TH 37830 + Talephoney; \$15 482-1434 + Fax; \$15 482-1780

Calculation 6-95-6082 Attachment A Page A10

DI-6820-152.0 SE ATTACHMENT 4 Pege 2

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Page 2

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3. It is assumed that the Tech Spec Improvement Program will be in place and accepted by the NRC by November 22nd. With the surveillance rapidly approaching, a Tech Spec revision prior to that date is impractical. The acceptance criteria for the interim period up to November 22 was discussed. Based on the established CR3 Tendon Surveillance Program as defined by SP-182 and other documents, it is assumed that this entire tendon surveillance can be performed against the new criteria. Therefore, the acceptance criteria within SP-182 which is related to the existing Tech Spec positions will be removed and replaced by the Reg. Guide 135, Revision 3 positions. This will involve new enclosures and calculations within SP-182.

Note that the above direction significantly changes most positions noted in the reference letter. However, items 4, 5, 6 and 7 of that letter are unchanged for O/C to implement the required scope of work.

FPC concurrence with the above positions by October 13 is required for G/C to complete our tasks in support of the surveillance. Any revision to the above will impact our completion of SP-182. Additional rework, enclosures and verification resulting from this change in criteria, as discussed above, has impacted the schedule. Assuming no further change in basic criteria, SP-182 Revision 11 will be electronically transmitted to FPC on October 26 for review and comments. In addition, a copy of the document will be Federal Expressed at the same time.

Should there be questions or discussion on any of the above items, please feel free to contact us at your convenience.

Very truly yours,

. Warall

M. D. Marcellus Structural Task Engineer

R. W. Adler Project Manager

R. T. Bowles J. Mascoll B. Gutherman B. Crane FPC Records Management (CL Only) R. W. Adler (2) C. N. Rentschler D. D. Krause



DOCUMENT EDENTIFICATION NO.

Florida

Power CORPORATION

# DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

Calculation S-95-0082

# ATTACHMENT B

TENDON HISTORY SHEETS FOR 6TH SURVEILLANCE REVISION

Page B1

· ·				· .
Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRE TENDON HI	FRESSING SYSTEM	Chica Attact Page I	intion 5-95-0082 Juneart D D2
/ . TENDON IDENTIFICATION NUM				
SHOP WASHER ID: PC_121		· · · · ·		والمتشافين منابع المتراجين
1. CAL/QA vendor inspect				
2. Date tendon received	1			
3. Date installed in co				
	Wires teplaced		· · · · · · · · · · · · · · · · · · ·	
	<u>10-1-74</u> But		•	
	Accept. Reheads			
5. Date stressed				
	· · · · · · · · · · · · · · · · · · ·	SHOP END	FIELD END	TOTAL
Elongation (1500 psi	to 80% ult.)-Pred./Ac	t. 4 34 14 34	43415	93193
/ Lift-Off Pressure -		•	684017000	<u></u>
Shim Thickness/80% 1	Itimate Pressure	07771 T	73/617790	N/A
Unseated/Broken Wird	s	1 effective wire:	after stressing	<u>_163</u>
6. Date Bulk-filled	<u>3-25-75</u> Bulk	-Filling NCR's	•	
Time since installa	ion 10 34 months Inle	t Pressure <u>50</u>	SI Outlet Tem	p. 140°
	led: Shop			
7. Data compiled by	? Milla			
		Date <u>3</u>	•	•
8. Additional Comments	•		· · ·	
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Florida Power	CRYSTAL RIVER REACTOR BUILDING PRI TENDON II		Attachment B Page 83
TENDON IDENTIFICATION NU	MBER <u>D113</u>	CUT LENG	mi <u>144'-6'</u>
SHOP WASHER ID: PC	CR FI	ELD WASHER ID: PC	121 CR 1075
			DATE 4/1/74
2. Date tendon received	on-site <u>3-18-</u>	74 RHR Number	37984
3. Date installed in co			
	Wires replaced		
4. Date buttonheaded _			
			ffective wires
			17
Date restressed	·	Restressing NCR's	
	•		FIELD END TOTAL
Siongation (1500 ps	i to 80% ult.)-Pred./A	ct. 428 1428 1	128,1434 934,1934
) Lift-Off Pressure, •	• Predicted/Actual	680017100,00	684016850pt N/A
Shim Thickness/80%	Ultimate Pressure	73, 017770	658"17790p= N/A
Unseated/Broken Wi	res Tot	al effective wires	after stressing <u>163</u>
6. Date Bulk-filled			
Time since install	ation 1034 months In	let Pressure 50 ps	T_ Outlet Temp. 140°
Date end caps refi	lled: Shop	Field	
7. Data compiled by _	D. Malla	Organization	Selen .
		, Date	30/7]
8. Additional Comment	5:		
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	Florida . Power	CRYSTAL RIVER UNIT REACTOR BUILDING PREJTR TENDON HISTO	ESSING SYSTEM	At	Jeuhetina 8-95-006 tachanant 8 ige 84
TENI	DON IDENTIFICATION NU	HBER		ENCTH	·
SHOI	P WASHER ID: PC	CR FIELD	WASHER ID: PC	CR	L
1.	GAI/QA vendor inspec	tion cover letter number-H	PC /	DATE	
2.	Date tendon received	on-site	RHR Numbe	r	
3.	Date installed in co	onduit	_ Installation	NCR'S	
•	Wires removed	Wires replaced	Total	Ineffective with	res
4.	Date buttonheaded	Butto	nheading NCR's	•	
	Bad vires	Accept. Reheads	Total I	neffective wire	s
5.		Str			
•		Res		•	
			SHOP END		TOTAL
	Elongation (1500 ps	i to 80% ult.)-Pred./Act.		·	/
مل	Lift-Off Pressure -	Predicted/Actual			N/A
	Shim Thickness/802	Ultimate Pressure			N/A
	Unsested/Broken Wir	es Total e	effective wire	after stressin	8
6.	Date Bulk-filled	Bulk-Fi	lling NCR's		
	Time since installs	tion Inlet P	ressure	Outlet Te	:mp
	•	lled: Shop			
7.	Data compiled by	D. Malla	Organizatio	n Sulem	
		· · · · · · · · · · · · · · · · · · ·		11/17	
8.	Additional Comments	: Dome Repair -	•••		
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Conconstiun	TENDON HIST			
NDON IDENTIFICATION NUMBER	<u>D114</u>	CUT LI	INCTH 146- 2	*s ·
OP WASHER ID: PC_/21 CR		-		
GAI/QA vendor inspection cover	letter number-	FPC 1	DATE	4/1/24
Date tendon received on-site _	3.18-74	RMR Number	37984	
Date installed in conduit	5-2-74	_ Installation	NCR's	
Wires removed Wire	s replaced	O Total	Ineffective wir	es <u>0</u>
Date buttonheaded	<u>74</u> Butto	nheading NCR's		
Bad wires <u>O</u> Accept.			•	0
Date stressed <u>11-27-</u>	<u>74</u> Str	essing NCR's	1726,1727	۱ 
Date restressed				
		SHOP END	FIELD END	TOTAL
, ongation (1500 psi to 80% ul	t.)-Pred./Act.	47815-8	4 1/8 , 4 5/8	914 193
) Lift-Off Pressure - Predicted/			<u>684016900</u>	N/A
Shim Thickness/80% Ultimate Pr	essure	7_17,770	6 % 17790	N/A
Unseated/Broken Wires/	Total e	+		
Date Bulk-filled 3-25-7	75Bulk-F	llling NCR's		
Time since installation $10\frac{4}{4}$	month Inlet 1	ressure 45	outlet Ten	p. 140°
Date end caps refilled: Shop				
Data compiled by <u>DMal</u>	a	Organization	Salam	
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. Additional Comments:AL	wire A	it Seated	e on til	dExd.
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Florida CRYSTAL RIVER REACTOR BUILDING PR TENDON II		ECTRESSING SYSTEM	Calcu Atiac Page 1	<b>intian 5-95-0082</b> Iument B B6
NDON IDENTIFICATION N	INBER <u>DIIH</u>	CUT 1.	ENGTH	•
OP WASHER ID: PC	CR FI	LELD WASHER ID: PC	CR	
GAI/QA vendor inspe	ction cover letter num!	ber-FPC #	DATE	
Date tendon receive	d on-site	RMR Numbe	r	
	onduit			
Wires removed	Wires replaced	Total	. Ineffective wir	es
Date buttonheaded _	B	uttonheading NCR's	·	
Bad wires	Accept. Reheads	Total I	ineffective wires	·
, Date stressed	· · · · · · · · · · · · · · · · · · ·	Stressing NCR's	· · · · · · · · · · · · · · · · · · ·	
Date restressed	·····	Restressing NCR's	} 	
	,	SHOP END	FIELD END	TOTAL
Elongation (1500 ps	i to 80% ult.)-Pred./A	let/		
Lift-Off Pressure -	Predicted/Actual			<u>N/A</u>
Shim Thickness/80Z	Ultimate Pressure			<u>N/A</u>
Unseated/Broken Win	tes Tot	al effective wire	s after stressing	\$
Date Bulk-filled	Bul	k-Filling NCR's	- 	
Time since installs	Ini	let Pressure	Outlet Ter	
Date end caps refil	lled: Shop	Field		·
Data compiled by	Denally	Organizatio	n Selan	
	• .	Date 🥂	11/22	
Additional Comments	: Dome Repair -			
	Shop End (7/11/16)			
	tolt Pressure - )			
Legrissing - (11	24/76) 200 FSH NCR	2581 190° N	KR 2582	-
	-			
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	Florida Power	CRYSTAL RIVER REACTOR BUILDING PI TENDON I	RE TRESSING SYSTEM		Calculation 5-95-0092 Affacturent B Page B7
) Tendon Ide	NTIFICATION NUMB	er <u>D115</u>	OT L	ENGTH	7/2
SHOP WASHE	R ID: PC	CR <u>675</u> F	IELD WASHER ID: PC	122	CR 1231
1. GAI/Q/	vendor inspecti	lon cover letter num	ber-FPC	90	DATE <u>4/1/14</u>
2. Date p	condon received o	on-site <u>3-18-</u>	74 RMR Numbe	r <u> </u>	<u>.</u>
3. Date f	Installed in cond	luit <u>5-2-7</u>	14 Installation	NCR's	
		Wires replaced			
4. Date b	outtonheaded	9-30-74 B	uttonheading NCR's	· · · · · · · · · · · · · · · · · · ·	
Bad wi	lres <u>O</u>	Accept. Reheads	O Total I	neffective w	ires <u>O</u>
		-11-74			
Date :	restressed	······································	Restressing NCR's	,	
•		to 80% ult.)-Pred./A	SHOP END	FIELD END	TOTAL
		redicted/Actual			
Shim '	Thickness/80Z V1	timate Pressure	635 17790	<u>653"177</u>	70 <u>N/A</u>
Vnsea	ted/Broken Wircs	Toz	al effective wires	s after stres	sing 163
6. Date	Bulk-filled	3-25-75 Bul	k-Filling NCR's		
Time	since installati	on 103/1 months In	let Pressure 52	<u>)51</u> Outlet	Temp. <u>1400</u>
Date	end caps refille	d: Shop	Field		
7. Data	compiled by <u></u>	d: Shop	Organization	n <u>Salem</u>	<b>~</b> 
			Date	3/30/77	•
8. Addit	ional Comments:	<b></b>			·
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		tion cover letter		-		
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			-		FIELD END	TOTAL
Elor	igation (1500 ps	i to 80% ult.)-Pr	ed./Act.			
) Lift	t-Off Pressure -	Predicted/Actual				<u></u> N/A
Shir	Thickness/807	Vitimate Pressure				<u></u>
Unse	ated/Broken Wir	¢s	_ Total e	fective wires	after stressi	ng
6. Dati	Bulk-filled		Bulk-Fi	Lling NCR's		
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, en	DON IDENTIFICATION NUMBER	D 115	CUT LE	NCTH	••••••••••••••••••••••••••••••••••••••
SHO	P WASHER ID: PC 121 C	R FIEL	D WASHER ID: PC_	C:	R
1.	GAI/QA vendor inspection co	over letter number	-FPC /	DAT	E
2.	Date tendon received on-si	te	MR Number	•	
3.	Date installed in conduit		Installation	NCR's	
	Wires removed				
4.	Date buttonheaded				
	Bad wires Acce				
5.	Date stressed				
	Date restressed				
	•		SHOP END	FIELD END	TOTAL
	Elongation (1500 psi to 80	X ult.)-Pred./Act.		•	
4	Lift-Off Pressure - Predic	ted/Actual	<u> </u>		<u> </u>
	Shim Thickness/80% Vitimat	e Pressure			<u></u>
	Unseated/Broken Wires	Total	effective vires	after stressin	8
6.	Date Bulk-filled				
	Time since installation	Inlet	Pressure	Outlet Te	:mp.
	Date end caps refilled: S		Field		
7.	Data compiled by	5. laffin	Organization	FPC	
		Ű	Date <u>9-31</u>	0 - 77	•
8.	Additional Comments: D	PREPARATIO	N FOR 15	T SURVER	LANCE
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	Florida CRYSTAL RIVER USIT NO. 3 REACTOR BUILDING PRISTRESSING SYSTEM TENDON HISTORY	Calculation S-95-0092 Attachment B Page 810
TEND	DON IDENTIFICATION NUMBER DI16 CUT LENGTH 148	-10/18
Shop	WASHER ID: PC_121_ CR_946_ FIELD WASHER ID: PC_121_	CR _734
1.	GAI/QA vendor inspection cover letter number-FPC #	DATE <u>4/1/74</u>
2.	Date tendon received on-site <u>3-18-74</u> RMR Number <u>3798</u>	74
3.	Date installed in conduit <u>5-6-74</u> Installation NCR's	
•	Wires removed Wires replaced Total Ineffective	wires O
4.	Date buttonheaded $9 - 30 - 74$ Buttonheading NCR's	
	Bad wires Accept. Reheads Total Ineffective w	ires
5.	Date stressed Stressing NCR's	
•••	Date restressed Restressing NCR's	······································
	SHOP END FIELD END	
$\searrow$	Elongation (1500 psi to 80% ult.)-Pred./Act. 5"1434" 5"154	
	Lift-Olf Pressure - Predicted/Actual 676076950,16300767	•
•	Shim Thickness/80% Ultimate Pressure <u>フェリフクロ</u> の フムリフク	· ·
	Unseated/Broken Wires Total effective wires after stres	-
6.	Date Bulk-filled <u>3-25-75</u> Bulk-Filling NCR's	
	Time since installation 10 mults Inlet Pressure 50 pst_ Outlet	Temp. <u>140</u>
	Date end caps refilled: Shop Field	
7.	Date end caps refilled: Shop Field Data compiled by <u>D</u> Mally Organization <u>Salery</u> Data	•
	Date 3/30/17	
8.	Additional Comments:	
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRE- TUNDON 1115	FRESSING SYSTEM	Calcu Attaci Page I	lation 8-95-0082 Internt B B13
) Tên	DON IDENTIFICATION NUMB	er <u>D130</u>	OIT LI	ENGTH	<u>k</u>
SHO	P WASHER ID: PC 1.21	CR 424 FIEL	D WASHER ID: PC	<u>୍ରା ଅନ୍ଥ</u> ମହ	1260
1.	GAI/QA vendor inspecti	on cover letter number	-FPC   _/020	Z DATE	4/1/24
2.	Date tendon received o	n-site <u>.3-22-74</u>	RMR Number	38020	
	Date installed in cond	•			
•	Wires removed	Wires replaced	O Total	Ineffective wire	
	Date buttonheaded				
	Bad wires <u>8</u>	Accept. Reheads	3 Total I	neffective wires	0
5.	Date stressed/	<u>0-31-74</u> si	ressing NCR's _		
	Date restressed	•			
-			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi (	o 80% ult.)-Pred./Act.	434"1.5"	43415"	95110"
5	Lift-Off Pressure - Pr	edicted/Actual	6870/6550	0080 10180	N/A
	Shim Thickness/80% Vi	imate Pressure	553 17810	53,17780	<u> </u>
•	Unseated/Broken Wires	Total	effective wires	after stressing	
6.	Date Bulk-filled	4-4-75 Bulk-	Filling NCR's		
•	Time since installation	on 10 34 molls Inlet	Pressure 55	ST_ Outlet Temp	. <u>140°</u>
			•		
7.	Date end caps refille Data compiled by <u></u>	Mulla	Organization	Salem_	
			Date	3/30/71	•
8.	Additional Comments:				
		·	·		
	<i>ــــــــــــــــــــــــــــــــــــ</i>				الحد مني المحالين والمحال البران والبروي
$\mathbf{y}_{\mathbf{r}}$				•	
				· · · · · · · · · · · · · · · · · · ·	·
	•			•	میں جنوبی میں میں میں میں میں میں میں میں میں می

•	·			
Florid Powe		RUSTRESSING SYSTEM	Calc Atta Page	ulation 5-95-0082 Ilmant B B12
LENDON IDENTIFICAT	ION NUMBER DI31	CUT LE	NGTIL 140'-	y7/8
SHOP WASHER ID: PO	: <u>) 21</u> CR <u>/002</u> F	TELD WASHER ID: PC	121 CR	470
1. GAI/QA vendor	inspection cover letter num	ber-FPC /	2 DATE	HILIN
•	eceived on-site <u>3-22-</u>			
3. Date installed	d in conduit	74_ Installation	NCR'S	
· Wires removed	0 Wires replaced	Total	Ineffective wire	. 0
	aded <u>9-20-74</u>	•		
Bad wires	//Accept. Reheads	9 Total I	neffective wires	2
•	12.5-74			
•	ed	-		
		SHOP END	FIELD END	TOTAL
$\boldsymbol{\triangleleft}$	500 psi to 80% ult.)-Pred./			931979
) Lift-Off Pres	sure - Predicted/Actual	· · · · · ·	674016600	
Shim Thicknes	s/80% Vitimate Pressure	6417660	641,7700	<u>N/A</u>
	en Wires To	•		
	led <u>4-4-75</u> Bu			
•	estallation <u>10<sup>3</sup>4months In</u>	•		
Date end caps	refilled: Shop	Field	•	
7. Data compiled	by D. Maller	Organization	Salem_	
8. Additional Co	nments:	•		·
<u></u>	·		•	
)				
·				
and the second se				أخون بالموادع بالمتشقين ويستهال

	Florida Power	CRYSTAL RIVER REACTOR BUILDING P TENDON	RES IRE	SSING SYSTEM		Culculation 8-95-6082 Attachment 8 Page 813
) Tendon (	IDENTIFICATION NUMB	er <u>0131</u>	, 		ENGTH	
	SHER ID: PC					
1. GAI	 /QA vendor inspecti	on cover letter num	aber-Fl	PC /	DAT	É
2. Dat	e tendon received o	n-site		RMR Numbe	r	
	e installed in cond					
	es removed					•
	e buttonheaded				-	
	wires					
	e stressed					
	e restressed					
					FIELD END	TOTAL
C El	engation (1500 psi (	to 80% ult.)-Pred./	Act.			/
) L11	t-Off Pressure - Pi	redicted/Actual	•		/	N/A
Sh	im Thickness/80% Uli	timate Pressure				
Un:	seated/Broken Wires	Ta	tal el	fective wire	s after stressi	ng
	te Bulk-filled	· · · · · · · · · · · · · · · · · · ·				
Ti	e since installati	on Ir	let P	ressure	Outlet T	emp.
Da	te end caps refille	d: Shop		_ Field		
7. Da	ta compiled by Z	> Malla		Organizatio	n Sala	<u>۲</u>
١	•	•		Date	4/1/2	2
8. Ad	ditional Comments:	Dome Repair				•
			_	(1/19/14)		· · · · · · · · · · · · · · · · · · ·
ke	<u>gorensing - Shy</u> gorensing - (13/1	(136) 225 PSIG	NC	R 2582	. 180° NCA	2581
						•
	· · · · ·					•
) -						
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Florida CRYSTAL RIVER UM REACTOR BUILDING PRUS TENDON HIS	RESSING SYSTEM	Color Astor Page	dation 8-95-0082 channet B B14
JUON IDENTIFICATION NUMBER D 132	CUT LE	NCTH	11 <sup>"</sup>
THOP WASHER ID: PC 121 CR 938 FIEL			
CAI/QA vendor inspection cover letter number			
. Date tendon received on-site <u>3-22-74</u>		· •	
. Date installed in conduit <u>5-13-74</u>		•	
Wires removed Wires replaced			
. Date buttonheaded 9-20-74 Built			
Bad wires Accept. Reheads		_	
i. Date stressed 12-3-74 5			
Date restressed R			۱ 
	SHOP END	FIELD END	TOTAL
Slongation (1500 psi to 60% ult.)-Pred./Act	434145	45/478	93,93
) .ift-Off Pressure - Predicted/Actual			
Shim Thickness/80% Ultimate Pressure			
Vnseated/Broken Wires Total	•	-	
. Date Bulk-filled Bulk-	Filling NCR's		
Time since installation Monarth Inles	Pressure 20p	5/ Outlet Tem	p. <u>160°</u>
Date end caps refilled: Shop	Field		
Date end caps refilled: Shop . Data compiled by <u>D.Malla</u>	Organization	Salem.	· ·
•	Date	3/39/17	
1. Additional Comments:			
ما ها <sup>و</sup> من مار المساحد			
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FIOTICA CRYSTAL RIVER UNIT NO. 3 REACTOR EULIDING PRESSING SYSTEM TENDON HISTORY	Colvulation 8-95-0082 Atlachment B Fage B15
IDUAL IDENTIFICATION NUMBER D211 OUT LENGTH 142	2-01/2
OP WASHER ID: PC 121 CR 487 FIELD WASHER ID: PC 122	CR 1268
GAL/QA vendor inspection cover letter number-FPC # DZ45 D	DATE 4/10/14
Date tendon received on-site <u>3-29-74</u> RMR Number <u>382</u>	46
Date installed in conduit 5-30-74 Installation NCR's	•
Wires recoved Wires replaced Total Ineffective	vires
Date buttonheaded 10-17-74 Buttonheading NCR's	
Bad wires O Accept. Reheads O Total Ineffective up	ires O
Date stressed 10-30-74 Stressing NCR's168	3
Date restressed Restressing NCR's	
SHOP END FIELD END	TOTAL
nsatiun (1500 psi to 60% ult.)-Pred./Act. 4981544 5" 154	
List-Off Pressure - Predicted/Actual 68/017100ps 6,870, 7,00	QDS: N/A
Shim Thickness/80% Ultimate Pressure 55"17,780 6" 1781	0 <u>N/A</u>
. Unseated/Broken Wires Total effective wires ofter stres	sing 162.
. Date Bulk-filled <u>3-26-75</u> Bulk-Filling NCR's	
Time since installation <u>934 month</u> Inlet Pressure <u>50 pri</u> Outlet	Temp32°
Date end caps refilled: Shop Field	, 
. Data compiled by Donally Organization Salan	1
Date 3/29/17	•
. Additional Coments: One wine not seated in u	rilev.
- · ·	•
· · ·	
<u>ــــــــــــــــــــــــــــــــــــ</u>	•
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	Sear POWER REACTOR BUIL	L RIVER UNIT LDING PRESTRE TENDON HISTOR	SSING SYSTEM	Ci Ai Pi	iculation 5-95-0082 forharms B go B16
TENDO	ON IDENTIFICATION NUMBER	211		ICTH	
	WASHER ID: PC CR				
	GAI/QA vendor inspection cover let		•		•
2. 1	Date tendon received on-site		RHR Number		
	Date installed in conduit			•	
	Wires removed Wires re				
	Date buttonheaded				
	Bad wires Accept. Reh				
	Date stressed				
	Date restressed				
			SHOP END		TOTAL
$\sum_{k=1}^{n}$	Elongation (1500 psi to 80% ult.)	-Pred./Act.			
~)	Lift-Off Pressure - Predicted/Act	val			<u>N/A</u> .
	Shim Thickness/80% Ultimate Press	UTC			<u> </u>
	Unseated/Broken Wires	Total ef	fective wires	after stressing	
6.	Date Bulk-filled	Bulk-F1	lling NCR's		
	Time since installation				
	Date end caps refilled: Shop				
7.	Data compiled by D. Mal	12	_ Organization	Sala	7
			Date	4/1/17	
8.	Additional Comments: <u>Porme</u> R	epair - ·	, 	·	
	Degreasing - Shop (7/15/20	•		·	.:
	· /.				- ····
-				- -	
<u>{</u>		•	·		
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FORICA CRYSTAL RIVER POWDY REACTOR EUILDING PR TENDON II	
:DON IDENTIFICATION SUBBR D212	CUT LENGTH 144 - 3
OP WASHER ID: PC $12.1$ CR $10.3.2$ FI	ELD WASHER ID: PC 122 CR 1214
	CET-FPC 7 10245 DATE 4/10/74
Date tendon received on-site <u>3-29-7</u> %	
	Installation NCR's 1410
· · · · · · · · · · · · · · · · · · ·	O Total Ineffective wires O
-	sttonheading NCR's
_	O Total Ineffective wires /
•	Stressing %CR's
Date. restressed	Restressing NCR's
Lift-Off Pressure - Predicted/Actual Shim Thickness/80% Ultimate Pressure	<u>SHOP END</u> <u>FIELD END</u> <u>TOTAL</u> TOTAL TOTAL 5/4"14/76" <u>9/5</u> "19/2 6,77016600pst 6,77016,700pst N/A <u>677016600pst 6,77016,700pst N/A</u> <u>677016600pst 6,77016,700pst N/A</u> al effective wires after stressing <u>1/0,2</u>
	k-Filling NCR's
Time since installation <u>934 months</u> Inl	et Pressure 47pzi Outlet Temp. 1240
Date end caps refilled: Shop	
. Data compiled by <u>Dowallen</u>	Organization Salam
	Date <u>3/29/77</u>
. Additional Coments:	•
· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·
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### CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRISSING SYSTEM TENDOM BURYRILLANCE PECOND

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TENDOR NO. \_\_\_\_\_\_

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Inspection Period and		Tores	Avg. Tores	Shin Thichdag		Effective	Tares	Avg. Force	Shim Thicksee		Total Effective	Timper		
l	Location	<u>(kips)</u>	<u>(1194)</u>	( <u>in)</u>	( <u>1</u> n)	Wiree	(Hipe)	(1199)	<u>(1a)</u>	<u>(10)</u> 11	Ulres	<u></u>	 14	<u>Comente</u>
Original Stressing		1588		6_3/84	4 5/8"		<u> 1/A</u>		¥/4_	<u>M</u> T				
12/3/74		1612	1600	6_3/8*	4 7/8"	162	¥/A.	1/4	<u>¥/4</u>	<u>. ₩/ A</u>	<u>¥/4</u>	<u>¥/4</u>	<u>¥/A</u>	۰.
1 24		1392		6_3/8"	<u>#/A</u>		¥/A		11/A	1/A				L. Life-off caly
10/26/81	_ <u>r</u> _	1283	1338	6 <u>3/8</u> *	<u>#/A</u>	162	<u>*/Å</u>	1/1	¥/A	¥/A	162			
ATH	5-1	1292			Pla		MA		ula	NIA			567	
0/26/87	F:3	1260	276	6 1/2	علا	<u>162</u>	MA	<u>r Ia</u>	nte	на	<u>u la</u>	90 <u>°E</u>	_E_ 72	Apped
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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY	Calculation 8-95-0082 Attachment B Page B19
TENDON IDENTIFICATION NUMBER D213 OUT LENGTH 146	- 2 1/4
SHOP WASHER ID: PC 121 CR 984 FIELD WASHER ID: PC 121	CR <u>878</u>
I. GAI/QA vendor inspection cover letter number-FPC # 10245 DA	TE <u>4/10/74</u>
2. Date tendon received on-site <u>3-29-74</u> RMR Number <u>3824</u>	16
3. Date installed in conduit <u>6-10-74</u> Installation NCR's	
. Wires removed Wires replaced Total Ineffective v	vires <u>O</u>
4. Date buttonheaded 10-16-74 Buttonheading NCR's	
Bad wires O Accept. Reheads O Total Ineffective wir	
5. Date stressed Stressing NCR's	
Date restressed Restressing NCR's	
SHOP END FIELD END 'ongation (1500 psi to 80% ult.)-Pred./Act. 5% 1434 438 1434	<u>TOTAL</u> <u>95,95</u>
Lift-Off Pressure - Predicted/Actual 68401 6900 psr 6800 1 6,800	MSE N/A
Shim Thickness/80% Vitimate Pressure - 658 17,790 63/8,7,77	0 <u>N/A</u>
Unseated/Broken Wires Total effective wires after stress	ing:
6. Date Bulk-filled 3-26-75 Bulk-Filling NCR's	
Time since installation <u>Jamontho</u> Inlet Pressure <u>51 psp</u> Outlet	Temp. 122.0
Date end caps refilled: Shop Field	
7. Data compiled by <u>Donalle</u> Organization <u>Salar</u>	
Date 3/29/77	
8. Additional Comments: <u>Yellow Shime</u>	·····
<u> </u>	
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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRE TRESSING SYSTEM TENDON HISTORY Chivalation 5-95-6082 Attachment B Page B26

ENI	DON IDENTIFICATION NUMBER	3	OIT LE	NCTH	
HO	WASHER ID: PC CR	FIELD V	ASHER ID: PC_	CR	
•	GAI/QA vendor inspection cover letter nu	mber-Fl	PC /	DATE	
2.	Dats tendon received on-site		RMR Number		
3.	Date installed in conduit		Installation	NCR'S	
	Wires removed Wires replaced	l	Total	Ineffective wir	es
4.	Date buttonheaded	Button	heading NCR's		
	Bad wires Accept. Reheads		Total I	neffective wires	
5.	Data stressed	_ Stre	ssing NCR's		
	Date restressed				
				FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred.	/Act.			
	Lift-Off Pressure - Predicted/Actual				
	Shim Thickness/80% Ultimate Pressure	•			N/A
	Unseated/Broken Wires T				•
6.	Date Bulk-filledB				
	Time since installation I				
	Date end caps refilled: Shop			-	
7.	Data compiled by Double				
			Date	+/11/22	
8.	Additional Comments: Dome Repair	· `		•	
	Degreasing - Shop - (7/15/16)			•	;
	- synamic - frankingen (frankingen)				_ •
	<sup>™</sup> \$1				
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DON IDENTIFICATION NUMBER $D_{2/4}$ , CUT LENGTH $147' \cdot 11'/4$ DP WASHER ID: PC CR 765 FIELD WASHER ID: PC $\times 121$ CR $964(Yu)$ GAL/QA vendor inspection cover letter number-FPC $V_{0245}$ DATE $4/10/34$
OP WASHER ID: PC CR_765 FIELD WASHER ID: PC_ $\frac{*121}{}$ CR_964(YW
Date condon received on-site 3-29-74 RMR Number 38246
Date installed in conduit 6-10-74 Installation NCR's
Wires repoved Wires replaced Total Ineffective wires
Date buttonheaded 10-16-74 Buttonheading RCR's
Bad wires Accept. Reheads Total Ineffective wires
Date stressed Stressing %CR's
Date-restressed Restressing KCR's
SHOP EXD FIELD END TOTAL
ngazion (1500 psi co 607 ult.)-Pred./Acc. 541494" 498", 478" 954'19
Lift-Off Pressure - Predicted/Actual 667016800psi 67406800psi N/A
Shim Thickness/80% Ultimate Pressure <u>7" 17600 7%; 7680</u> N/A
Unseated/Broken Wires Total effective vires after stressing
. Date Bulk-filled <u>3-26-75</u> Bulk-Filling NCR's
Time since installation <u>96 months</u> Inlet Pressure <u>48ps;</u> Outlet Temp. <u>1340</u>
Date end caps refilled: Shop Field
. Data compiled by Donally Organization Salen
Date 3/29/77
. Additional Coments: * Yellow slims used with yellow washer.



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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRE:: CRESSING SYSTEM TENDON HISTORY Calculation S-95-0082 Attachment B Page B22

SHOP	P WASHER ID: PCC	R FIEL	D WASHER ID: PC	CR	·
i.	GAI/QA vendor inspection c	over letter number	-FPC /	DATE	
2.	Date tendon received on-si	.te	RHR Numbe	£	
3.	Date installed in conduit		Installation	NCR's	
	Wires removed	Wires replaced	Total	Ineffective wir	
4.	Date buttonheaded	Buci	tonhesding NCR's	·	
	Bad wires Acce	ept. Reheads	Total 1	ineffective wires	
5.	Date stressed				
	Date restressed				
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi to 80	0% ult.)-Pred./Act	•		/
	Lift-Off Pressure - Predic	cted/Actual			N/A
·	Shim Thickness/80% Ultima	te Pressure			N/A
	Unseated/Broken Wires	Total	effective wire	s after stressing	B
6.	Date Bulk-filled	Bulk-	Filling NCR's		
	Time since installation _	Inlet	Pressure	Outlet Te	mp
	Date end caps refilled;	Shop	Field		
7.	Data compiled by	mally	Organizatio	a Saling	
			Date	Alutr	
8.	Additional Comments: <u>Do</u>	me Repair -			
	Degreasing - Stop	(alula) Field	(7/9/76)	•	:
	Lift-off Readings - 2	Ten 5600 (1/13/16	) Field 6350	(1/10/76)	·
~	Legrensing - Field	200 FAC NEE 15	81,2582	1900-1900 (	(12/1/16)
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WASHER ID: PC	ength cr	
FPC #		
	DATE	
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	· _	
-		
		TOTAL
	•	
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_ Organizatio	FPC	
Date 9	- 30-77	•
N FOR	IST SURVE	TLLANCE
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	,	<u>مەرىپە مەرىپە مەرىپە مەرىپەر م</u>
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	- <u></u>	•
	Total ponheading NCR's Total I ressing NCR's stressing NCR's <u>SHOP END</u>  effective vires illing NCR's Pressure Field   Date	Total Ineffective wire Total Ineffective wires ressing NCR's stressing NCR's <u>SHOP END</u> <u>FIELD END</u>    effective wires after stressing 111ing NCR's Pressure Outlet Ten  Field  Date <u>9-30-77</u> Date <u>9-30-77</u> DATE DATE DATE  DATE  

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Calculation 8-95-0082 Attachment B Page #24

Power	REACTOR BUILDING PREST TENDON HIST			
LENDON IDENTIFICATION NUM	BER D-215	CUT LE	INGTH _149	3 3/4
SHOP WASHER ID: PC 121				
1. GAI/QA vendor inspect		_		
2. Date tendon received				
3. Date installed in co		•		
	Wires replaced			s ()
4. Date buttonheaded			· · ·	
	_ Accept. ReheadsO			
5. Date stressed				
	Re			
	to 80% ult.)-Pred./Act.	SHOP END	FIELD END	TOTAL
-	Predicted/Actual		6870 17000 pst	
	ltimate Pressure -	•		N/A
•	s <u>0</u> Total	•		163
6. Date Bulk-filled				r
· · · ·	ion <u>Hamostha</u> Inlet			. <u>132°</u>
Date end caps refill		Field		
7. Data compiled by Z	? Mille.	Organization	Silin	
		Date <u>3/29/</u>		
8. Additional Comments:	;	·.		
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CRYSTAL RIVER UNIT NO. 3

Colculation S-95-0082 Attachment B Page B25



CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESIRESSING SYSTEM TENDON HISTORY

TENDON IDENTIFICATION N	UMBER <u>215</u>	an	LENGTH	
SHOP WASHER ID: PC	CR	FIELD WASHER ID:	PC CR	L
1. GAI/QA vendor inspe	ection cover letter nu	mber-FPC /	DATE	
2. Date tendon receive	ed on-site	RMR Nu	aber	
3. Date installed in (	conduit	Installat	Lon NCR's	
. Wires removed	Wires replaced	To	tal Ineffective wi	res
4. Date buttonheaded		Buttonheading NC	R'*	
Bad wires	Accept. Reheads	Tota	1 Ineffective wire	\$
5. Date stressed		Stressing NCR'	£	
•				
,	•	SHOP END	FIELD END	TOTAL
J Elongation (1500 p	si to 80% ult.)-Pred.	/Act		/
Lift-Off Pressure	- Predicted/Actual			<u> </u>
Shim Thickness/802	Ultimate Pressure	·		<u></u>
Unscated/Broken Wi	lreb 1	otal effective w	ires after atressi	ng
6. Date Bulk-filled		ulk-Filling NCR'	5	
Time since install	lation1	inlet Pressure	Outlet T	eap
•	illed: Shop		<b>_</b>	
7. Data compiled by	D. Malla	Organiza	tion <u>Sala</u>	
		Date	thilr	?
8. Additional Commen	25: Dome Lepain	,		
Degreasing -	Shop (7/15/16)			
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Calculation \$-95-0082 Attackment B Page B26

-).	CRYSTAL RIVER UNIT NO. 3 Page 1 CRYSTAL RIVER UNIT NO. 3 PAGE	
<b>FEN</b>	DON IDENTIFICATION NUMBER D-215 OUT LENGTH	
5HO	P WASHER ID: PC CR FIELD WASHER ID: PC CR	·
L.	GAI/QA vendor inspection cover letter number-FPC / DATE	
2.	Date tendon received on-site RMR Number	
3.	Date installed in conduit Installation NCR's	
	Wires removed Wires replaced Total Ineffective wires	
4.	Date buttonheaded Buttonheading NCR's	
-	Bad wires Accept, Reheads Total Ineffective wires	•
5.	Date stressed Stressing NCR's	~
	Date restressed Restressing NCR's	
	SHOP END . FIELD END	TOTAL
5	Elongation (1500 psi to 80% ult.)-Pred./Act. /	
	Lift-Off Decouve - Predicted/Actual (KTPs) 1336.6/1612 1336.6/1675.5	N/A
	Shim Thickness/80% Ultimate Pressure	<u></u>
	Unseated/Broken Wires O Total effective wires after stressing	163
6.	Date Bulk-filled Bulk-Filling NCR's	
	Time since installation Inlet Pressure Outlet Temp.	
	Date end caps refilled: Shop 2-8-78 Field 7-9-78	
7.	Data compiled by D.F. Kiff Organization FR	<u> </u>
	10 Date 5-15-78	•
8.	Additional Comments: INSPECTED FIRST SURVETLANCE (2-3	-78)
	1) NO INDICATION OF RUST-CORROSION	·
	2) LOCK-OFF PORCE (SHOP-SAME AS LIFT-OFF; FIELD-165	<u>4K)</u>
	3) NO CRACKING AT ANCHORAGE	~~~~~
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#### CRITICAL RIVER UNIT NO. 3 BRACTOR BUILDING PRESTRESSING STATEM THNOM SURVEILLANCE RECORD

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TENDON NO. \_\_\_\_\_\_

			Lt1	T OFF COMD	TION				RETENSION	10					
Isspection Period and Data	Location	Jorce (k(pe)	Avg. Torce (kipe)	Shis Thickness ((a)	flong- ation (in)	Total Effective Vires	Torco (hipe)	Avg. Force (Lipe)	Shin Thichness ((s) 10	Elong- ation (in)	Totel Effective Viree 12	Temper	r 31dg. atura 91 <u>Ret.</u> 14		
Original Stressing	 	1663			45-	·	<u>W/A</u>		<u>₩/A</u>	<u>#/A</u>					
11/4/74	1	1670	1667	<u>6 3/4</u> -	<u>5 1/8"</u>	163	<u></u>	<u> 1/4</u>	1/4	<u>#/A</u>	<u> </u>	<u>¥/A</u>	<u>₩/A</u>	•	
_1 <sup>st</sup> 2/3/78	<u>هـ</u> ۲	<u>1612</u> 1676	1644	<u>7"</u> 6 3/4"	<u>R/A</u> N/A	163	<u>1612</u> 1654	1633	7" 6 3/4"	<u>H/A</u> H/A	163	92	46		
14	_ <u>\$_</u>	1568	·	_ <u>7</u> *	¥/A		3/4		<u>7"</u>	<u>₩/A</u>				1. Lift-off only	
10/22/81	-L-	<u>1619</u>	_1594	6_2/5"	¥/A.	_163	H/A	<u>H/A</u>	6_3/4"	<u>H/A</u>	163		85		
5TH 11/4/13	<u>S</u> F	<u>1458</u> 1 <u>579</u>	1 <u>518</u>	748 678	<u>N/A</u> <u>N/A</u>	<u>163</u>	NIA NIA	. <i>6</i> 14	ын Лн	N/A N/A	<u>N/A</u>	/23°	<u>72</u> °	32 GALLONS OF GLC ADDED OVER LETHON	
	~~					·	~		• 						Attentioner Page 827
•								•					•		3

Chirakatan S. 75.4042 Attentional B Page RJ1

Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	"ESSING SYSTEM		alation 5-95-0082 :havent 8 B28
CENDON IDENTIFICATION NUMB	BER <u>D 216</u>	ຒຬຏ	ength <u>150'-6</u>	3/4
SHOP WASHER ID: PC 121	-			
1. GAL/QA vendor inspect:	lon cover letter number-	FPC 1 102	date	4/10/74
2. Date tendon received (	on-site <u>4-1-74</u>	RMR Numbe	3 8273	
3. Date installed in con		•		
. Wires removed	Wires replaced	O Total	Ineffective wire	s_0
4. Date buttonheaded		_		
	Accept. Reheads			0
5. Date stressed				
Date restressed	Re	stressing NCR's	•	· · · · · · · · · · · · · · · · · · ·
		SHOP END	FIELD END	TOTAL
S iongation (1500 psi	to 80% ult.)-Pred./Act.	54"15"	4815"	94 10"
Lift-Off Pressure - P			- 6810 16700 pst	*
Shim Thickness/80% U	timate Pressure	74 17770	634 ,7780	<u>N/A</u>
Unseated/Broken Wires	Total	effective wire:	after stressing	
6. Date Bulk-filled	<u>3-26-75</u> Bulk-F	illing NCR's		
Time since installati	ion <u>92 months</u> Inlet	Pressure 55p	GT_ Outlet Temp	. <u>132°</u>
Date end caps refille	ed: Shop	Field		
7. Data compiled by	? avath	Organization	Salam_	
		Date 3/2	/17	
8, Additional Comments:	<u></u>	•		
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Florida	CRYSTAL RIVER		Ci At	alculation 8-95-808 Hackgrout B
	REACTOR EUILDING PETERDON I		Pa	ge \$29
$\sim$	0.205	. •		
DON IDENTIFICATION NUE	er 0 303	CIT L	ENGTH	Y
P WASHER ID: PC 121		-		
GAI/QA vendor inspects	on cover letter num?	er-FPC 1	T7 DATE	4/30/74
Date tendon received of	n-site <u>4-10-7</u>	4 RMR Numbe	- 38726	
Date installed in con-	luit <u>6-20-71</u>	L Installation	NCR's	•
Wires removed	Wires replaced	0 Total	Ineffective wire	<u> </u>
Date buttonheaded				
Bad vires			•	
Date stressed	_			
• •				
Date restressed	<u> </u>			
~		SHOP END	<u>FIELD E:D</u> 3/." 33/."	TOTAL
Jongation (1500 psi				76.8
Lift-Olf Pressure - P	redicted/Actual		si 6770, 7030ps	<u>N/A</u>
Shim Thickness/80% Vl	timate Pressure	<u>64 17,720</u>	678 17,730	<u>N/A</u>
Unseated/Broken Wires	Tot	al effective wires	after stressing	_161_
Date Bulk-filled		• <u>•</u> •••		
Time since installati	on <u>94 months</u> In1	et Pressure: <u>956</u>	SI Outlet Temp	1240
Data end caps refille	d: Shop	Field	·····	
Data compiled by Z	? Maller	Organization	Salem	
•		Date		
Additional Coments:	Brokenseur	-		
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0	Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PRETT TENDON HIST	RESSING SYSTEM		ruintien 5-95-8082 ichment B e B30
TEN	DON IDENTIFICATION NUMB	ER 0303	CUT LET	IGTH	
		CR FIELD		•	
		on cover letter number-			
2.	Date tendon received o	n-site	MR Number	-	
3.	Date installed in cond	luit	Installation	KCR's	
•	Wires removed	Wires replaced	Total	Ineffective win	
4.	Date buttonheaded	Butte	onheading NCR*s		
	Bad wires	Accept. Reheads	Total In	effective wire	·
5.	•	St:		•	
		Re			
			SHOP END		
	Elongation (1500 psi	to 80% ult.)-Pred./Act.			
Y,	Lift-Off Pressure - P	redicted/Actual			<u>N/A</u>
	Shim Thickness/80% Ul	timate Pressure			<u>. N/A ·</u>
	Unscated/Broken Wires	Total	effective wires	after stressin	B
6.		Bulk-F			•
	Time since installati	on Inlet	Pressure	Outlet Te	mp
	Date end caps refille	d: Shop	Field		
7.	Data compiled by Z	malle	Organization	Salem	
		• •	Date <u>4</u>	11/17	
8.	Additional Comments:	Dome Repair -			
	Degreasing - Sho	o (1/1/16) Field (	[1]16) (1/11/16)	)	
	• •	NCR 2582 15			
<u> </u>					
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Florida CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	RESSING SYSTEM Pope BJ	8-95-4082 · B
ENDON IDENTIFICATION NUMBER <u>D304</u>	CUT LENGTH /20 - 4 /2	٠ •
HOP WASHER ID: PC 121 CR 479 FIELD	• • •	•
. GAI/QA vendor inspection cover letter number-		
. Date tendon received on-site 4-10-74		
1. Date installed in conduit <u>5-23-74</u>	Installation NCR's	
Wires removed Wires replaced		· -
. Date buttonheaded 10-11-74 Butto	onheading NCR's	
Bad wires Accept. Reheads	Total Ineffective wires	0
. Date stressed 12-6-74 St		
Date restressed Re	stressing NCR's	
Riongation (1500 psi to 80% ult.)-Pred./Act.	<u>SHOP END</u> <u>FIELD END</u> <u>3<sup>7</sup>/<sub>8</sub><sup>1</sup>/4<sup>4</sup>/4<sup>4</sup>/7</u>	TOTAL
Lift-Off Pressure - Predicted/Actual		
Shim Thickness/80% Ultimate Pressure	5 3 17,790 6 4 17,770 _	<u>N/A</u>
Unseated/Broken Wires Total	effective wires after stressing	163
Date Bulk-filled 3-27-75 Bulk-F	illing NCR's	
Time since installation 10 months Inlet	Pressure 35 psp Outlet Temp	120°
Date end caps refilled: Shop	Field	
. Data compiled by D. Malle	Organization Salam	
	Date 4/1/27	•
I. Additional Comments:		
·		·
		<u> </u>
( <del></del>	•	
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· · · · · · · · · · · · · · · · · · ·	میں <sup>ش</sup> اری کر اور ایک مؤردی کے انہیں کو اور اور میں	

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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY Culculation 8-95-0082 Attachment B Page B32

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TENDON IDENTIFICATION NUMBER	304	OT L	ENGTH	····
HOP WASHER ID: PC CR	FIELD 1	WASHER ID: PC	CR	
. GAI/QA vendor inspection cover let	ter number-F	PC /	DATE	
2. Date tendon received on-site		RMR Numbe	£	
3. Date installed in conduit		Installation	NCR'S	نيڪره سنڌ جي مينيون
Wires removed Wires re				
4. Date buttonheaded	Button	heading NCR's		
Bad wires Accept, Reho	eads	Total I	peffective wires	. <b></b>
5. Date stressed	Stre	essing NCR's		·
Date restressed	Rest	ressing NCR's	میں میں بین الک <mark>ار می</mark> میں میں میں ا	
		SHOP END	FIELD END	TOTAL
Elongation (1500 psi to 80% ult.)	-Pred./Act.		/	
Lift-Off Pressure - Predicted/Act	val			N/A
Shim Thickness/80% Ultimate Press	ure			N/A
Unseated/Broken Wires	Total e	fective wire	s after stressing	·
6. Date Bulk-filled	Bulk-Fi	lling NCR's _		
Time since installation	Inlet P	ressure	Outlet Ter	np
Data end caps refilled: Shop		_ Field		
7. Data compiled by Dulat	lu	_ Organizatio	" Salan	
		Date	1/11/77	
8. Additional Comments: <u>Deme</u>	epir -	•		
8. Additional Comments: <u>Deme</u> <u>Degreasing - Field (7/2)</u>	116)	•		
		•		
A	•			
•				•
مەربىيە مەربىيە بىرىمىيە بىرى				
	تەرىپ مەسىرى بەر بىر مەرىپ مەسىرى بەر بىر	•	 مەمەر مەمەر بۇرىيە (مەر يېچى مەر يېچى)	
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Florida	CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	PESSING SYSTEM	Calca Attaci Page 1	intion 8-95-4082 mount B XXX
AN IDENTIFICATION STUDE	r <u> </u>	art le	NGTH 124 - 91	4
IP WASHER ID: PC 120	_ CR FIELD	WASHER ID: PC_	<u>/2/</u> CR	541
GAI/QA vendor inspectio	on cover letter number-	TPC 1 1035	7 DATE	4/30/74
Date tendon received or	1-sice 4-10-74	RMR Number	38726	······································
Date installed in condu				*.
Wires recoved	Wires replaced	O Total	Ineffective wires	_/
Date buttonheaded	0-11-74 Butto	onheading NCR's		
Bad vires 3	Accept. Reheads/	Total In	effective wires _	2
Date stressed/	<u>-25-74</u>	cessing NCR's		<u></u>
Date restressed	Re:	stressing NCR's		•
		· SHOP END	FIELD END	TOTAL
Jongation (1500 psi to	o 60% ult.)-Pred./Act.	45148	48 49/6	841 1876
Juft-Off Pressure - Pr	edicted/Actual	670016900pc	i 668016650psi	N/A
Shim Thickness/80% Ult	imate Pressure	6"17630	5\$ 17620	N/A
.Unseated/Broken Wires	Total (	effective wires	after stressing	160 .
Date Bulk-filled	<u>3-27-75</u> Bulk-F	illing NCR's	وروار والمراجع المراجع والمراجع و	استان المراجع المراجع المراجع
Time since installatio	n 10 months Inles	Pressure 25p	Si Outlet Temp	· _126°
Date end caps refilled	: Shop	Field		
Data compiled by Z	Malla	_ Organization	Salem	·
		Date	1/77	
Additional Coments:	•••	•		
· · · · · · · · · · · · · · · · · · ·				
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	Florida Power	CRYSTAL RIVE REACTOR BUILDING TENDON				inclos 5-75-0082 knowt () 834
TENDON ID	ENTIFICATION NUMB	ER 17 305	5	CUT LENGTH		
		CR				
1. GAI/Q	A vendor inspecti	on cover letter nu	mber-FPC #		DATE	
2. Date	tendon received o	on-site	RMR	Number	•	
3. Date	installed in cond	luit	Instal	lation NCR'		
Wires	removed	Wires replaced	<b></b>	Total Inef	fective wire	es
4. Date	buttonheaded		Buttonheading	NCR's		
Bad w	ires	Accept. Reheads	T	otal Ineffe	ctive wires	
5. Date	stressed		Stressing N	CR*#		
Date	restressed		_ Restressing	NCR's		
<u> </u>			SHOP E	ND FI	ELD END	TOTAL
Elong	ation (1500 psi <sup>.</sup> )	to 80% ult.)-Pred.	Act/			
) Lift.	-Off Pressure - P:	redicted/Actual				N/A
Shim	Thickness/80% VI:	timate Pressure	/			<u>N/A</u>
Unse	ated/Broken Wires	Tc	tal effective	vires afte	r stressing	· · · · · · · · · · · · · · · · · · ·
6. Date	Bulk-filled	Bi	ilk-Filling N(	:R's		
Time	since installation	on I:	let Pressure		_ Outlet Tem	ıp.
Date	end caps refille	d: Shop	Field			-
7. Data	compiled by Z	- Alla	Organ:	lzation	Elem	
			Date	stul	2	
8. Áddli	tional Comments:	Dome Repair	• ••		·····	*****
Des	reasing - S	her (18/24)	Field (7/8/10	)/1/11/14	)	
Rig	reasing - 200	PSIG NCR # 2582	164° N	CR \$ 258		. •
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<b>_</b>		•	······································			<del></del>

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Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PRESTI TENDON HISTO	ESSING SYSTEM	Culcula Attacka Page Bi	· · · ·
ENJON IDENTIFICATION NUMBE	R	OUT LE	NGTH	, 
HOP WASHER ID: PC 121	_ CR _1069 FIELD	WASHER ID: PC_	<u>121.</u> cr_	363
GAI/QA vendor inspectio	on cover letter number-	FPC 1 1035	DATE-	4/30/74
. Date tendon received on	1-site 4-12-74	RMR Number	38757	
J. Date installed in condu	it	Installation	NCR's	
. Wires removed	Wires replaced	O Total	Ineffective wires	
. Date buttonheaded	10-9-74 Butto	nheading NCR's		
Bad wires	Accept. Reheads	O Total Ir	effective wires _	1
i. Date stressed/	<u>-27.74</u> Str	essing NCR's		
Date restressed	Rea	tressing NCR's	<del></del>	
		SHOP END		TOTAL
Plongation (1500 psi t	o 80% ult.)-Pred./Act.	4715	48,42"	94 192
)_lft-Off Pressure - Pr	edicted/Actual	6 <u>77016800</u> ps	6770,6800pst	N/A
Shim Thickness/80% Ult	imate Pressure	<u>6"1772</u> 0	_6_177.30 _	N/A
	Total d			•
. Date Bulk-filled				
Time since installation	n 10 months Inlet 1	ressure <u>30 p</u>	ST_ Outlet Temp.	<u>138°</u>
Date end caps refilled	shop	Field		
1. Data compiled by Z?				
3. Additional Comments:		Date	/27	
3. Additional Comments:	Life off no	t simul	tareaus	
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	Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	RESSING SYSTEM	Attachm	
) Teni	DON IDENTIFICATION NUM	BER <u>D310</u>		ENCTH	
SHO	P WASHER ID: PC	CR FIELD	WASHER ID: PC	CR	
1.	GAI/QA vendor inspec	tion cover letter number-	FPC I	DATE	
2.	Date tendon received	on-site	FMR Numbe	r	
	•	nduit			
•	Wires removed	Wires replaced	Total	Ineffective wire	s
4.	Date buttonheaded	Butte	onheading NCR's		
		_ Accept. Reheads	-		
5.	Date stressed	Sti	essing NCR's _		
		Res			
_				FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act.			
$\smile$ )	Lift-Off Pressure -	Predicted/Actual			<u>N/A</u>
	Shim Thickness/802 L	Ultimate Pressure			N/A
	Unseated/Broken Wire	Total	effective wires	s after stressing	•
6,	Date Bulk-filled	Bulk-F	illing NCR's		
	Time since installat	tion Inlet	Pressure	Outlet Temp	»
	Date end caps refill	led: Shop	Field	· · · · · · · · · · · · · · · · · · ·	
7.		? Walley			
			Date <u>#</u>	11/17	•
8.	Additional Comments:	Dome Repair -	•		·
	Degrasing -	Shop (7/8/22)			
A					
U		·		•	
J		· · · · · · · · · · · · · · · · · · ·		مىلىنى بى	
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### CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTNESSING SYSTEM TENDON HISTORY

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Calculation 8-95-0082 Attachment B Page B37

: JON IDENTIFICATION NUMBER	
HOP WASHER ID: PC_121_CR_1040_FIELD WASHER ID: PC_121_CR_6	36
GAI/QA vendor inspection cover letter number-FPC # DATE DATE/3	0/74
?. Date tendon received on-site RMR Number RMR Number	
3. Date installed in conduit5-22-74 Installation NCR's	
Wires removed Wires replaced Total Ineffective wires	
i. Date buttonheaded 10-9-74 Buttonheading NCR's	
Bad wires Accept. Reheads Total Ineffective wires	>
i. Date stressed Stressing NCR's	
Date restressed Restressing NCR's	
SHOP END FIELD END TO	TAL
Flongation (1500 psi to BOX ult.)-Pred./Act. 4341416 4341458 94	1936
	N/A
Shim Thickness/80% Ultimate Pressure 63/7770 63/7790	N/A
Unsested/Broken Wires Total effective wires after stressing	63 .
. Date Bulk-filled 3-27-75 Bulk-Filling NCR's	
Time since installation 10 months Inlet Pressure 30 05 Outlet Temp. 1	32 <b>°</b>
Date end caps refilled: Shop Field	
1. Data compiled by D. Mallen Organization Salem	<b></b>
Date <u>4/1/77</u>	•
3. Additional Comments:	
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Florida Power	CRYSTAL RIVER I		Calcu Atlact Page 1	intice 8-95-0082 Internt B R38
	REACTOR BUILDING PRE TENDON III			
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TENDON IDENTIFICATION NUMBE	ir <u>D 3//</u>	· CUT LE	NCTH	
SHOP WASHER ID: PC	CR FI	ELD WASHER ID: PC_	CR	
1. GAI/QA vendor inspection	on cover letter numb	er-FPC 1	DATE	·
2. Date tendon received of	n-site	RMR Number	•	
3. Date installed in cond	uit	Installation	NCR's	
. Wires removed				
4. Date buttonheaded				_
Bad wires			•	
5. Date stressed				
Date restressed				
		SHOP END	FIELD END	TOTAL
Elongation (1500 psi t	a BOT ult. )-Pred. /A			1
Lift-Off Pressure - Pr				N/A
	· · · ·			N/A
Shim Thickness/802 Ul				
Unseated/Broken Wires				
6. Date Bulk-filled				
Time since installation			-	•
Date end caps refille	d: Shop	Field	<u> </u>	
7. Data compiled by	Mallu	Organization	a <u>Selan</u>	
			1/11/22	
8. Additional Comments:	Dome Repor	<u> </u>		
Degreesing -	Field (7/15/14)			••
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<u>)</u>		•		•

Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRE TENDON 111	STRESSING SYSTEM		vintion 8-95-4082 channet 8 : B39
C. DN IDENTIFICATION NU	BER <u>D.312</u>	OUT LI	NGTH	5 3/4
SHOP WASHER ID: PC 12	)_ CR_1052 FIE	LD WASHER ID: PC	121 CR	655
L. GAI/QA vendor inspec	tion cover letter numbe	T-FPC 1 103	57 DATE	4/30/14
2. Date tendon received	on-site 4-12-74	RHR Number	38757	
3. Date installed in co	nduie <u>5-22-74</u>	Installation	NCR'S	
. Wires removedO	Wires replaced	O Total	Ineffective wire	s <u> </u>
;. Date buttonheaded	10-9-74 But	tonheading NCR's		
Bad wires 0	_ Accept. Reheads	O Total I	neffective wires	
i. Date stressed	12-6-74	Stressing NCR's		·
Date restressed		Restressing NCR's		·
		SHOP END	FIELD END	TOTAL
Elongation (1500 psi	to 80% ult.)-Pred./Ac	e. 434 1478	434,478	931934
) lft-Off Pressure -	Predicted/Actual	6840/6950	680016700	<u></u> N/A
Shim Thickness/802 U	Ultimate Pressure	64 17790	62 17770	N/A
Unseated/Broken Wird	23 Tota	l effective wires	after stressing	
	<u>3-27-75</u> Bulk		·····	
Time since installa	tion 10 mostle Inle	t Pressure 25	<u>157</u> Outlet Tem	p. <u>136°</u>
Data end caps refil	led: Shop	Field		
'. Data compiled by	D. Malla .	Organization	Salam	
		Date <u>4/1/</u>	77	
. Additional Comments	•			
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	Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRES TENDON 111:	STRESSING SYSTEM	An	iculation 5-95-0083 Inchancut B Je Bóð
TENI	OON IDENTIFICATION NUME	ER 42 H 17	OIT L	ENGTH 155 - 8	r *
Shop	WASHER ID: PC_121	CR 674 FIE	LD WASHER ID: PC	122 CR	1275
1.	GAI/QA vendor inspect:	lon cover letter numbe	r-FPC 198	61 DATE	2/12/14
2.	Date tendon received	on-site 12-28-7.	3 RMR Numbe	x 35496	·
	Date installed in con	•			
	Wires removed	Wires replaced	O Total	Ineffective wir	es
4.	Date buttonheaded	6-17-74 But	tonheading NCR's		
		Accept. Reheads			
5.	Date stressed				
		1	_		·
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act	· 5/18 15 78	51/8 ,45/8	10/4,10/14
$C_{j}$		redicted/Actual	_		·
	Shim Thickness/80% VJ	timate Pressure	7 17810	6 ,7780	N/A ·
	Unseated/Broken Wire	Tota	L effective wire	s after stressing	163
6.	Date Bulk-filled7				•
	Time since installat	ion 6 months Inle	t Pressure 9	5/ Outlet Ter	np. 142
7.	Date end caps refille Data compiled by 2	2 Mulla	Organizatio	n Jala	22
		· · · · ·		4/ 77	
8.	Additional Comments:				
	·			·	
		•			
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PREST TENDON HIST	RESSING SYSTEM	Calinda Attachy Page B	tion 5-95-8082 ment 13 41
) TENI	on Identification numb	er <u> </u>	OUT LE	NGTH	6 /4
Shop	WASHER ID: PC 121	CR 615 FIEL	D WASHER ID: PC_	12.1 CR	906
1.	GAI/QA vendor inspecti	on cover letter number	-FPC #99	2/ DATE	2/2014
2.	Date tendon received o	on-site <u>12-20-73</u>	RMR Number	35528	
3.	Date installed in cond	luit <u>1-22-74</u>	Installation	NCR's	
,	_	Wires replaced		•	
4.	Date buttonheaded	· · · · · · · · · · · · · · · · · · ·			
		Accept. Reheads	•		
5.	Date stressed3	-			
		Re			
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act.		عالقني وتتقيير فالتنبية	the second s
$\cup_{j}$		redicted/Actual			
		timate Pressure			N/A
	Unseated/Broken Wires	Total	effective wires	after stressing	/63
6.	Date Bulk-filled				, <del></del>
		on 6 months Inlet			p. 148
•					· · · · · · · · · · · · · · · · · · ·
7.	Date end caps refille Data compiled by	Walle	Organization	n Sale	em
, -			Date <u>4</u> /.		
8.	Additional Comments:	·			
		<u>، با بالاستان میکرد. و با با بالا</u> میکرد. اور	······		
	ىرىدىرىتىتەر <sub>ئ</sub> ەتتىرىنىڭ تەرىپىيە يېرىمىيە تەرىپىيەن تەرىپىيەن تەرىپىيە تەرىپىيە تەرىپىيە تەرىپىيە تەرىپىيە تەر	······································			•
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/		والمراوري المقرب والمنافقة فيشارك بترجي المحاصر والمحاصر والمحاصر			

	Florida CRYSTAL RIVER UNI REACTOR BUILDING PRIST TENDON HIST	RESSING SYSTEM	Calcal Attach Page 1	ntine 5-95-8082 Invent B 142
) TEND	ON IDENTIFICATION NUMBER 42H19	· OJT 1.	NGTH 155'-	1/2
Shop	WASHER ID: PC 121 CR 555 FIELD	WASHER ID: PC	<u>/2/</u> CR	1013
1.	GAI/QA vendor inspection cover letter number-	FPC 1 99	2/ DATE	2/20/14
2.	Date tendon received on-site 12-28-73	RMR Number	35528	
	Date installed in conduit _/-22-74			
	Wires removed Wires replaced			
4.	Date buttonheaded <u>6-18-74</u> Butto			
	Bad wires <u>O</u> Accept. Reheads			
5.	Date stressed Str		•	
	Date restressed Re			
		SHOP END	FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred./Act.	5/18 15/14	5/18,5	10/4, 10/4
$\bigcirc$	Lift-Off Pressure - Predicted/Actual		6810 ,6850	N/A
•	Shim Thickness/802 Ultimate Pressure	71/16 17810	6/8 ,7780	N/A
	Unseated/Broken Wires Total	effective wires	after stressing	163
6.	Date Bulk-filled 7-26-74 Bulk-F			•
	Time since installation 6 months Inlet			15. 15.4°
7.	Date end caps refilled: Shop Data compiled by	Organization	- Sale	· · · · · · · · · · · · · · · · · · ·
		Date 4/4	1/17	
8.	Additional Comments:		•	•
		· ·		, 
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TENDON IDENTIFICATION NUMBER       42 H 31       OFT LENGTH       155'-7'/4         SHOP WASHER ID: PC       121       CR       368       FIELD WASHER ID: PC       122:       CR       1233         1. GAI/QA vendor inspection cover letter number-FPC 1       9285       DATE       115/2         2. Date tendon received on-site       10: -4' - 73       Wire Number       33356         3. Date installed in conduit       1-29-74'       Installation NCR's         Wires removed       0       Wires replaced       0       Total Ineffective wires       0         4. Date buttonheaded       6-25 - 74'       Buttonheading NCR's       0       0       10 and	
<ol> <li>GAI/QA vendor inspection cover letter number-FPC # <u>92.85</u> DATE <u>11/5/7</u></li> <li>Date tendon received on-site <u>10 - 4 - 7 3</u> NMR Number <u>33356</u></li> <li>Date installed in conduit <u>1 - 29 - 74</u> Installation NGR's</li> <li>Wires removed <u>0</u> Wires replaced <u>0</u> Total Ineffective vires <u>0</u></li> <li>Date buttonheaded <u>6 - 25 - 74</u> Buttonheading NGR's</li> <li>Bad wires <u>0</u> Accept. Reheads <u>0</u> Total Ineffective vires <u>0</u></li> <li>Date stressed <u>2 - /3 - 75</u> Stressing NCR's</li> <li>Date restressed <u>2 - /3 - 75</u> Stressing NCR's</li> <li>Bate restressed <u>2 - /3 - 75</u> Stressing NCR's</li> <li>Elongation (1500 psi to 80% ult.)-Pred./Act. <u>51/5 151/4 51/5 147/5 101/41</u></li> <li>Lift-Off Pressure - Predicted/Actual <u>6870 17000 6810 16400 N/</u></li> <li>Shim Thickness/80% Ultimate Pressure <u>61/6 17810 51/5 17750 N/</u></li> <li>Unsested/Broken Wires <u>0</u> Total effective vires after stressing <u>163</u></li> <li>Date since installation <u>6 monthis</u> Inlet Pressure <u>22 fill</u> Outlet Temp. <u>128</u></li> </ol>	
<ol> <li>GAI/QA vendor inspection cover letter number-FPC # <u>92.85</u> DATE <u>11/5/7</u></li> <li>Date tendon received on-site <u>10 - 4 - 7.3</u> NMR Number <u>33356</u></li> <li>Date installed in conduit <u>1 - 29 - 74</u> Installation NGR's <u>Vires removed 0</u> Vires replaced <u>0</u> Total Ineffective vires <u>0</u></li> <li>Date buttonheaded <u>G - 25 - 74</u> Buttonheading NGR's <u>Bad vires 0</u> Accept. Reheads <u>0</u> Total Ineffective vires <u>0</u></li> <li>Date stressed <u>2 - /3 - 75</u> Stressing NCR's <u>Date restressed 2 - /3 - 75</u> Stressing NCR's <u>SHOP END FIELD END 107A</u></li> <li>Elongation (1500 psi to 80% ult.)-Pred./Act. <u>51/5 151/4 51/5 147/5 101/41</u></li> <li>Lift-Off Pressure - Predicted/Actual <u>G870 17000 G810 16700 N/</u></li> <li>Shim Thickness/80% Ultimate Pressure <u>61/6 17810 51/5 17780 N/</u></li> <li>Unsested/Broken Wires <u>0</u> Total effective vires after stressing 163</li> <li>Date Bulk-filled <u>7 - 31 - 74</u> Bulk-Filling NCR's <u>10 - 16700 1636</u></li> </ol>	
<ul> <li>3. Date installed in conduit <u>1-29-74</u> Installation NGR's <u></u> <ul> <li>Wires renoved <u>0</u></li> <li>Wires replaced <u>0</u> Total Ineffective wires <u>0</u></li> </ul> </li> <li>4. Date buttonheaded <u>6-25-74</u> Buttonheading NGR's <u></u> <ul> <li>Bad wires <u>0</u> Accept. Reheads <u>0</u> Total Ineffective wires <u>0</u></li> </ul> </li> <li>5. Date stressed <u>2-13-75</u> Stressing NGR's <u></u> <ul> <li>Date restressed <u>Restressing NGR's </u></li> <li>Bad vires <u>0</u> Restressing NGR's <u>SHOP END FIELD END TOTAL</u></li> <li>FIELD END <u>TOTAL</u></li> <li>FIELD END <u>10/4 /</u></li> <li>Lift-Off Pressure - Predicted/Actual <u>6870 / 7000 6810 / 6900 N/</u></li> <li>Shim Thickness/80% Ultimate Pressure <u>61/6 / 7510 51/4 / 7780 N/</u></li> <li>Unseated/Broken Wires <u>0</u> Total effective wires after stressing <u>163</u></li> </ul> </li> <li>6. Date Bulk-filled <u>7-31-74</u> Bulk-Filling NCR's <u></u> <ul> <li>Time since installation <u>6 months</u> Inlet Pressure <u>22 RSL</u> Outlet Temp. <u>128</u></li> </ul> </li> </ul>	
<ul> <li>3. Date installed in conduit <u>1-29-74</u> Installation NCR's <u>Nires removed 0</u> Wires replaced <u>0</u> Total Ineffective wires <u>0</u></li> <li>4. Date buttonheaded <u>6-25-74</u> Buttonheading NCR's <u>154 5/55 14/55</u> Bad wires <u>0</u> Accept. Reheads <u>0</u> Total Ineffective wires <u>0</u></li> <li>5. Date stressed <u>2-19-75</u> Stressing NCR's <u>154 5/55 14/55</u> Jete restressed <u>Restressing NCR's <u>1115-015</u> Predicted/Actual <u>6570 17000 6510 6500 N/</u></u></li> <li>7. Elongution (1500 psi to 80% ult.)-Pred./Act. <u>51/5 1710 51/55 1750 N/</u></li> <li>9. Lift-Off Pressure - Predicted/Actual <u>6570 17000 6510 6500 N/</u></li> <li>9. Shim Thickness/80% Ultimate Pressure <u>61/16 17510 51/55 1750 N/</u></li> <li>6. Date Bulk-filled <u>7-31-74</u> Bulk-Filling NCR's <u>158</u> Outlet Temp. <u>128</u></li> </ul>	
Wires removed       0       Wires replaced       0       Total Ineffective wires       0         4. Date buttonheaded       G-25-74       Buttonheading NCR's       0       Total Ineffective wires       0         5. Date stressed       2-13-75       Stressing NCR's       0       0       107All         5. Date stressed       2-13-75       Stressing NCR's       0       107All         6. Date stressed       2-13-75       Stressing NCR's       0       107All         9. Date stressed       Restressing NCR's       0       107All       10/4/1         9. Elongation (1500 psi to 80% ult.)-Pred./Act.       5/18/15/14       5/18/14/15       10/14/1         1. Lift-Off Pressure - Predicted/Actual       G870/7000       G5/10/6500       N/         Shim Thickness/80% Ultimate Pressure       6/16/175/0       5/18/17750       N/         Unseated/Broken Wires       0       Total effective wires after stressing       163         6. Date Bulk-filled       7-31-24       Bulk-Filling NCR's       0       0         Time since installation       Genomics       Inlet Pressure       22       0       0	
<ul> <li>4. Date buttonheaded <u>6-25-74</u> Buttonheading NCR's <u>Date buttonheaded <u>6-25-74</u> Buttonheading NCR's <u>5. Date stressed <u>2-13-75</u> Stressing NCR's <u>5. Date stressed <u>2-13-75</u> Stressing NCR's <u>5. Date restressed <u>2-13-75</u> Stressing NCR's <u>5. Date restressed <u>2-13-75</u> Stressing NCR's <u>5. Date restressed <u>2-13-75</u> Stressing NCR's <u>5. Date stressed <u>2-13-75</u> Stressing NCR's <u>5. Date stressing to 80% ult.</u>)-Pred./Act. <u>5. SkOP END FIELD END TOTAL</u> <u>5. SkOP 1. 5. Skop 1. 4. 7. 7. 5. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7.</u></u></u></u></u></u></u></u></u></u></u></u></u></u></li></ul>	
Bad wires       O       Accept. Reheads       O       Total Ineffective wires       O         5. Date stressed       2-13-75       Stressing NCR's	
<ul> <li>5. Date stressed <u>2-/3-75</u> Stressing NCR's</li></ul>	
Date restressed Restressing NCR's Restressing NCR's Elongation (1500 psi to 80% ult.)-Pred./Act. $\frac{5'/8}{15'/4}$ $\frac{5'/8}{15'/4}$ $\frac{5'/8}{14'/8}$ $\frac{10'/4}{10'/4}$ Lift-Off Pressure - Predicted/Actual $\frac{6870}{16}$ $\frac{7000}{17810}$ $\frac{6810}{5'/8}$ $\frac{6800}{16}$ N/. Shim Thickness/80% Ultimate Pressure $\frac{6'/6}{16}$ $\frac{7810}{17810}$ $\frac{5'/8}{5'/8}$ $\frac{7780}{163}$ N/. Unseated/Broken Wires Total effective wires after stressing $\frac{163}{163}$ 6. Date Bulk-filled $\frac{7-31-74'}{10}$ Bulk-Filling NCR's Outlet Temp. $\frac{128}{10}$	
<ul> <li>Elongation (1500 psi to 80% ult.)-Pred./Act. 5/8/5/4/5/5/4/5/5/4/5/10/4/1</li> <li>Lift-Off Pressure - Predicted/Actual 6870/7000 6810/6800 N/</li> <li>Shim Thickness/80% Ultimate Pressure 61/16/7810 51/8/7780 N/</li> <li>Unseated/Broken Wires 0 Total effective wires after stressing 163</li> <li>Date Bulk-filled 7-31-74 Bulk-Filling NCR's</li> <li>Time since installation 6 months Inlet Pressure 22 PSI. Outlet Temp. 128</li> </ul>	
<ul> <li>Lift-Off Pressure - Predicted/Actual 6870 17000 6810 6800 N/</li> <li>Shim Thickness/80X Ultimate Pressure 61/6 17810 51/8 7780 N/</li> <li>Unseated/Broken Wires 0 Total effective wires after stressing 163</li> <li>Date Bulk-filled 7-31-74 Bulk-Filling NCR's</li> <li>Time since installation 6 pronths Inlet Pressure 22 PSI. Outlet Temp. 128</li> </ul>	ل ا
Shim Thickness/80X Ultimate Pressure       6. Unseated/Broken Wires       0       Total effective wires after stressing       16. Total effective wires after stressing       16. Date Bulk-filled       7-31-74       Bulk-Filling NCR's         Time since installation       6. pronths       Inlet Pressure       22. PSI.       Outlet Temp.       128	10 1/
Unseated/Broken Wires 0 Total effective wires after stressing 163 6. Date Bulk-filled 7-31-74 Bulk-Filling NCR's Time since installation <u>6 months</u> Inlet Pressure 22 <sup>PSI</sup> . Outlet Temp. 128	A
6. Date Bulk-filled 7-31-74 Bulk-Filling NCR's Time since installation <u>6 months</u> Inlet Pressure 22 <u>PSI</u> Outlet Temp. <u>128</u>	<u>A</u>
Time since installation <u>6 months</u> Inlet Pressure 22 PSI. Outlet Temp. <u>128</u>	
Date end caps refilled: Shop Field	•
Date end caps refilled: Shop Field 7. Data compiled by D. Malla Organization Salam	
Date <u>4/4/27</u>	
8. Additional Comments:	
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_	Florida Power	CRYSTAL RIVER UNIT REACTOR BUILDING PRIST TENDON HISTO	ESSING SYSTEM		Calculation 8-75-0082 Attachment B Page 844
) teni	ON IDENTIFICATION NUM	ER 42H32	OT LE	NGTH	6
SHOI	WASHER ID: PC 121	CR FIELD	WASHER ID: PC_	120 CR	123
1.	GAI/QA vendor inspect:	lon cover letter number-	FPC 1 993	20 DATE	-2/20/14
2.	Date tendon received	on-site <u>1-9-74</u>	MR Number	3588	۴
	•	duit			
	Wires removedO	Wires replaced	O Total	Ineffective wir	es _ O
4.	Date buttonheaded	G-27-74 Butto	nheading NCR's	• • • • • • • • • • • • • • • • • • •	
		Accept. Relieads			
5.	•	2-28-75 Str			
		Res			
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act.	5/1815/4	5/18 ,5/18	10/14 1078
$\sim$ )	Lift-Off Pressure - H			6790,6800	
	Shim Thickness/802 UI	timate Pressure	63/8,7810	63/8 ,7750	N/A
	Unseated/Broken Wires	Total (	effective wires	after stressin	8 163
6.	Date Bulk-filled	<u>8-9-74</u> Bulk-F:	[11ing NCR's		
		ion 7 months Inlet			пр. <u>157</u> *
		•			
7.	Data compiled by Z	ed: Shop	Organization	Sale	200
				/17	
8.	Additional Comments:				
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<b>)</b>				•	
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRES TENDON HIS	TRESSING SYSTEM	Cale Atta · Pag	ulation 6-95-0082 channet B 1 B45
) 	DON IDENTIFICATION NUME	er <u>42H33</u>	OT L	ENGTH	r
SHO	P WASHER ID: PC_121	CR FIE	LD WASHER ID: PC	<u>121</u> CR	934
1.	GAI/QA vendor inspect:	lon cover letter numbe	r-FPC 1 9		2/20/74
2.	Date tendon received	on-site <u>1-9-74</u>	RMR Numbe	r	۶
3.	Date installed in con	iuit <u>1-18-74</u>	Installation	NCR's	
	Wires removedO	Wires replaced	O Total	Ineffective wir	
4.	Date buttonheaded	<u>6-27-74</u> But	tonheading NCR's	۱ <u></u>	
	Bad wires	Accept. Reheads	D Total 1	Ineffective wires	
5.	Date stressed				
	Date restressed		lestressing NCR's	3	
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act	5/14 153/4	518 15/4	10 1/4 10 1/8
⊂)	Lift-Olf Pressure - P	redicted/Actual	6870 17000	6810 6800	<u>N/A</u>
	Shim Thickness/80% Ul	timate Pressure	7 /8 17010	7 3/8 17780	N/A
	Unseated/Broken Wires	O Tota	l effective wire	s after stressing	163 .
6.	Date Bulk-filled	8-9-74 Bulk-	-Filling NCR's		
	Time since installati	on 7 months Inle	Pressure N/A	Outlet Ter	np. 160°
	Date end caps refille	d: Shop	Field		
7.	Data compiled by Z	Walles_	Organizatio	n <u>Sall</u>	2 <u>m</u>
			Date 4/4	1/77	
8.	Additional Comments:				
· • •					
./					
				<u></u>	

1       1       2       1       2       1       1       1       5       6       1       1       1       5       1       1       1       1       1       5       1		Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRES TENDON 1115	STRESSING SYSTEM	Cale Atta Page	viation 5-95-0081 charant B : B46
<ol> <li>GAI/QA vendor inspection cover letter number-FFC # <u>9920</u> DATE <u>2/20/14</u></li> <li>Date tendon received on-site <u>1-14 - 74</u> Bit Number <u>36031</u></li> <li>Date installed in conduit <u>1-21-74</u> Installation NCR's</li></ol>	ENDC	N IDENTIFICATION NUH	BER 4244	<u>'3</u> at u	ENGTH	6 3/4
<ul> <li>2. Date tendon received on-site /-/4/-74/ FMR Number 3603/</li> <li>3. Date installed in conduit /-2/-74/ Installation NCR's</li></ul>	IOP	WASHER ID: PC_121	CR <u>524</u> FIE	LD WASHER ID: PC	121 CR	978
<ul> <li>3. Date installed in conduit</li></ul>	. (	CAI/QA vendor inspect	ion cover letter numbe	r-FPC 199	20 DATE	2/20/14
Wires removed       O       Wires replaced       O       Total Ineffective wires       O         4. Date buttonheaded       7-P - 74'       Buttonheading NCR's	. 1	Date tendon received	on-site74 - 74	RHR Numbe	r <u>3603/</u>	
<ul> <li>4. Date buttonheaded <u>7-9-74</u> Buttonheading NCR's <u>0</u> Accept. Reheads <u>0</u> Total Ineffective wires <u>0</u></li> <li>5. Date stressed <u>2-19-75</u> Stressing NCR's <u>Elongation (1500 psi to 80% ult.)-Pred./Act. <u>5//y15//2</u> <u>5//y 15//y 10//y 1/0//y</u> Lift-Off Pressure - Predicted/Actual <u>6700 16750 68/00 1670</u></u></li></ul>	. 1	Date installed in con	iduit <u>1-2/-74</u>	Installation	NCR's	
Bad wires       0       Accept. Reheads       0       Total Ineffective wires       0         5. Date stressed       2-19-75       Stressing NCR's	_ 1	Wires removed	Wires replaced	O Total	Ineffective wir	es _ O
5. Date stressed <u>2-19-75</u> Stressing NCR's Date restressed <u>Restressing NCR's</u> <u>Shop END</u> <u>FIELD END</u> <u>TOTAL</u> Elongation (1500 psi to 80% ult.)-Pred./Act. <u>5//y15//2</u> <u>5//y15//2</u> <u>10//y105//</u> Lift-Off Pressure - Predicted/Actual <u>G70016750</u> <u>G81016700</u> <u>N/A</u> Shim Thickness/80% Ultimate Pressure <u>7//617800</u> <u>6//4177800</u> <u>N/A</u> Unseated/Broken Wires <u>0</u> Total effective wires after stressing <u>163</u> 6. Date Bulk-filled <u>7-31-74</u> Bulk-Filling NCR's Time since installation <u>6 months</u> Inlet Pressure <u>10 M1</u> Outlet Temp. <u>136</u> Date end caps refilled: Shop <u>Pield</u> 7. Data compiled by <u>IR MCR</u> Organization <u>SacCom</u> Date <u>4//4/71</u>	. 1	Date buttonheaded	7-8-74 But	tonheading NCR's		
Date restressedRestressing NCR'sSHOP ENDFIELD ENDTOTALElongation (1500 psi to 80% ult.)-Pred./Act. $5'/r_15'/r_2$ $5'/r_15'/r_2$ $5'/r_15'/r_2$ $10'/r_110'/r_2$ Lift-Off Pressure - Predicted/Actual $6700   6750$ $6700$ N/AShim Thickness/80% Ultimate Pressure $7'/r_16   700'/r_20$ N/AUnseated/Broken Wires $O$ Total effective vires after stressing $163$ 6. Date Bulk-filled $7-31-74$ Bulk-Filling NCR'sTime since installation $G$ monthsInlet Pressure $10^{-00'}$ Outlet Temp. $136^{\circ}$ Date end caps refilled: ShopPieldDrganizationSales7. Data compiled by $R$ MallaOrganizationSalesDate $4//4/17$ Date $4//4/17$	1	Bad wiresO	Accept. Reheads	O Total I	neffective wires	0
SHOP END       FIELD END       TOTAL         Elongation (1500 psi to 80% ult.)-Pred./Act.       5/1/15/1/2.       5/1/2.       5/1/2.       5/1/2.       10/1/4.       10						
Elongation (1500 psi to 80% ult.)-Pred./Act. <u>5//y15//2</u> <u>5//y15//2</u> <u>5//y15//2</u> <u>10//4109/</u> Lift-Off Pressure - Predicted/Actual <u>687016750</u> <u>681016700</u> <u>N/A</u> Shim Thickness/80% Ultimate Pressure <u>7/161780</u> <u>6//417780</u> <u>N/A</u> Unseated/Broken Wires <u>0</u> Total effective wires after stressing <u>163</u> 6. Date Bulk-filled <u>7-31-24</u> Bulk-Filling NCR's Time since installation <u>6 months</u> Inlet Pressure <u>10 mail</u> Outlet Temp. <u>136</u> Date end caps refilled: Shop <u>Field</u> 7. Data compiled by <u>RMall</u> Organization <u>Sallan</u> Date <u>4/4/71</u>	1	Date restressed	۶	lestressing NCR's	·	
Lift-Off Pressure - Predicted/Actual <u>GY70 / 670 / 670 N/A</u> Shim Thickness/802 Ultimate Pressure <u>7<sup>3</sup>/6 / 7<sup>1</sup>/6 / 7<sup>1</sup></u>		- All and a second second		SHOP END	FIELD END	TOTAL
Lift-Off Pressure - Predicted/Actual <u>GY70 / 6750 GY10 / 6700 N/A</u> Shim Thickness/80% Ultimate Pressure <u>7<sup>3</sup>/6 / 770 G/4 / 7770 N/A</u> Unseated/Broken Wires <u>0</u> Total effective wires after stressing <u>163</u> . 5. Date Bulk-filled <u>7-31-74</u> Bulk-Filling NCR's Time since installation <u>G months</u> Inlet Pressure <u>10 Mar</u> Outlet Temp. <u>136</u> Date end caps refilled: Shop <u>Pield</u> 7. Data compiled by <u>R Malla</u> Organization <u>Salam</u> Date <u>4/4/71</u>	`	Elongation (1500 psi	to 80% ult.)-Fred./Act	5/18/5/2	51/8 ,51/8	10/4 10 /8
Unseated/Broken Wires Total effective vires after stressing Date Bulk-filled Bulk-Filling NCR's Time since installation <u>General4s</u> Inlet Pressure <u>10 min</u> Outlet Temp. <u>136</u> Date end caps refilled: Shop Pield Data compiled by <u>Reallan</u> Organization <u>Salarn</u> Date <u>4/4/17</u>						
<ul> <li>Date Bulk-filled <u>7-31-74</u> Bulk-Filling NCR's</li> <li>Time since installation <u>Generalds</u> Inlet Pressure <u>10 ms/</u> Outlet Temp. <u>136</u></li> <li>Date end caps refilled: Shop <u>Field</u></li> <li>Data compiled by <u>R Malla</u> Organization <u>Sallem</u></li> <li>Date <u>4/4/11</u></li> </ul>		Shim Thickness/802 U	ltimate Pressure	7/16 17810	6/14 17780	<u>N/A</u>
Time since installation <u>6 months</u> Inlet Pressure <u>10 mst</u> Outlet Temp. <u>136</u> Date end caps refilled: Shop Field Data compiled by <u>R Malla</u> Organization <u>Sallam</u> Date <u>4/4/71</u>		Unseated/Broken Wire		l effective wire	s after stressing	s <u> </u>
Date end caps refilled: Shop Field Data compiled by <u>RMalla</u> Organization <u>Sallan</u> Date <u>4/4/77</u>	•	Date Bulk-filled	7-31-74 Bulk	-Filling NCR's		
. Data compiled by <u>RMalla</u> Organization <u>Salem</u> Date <u>4/4/11</u>		Time since installat	ion <u>6 months</u> Inle	t Pressure 10. M	9/ Outlet Te	mp. 136
Date <u>4/4/11</u>		Date end caps refill	ed: Shop	Field		
	•	Data compiled by Z	2 Malla	Organizatio	n_ <u>Sala</u>	cm_
			• •	Date _4/4/	177	•
3. Additional Comments:	l.	Additional Comments:				
		•	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	
	~					•
			i			
<ul> <li></li></ul>		<u></u>	<u></u>			

	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRIS TENDON HIS	TPESSING SYSTEM		lation 5-95-0082 Innent B B47
) • Tend	OON IDENTIFICATION NUM	ier 42 H 4	<u>4</u> of 1	NGTH 155 -	6"
		CR <u>/230</u> FIEL		•	
1.	GAI/QA vendor inspects	lon cover letter number	-FPC 1	O DATE	2/20/14
		on-site		_	
		duit <u>1-21-74</u>			
	Wires removed	Wires replaced	O Total	Ineffective wir	es
		7-10-74 Buti	•		
		Accept. Reheads		· · ·	
5.		-26-75 SI			
	Date restressed	R	estressing NCR's		
	•	· · · · · · · ·	SHOP END	FIELD END	TOTAL
1	Elongation (1500 psi	to 80% ult.)-Pred./Act	. s'/r, s'/r	5/18,5	10/4 , 50%
$\smile$ )	Lift-Off Pressure - F			6840 , 6750	N/A
	Shim Thickness/80% UI	timate Pressure	6/4 17150	7,7790	N/A
	Unseated/Broken Wire	Total	effective wires	after stressing	163 .
6.	Date Bulk-filled		Filling NCR's	······	
	Time since installat;	lon <u>6 months</u> Inlet	Pressure 14 P	Outlet Te	mp. <u>140</u> °
		ed: Shop			
7.	Data compiled by 💻	. Malla	Organization	Sale	
			Date 4/4/	117	
8.	Additional Comments:		· · · · · · · · · · · · · · · · · · ·		
	•				·····
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• 、		· · · · · · · · · · · · · · · · · · ·			

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	Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	RESSING SYSTEM	Cui An Pa	enintion 5-95-0082 actiment B 19 848
) Texi	DON IDENTIFICATION NUM	BER 4-2144.	5 at 1	ENGTH _ 155 -	7
	• '	CR 566 FIELD			
		ion cover letter number-	-		
		on-site <u>1-16-74</u>			**************************************
	•	duit74			
		Wires replaced			
4.		7-10-74 Butte			· <u>·</u> ·····
		Accept. Reheads			0
5.		-20-75 St			
		Re			•
۲. ۲.	Lift-Off Pressure - 1 Shim Thickness/802 UN Unseated/Broken Wires Date Bulk-filled Time since installat Date end caps refill	Ltimate Pressure <u>C</u> Total <u>7-31-74</u> Bulk-F Lon <u>C months</u> Inlet ed: Shop <u>Mulle</u>	<u>5<sup>-</sup>//81 5<sup>-</sup>//6</u> 68-70   7000 <u>7<sup>1</sup>/4   78-10</u> effective wire: filling NCR's _	$\frac{58/0}{678},7350$ s after stressing $\frac{53}{0}$ Outlet Tex $\frac{53}{2}$	N/A N/A /63
			· · · · · · · · · · · · · · · · · · ·		
-)				· · · · · · · · · · · · · · · · · · ·	
•					· · · · · · · · · · · · · · · · · · ·
				· · · · · · · · · · · · · · · · · · ·	907 716



٦ ز CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY

Calculation 8-95-0082 Attachment B Page 849

•			
Ju	DON IDENTIFICATION NUMBER 46420 CUT LENGTH	155'-	11/4
Shoi	P WASHER ID: PC 120 CR 78 FIELD WASHER ID: PC 122	ĊR	1138
1.	GAI/QA vendor inspection cover letter number-FPC 1 9245	DATE	10/31/13
2.	Date tendon received on-site <u>1-17-73</u> RHR Number <u>326</u>	81 <u>.</u>	
	Date installed in conduit 4-15-74 Installation NCR's		
	Wires removed Wires replaced Total Ineffer	ctive wire	. 0
4.	Date buttonheaded <u>1-14-74</u> Buttonheading NCR's		
	Bad wires 13 Accept. Reheads 12 Total Ineffect:	······	
5.	Date 'stressed 5-75 Stressing NCR's	-	
	Date restressed Restressing NCR's		
	SHOP LND FIEL	D END	TOTAL
1	Elongation (1500 psi to 80% ult.)-Pred./Act. 5.15/14. 5/14	,51/8	10/4/103/8
-') -')	Lift-Off Pressure - Predicted/Actual 6640 6930 6600	16600	<u>N/A</u>
	Shim Thickness/80% Ultimate Pressure 73/8/7700 65/8	17610	N/A
•	Unseated/Broken Wires Total effective wires after	stressing	160
6.	Date Bulk-filled 11-4-74 Bulk-Filling NCR's		······································
	Time since installation is month Inlet Pressure 50 poir 0		p. <u>130°</u>
	Date end caps refilled: Shop <u>414-75</u> Field <u>4-14-7</u>	15	
7.	Data compiled by D. Willin Organization Se		
	Date		
8.	Additional Comments:		
-			•
	\		,
)		· · · · · · · · · · · · · · · · · · ·	
	•		
	•		007 716

	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRUS TENDON HIS	TRESSING SYSTEM	Ci At Tr	skralation 8-95-8082 Exchanent B 190 B50
a anti DO	N IDENTIFICATION NUM	BER 46H21	CUT L	ENGTH	4
Shop	WASHER ID: PC 120	CR FIEL	D WASHER ID: PC		R 1141
1. G	SAI/QA vendor inspect	ion cover letter number	-FPC I N/A	DATI	6
		on-site 10-13-7	,		•
		duit 4-23-74	•		
		Wires replaced	•		
		7-19-74 But			
		Accept. ReheadsC			s_/
	• _	<u>7-15</u> s		•	
		R	_		
			SHOP END	FIELD END	TOTAL
2	Elongation (1500 psi	to 80% ult.)-Pred./Act	. 5/18/5/18	51/8 ,51/4	10/14/103/
	Lift-Off Pressure - 1			6730 6950	N/A
	Shim Thickness/802 U		5 Str 17700	51/16 ,7640	N/A
•	Unseated/Broken Wire	<b>o</b> Total	effective wire	s after stressin	18 162
6.	Date Bulk-filled	1-4-74 Bulk-	Filling NCR's _	•	
	Time since installat	ion 6 12 months Inlet	Pressure 50	ODi. Outlet To	emp. 130°
		ed: Shop <u>4-14-75</u>	-	-	
7.		D. malla			
			Date		-
8.	Additional Comments:				
	•		· · · ·		
					•
)		•			
	<u></u>				• .
		•			907 715



Calculation S-95-0082 Attachment B Page BS1

TEN	DON IDENTIFICATION NUMBER 46	H21		Ength	•
	WASHER ID: PC CR			•	
1.	GAI/QA vendor inspection cover 1	etter number-	-FPC /	DATE	•
2.	Date tendon received on-site	· · ·	RMR Numbe	۳	
	Date installed in conduit				
	Wires removed Wires :	replaced	Total	Ineffective wire	۶۶
'4.	Date buttonheaded	Butt	onheading NCR's	•	•
	Bad wires Accept. Re	heads	Total I	neffective wires	
5.	Date stressed	5t	ressing NCR's		
	Date restressed	Re	stressing NCR's		
			SHOP END	FIELD END	TOTAL
1	Elongation (1500 psi to 80% ult.				· · /
)	Lift-Off Pressure - Predicted/Ac	tual (ATPS)	1425.6 1 1457.5	1425.6,1546	<u></u>
	Shim Thickness/80% Ultimate Pres		5741		<u>.</u> N/A
	Unseated/Broken Wires D- MT St		effective vires	after stressing	/62.
6.	Date Bulk-filled	Bulk-F	illing NCR's	•	, . 
	Time since installation	Inlet	Pressure	Outlet Tem	P•
	Date end caps refilled: Shop		Field		
7.	Data compiled by <u>0-</u> F.	- X/)			
		<b>V</b>	Date 5-		
8.	Additional Comments: INSPECT				0-18)
	DNO INDICATION OF				
	2) LOCK-OFF FORCE				• •
,	3) NO DNOTRATION O	F CRACK	ING AT	ANCHOR AGES	
)	4 (		11/20/1	101.01 15	31.41
	4) SHOP END SHAM - R	turos si	tow (5%g")	-HUNAL (S	74

#### CETATAL BIVER UNIT NO. 3 BRACTOR BUILDING PERSTERSING SYSTEM TENDON EPRVEILLANCE RECORD

TENDON NO. \_46H21

.

		•	LI	T OFT COND	TION_					NC				
Inspection Partod and Date	Location	the second s	Ave. Force (kipe)	fbin Thickness (in)	Elong- ation ((p)	Total Effective Vires	Pores (kipe)	Avg. Verce (tipe)	Shim Thickness (in)	Elong- stlen (is)	Total Effective Vires			Comente
 Driginal Stressing	<u>s-6</u>	<u> </u>	<b>^</b>	5 5/8	5 1/8		<u>#/A</u>	?	<u>10</u> <u>¥/A</u>	 /A	12	13	_19	15
2-1-15_	<u>r-4</u>	1682	<u>1653</u>	5_9/16	<u>3 1/4</u>	162	<u>#/4</u>	<u>»/1</u>	<u> 11/4</u>	<u>¥/A</u>	<u> #/A</u>	<u>#/A</u>	<u>#/A</u>	
lat	5-6	1458		5 3/4	¥/A		1458		5 3/4	¥/A	162			
1-10-78	<u>r-4</u>	1546	1502	5 9/16	<u> 18/4</u>	163	1514	1536	5 9/16	<u>¥/A</u>	-Jug-	106	41	
5 TH 217/93	<u>5-</u> 6 E-4	<u>14/2</u> 3 14/27 ·	1425	<u>5%</u> 5%	<u>NIA</u> NIA	162	NA NIA	مارم	rla rla	NA	MA	130°	_ <b>6</b> 8°	15 GALLIS OF GRONSE ADDO OND REMOVED.
														•
		•••••					•	<u> </u>		'	,		•	· · · · · · · · · · · · · · · · · · ·
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### INTEROFFICE CORRESPONDENCE A-C-XMTL.FRM

**Nuclear Engineering** NT6D 240-1511 Office MAC

Telephone

SUBJECT: Crystal River Unit 3

Quality Records Transmittal - Analysis/Calculation

**TO: Records Management - NR2A** 

The following analysis/calculation package is submitted as the QA Record copy:

DOCHO IFPC DOCUMENT IDENTIFICATION NUMBERS	REV. 3	Bystemis)	TOTAL PAGES TRANSMITTED
\$ 95-0082		MX	88
1111			

#### 6th Tendon Surveillance - Generation of Tendon Force Curves

kwos soentify keywords fon Layer netriev Tendon, Surveillance			·
DXREF (REFERENCES ON FILES - LIST PRIMARY FI REA 97-1975	LE FIRST)		
REA 97-2110	· · · · · · · · · · · · · · · · · · ·		
REA 97-2129		• • •	
VEND (VENDOR NAME) FPC (from Parsons Power)	VENDOR DOCUM	ent Number (DxRef)	SUPERSEDED DOCUMENTS (DXREF)
		TAG	
•			
		PART NO.	۱

Revision by FPC to Parsons Power calculation (using FPC format).

#### NOTE:

Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99), otherwise; use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

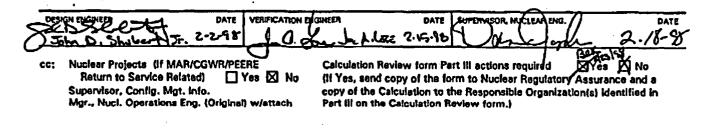
### \*\*FOR RECORDS MANAGEMENT USE ONLY \*\*

Quality Record Transmittal received and Information entered into SEEK.

Date

Entered by:

(Return copy of Quality Docment Transmittal to NOE Supprt Specialist.)





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## ANALYSIS/CALCULATION SUMMARY

	NUMBER S	CONTROL NO. 95-0082	REVISION LEVEL
TLE			CLASSIFICATION ICHECK ONE Safety Related
6th Tendor	n Surveillance - Generation of Tendon	Force Curves	MAR/SP/CGWR/PEERE NUMBER
			VENDOR DOCUMENT NUMBER
	APPROVAL SIGNATURES		PRINTED NAME
Design Engineer	Jebselett	Johi	n D. Shubert, Jr.
Date	0 2-2-98		
Verification Engineer	L. Q. She	J	or A. Lexic
Date	2.15.18		
Supervisor	Eden Jack		Dan Jopling
Date	2-16-98		
MS REVISED	ion Sheet" for revision 3)		
	erce losses and prepare Tendon For	ce Curves for additio	nal Tendons required
Determine Tendon Fo	ce inspection. The data for the fol		
Determine Tendon Fo for the 6th Surveilland	ce inspection. The data for the fol		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42	ce Inspection. The data for the fol 2H29, 42H30, 42H34,		
·	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29,		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 621 RESULTS SUMMARY	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 62I	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29,		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 62I	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 62I	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 621 RESULTS SUMMARY	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 621 RESULTS SUMMARY	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		
Determine Tendon Fo for the 6th Surveillan D111, D302, D306, 42 42H35, 42H36, 42H37 62H39, 62H43 and 621 RESULTS SUMMARY	ce Inspection. The data for the fol 2H29, 42H30, 42H34, 7, 51H28, 51H29, H44.		



### **CALCULATION REVIEW**

CALCREVITM

Page 1 of 2

LCULATION NO.1	S 95-0082 Revision 3	
ARTI -	DESIGN ASSUMPTION/INPUT REVIEW	/: APPLICABLE ] Yes X No
	The following organizations have review Identified for this calculation:	ad and concur with the design assumptions and inputs
	Nuclear Plant Technical Support System Engr	N/A Signeture/Dete
	Nuclear Plant Operations otheris	N/A Signature/Date
	•	
RT II	RESULTS REVIEW: APPLICABLE	
	The following organizations have review	red and concur with the results of this calculation and izations must take to implement the results.
	Nuclear Plant Technical Support System Engr	N/A Signeture/Data
	Nuclear Plant Operations	N/ASignature/Oute
	Nuclear Plant Maintenance	<u>N/A</u>
	Yes X N/A	Signature/Date
	Nuclear Licensed Operator Training	N/A Signeture/Date
	Manager, Site Nuclear Services	N/A Signeture/Date
	Sr. Radiation Protection Engineer	N/A Signature/Date
	Nuclear Plant EOP Group	
	OTHERS:	
		N/A Signeture/Date



CALCULATION NO REV.

### **CALCULATION REVIEW**

Page 2 of 2

#### S 95-0082 Revision 3

### PART III - CONFIGURATION CONTROL: APPLICABLE 🔲 Yes 🖾 No

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document	Date Regulred	Responsible Organization		
· · · · · · · · · · · · · · · · · · ·				
		·		
· · · · · · · · · · · · · · · · · · ·				
	·			
· · ·		· ·		
······				

Upon completion, forward a copy to the Manager, Nuclear Regulatory Assurance Group for tracking of actions if any items are identified in Part III. If calculations are listed, a copy shall be sent to the original file and the calculation log updated to reflect this impact.

### PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorizations must be listed below and issued concurrently with the calculation.

Enhanced Design Basia Document	🔲 Yes 🖾 No	ຕະກ	Vendor Qualification Packag	ie 🗋 Yes 🖾 No <u>Ma</u>	P <b>n</b>
FSAR	🗋 Yes 🖾 No	(Letter#)	Topical Design Basis Doc.	Yes 🛛 No ITC	n
Improved Tech. Specification	🖸 Yes 🖾 No	(Letter#)	e/sopm		ŋ
Improved Tech. Spec. Bases	Yes 🛛 No	(Letter#)	Other Documents reviewed		
Config. Mgmt. Info. System	Yes 🛛 No		·	_ Yes 🗋 No	
Analysis Basis Document	🗋 Yes 🔯 No	(TCP)		Yes No	(CHANGE DOC. REFERENCE)
Design Basis Document	🔲 Yes 🖾 No	กะภ		Yes No	(CHANGE DOC. REFERENCE)
Appendix R Fire Study	🗋 Yes 🖾 No	<u>៣୯୬</u>		Yes 🛄 No	CHANGE DOC. REFERENCES
Fire Hezerdous Analysis	Yes 🛛 No	(104)		Yes [ No	(CHANGE DOG. REFERENCE)
NFPA Code Conformance Document	Yes 🖾 No	การก		 Yes No	(CHANGE DOC. REFERENCE)
process.	roval is require	ed if a setpoint i	s to be physically change		counties for the NEP 213
PRC Review Required	Yes	🛛 No	N/A PRC Chairman	n	/Date
) DNPO Review Required	Yes	No No	N/A DNPO		/Date
DESIGN ENGINEERVOATE	274	2-2-98	DESIGN ENGINEER - PRINTED NU John D. Shubert, Ju		
Re 107	V				



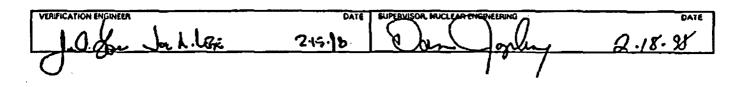
### **CALCULATION VERIFICATION REPORT**

Crystal River Unit 3

Page 1 of 1

CALCULATION N	WMBER		\$ 95.0082 Revision 3
PROJECT/TITLE			6th Tendon Surveillance - Generation of Tendon Force Curves
YES	NO	N/A	
1. 💢			Are inputs, including codes, standards, regulatory requirements, procedures, data, and
		• •	Engineering methodology correctly selected and applied?
2. 🔲		X	Have assumptions been identified? Are they reasonable and justified? (See NEP 101, V.c,
~ <del>~ ~</del>	<b></b>	_	for discussion on references).
з. 🕅	Ц		Are references properly identified, correct, and complete? (See NEP 101, V.c., for
Υ.	_	_	discussion on assumptions and justification.)
4. 🕅			Have applicable construction and operating experiences been considered?
5. 🕱			Was an appropriate Design Analysis/Calculation method used?
6.		ষ	In cases where computer software was used, has the program been verified or reverified in
		-	accordance with NEP 136 for safety related design applications and/or are inputs, formulas,
			and outputs associated with spreadsheets accurate?
7. 🗖		X	Is the output reasonable compared to inputs?
8. 🔲		X	Has technical design information provided via letter, REA, IOC or telecon by other
			disciplines or programs been verified by that discipline or program?
9. 🗖		X	Has technical design information provided via letter or telecon from an external Engineering
			Organization or vendor been confirmed and accepted by FPC?
10. 🔲	図		Do the calculation results indicate a non-conforming condition exists? If "Yes," immediately
			notify the responsible Supervisor.
11. 🔲	図		Do the results require a change to other Engineering documents? If "Yes," have these
			documents been identified for revision on the Calculation Review Form?

I have performed a verification on the subject calculation package and find the results acceptable.





## INTEROFFICE CORRESPONDENCE

Nuclear Engineering

NT6D

MAC

240-1511 Telephone

SUBJECT: Crystal River Unit 3

Quality Document Transmittal - Analysis/Calculation

TO: Records Management - NR2A

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO (FPC BOCUMENT IDENTIFICATION NUMBER)	<sup>riev.</sup> 2	systemis)	TOTAL PAGES TRANSMITTED
\$ 95-0082		MX	153
τπιξ			

6th Tendon Surveillance - Generation of Tendon Force Curves

kwos rochtuy keywords for later retrieval Tendon, Surveillance	<b>i</b> .			
DXREF (AEFERENCES OR FLES - UST PRIMARY FILE F	IRST)		•	
•				
			-	
FPC (from Parsons Power)	VENDOR DOCUMENT NUM	BER (DXREF) N/A	SUPERSEDED DOCUMENTS (DXREF N/A	
		TAG		
			<u>.</u>	
		<u> </u>		
	P	ART NO.		

COMMENTS RESAGE RESTRICTIONS, PROPRIETARY, ETC.

Revision by FPC to Parsons Power calculation (using FPC format)

NOTE:

Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99), otherwise; use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

VERIFICATION ENGI DATE DATE DATE 9-22-97 7-15-17 Z Z ATRICK A. MCCARRAHER John Sh D.

cc: Nuclear Projects (If MAR/CGWR/PEERE Return to Service Related) 🗍 Yes 🔯 No Supervisor, Config. Mgt. Info. Mgr., Nucl. Operations Eng. (Original) w/attach Calculation Review form Part III actions required Yes No (If Yes, send copy of the form to Nuclear Regulatory Assurance and a copy of the Calculation to the Responsible Organization(s) identified in Part III on the Calculation Review form.)





## ANALYSIS/CALCULATION SUMMARY

DOCUMENT IDENTIFICATION	NUMBER	scipline S	CONTROL NO. 95-	0082	REVISION LEVEL
nnte 6th Tendon Surv	velllance - General	tion of Tendon F	orce Curves		CLASSIFICATION ICHECK ONE)
					MANSPICGWRIPEERE NUMBER 11/0
					VENOOR DOCUMENT NUMBER
	A	APPROVAL GNATURES			PRINTED NAME
Design Engineer	Debs	seeren	~	John D	). Shubert, Jr.
Date	9-1	5-97			
Verification Engineer	Patrice a	. Mc Canal	la P	ATRICK	A. MCCARRANTER
Date	9-7	22-97			
Supervisor	Sellin	Joseph	T	). Jopi	L/29
Date	Q.	12-91			
for Tenc	ions for 6th Surve	eillance Inspectio	re Tendon Force ( n.		
	urves are plotted	and attached.			
					· · · · · · · · · · · · · · · · · · ·
			· · · · · · · · · · · · · · · · · · ·		
				·······	



## 

Page 1 of 2 CALCULATION NO. REV. S 95-0082 Revision 2 PARTI -DESIGN ASSUMPTION/INPUT REVIEW: APPLICABLE 🔲 Yes 🖾 No The following organizations have reviewed and concur with the design assumptions and inputs Identified for this calculation: **Nuclear Plant Technical Support** Second Parts System Engr **Nuclear Plant Operations** Signature/Data OTHERISI Signature/Date Signature/Date PART II -RESULTS REVIEW: APPLICABLE 🔲 Yes 🖾 No The following organizations have reviewed and concur with the results of this calculation and understand the actions which the organizations must take to implement the results. Nuclear Plant Technical Support Signature/Date System Engr **Nuclear Plant Operations** Signature/Date **Nuclear Plant Maintenance** Signature/Date Yes □ N/A **Nuclear Licensed Operator Training** Signature/Date Yes □ N/A Manager, Site Nuclear Services Signeture/Dete Yes Sr. Radiation Protection Engineer Signature/Dete Yes □ N/A **OTHERS:** Signature/Dete Signature/Date



### **CALCULATION REVIEW**

Page 2 of 2

#### CALCULATION NO JEV. S 95-0082 Revision 2

### PART III - CONFIGURATION CONTROL: APPLICABLE 🖾 Yes 🔲 No

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document	Date Required	Responsible Organization
SP-182	11-1-97	Nuclear Engineering Programs
·····		
		· · · · · · · · · · · · · · · · · · ·
		••• ••••••••••••••••••••••••••••••••••
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	<u> </u>	
	)	

Upon completion, forward a copy to the Manager, Nuclear Regulatory Assurance Group for tracking of actions if any items are identified in Part III. If calculations are listed, a copy shall be sent to the original file and the calculation log updated to reflect this impact.

### PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorizations must be listed below and issued concurrently with the calculation.

Enhanced Design Basis Document	Yes 🛛 No 👖	r¢ø)	Vendor Qualification Pac	kaga	MOPIN
FSAR	Yes No	,étter#)	Topical Design Basis Doc	. 📋 Yee 🛛 No	(TCM)
Improved Tech, Specification	Yes 🛛 No 🖗	atter/1)	E/SQPM	🗌 Yes 🖾 No	(TC#)
Improved Tech. Spec. Bases	Yes No	attar ()	Other Documents review	red:	
Config. Mgmt. Info. System	Yes 🛛 No	CIOPIN		Yes 🔲 No	
Analysis Basis Document	- Yes 🛛 No ַ	rcn		Yes 🔲 No	
Design Basis Document	Yes 🛛 No 🖸	rc <i>m</i>	<u></u>	Yes 🗌 No	
Appendix R Fire Study	Yes 🛛 No 🖞	1Cm		Yes 🗍 No	
Fire Hazardous Analysis	Yes 🛛 No 🤇	rcn		Yes 🗋 No	
NFPA Code Conformance Document	Yes 🛛 No 🧐	rc n		Yes 🚺 No	CHANGE DOC, MARMENCES
PART V - PLANT REVIEW PRC/DNPO appr process. PRC Review Required					t through the NEP 213
	pand · · ·		PRC Chain	man	/Date
DNPO Review Required	Yes	🛛 No	DNPO		/Date
DESIGN ENGINEER/DATE			DESIGN ENGINEER . PRINTE	DNAME	
Selsee	4	9-15-97	John D. Shubert,	Jr.	



### **CALCULATION VERIFICATION REPORT**

Crystal River Unit 3 CALVERRP\_FRM

Page 1 of 1

CALCULATION NUMBER						 	<u> </u>
S S	95-0082	Revision 2					
PROJECT/TITLE							
61	th Tendon S	Surveillance -	<ul> <li>Generation o</li> </ul>	f Tendon Fo	rce Curves	 	

		YES	NO	N/A	
	1.	X			Are inputs, including codes, standards, regulatory requirements, procedures, data, and
					Engineering methodology correctly selected and applied?
	2.	X			Have assumptions been identified? Are they reasonable and justified? {See NEP 101, V.c,
					for discussion on references).
•	3.	X			Are references properly identified, correct, and complete? (See NEP 101, V.c., for
		-			discussion on assumptions and justification.)
	4.	Ø			Have applicable construction and operating experiences been considered?
	5.	Ø			Was an appropriate Design Analysis/Calculation method used?
	6.			Ø	In cases where computer software was used, has the program been verified or reverified in
					accordance with NEP 135 for safety related design applications and/or are inputs,
					formulas, and outputs associated with spreadsheets accurate?
J.	7.	囟			is the output reasonable compared to inputs?
	8.	X			Has technical design information provided via letter, REA, IOC or telecon by other
					disciplines or programs been verified by that discipline or program?
	9.	X			Has technical design information provided via letter or telecon from an external Engineering
			·		Organization or vendor been confirmed and accepted by FPC?
	10.		Ø		Do the calculation results indicate a non-conforming condition exists? If "Yes,"
			-		immediately notify the responsible Supervisor.
	11.		$\mathbf{X}$		Do the results require a change to other Engineering documents? If "Yes," have these
					documents been identified for revision on the Calculation Review Form?

I have performed a verification on the subject calculation package and find the results acceptable.

VERIFICATION ENGINEER	DATE SUPERVISOR, NUCLEAR ENGINEERING	DATE
Patrice a. Mc Caughy	9-22-97 Jan Juch 9-2	2-97

	Florida Power
--	------------------

# INTEROFFICE CORRESPONDENCE

Nuclear Engineering Design Office

NA1E MAC 240-3568 Telephono

SUBJECT: Crystal River Unit 3 Quality Document Transmittal - Analysis/Calculation

TO: Records Management - NR2A

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO (FPC DOCUMENT IDENTIFICATION NUMBER)	REV.	BYSTEM(S)	TOTAL PAGES TRANSMITTED
S-95-0082	1	MX	139-138 5
me			3-77-97
6th Tendon Surveillance - Ger	eration of Tendon I	Force Curves	- (7/)

KWOS IDENTIFY KEYWORDS FOR LATER RETRIEV	/AL)		
Tendon Surveillance			
DUREP (REFERENCES OR FILES - LIST PRIMARY F	LE FIRST)		
SP-182			
VEND (VENDOR NAME)	VENDOR	XXXUMENT MUMBER (XXREF)	SUPERSEDED DOCUMENTS (DXREF)
FPC (from Parsons Power)		N/A	N/A
		TAG	
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_		DADTINO	
		PART NO.	
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COMMENTS (USAGE RESTRICTIONS, PROPRIETARY, ETC.)

Parcons Power calc revision using FPC format.

### NOTE:

Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99), otherwise; use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

L. a. L. 3.12.97	D/A 11 m Jaling 3-17-97
co: MAR Office (It MAR Releted) [] Yes [2] No Mgr. Nucl. Config. Mgt.	Plant Document Updates Required I Yes A No (if Yes, ) and copy of the Calculation Review form to Nuclear Licensing and a copy of the Calculation to
Mgr., Nucl. Eng. Design	the Responsible Organization(s) Identified in Part II on the Calculation Review form.)
(Original) w/attach	A/E D'Yes D'No (If yes, Transmit w/sttach)





## ANALYSIS/CALCULATION SUMMARY

		DISCIPUNE		CONTROL NO.	· · · ·	REVISION LEVEL
DOCUMENT IDENTIFICAT	ION NUMBER	STRU	CTURAL	<u>S-95-0082</u>		1
PREPARATION ( SURVEILLANCE	OF TENDON FO INSPECTION	ORCE CUR	VES FOR 6TH	TENDON		CLASSIFICATION (CRECK ONE) Safety Related Non Safety Related MAR/SP/CGWR/PEERE MUNISER VENDOR DOCUMENT NUMBER
	REVIS			ITEMS	REVISE	D
Design Engineer	Rusha	Charp	HEE PAG	i l of TABS	Bertha	o for potence Litt
Date	1/20	197	of class			
Verification Engineer	Patrie 201.	Ne Canala				
Date/Method*	2/5/					
Supervisor	Samir J.	Serbar				
Date	10 Feb.	97			_	
				RE TENDON FOR	CE CURV	'es
FOR TENDO	ons for 6th s	SURVEILL	NCE INSPECT	10N		
PEBLITS BURMARY	· •					
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	* <b>6.</b>					

PARSONS POWER GROUP INC. a combination of Gilbert Commonwealth and Parsons Main

2475 Libraniawi Road • Reading: P# 19607 • (610) 835-2000 • Fex. (610) 855-2001

February 11, 1997

FCS-14771 Contract N00821AD, WA048

Mr. W. W. Nisula Contract Manager Florida Power Corporation (NA1B) 15760 West Power Line Street Crystal River, FL 34428-6708

Attention: Mr. J. Lese

Re: Crystal River Unit 3 6th Tendon Surveillance Force Curve Calculation

Dear Mr. Nisula:

Please find attached calculation S-95-0082 Revision 1, which documents the generation of the tendon force curves to accommodate the proposed inspection date of early March 1997.

Included are disks with related electronic files used in the preparation of the data and force curves.

Should there be any questions please feel free to contact Dr. Samir Serhan at (610) 855-3209.

Very truly yours,

Emir DE

Samir J. Serhan, Ph.D., P.E. Supervising Engineer

Roy W. Adler Project Manager

5-15-0082 feursion #1 Orke Letter for 1150

RWA/SJS/bmb

Attachment

cc: W. W. Nisula (NA1B)
D. L. Jopling (NA1E)
J. A. Lese (NA1E)
R. E. Vaughn
FPC Records Management (CL Only)
R. W. Adler(2)
P. J. Hamilton
S. J. Serhan

PARSONS



### INTEROFFICE CORRESPONDENCE

Nuclear Engineering Office

NAIE MAC

240-3568 Telephone

SUBJECT: Crystal River Unit 3 Quality Document Transmittal - Analysis/Calculation

TO: Records Management - NR2A

COOND FIC DOCUMENT IDENTIFICATION NUMBER	Rý PREV.	BYSTEMP	a)	TOTAL PAGES TRANSMITTED
S-95-0082	0		MX	383
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6th Tendon Surveillance -	Generation of Tende	on Force Curv	/03	
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WDB (DENTIFY KEYWORDB FOR LATER RETRIEV	AL}			
Fendon Surveillance				·
XREF (REFERENCES OR FILES - UST PRIMARY FI	LE FIPOT)		•	
		1		,
END (VENDOR NAME)	VENDOR DOCUMENT N		·	BUPENSEDED DOCUMENTS (DXREF)
	N/A			N/A
FPC (from Parsons Power)	11/7			N/A
		TAG		
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COMMENTS (USAGE RESTRICTIONS, PROPRIETAR	· · · · · · · · · · · · · · · · · · ·			· · · ·
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Force Curves for 6th Tendon Su	urveuillance			
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se Tag number only for valid ta	g numbers (i.e., RC	V-8. SWV-34.	DCH-99), othe	rwise: use Part number field
.e., CSC14599, AC1459). If mor	e space is required,	write "See A	ttachment" and	L list on separate A sheet.
ESIGN ENGINEER DAT	E VERIFICATION ENGINEER	. ol .	DATE SUPERMON	NUCCENTERA DAY
Ja Q. Jan 4.26. X	0	MA	N	· Unawhed 4/24
: MAR Office (If MAR Related)		Document Update	as Required RY	es D No (If Yes send copy of the
Mgr. Nucl. Config. Mgt.				nsing and a copy of the Calculation t
Mgr., Nucl. Eng. Design			tion(s) identified in F	Part II on the Calculation Review form.)
(Original) w/attach	A/E	•	Ū۲	es 12 No

Fork		ATION REVIEW
CALOULATION NOUREY.	S-95-0082/Revision #0	
PARTI -	DESIGN ASSUMPTION/INPUTREVIEW	
		and concur with the design assumptions and inputs $\sqrt{2}$
	Nuclear Plant Technical Support System Engr	Bigmelture/Cato
	Nuclear Plant Operations OTHER(8)	Bignature/Date
		Signature/Dale
	·	Signature/Dete
PART II -	RESULTS REVIEW	
		and concur with the results of this calculation and ations must take to implement the results.
	Nuclear Plant Technical Support System Engr	N/A Bignatumy/Cada
	Nuclear Plant Operations	Bigneture/Deto
	Nuclear Plant Maintenance Yes X N/A	Signature/Date
	Nuclear Licensed Operator Training	Signature/Date
	Manager, Site Nuclear Services	Bignebere/Date
	Sr. Radiation Protection Engineer	Signature/Date
OTHE	RS:	
	<u></u>	Signature/Date
		Signatura/Date

	ida rer	•	CALC	CULATI	ON REVI	EW	Page 2
CALCULATION NO./RE	v	S-95-0082	Revision	#0			rage 2 (
PART III -	CONFIGUR	ATIONCONT		a v		· · · · · · · · · · · · · · · · · · ·	
	The followin	ig is a list of l	luclear E		d Plant procedure sults review:	es/lesson plans/o	ther documents
D	ocument		Da	ate Required		Responsible O	rganization
	SP-182			3/1/98		Nuclear Engin	cering Design
						(A. Pet	rowsky)
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PART IV - PI	LANTREVIEW	VS/APPROVA	LS FOR F	IELDSETPOI	NT CHANGE		
	review is requi				uation is perform	ed. DNPO approva	al is required
PRC Review I	Required	Yes	X	No	PRC Chelrman	n	/Oate
DNPO Review	Required	T Yes	X	No	DNPO		/Date
DEBIGN ENGINEERVO	ATE	.1	26.96				

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ANALYSIS/CALCULATION SUMMARY

CUMENT IDENTIFICATION N	UMBER	STRUCTURAL	CONTROL NO. 5-95-0082	REVISION LEVEL
PREPARATION	OF TENDON S	NDON FORCE C SURVETILANCE	URVES	CLASSIFICATION (CHECK ONE) Selvity Related V Non Selvity Related MAR/SP/COWR/PEERE NUMBER
				VENDOR DOCUMENT NUMBER
	REVISIO APPROVA		ITEMS REVISE	Ð
eeign Engineer	Rusha C	have INITIA	L ISSUE	
de .	4/15/96			
attication Engineer	M. Marce	elus		
te/Method*	4/15/9			:
upervisor	Sani d.o	Erlan		·
4	22 April	96		
			; T - Qualification Testing	· · · · · · · · · · · · · · · · · · ·
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SCABE BELOW & LIETHOD OF VEAF PROBE BLANNARY DETERMINE CURVES	CATION WAS OTHER T	NUN DESIGN REVIEW	rsee + Prepare -	ALSO PREPARE
SCRIBE BELOW & WETHOS OF VERF REPORE BLANNIN DETERMINC CURVES SULTS SUMMITY	CATION WAS OTHER T	HUN DESIGN REVIEW	SSEE & PREPARE EXT SURVERLANCE. SP-182 ENCLOSUR	ALSO PREPARE
SCRUE BELOW & WETHOS OF VERF REPORE BLAMMARY DETERMINIC CURVES SUPPORTIN SURTS SUMMARY FORCE C	CATION WAS OTHER T TEN DOM FOR TED 16 CALCU URVES A	LATIONS FOR	ESSE & PRECLARE EXT SURVERLANCE. SI-182 ENCLASUR & ATTACHED. CAU	ALSO PREPARE
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SCRUE BELOW & WETHOS OF VERF REPORE BLAMMARY DETERMINIC CURVES SUPPORTIN SURTS SUMMARY FORCE C	CATION WAS OTHER T TEN DOM FOR TED 16 CALCU URVES A	LATIONS FOR	ESSE & PRECLARE EXT SURVERLANCE. SI-182 ENCLASUR & ATTACHED. CAU	ALSO PREPARE

Nev. 8/85



### **DESIGN ANALYSIS/CALCULATION**

Crystal River Unit 3

Page	1
rayv	

REVISION

3

DOCUMENT IDENTIFICATION NO. S-95-0082

### This page followed by page 1A

. برجره مرزد .

**Revision No.:** 3 The following items have been revised in the current revision:

Revised Pages	Affected Sections	Add	Replace	Remove	Description/Purpose of Revision
1		X			add "Revision Description Sheet" for revision 3
14			x		change page number on revision 2 "Revision Description Sheet" from page 1 to page IA and state that "page 1B follows"
18			x		change page number on revision 1 "Revision Description Sheet" from page 1A to page 1B and state that "page 1C follows"
1C			x		change page number of Table of Contents from page 1B to page 1C and add item for Revision 3 Description Sheet
_11			x		change data input file names to correspond to current names (1.e. DOMER3.XLW, ctc) and add note
20			x		change data input file name to correspond to current name (DOMER3.XLW), add data for Tendons D111, D302, D306 and state that "page 20A follows"
20A-20B		X			add spreadsheet and curve for Tendon D111
49			X		state that "page 49A follows"
49A-498		X			add spreadsheet and curve for Tendon D302
55			X		state that "page \$5A follows"
55A-55B		×		[	add spreadsheet and curve for Tendon D306
63-64			x		change data input file name to correspond to current name (HOOPER3.XLW) and add data for Tendon 42H29, 42H30, 42H34 thru 42H37, 51H28, 52H29, 62H39, 62H43 and 62H44
70			X		state that "page 70A follows"
704-700		X			add spreadsheets and curves for Tendons 42H29 and 42H30
76			×		state that "page 76A follows"
76A-76H		X			add spreadsheets and curves for Tendons 42H34 thru 42H37
94			X	1	state that "page 94A follows"
94A-94D		X			add spreadsheets and curves for Tendons 51H28 and 51H29
112			X	[	state that "page 112A follows"
112A-112B		X			add spreadsheet and curve for Tendon 62839
118			X		state that "page 118A follows"
118A-118D		×			add spreadsheets and curves for Tendons 62H43 and 62H44
159			X		include "Original Stresses data" for Tendons D111, D302 and D306 and change data input file name to correspond to current name (DOMER3.XLW)
160			x		include "Original Stresses data" for Tendons 42H29 42H30, 42H34 thru 42H37, 51H28, 52H29, 62H39, 62H4 and 62H44 and change data input file name to correspond to current name (HOOPER3,XLW)
B94-B110		x			add Tendon History Sheets for Tendons D111, D302, D305, 42H29, 42H30, 42H34 thru 42H37, 51H28, 52H29 52H39, 62H43 and 62H44
K2			X		change data input names to correspond to current names (i.e. DOMER3.XLW, etc) and add note

**REVISION TYPE:** (check one)

Superseded by Calculation Number Full Revision

Page for Page



# **DESIGN ANALYSIS/CALCULATION**

Crystal River Unit 3

DOCUMENT IDE	TIPICATION NO.					REVISION
L		S-95-0082			· · · · · · · · · · · · · · · · · · ·	3
Revision The follo	wing items		revised	<u>in the cu</u>	This page followed by urrent revision:	y page 18
Revised Pages	Affected Sections	Add	Replace	Remove	Description/Purpose of	Revision
1		×			add "Revision Description Sheet"	for revision 2
1A			x		change page number on revision 1 Description Sheet" from page 1 to that "page 1B follows"	page 1A and stat
18			x		change page number of Table of Cu IA to page 1B and add item for Re Description Sheet	evision 2
3			×		change start date from Spring 19	97 to Fall 1997
8			X	T	change start date from Spring 19	97 to Fall 1997
9			×		change reference to Enclosure 30 "Original Stressing Data"	to just state
10			x		change start date from March 199 and change numerical values to c November 1997	orrespond to
11			x		change data input file names to current names (i.e. DOMER2.XLW,	etc)
18			×		revise the discussion about the between data on the spreadsheet:	· .
20			X		change data input file name to ( current name (DOMER2.XLW)	
21			×		revise spreadsheet for November	
23-61			×		revise spreadsheets and curves t start date	
64			X		change data input file name to current name (HOOPER2.XLW)	correspond to
65-124	1		x	1	revise spreadsheets and curves start date	for November 1997
126	1		x		change data input file name to current name (VERTR2.XLW)	correspond to
127-155			x		revise spreadsheets and curves start date	for Kovember 1997
157			x		change reference to Enclosure 3 "Original Stressing Data" and E state "data sheets"	nclosure 29 to ju
159-161			×		change reference to Enclosure 3 "Original Stressing Data" and c file names to correspond to cur DOMER2.XLW, etc)	hange data input rent names (i.e.
162			<b>x</b> .		change reference to Enclosure 3 "Original Stressing Data" and 1 state "data sheets"	Enclosure 29 to j
K2			X		change data input file names to current names (i.e. DOMER2.XLW	correspond to

**REVISION TYPE:** (check one)

Superseded by Calculation Number

Full Revision

Page for Page

R3



### Florida Power CORPCRATION

1

Calculation S-95-0082

## DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

Page 1B

AEVISION

RЗ

**Revision No.:** 

CULAENT IDENTIFICATION NO

This page followed by page 1C

This form shall be used to record the purpose or reason for the revision, indicate the revision pages and/or affected sections and give a short description of the revision. Check (X) the appropriate function to add. replace or remove the affected pages.

Revis	ed Affected	Add	Replace	Remove	Description/Purpose of Revision
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1		x			Add revision description sheet.
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PURPOSE AND OBJECTIVE	File CR3C6TSP.DOC (Word 6.0)
The purpose of this calculation is to provide tendon force c Crystal River Unit 3 facility in support of the upcoming 6th of 1997. Specific tasks to be performed as part of this sco	h tendon surveillance period scheduled for the Fall
A.) Determine the prodicted tendon losses and develop for the upcoming sixth surveillance period. Generate the t tendons adjacent to the selected tendons, and alternate specifically scheduled for this surveillance but force cu substitute tendon should be required during the surveillance tendons deferred/exempted from the previous surveillance detail in Section 5.0.	ce/time curves for each of the selected tendons for tendon force curves for the selected tendons, the tendons. Alternate tendons are tendons not urves are prepared to be available in case a lance. In addition, force curves for a group of
B.) In addition to the force curve development, other calcu included within Surveillance Procedure SP-182 will also	
DESIGN INPUT	
Design input information has been reviewed and is included	d as Attachment A to this calculation. Note that

Design there are no significant changes to the basic criteria and related documentation which address the licensing of the CR3 plant with respect to the tendon surveillance program. The previous surveillance efforts completed various studies and addressed the CR3 tendon program and its' compliance with U.S. Regulatory Guide 1.35, Revision 3, since it was formally issued in July 1990. Based on FPC licensing efforts and Technical Specification revisions performed at the time of the last surveillance period, as well as recent discussions with the NRC, FPC has now committed the CR3 tendon surveillance program to be performed in accordance with U.S. NRC Regulatory Guide 1.35, Revision 3 (Reference 3).

U.S. Regulatory Guide 1.35.1, Revision 0 (Reference 4) is a daughter document referred to by the above Reg. Guide and deals specifically with the calculation of individual tendon losses and the generation of tendon force curves. While calculation efforts for the CR3 tendon force curves have followed closely with both of these Regulatory Guides as they evolved through the 1970's and 1980's, the format and current procedure for the preparation of the force curves is not in exact compliance with Regulatory Guide 1.35.1 Revision 0 as issued in 1990. The method and approach used in the generation of the CR3 force curves is superior to that of the Reg. Guide in that a specific curve is generated for each individual tendon. Based on the discussions held with the NRC and the results of their review, the method and approach used for these calculations shall be the same as used for previous surveillances. See the Attachment A information for further discussion and references to recent correspondence and documentation with the NRC on various issues related to the tendon surveillance program.

Applicable Technical Specification sections, as well as FSAR sections were also reviewed for this effort. They support the position noted above on the FPC commitment to R.G. 1.35, Rev. 3 and are discussed and referenced within the Attachment A information.



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#### Calculation S-95-0082

### 3.0 COMPUTER CODES

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This calculation package is being prepared using Microsoft Word, Version 6.0 and Microsoft Excel, Version 5.0. Spreadsheets from earlier surveillance efforts were prepared using Lotus 123, Release 2.01 and 3.0 and were converted to Excel format for this calculation. All input and calculations are manually checked and verified, therefore, verification of computer programs is not applicable or necessary.

### 4.0 ASSUMPTIONS

Any assumptions made are noted and contained within the calculation package. None require future confirmation.

### 5.0 SCOPE AND TENDON SELECTION

Tendons were selected for the sixth surveillance period in accordance with the requirements of Reg. Guide 1.35, Revision 3 and using the same methodology as was used in the past surveillance. Basically, a random but representative sample was selected and checked at the site for accessibility. Specific criteria used for this selection process is summarized as follows:

### **Tendon Selection Process**

The tendon selection process has remained the same as that completed for the last several surveillances where a random but representative sample is selected for inspection and testing. The intent is to get as many new and never tested tendons in the sample population, but still keeping one control tendon from each major tendon group to be investigated in each surveillance. Note that this current method differs from methods used during the early life of the plant where some tendons were repeated for inspection every third surveillance. Basically, the selection criteria and process used considers the following:

#### 1.) Select tendons based on Reg. Guide 1.35 Revision 3

Based on the good results of prior surveillances, the Reg. Guide requires a minimum of 11 tendons to be inspected, including 5 hoop, 3 vertical and 3 dome. Tendons should be selected which were never previously inspected or tested. Previously detensioned and retensioned tendons should not be included (unless there is a specific need to investigate the tendon per item 3 below). In addition to being selected at random, tendon selection should be representative of various areas and conditions. For example, the hoop tendons selection was based on random selection but also considered what tendons were inspected in the past and in what hoop area. A plot of previously inspected hoop tendons was prepared to track tendons inspected by grouping (i.e. 13's, 42's, 35's, 46's, 51's, and 62's). Therefore, the selection process considered those sections not equally represented by as many tendons as completed within other sections from prior surveillances. See Attachment J for various plots and information of the hoop group. The same procedure was applied to the dome group (i.e. 100's, 200's & 300's groups) and to the vertical group (i.e. 12's, 23's, 34's, 45's, 56's & 61's & quadrants). See Attachment D for groups information.



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- 2.) Maintain Control Tendons to be completed each surveillance. The Reg. Guide also requires a control tendon from each group to be inspected every surveillance for comparative purposes. CR3 has not had control tendons since the first surveillance. The concept was introduced probably in the fourth surveillance. Tendons D212, 12V1 and 51H26 were probably the original control tendons since about the time of the fourth surveillance. They were intended to be inspected during the fifth surveillance but the group of tendons selected was based on the surveillance being performed during an outage. FPC decided to complete the 5th surveillance during normal plant operation and the original tendons selected were affected because many tendons were located within the area of the plant steam vent zone. This included the above three control tendons, and three new control tendons, D215, 34V6 and 46H29 were selected for completion of that surveillance. A problem with 46H29 during the 5th surveillance forced the selection of another control tendon, 46H21, for the hoop group, New control tendons may need to be selected periodically if the tendon has a problem and is ever detensioned and/or retensioned. As earlier surveillances on CR3 did repeat some tendons, the selection of these other control tendons was easily done from several good candidates. New control tendons should be selected from those previously inspected as far back as possible and cannot be one previously detensioned and/or retensioned. A tendon inspected in more than one prior surveillance is preferred. Based on the above, it is recommended that both of the above two sets of control tendons be used by FPC as control tendons, with one set of three to be utilized in the 6th surveillance during a plant outage, and for the other three to be used in any future inspections scheduled to be performed on-line.
- 3.) Consider any tendons with problems or abnormal conditions as reported by plant personnel. Any leaking tendons or tendons with any reported problems should be considered within the scope of the surveillance. Also, past inspection reports and records should be checked for open items, recommendations, or noted problem tendons.
- 4.) In the selection of tendons for detensioning, (one per group is required per R.G.) consider the number of effective wires as recorded in the tendon history sheets and summarized in the effective wire summary in Attachment D to this calculation. As any tendon is to be considered ineffective if it has less than 155 effective wires per the FSAR, it is therefore not desirable to select a tendon with many missing, cut or ineffective wires. Unless there was a specific need to detension that particular tendon, doing so could therefore render the entire tendon as out of service. Only a maximum of 3 tendons are allowed out of service at one time per criteria in the FSAR.
- 5.) The reduced force dome tendons are not normal candidates for normal liftoff testing per SP-182, Enclosure 8.
- 6.) Tendons adjacent to the selected tendon may require testing and should also be feasible to inspect and test. Adjacent tendons in the dome should not include any reduced force dome tendons. Jump to the next regular dome tendon for the required adjacent tendon. Also, adjacent tendons of the lowest hoop tendons (#1) shall be considered as the two directly above the selected tendon. Adjacent tendons of the highest hoop tendons (#47) shall be considered as the two directly below the selected tendon.
- 7.) One alternate tendon should be selected from each group, and the two adjacent tendons of these alternates at least considered for possible inclusion.



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In addition to the above selection criteria, there are several other factors which have influenced the scheduling of actual field inspection and testing. These include:

### A.) Steam Vent Zonc -

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Plant steam venting can impose a safety hazard to personnel during plant operation and early modes of shutdown. Tendon work in the range between 0 and 120 degrees is affected during plant operation by the potential steam venting of the plant. Tendon work in this area must be held off until the potential hazard is eliminated or other approval is obtained from plant operations. Note that for the fifth surveillance per FPC operations, this even includes the outside tendon caps of the affected butresses at 0 and at 120 degrees.

#### B.) Fuel Pool Area -

Work over the fuel pool can only be performed while missile shields are in place. (Nureg 0612 reqmt.)

### C.) Plant Interior Work -

Work inside some plant areas is difficult due to access problems, high radiation areas, interferences, ram accessibility, etc.

### Deferred/Exempted Tendons

After the tendons were selected for the fifth surveillance for an outage surveillance, it was decided that the 5th surveillance would be completed during normal plant operation. A group of tendons originally selected for inspection during that surveillance had to be exempted from that surveillance due to their proximity to the main steam vent zone and the associated hazards with working in that area. FPC discussed this issue with the NRC and has documented the following 8 tendons as deferred tendons:

1: -



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	ENEMPTED TENDON	COMMENTS
	D115	Never inspected in any surveillance.
	D212	Inspected in Surveillance 3 and 4.
		Considered as Control Tendon for outage condition.
	D311	Never inspected in any surveillance.
	12V1	Previously included for liftoff testing in the 3rd and 4th surveillances. Considered as Control Tendon for outage condition.
	42H44	Never inspected in any surveillance.
-	51H26	Previously included for liftoff testing in the 3rd and 4th surveillances. Considered as Control Tendon for outage condition.
┢	53H46	Never inspected in any surveillance.
┢	62H46	Never inspected in any surveillance.
1		

As FPC has committed to the NRC to address the above tendons within the upcoming 6th surveillance, these tendons were considered in the scope of this calculation. The 6th surveillance is scheduled to be completed during an outage. Since three of the above exempted tendons were also previous control tendons, it was considered that these tendons can again be used as control tendons for this surveillance instead of the 3 control tendons used in last surveillance (when the surveillance was done on-line). Therefore, the three exempted control tendons can be considered as three of the 11 tendons required per Reg. Guide. A total of 16 tendons should be inspected during the surveillance with three additional alternates selected. Note however that the scope of this calculation will include force curves to be regenerated for the other control tendons, D215, 34V6 and 46H21.

A complete historical record of all tendons included in all prior surveillances, along with the list of selected adjacent, exempted and alternate tendons which are planned for in the 6th surveillance is provided on the following Table.

			•	•	•••							•	•		
TENDONS INSPECTED TH					I GTH SURVER	LANCE							1-349-97 FLE-CR3R6TSF-XLS	ENTRICA	N.
SURVEELANCE PERIOD YEARS AFTER SIT	15T SURV 11/27/77 TC		250 SURV 3750 TO 9	ellance 19/30	1RD SURV 922-81 TO		4TH SURT 91.547 TO	/EDLANCE	STILSURY IV93 TO I	VERLANCE 1794	. FLANNE . 6111 SUR . FALL 197	VEILLANCE	PLIOR	ICATION NO.	
SIT 11/76	I YEAR		3.5 YEARS		S YEARS		II YEARS		17 YEARS		21 YEARS	;	TENDON DISPECTION SUBMARY DATA		
REQUIRED TO INSPECT ACTUALLY INSPECTED	21 TOT-10 23 TOT-10		21 TOT-10 22 TOT-10		21 TOT-10 21 TOT-10		11 TOT-57 11 TOT-57		11 TOT-51 14 TOT-41		. II TOT-S		, 83 TOT-401247,21D , 91 TOT-4312267,22D	- Ca	¥7
SP BASIS GC REPORT DATE	5P-3583, 58 5P-395, 5P- 3-27-89 & 4	4156	57-182 REV - 570		SP-182 REV 4 51982		57-122 REV 7 3/10/15		5P-182 REV 10 & 594	11	TOTAL-	16	• • • • • • • • • • • • • • • • • • • •	Calculation	
DOME TENDONS 13 TOTAL 3 GROUPS OF 41 DIOPS, D200%, D300%	D137 D215 D228 D228 D234 D340	D	D173 D140 D208 D373 D331	D	D123 D215 D212 D322 D322 D329	R D	D105 D212 D338	D RC	D715 D231 D231 U224	RC D A	, D212 , D304 , D113 , D115 , D115 , D131	RCE D E E A	, 11 DONE TENDONS PNSPECTED , TO DATE	on S-95-0082	
VERTICAL TENDONS 144 TOTAL 6 GROUPS OF 24 12, 34, 54, 23, 45, 61	12V19 12V20 12V21 23V13 34V4 45V3 56V1	D	12V12 12V20 23V3 34V1 45V6 56V20 56V1	R D.R	12V1 34V6 34V19 45V16 56V11 61V3	R D	3474 26A5	r,C D	34V6 54V[3 61V[4	RC D	12V1 61V21 23V2 61V10	RCE D A	26 VERT. TENDONS INSPECTED TO DATE		Crystal
INTELENTAL TENDONS 202 TOTAL 6 GROUPS @ 47 IOCH 13, 24, 33, 46, 51, 62 3 TENDONS PER HOOP TOTAL TENDONS = 549	131110 131139 131137 131147 131147 511111 62139 461121 461129 461129 461129	D	131122 131432 131443 531110 531123 511437 53124 53124 53124 462142	D	131(19 131446 421(26 421(46 511(26 511(45 531(46) 531(46) 531(46) 621(34 46(110)	R D	13120 13440 51126 51151 46819	D R	351 m 422 m 461 121 461 125 461 125 461 126 461 127 461 137 622 m	C(N==) ADJ_X RC(OM)D ADI D	<ul> <li>511/26</li> <li>421/35</li> <li>421/35</li> <li>421/34</li> <li>421/32</li> <li>421/44</li> <li>421/32</li> <li>421/44</li> <li>421/32</li> <li>421/44</li> <li>531/344</li> <li>531/344</li> </ul>	R.C.E E D E E Z A	43 HOOP TENDONS RISPECTED TO DATE		Crystal River Unit 3
TUTAL DISPECTED	23		22		21		11	<b>.</b>	i4		16+3 AL		, 91 TOTAL	11	
LEGEND-	a, alterna <u>e</u> , ex <b>emp</b> te		ADJ.ADJAC J FROM STILS		C, Controi , R, Repeate		D, DETENS T, RETENSI	ioned a ret Ioned	DINGLENS			·	Inspected		



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### 6.0 CALCULATIONS

### 6.1 General Background and Schedule Information

### General Background

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Tendon forces curves are to be prepared for the upcoming 6th tendon surveillance period at CR3. From the basic criteria as presented in the Design Input Section, as well as from several discussions with Mr. Joe Lese of Florida Power & Light, it was determined that the criteria for this surveillance period has not changed since the last surveillance efforts. A review of Tech Spec and FSAR criteria confirms the FPC positions with respect to the tendon program. Supporting work for this surveillance period will be based on the same criteria that was used and accepted in the previous surveillance periods.

Tendon losses have been calculated in the past per the Reference 8, 9, 10 and 11 documentation. Individual tendon losses include the following:

- Force loss due to elastic shortening of the containment as a result of the prestressing process and the particular sequence of tendon stressing.
- Force loss due to the stress relaxation of the tendon wires.
- Loss of prestress force due to the creep characteristics of the concrete structure.
- Loss of prestress force due to the shrinkage of the concrete structure.

Based on some earlier calculations made for tendon losses per the Reference 11 document, Lotus spread sheet templates were prepared for tendon losses calculations for the 4th tendon surveillance calculations. See References 9 & 10. These templates were reran and tested for their accuracy and validity for the fifth surveillance. In addition, the procedure for the gathering of all input data was automated in the fifth surveillance to the format presented herein. Numerous test cases were ran to duplicate force curves prepared in the past. There were four master templates prepared for the fourth surveillance; one for the hoop tendons, one for the vertical tendons, and two for the dome tendons. The dome tendons are divided into two groups; one for tendons with an original stressing sequence below 27, and the other for tendons with stressing sequences above 27.

Based on the work previously accomplished in the prior surveillances, new spreadsheets were prepared this surveillance using Microsoft Excel for the collection of input data and for the calculation of tendon losses needed for generation of force curves. The generation of the force curves was also automated this surveillance by using Excel to plot the graphs. The organization of most data used for this calculation was setup into Excel workbooks with subfiles built and included in each workbook. There is a separate workbook for each of the three tendon groups and each one contains the following:

- Tabulated input data
- Original tendon stressing sequences.
- Effective wire summaries.
- "Original Stressing Data" calculations for SP-182.
- Separate files including each tendon loss spreadsheet, plot data and an individual force curve.

Additional information on electronic file names etc. used in this calculation is provided in Attachment K.



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### Schedule Information

The expected timing for the sixth surveillance is Fall 1997. A date of November 1, 1997 will be used as a bases for determining the predicted values of base, 95% base and 90% base and labeling this information on the force curves. This allows for field use and decisions to be made based on the requirements of Surveillance Procedure, SP-182.

The scales of the force curves are based upon previous surveillance efforts. The x axis is a log scale in time representing the time after average date of dome or wall concrete placement, in years. This scale is labeled at the top of each curve. Force curves are plotted using the actual log scale points for the x axis (not the scheduled surveillance years after SIT) versus the calculated tendon forces in kips on the y axis. The scale at the bottom of the curve for scheduled surveillance periods after SIT are for ease and readability relative to regular scheduled surveillances per Reg. Guide 1.35, Revision 3.

Most of the CR3 surveillances were performed on the regularly scheduled years, however, the 5th surveillance was actually performed in the 17th year after SIT. Note that the containment Structural Integrity Test (SIT) was performed in November 1976.

For the dome tendons force curves, the point on the bottom scale at SIT corresponds to the log scale at the top of 2.5 years. Therefore, a corresponding log scale data point must be determined for curve plotting for the period of the 6th surveillance.

Based on a date of November 1, 1997 for the Fall 1997 surveillance, the length of time between November 1976 (@ SIT) and November 1, 1997 is 21 years. Since the dome group at SIT is at year 2.5 on the log scale, the 6th surveillance will correspond to (21.0 + 2.5) or 23.5 years on the log scale.

The same procedure must be performed for the hoop and vertical groups as they have different reference points on the log scale for time after concrete wall placement. Both hoop and vertical groups are the same with SIT corresponding to year 4.4 on the log scale. Therefore, the 6th surveillance period will correspond to (21.0 + 4.4) or 25.4 years on the log scale.

A vertical line will be shown on the force curves at the point of the next surveillance and the calculated values of base, 95% base and 90% base representing points on the curves at that time will be included on each of the curves.



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### 6.2 General Procedure for Force Curve Generation

The same procedure within the calculation for the preparation of the force curves for the fourth and fifth surveillance periods will be followed.

### 6.2.1 Preparation of Data Input Spreadsheets

In each of the Excel workbooks is a data input file where data from source calculations and current tendon history sheets has been tabulated. See DOMER3.XLW (DOMEINP), HOOPR3.XLW (HOOPINP) & VERTR2.XLW (VERTINP).

The compiled books of tendon surveillance historical information, as updated to include the results of the fifth surveillance, provide key input data for the development of force curves. See References 12, 13 & 14. The selected tendon history sheets related to this surveillance have been included herein as Attachment B of this calculation. The Reference 11 calculation is essentially a source calculation for this procedure with the Reference 8 & 10 calculations also providing information.

Notes and references related to the tabulation of the data on these spreadsheets are shown on the individual sheets. The data input tabulations are presented as the first sheet within the following Sections 6.3, 6.4 & 6.5.

### 6.2.2 Procedure for Determination of Individual Tendon Losses

The procedure for the tendon loss calculations, as derived from the reference documentation, is as follows:

1.) Calculate original force in the tendons

The original force in the tendons is determined as follows:

$$ORIG.FORCE = 0.7 * Fult * \left[ \frac{ActualLiftoff Pressure}{PredictedLiftoff Pressure} \right] \times WireFactor$$

Where:

 $f_{uh} = 240$  Ksi, typical for all CR3 wires.

Wire area = 0.07685 in 2 per Appendix F of the Reference 11 calculation.

Fut (Kip Force)= Tendon Area (in2) x fut (Ksi) = 0.05985 \* 240

Tendon Area (in2) = Area/Wire (in2) x No. of Wires. (Considered by wire factor.)

Actual and predicted original liftoff pressures are obtained from Tendon History Sheets References 12, 13, 14, with those within the scope of this calculation attached in Attachment B.

Refer to the Appendix F part of the Reference 11 calculation, for source data of above formula. The above expression was used as the basis for the calculations for all the shop and field end forces calculated on the Data Input Spreadsheets. This procedure does not apply to retensioned tendons.

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Note that the wire factor as shown in the various spreadsheets is a value representing the tabulated number of effective wires over a total of 163. The number of wires is usually 163 unless cut, loose or considered ineffective. The number of effective wires as recorded from the original installation is documented on the tendon history sheets. The number of effective wires for each tendon has been updated, tabulated and presented in the Effective Wires Summary for each individual group within Attachment D. This tabulation was updated to include the results of all previous surveillances. It does not imply each of the tendons was specifically checked for the numbers of effective wires as presented in the table. It represents only data from the original records and as made available from surveillance records and subsequent inspections.

Note that the wire factor used is based on current information and is not based on the number of wires at the time of original installation, therefore the original Force calculated may not be the "original force" in the tendon back at that time. The effect of less effective wires lowers the curve vertically. This is insignificant at the current time as the curve of interest will be correct for use at this time. Another method would have been to plot the original value using the wire factor then and then to show a step down on the curve should a lower wire factor occur at some point later on the graph.

2.) Calculate Elastic Shortening Losses

The elastic shortening losses are a function of the stressing sequence number for the individual tendon. In addition, the tendon wire factors are also considered and used. The base expression used to calculate these forces is the same as used in previous calculations and is already built into the basic spreadsheet templates. All the equations for elastic shortening were confirmed as being the same as established in prior calculations. Based on the review of the procedure for calculating these losses, it is concluded that the existing templates are still appropriate and correct with the additional input of stressing sequence data and wire factors to be input for the current group of tendons for this surveillance.

Reference 10 & Reference 11 data and information on elastic shortening was included in Attachment E to these calculations. See Attachment C for original stressing sequences for all tendons and see the Data Input Worksbeets & Attachment D information for tendon wire factors and source data.

### Elastic Shortening Losses for Dome Tendons

Note there are two expressions used for elastic shortening for the dome tendons depending on the stress sequence numbers. For dome tendons in sequences 1 through 27, the Domelow template is used. For dome tendons in sequences 28 through 32, the Domehigh template is to be used. This is because of the two separate expressions used for the calculation.

Elastic Shortening Losses-For Dome Tendons in Sequences 1 through 27-

N = 27 Total Sequences n = Sequence of particular tendon.

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Force Loss due to elastic shortening =  $F_{les}$ 

$$F_{\text{bas}} = \left[\frac{N-n}{N} \times 82.7 + 75\right] \times WireFactor$$

Elastic Shortening Losses-For Dome Tendons in Sequences 28 through 32-

N = 5 (Sequences 28 through 32) n =Sequence number less 27

i.e. for sequence 28, n = 1 for sequence 29, n = 2 for sequence 30, n = 3 for sequence 31, n = 4 for sequence 32, n = 5

$$Fles = \left[\frac{N-n}{N} \times 47.4 - 13.7\right] \times WireFactor$$

The value for elastic shortening in kips declines as the stressing sequence increases. A review of the data for the dome group shows that values for the dome group go from 154.6 kips for sequence 1 tendons down to 75 kips for sequence 27 tendons, and further going down to -13.7 kips for the last sequence, sequence 32. Note that wire factor differences between individual tendons will cause the calculated result to vary slightly for two tendons within the same stressing sequence.

Elastic Shortening Losses for Hoop Tendons -

N = 60 Total Sequences n =Sequence of particular tendon.

Force Loss due to elastic shortening =

$$Fles = \left[\frac{(N-n)}{N} \times 134.0\right] \times WireFactor$$

A review of the data for the hoop tendon group shows that the range of values for the calculated elastic shortening go from 127.3 kips for sequence 3 tendons down to 0 kips for the last tendon sequence, sequence 60.



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Elastic Shortening Losses for Vertical Tendons -

N = 31 Total Sequences n =Sequence of particular tendon.

Force Loss due to elastic shortening =

$$Fles = \left[\frac{(N-n)}{N} \times 73.5\right] \times WireFactor$$

A review of the data for the vertical tendon group shows that the range of values calculated for elastic shortening go from 71.1 kips for sequence 1 tendons down to 4.7 kips for sequence 29 tendons. There are a total of 31 stressing sequences for the vertical tendons.

3.) Calculate Wire Stress Relaxation Losses

Wire stress relaxation losses and the procedure for the determination of these losses for the 4th and 5th surveillances are addressed in the Reference 10 and 11 calculations. The original wire relaxation curve, as provided by test data from the wire vendor forms the bases for wire relaxation loss values (See also FSAR Figure 5-23). It was determined that the same procedures and figures as calculated in those prior calculations are still applicable for this surveillance. Applicable data from the reference sources was attached and included within this calculation as Attachment F.

Note that there were adjustments made to the original stress relaxation values from the vendor relaxation curve to allow for some conservatism and for temperature consideration of 100 degrees vs. 68 degrees F. Also, per the original design the wire factor or actual number of effective wires was considered as negligible for these losses and was not included. Note that values for stress relaxation range between 40 and 50 kips for the surveillance period for all three tendon groups.

4.) Calculate Creep Losses

Concrete creep calculations in the Reference 11 document are attached in Attachment G. The losses are based on the curve contained in the reference calculation. Creep values are different for each of the three groups of tendons. For the dome tendons in the coming surveillance period, creep values are the same and are about 152 to 158 kips, hoop values are between 79 and 83 kips, verticals are 36 to 38 kips.

5.) Calculate Shrinkage Losses

Attachment H contains source information for concrete shrinkage from Reference 10, pg. 11 and Reference 11, cover page & Pages 13 & 14. The straight line shrinkage losses in micro inches per inch as calculated in the above two references are still applicable for this surveillance period. Tabulated values from these references were input into the dome, hoop and vertical spreadsheets. There are no additional variables or considerations and the same values are to be used for this calculation. From a review of the output information, the dome values are constant at 8 to 9 kips, hoop values are above 5 kips, verticals are also slightly above 5 kips.



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### 6.) Total Losses

Calculated force losses for elastic shortening, wire stress relaxation, creep and shrinkage are added for a total of all losses. Also, a percent of this total of all losses is calculated based on the original average force in the tendon.

7.) Determine Predicted Forces for Base, 95% Base and 90% Base values

The original force less the total of losses calculated yields the base predicted value for the subject period of surveillance inspection. The 95% and 90% values are then calculated based on the calculated predicted base value.

### 8.) Normalization Factors

Normalization factors are calculated based on the expressions and the source article contained in Attachment I of this calculation. This factor usually does not change much over the forty year time span of the calculation. The base expression for the dome normalization factor value is presented as follows:

$$(A-B) \times (1-C) + (D-97.7)$$

Where:

 $\dot{A} = Average of all Domes group$ B = Original average tendon force

C = Wire Stress Relaxation Percentage

D = Elastic Shortening

As an example, Dome tendon D112 calculates as follows:

NormalizationFactor =  $(1639 - 1676) \times (1 - 0.0257) + (D - 97.7)$  or

 $NF = (-37) \times (0.9743) + (-101.9)$  or

NF = -138 which matches the spreadshoet calculation.

Similar expressions are shown for the hoop and vertical tendons in the information in Attachment I.



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9.) Plotting of Data

Only the data from Column B, L, M, & N are tabulated on a separate area on the side of the spreadsheet. See Columns R, S, T & U; Rows 40 through 50. Only these values are selected for plotting on the force curves. This is for ease of plotting and has no affect on the quality or accuracy of the plots. An example copy of this data immediately follows the first dome tendon.

The plots of all dome curves with all the data points showed the force curve plot line as slightly crooked from a true linear plot. The large scale used showed some inflection points slightly off of linear. After investigation, the condition was avoided by omitting data points at year 10 and 15 after SIT for the final plotted figures. This was done only for presentation purposes and there is no affect on the accuracy of the plot or the base values calculated and presented on each curve.

A column by column explanation of the losses calculation worksheet follows:



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		Calculation S-95-0082	0
	· .	INDIVIDUAL TENDON LOSSES LOSSES CALCULATION WORKSHEET NOTES AND LEGEND	• • • • • • • • • • • • • • • • • • •
fi	ollowing not	ndon losses are calculated based on the procedure presented in t es explain the spreadsheet process, input and calculations perfo be shaded values on the losses worksheet are extracted from th	ormed for each of the column
2	Column	Description	
	Scale bas this infor	n Period after SIT sed on years after SIT which is shown on the bottom scale of ex mation is provided for easier readability with respect to SIT bu construct the x axis of the plots.	
Ē	Scale of shown as tendons i	ter Concrete Placement years after concrete placement as used for the x axis for plottin to the upper log scale at the top of each plot Note that one yea is 3.5 years on the log scale and for the hoop and vertical tendo is calculation for further information.	r after SIT for the dome
(	C. Elastic S Calculat	hortening ed based on formulas presented in Section 6.2.2 and Attachmer	nt E information.
Ţ	Calculat	claxation Percent ed based on original wire loss curve percentages modified per t ent F of this calculation.	he information presented in
· ]		elaxation Forces ut from the Reference 11 calculation page 12. See Attachment	t F.
1		train alue (x 0.0001Data input from the Reference 11 calculation. S on for data.	ce Attachment G of this
	G. Creep S Data inp	train Force out from the Reference 11 calculation. See Attachment G of thi	is calculation for data.
1	•	ge Values out from the Reference 11 calculation based on the shrinkage cu ion for data.	arve. See Attachment H of th
1	I. Shrinka	ge Force	-

Data input from the Reference 11 calculation. See Attachment H of this calculation for data.



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Page 18 DOCUMENT IDENTIFICATION NO. REVISION Calculation S-95-0082 2 J. Total Force Loss Calculated value, Sum of columns C, E, G,& I. K. Total Percent Loss Total loss in percentage, Column J / Average of original forces for shop & field ends calculated and shown above on the spreadshoet. L. Base The average original force for the tendon noted above on the spreadsheet, less the total losses calculated in Column J. Note that total losses were not calculated on the row for the 17 year period, the 21 year 3 month period, as well as the 21 year period after SIT. These rows represent the fifth. the originally planned sixth and the current sixth surveillance periods and the values of Base were derived through linear interpolation of above and below data presented on the spreadsheet. The quality and accuracy is not affected by this procedure. M. 95% Base 0.95 x Column L for the same row. N. 90% Base 0.90 x Column L for the same row. O. Normalization Factor -Calculated based on formula presented in this calculation and in the information presented in Attachment I.



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COMENT DENTIFICATION NO.	ENT DENTIFICATION NO. Calculation S-95-0082						
Column H & I	Calculated force values in Kips which represent ram pressure @ represent a zero slack starting point for both shop and field ends provide a basis for the start of any retensioning effort. The follow calculate these values:	of each tendon and					
· ·	0.7 * Tendon Ultimate Strength * 1500 / Predicted Lift-Off Ultimate Strength. See Reference 10 Calculation, page 34.	Pressure at 0.7 Tendon					
Column J & K	Calculated force values in Kips which represent forces at 80 following expression:	% ultimate based on the					
	(Actual pressure @ 80% ultimate strength (Columns F or C Strength) / Predicted pressure @ 70% Ultimate Strength.	3) * 0.7 Tendon Ultimate					
Column L & M	Actual elongation data, repeated from columns B and C.						
In addition, the fo	lowing calculations support the ultimate strength values provid	led on these spreadsheets					
	ate strength = $f_{ek}$ for wire = 240 ksi Strength = $F_{uk}$ = [ $f_{uk}$ for wire * Tendon wire area] = = 240 ksi * (0.05985 * 163 wires) = 2341.3 Kij	ps					
	34].3 = 1638.9 Kips 341.3 = 1873 Kips						
ı		×					
		•					

### LORIDA POWER CORPORATION - CRYSTAL RIVER UNIT 3 BUL, REACTOR BUILDING PRESTRESSING SYSTEM IN ST 6th TENDON SURVEILLANCE

DOC ID:S-95-0082 REVISION 3 PAGE 159

CALCULATIONS SUPPORTING SP-182 "ORIGINAL STRESSING DATA" FOR THE DOME TENDONS GROUP

0.7 Tendon Ultimate Strength	•
0.8 Tendon Ultimate Strength	

- 16	0	i ĝn	aps -
	120	Ľκ	ins
- 20	And.	 -	-P-

	Actu	L)	Predicted L	HR-Off	\$0% Uu	mate		For SP-182 '	Original Str	nsing Deta"		-
Tendon	a Elongation (In.)		Pressure (psl)		Pressure (psi)		Row 1 (Kips)		Row 2 (Kips)		Row 3 (In.)	
D	Shep	Field	Shop	hed	Shop	Pield	5bep	Field	Shop	Inde	Shop	Field
<b>(</b> A)	(B)	ŝ	(¢)	(E)	(F)	(Ğ)	(8)	(1)	(l)	(X)	(L)	(M)
DUI	5	5	6410	6810	7780	1780	361	361	1172	1872	5	5
D112	4-3/4	5	6600	6840	1170	7790	362	359	1873	1867	4-3/4	5
DIIS	4-7/8	4-3/4	6800	6840	7770	7790	362	359	1873	1867	4-7/8	4-3/
D114	5-1/8	4-5/8	6800	6840	7770	7790	362	319	. 1873	1367	5-1/8	4-5/
DL15	5	5	6340	6800	7790	7770	359	362	1667	1873	5	5
D116	4-3/4	5-1/1	6760	6800	7720	7750	364	362	1872	1868	4-3/4	5-1/
D130	· 5	_ 5	6870	6810	7810	7780	358	361	1863	1872	5	5
DI31	41/2	4-7/8	6710	6740	7660	7700	366	365	1871	1872	4-1/2	4-7/
D132	41/2	4-7/8	6760	6800	1720	7750	364	362	1872	1868	4-1/2	4-7/
D211	5-1/4	5-1/2	6410	6870	7780	7810	361	354	1872	1863	5-1/4	5-1/
D212	45/8	4-7/1	6770	6770	7730	7720	363	363	1871	1869	4-5/8	4-7/
22213	4-344	4-3/4	6840	6800	7790	7770	359	362	1867	1873	4-3/4	43/
0214	4-3/4	4-7/8	6670	6740	7600	7680	369	365	1868	1868	4-3/4	4-7/
D215	41/2	5-1/8	6800	6870	7800	7810	362	358	1880	1863	41/2	5-1/
D216	5	5	0080	6810	1770	7780	362	361	1873	1872	5	5
D302	3-5/8	3-7/8	6530	6510	7450	7430	376	378	1870	1871	3-5/8	3-7/
D303	4-1/4	3-3/4	6760	6770	7720	1730	364	363	1872	1871	4-1/4	3-3/
D304	41/1	4	6840	6800	7790	7770	359	362	1667	1873	4-1/8	4
D305	4-1/8	4-3/16	6700	6680	76.10	7620	367	368	1867	1870	4-1/8	4-3/1
D306	4-3/4	4-3/4	6810	6810	7780	7780	361	361	1872	1872	4-3/4	4.3/
D310	5	41/2	6770	6770	7720	7730	363	363	1869	1871	5	4-1/
DSU	411/16	4-5/8	6800	6840	7770	7790	362	359	1873	1867	4-11/16	4-5/
D312	4-7/8	4-7/8	6840	6800	7790	7770	359	362	1867	1873	4-7/8	4-7/

See the same encutations completed for the vertical group for notes and explanation of data & expressions used in Columns A through M.

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#### J FLORIDA POWER CORPORATION - CRYSTAL RIVER UNIT 3 REACTOR BUILDING PRESTRESSING SYSTEM ) 6th TENDON SURVEILLANCE

DOC ID:S-95-0082 REVISION 3 PAGE 160

CALCULATIONS SUPPORTING SP-182 "ORIGINAL STRESSING DATA" FOR THE HOOP TENDONS GROUP

file: HOOPI	3.XLW							Strength = Strength =		1639 3873			
1	Act	nel	Predicted I	10-01	80% UM	limate	1	Ver SP-	182 "Origina	Streeting D	eta"		
Tendon		Riorgation (in.)		Pressure (pdl)		Pressure (psl)					ow 2 (Kips) Row 3 (in.)		
D	Shop	Meld	Shop	Pield	Shop	Fled	Shop	Pield	Shop	Field	Shop	मनव	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	0	U)	(K)	(1)	(M)	
421117	5-5/8	4-5/8	6870	6810	7810	7780	358	301	1863	1872	5-5/8	4-5/8	
42818		5-3/8	6840	6799	7810	7750	359	362	1871	1868	3	5-3/8	
421119	5-1/4	3	6870	6810	7810	7780	358	361	1863	1872	5-1/4	5	
421129	5-1/2	5-1/8	6870	6810	7810	7780	358	361	1863	1872	5-1/2	5-1/8	
42HJ0	4-7/8	5-3/4	6870	6790	7810	7750	358	362	1863	1871	4.7/8	5-3/4	
421131	5-1/4	4-7/8	6870	6810	7810	1780	358	361	1863	1872	5-1/4	4-7/8	
42H32	5-1/4	5-1/8	6870	6790	7810	7750	358	362	1863	1871	5-1/4	5-1/8	
42H33	5-3/8	5-1/4	6870	6810	7810	7780	358	361	1863	1872	5-3/8	5-1/4	
428134	5-1/2	5-3/8	6750	6660	7680	7600	364	369	1865	1870	5-1/2	5-3/8	
421135	5	5-1/4	6830	6770	7760	7720	360	363	1862	1869	5	5-1/4	
421136	5-1/8	5-1/8	6870	6790	7810	7750	358	362	1863	1871	5-1/8	5-1/8	
421137	5-5/16	4-7/8	6870	6810	7810	7780	358	361	1863	1872	5-5/16	4-7/8	
42H43	5-1/2	5-1/8	6870	6810	7810	7780	358	361	1863	1872	5-1/2	5-1/8	
421144	5-1/8	5	6790	6840	7750	7790	362	359	1871	1867	5-1/8	5	
421145	\$-7/16	5	6870	6810	7810	7780	358	361	1863	1872	5-7/16	5	
461120	5-1/4	5-1/8	6640	6600	7700	7610	370	373	1901	1890	5-1/4	5-1/8	
461121	5-1/8	5-1/4	6720	6730	7700	7640	366	365	1878	1861	5-1/8	5-1/4	
46H22	5-5/8	5-1/4	6720	6730	7700	7640	366	363	1878	1861	5-5/8	5-1/4	
51H25	5	5-1/8	6770	6800	7720	7750	363	362	1869	1868	5	5-1/8	
51H26	5-1/2	5-1/4	6760	6760	7750	7700	364	364	1879	1867	5-1/2	5-1/4	
51K27	5-1/8	4-7/8	6740	6670	7680	7600	365	369	1868	1868	5-1/8	4-1/8	
51H28	5-1/8	5	6760	6750	7750	7700	364	364	1879	1870	5-1/8	5	
51H29	5-1/2	4-3/4	6810	6750	7780	7700	361	364	. 1872	1870	5-1/2	4-3/4	
53H1	5-3/4	5-1/8	6700	6760	7650	7720	367	364	1871	1872	5-3/4	5-1/8	
\$3112	5-3/4	4-5/8	6800	7170	7760	7720	362	316	1870	1628	5-3/4	4-5/8	
53H3	5-3/8	4-1/8	6670	6710	7600	7660	369	366	1868	1871	5-3/8	4-1/8	
53H45	5-1/4	5-1/4	6840	6800	7790	7770	359	362	1867	1873	5-1/4	5-1/4	
531146	4-7/8	5-3/8	6760	6730	7750	7660	364	365	1879	1865	4-7/8	5-3/1	
531147	4-3/4	5-1/2	6840	6800	7790	1170	359	362	1867	1873	4-3/4	5-1/2	
621121	5-1/8	4-3/4	6760	6700	7720	7650	364	367	1872	1871	5-1/8	4-3/4	
621122	5-5/16	\$	6800	6750	7770	7700	362	364	1873	1870	5-5/16	5	
62H23	5-1/8	5-1/4	6800	6750	7770	7700	362	364	_1873	1870	5-1/8	5-1/4	
621139	5-7/16	5-1/4	6800	6750	7770	7700	362	364	1873	1870	5-7/16	5-1/4	
62H40	5-3/8	4-7/8	6800	6750	7770	7700	362	364	1873	1870	5-3/8	4-7/8	
621141	5-1/4	5	6800	6750	7770	7700	362	364	1873	1870	5-1/4	5	
621142	5-3/8	5-1/16	6800	6750	1110	7700	362	364	1873	1870	5-3/1	5-1/16	
62H43	5-3/8	4-7/8	6710	6670	7660	7600	366	369	1871	1865	5-3/8	4-7/8	
62)144	5-1/2	4-7/8	6800	6750	7770	7700	362	364	1873	1870	5-1/2	4-7/8	
621145	5-3/16	5-1/8	6760	6700	7770	7700	364	367	1884	1884	5-3/16	5-1/8	
62H46	5-1/8	5-3/8	6800	6750	7770	7700	362	364	1873	1870	5-1/8	5-3/8	
621147	5-5/8	4-1/2	6680	6640	7620	7550	368	370	1870	1864	5-5/8	4-1/2	

Notes -

See the same calculations completed for the vertical group for notes and explanation of data & expressions used in Columns & through M.

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#### , FLORIDA FOWER CORPORATION - CRYSTAL RIVER UNIT 3 REACTOR BUILDING PRESTRESSING SYSTEM 6th TENDON SURVEILLANCE

DOC 10:5 95-0082 REVISION 2 PAGE 161

CALCULATIONS SUPPORTING SP-182 "ORIGINAL STRESSING DATA" FOR THE VERTICAL TENDONS GROUP

0.7 Tendon Ultimate Strength	1639 Kips
0.8 Tendon Ultimate Strength	1873 Kips

		ctual	Predicte	10-1116	80%	Ultimate		For SP-18	2 "Origin	al Stressia	ig Data"	
Tendon	Elonga	tion (In.)	Pressi	ure (psi)	Press	ure (psi)	Row	1 (Kips	Row	2 (Kips)	Row	3 (ln.)
D	Shop	Field	Shop	Field	Shop	Field	Shop	Pield	Shop	Field	Shop	Field
(A)	(B)	(C)	(Ú)	(E)	(F)	(G)	(H)	(1)	()	(K)	(L)	(M)
23724	12-7/8	N/A	6870	N/A	7810	NA	358	N/A	1863	N/A	12-7/8	N/A
12 11	12-1/2	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/2	N/A
12V2	12-1/2	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/2	N/A
23V1	12-1/4	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-1/4	N/A
23V2	13-1/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	13-1/8	N/A
23V3	13	N/A	6760	N/A	7750	N/A	364	N/A	1879	N/A	13	N/A
34V5	12-5/8	N/A	6800	N/A	7770	N/A	362	N/A	1873	N/A	12-5/8	N/A
3476	13	N/A	6810	N/A	7780	N/A	361	N/A	1872	N/A	13	N/A
34V7	12-3/4	N/A	6870	N/A	7810	N/A	358	NA	1863	N/A	12-3/4	N/A
61V9	12-5/16	N/A	6860	N/A	7840	N/A	358	N/A	1873	N/A	12-5/16	N/A
61V10	12-3/4	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-3/4	N/A
61V11	12-5/8	N/A	6710	N/A	7660	N/A	366	N/A	1871	N/A	12-5/8	N/A
61V20	12-1/2	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-1/2	N/A
61V21	12-1/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-1/8	N/A
61V22	12-7/8	N/A	6870	N/A	7810	N/A	358	N/A	1863	N/A	12-7/8	N/A

. .

#### Notes -

File: VERTR2.XLW

Columns A through G are data input extracted from the tendon history books (applicable sheets contained in Attachment B). Columns H through M are calculated using the expressions noted below.

Column Tendons within the scope of this surveillance.

Col.B&C Actual elongation data taken from tendon history sheets for shop and field ends respectively.

For the vertical tendons, only the shop end applies.

Col.D&E Predicted Liftoff Pressures taken from tendon history sheets for shop and field ends respectively.

Col.F&G 80% Ultimate pressures taken from tendon bistury sheets for shop and field ends respectively.

Col. H&1 Columns H & 1 - Calculated force values in Kips for "Original Stressing Data" Row 1 which represent ram pressure @ 1500 psi. These forces represent a zero slack starting point for both shop and field ends of each tendon and provide a basis for retensioning efforts.

The following expression is used to calculate the values for Row 1 data:

0.7 \* Tendon Ultimate Strength \* 1500 / Predicted Lift off Pressure at 0.7 tendon Ultimate Strength.

ie. for 23V24: 1639 \* 1500 / 6870 = 358

Col.J&K Calculated force values in Kips for Original Stress Data" Row 2 data which represent forces at 80% Ultimate based on the following expression: Actual pressure @ 80% Ultimate Strength (Cols. F or G) \* 0.7 Ultimate Strength / Predicted pressure @ 70% Ult. from Cols. D or E. ie. for 23V24: 7810 \* 1639 / 6870 = 1863

Col.L& Actual elongation values repeated from Columns B & C for Row 3 of "Original Stressing Data".



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## **DESIGN ANALYSIS/CALCULATION**

**Crystal River Unit 3** 

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### DOCUMENT IDENTIFICATION NO. REVISION Calculation S-95-0082 2 7.0 CONCLUSIONS Tendon Force/Time Curves have been generated from the results of this calculation. Final force curves are presented and attached in Section 6.0 of this calculation. Force curves for the three control tendons were also generated by this calculation and were used for comparison and verification of data and spread sheets with the same curves generated previously for the same tendons. The comparison was completed and the data sheets and force curves were found to be the same as that previously generated. Other calculations supporting the "Original Stressing Data" and "Data Sheets" in SP-182 were completed and are presented in Section 6.6 of this calculation. **8.0 REFERENCES** The following references are used in the preparation of this calculation: 1. G/C Letter to FPC, FCS-14594, Scope Document, November 24, 1995, for Preparation of Tendon Force Curves for the 6th Surveillance and site trip to CR3. 2. G/C Letter to FPC, FCS-12439, August 13, 1991, Tendon Selection and Recommendations for the Fifth Surveillance. 3. Reg. Guide 1.35, Revision 3 4. Reg. Guide 1.35.1, Revision 0 5. CR3 FSAR, Section 5.2 6. Technical Specification, Section 3.6.1.6 & Section 4.6.1.6. 7. Design Input for the 5th Surveillance, DI-55220-152.0 SE, Revision 2. 8. G/C Calculation of Force curves for the 5th Surveillance for SP-182, Revision 11. 9. Design Input 5500-528-1, Revision to SP-182 Procedure for Tendons and Calculations for Force-Time Curves for Surveillance 4, Revisions 0 and 1, Jan.87 and Sept.87. 10. G/C Calculation 5500-528-1, Tendon Loss Calculations for Surveillance 4, Revisions 0 and 1, Jan.87 and Sept.87. 11. G/C Calculation 04-4762-099, Tendon Loss Calculations and Appendices for CR3 Tendons, J.Fulton and G.T.DeMoss, 3/6/87 and 1980 calculations. 12. Dome Tendon History Sheets updated to the 5th surveillance. 13. Hoop Tendon History Shects updated to the 5th surveillance.



## DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

DOCUMENT IDENTIFICATION NO.

### Calculation S-95-0082

14. Vertical Tendon History Sheets updated to the 5th surveillance.

15. Effective Wire Summary information, letter to FPC

16. Prescon Vendor Drawings

17. SP-182, Rev 11.

Florida

POWER CORPORATION

18. Surveillance Report for the Fifth Inspection Period, VSL.

19. Engineering Report for the Fifth Tendon Surveillance, G/C Letter to FPC, FCS 14401, 6/20/94.

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REVISION



DOCUMENT IDENTIFICATION NO

Florida

Power corporation

# **DESIGN ANALYSIS/CALCULATION**

Crystal River Unit 3

Calculation S-95-0082

Page A1

### ATTACHMENT A

DESIGN INPUT DATA FOR 6TH SURVEILLANCE

RET: Life of Plant, RESP: Nuclear Engineering



## **DESIGN ANALYSIS/CALCULATION**

**Crystal River Unit 3** 

Page A2

DOCUMENT DENTIFICATION NO.

# Design Input Information for the 6th Surveillance

The Gilbert/Commonwealth Design Input document prepared for the 5th surveillance is still applicable since it was prepared at the time FPC addressed new licensing and Tech Spec revisions concerning the CR3 Tendon Surveillance Program. The document and some of it's attachments are attached herein. Also, correspondence from the NRC resulting from it's review of CR3 tendon program issues is attached for reference.

The following Tech Spec sections were reviewed and are applicable to the tendon surveillance program.

Section 3.6.1.2, Amendment 149 Section 5.6.2.7, Amendment 149

Florida Power

Calculation S-95-0082

FSAR Sections applicable include: Sections 5.2 & 14.2.2 Figures 5-24 and 5-25

RET: Life of Plant RESP; Nuclear Engineering

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### UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON. D.C. JOSS-0001

July 28, 1995

	Powar Corporati	
ATTN: H	lanager, Nuclear	•
Licens	Ing	
15760 ¥	Power Line Stre	et
Crystal	River, Florida	34428-6708

Nuclear Cogrations (NA21)

Senior Vice President.

SUBJECT: FIR	ALTENDON AURVEILL ANCE
FILE NO .:	310799-11
FECENED:	Jorles
	LY.CECILIA
	T.8.4.

SUBJECT: REVIEW OF THE FIFTH TENDON SURVEILLANCE REPORT - CRYSTAL RIVER NUCLEAR GENERATING PLANT UNIT 3 (TAC NO. M90195)

Dear Mr. Beard:

By letter dated August 12, 1993, as supplemented December 15, 1994, and Hay 15, 1995, you submitted for staff review a report on the results for the fifth (seventeenth year after structural integrity test (SIT)) physical surveillance of the Crystal River 3 (CR3) Plant containment building posttensioning system. You performed the surveillance in accordance with the requirements of the original plant technical specifications (TS) for tandon surveillance and Regulatory Guide (RG) 1.35 Revision 3. On the basis of your surveillance and inspection of the various elements of the post-tensioning system, you concluded that the surveillance results deponstrate the integrity of the containment tendon system.

We have completed our review of your submittal and we concur with your conclusion with certain exceptions. Your surveillance revealed grease Jeakage, corrosion of anchorheads and bearing plates and spalling and crecking of concrete, all of which could be detrimental to the containment tendon system. Please submit an action plan to rectify the undesirable conditions as identified and to implement appropriate actions to rectify them before the next scheduled inspection. Our evaluation is enclosed.

This completes our review under the TAC No. M90195 and, therefore, the TAC is closed.

This requirement affects nine or fewer respondents, and therefore, it is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerély. L. Raghavan, Project Manager Project Directorate II-1 Division of Reactor Projects - I/II Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: As stated

cc w/enclosure: See next page

#### AUG 39 '95 03:07PM NUC ADMIN BLDG

Hr. Percy M. Beard Florida Power Corporation

**CC:** 

Mr. Gereld A. Williams Corporate Counsel Florida Power Corporation MAC-ASA P.O. Box 14042 St. Petersburg, Florida 33733

Mr. Bruce J. Hickle, Director Muclear Plant Operations (MA2C) Florida Power Corporation Crystal River Energy Complex 18760 W. Power Line Street Crystal River, Florida 34428-6708

Mr. Robert B. Borsum BAN Nuclear Technologies 1700 Rockville Pike, Suita 525 Rockville, Maryland 20852

Regional Administrator, Region II U.S. Nuclear Regulatory Commission 101 Marietta Street M.W., Suite 2900 Atlanta, Georgia 30323

Mr. Bill Passetti Office of Radiation Control Department of Health and Rehabilitative Services 1317 Winewood Blvd. Tallahassee, Florida 32399-0700

Attorney General Department of Legal Affairs The Capitol Tallahessee, Florida 32304

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Calculation 8-95-4082 Attachment A Page A4

Crystal River Unit No. 3 Generating Plant

Mr. Joe Myers, Director Division of Emergency Preparedness Department of Community Affairs 2740 Centerview Drive Tallahasses, florida 32395-2100

Chairman Board of County Commissioners Citrus County 11D North Apopka Avenue Inverness, Florida 32650

Mr. Larry C. Kelley, Director Nuclear Operations Site Support (SA2A) Florida Power Corporation Crystal River Energy Couplex 15760 W Power Line Street Crystal River, Florida 34428-6708

Senior Resident Isspector Crystal River Unit 3 U.S. Nuclear Regulatory Commission 6743 N. Tallahassee Road Crystal River, Florida 34429

Mr. Gary Boldt, Vice President -Huclear Production (SA2C) Florida Power Corporation Crystal River Energy Couplex 18760 M Power Line Street Crystal River, Florida 34428-6708

Colculation 5-95-GOG3 Attachment A Page AS

### Enclosure

The Crystal River 3 (CR3) plant technical specifications (T5) require performing periodic tendon surveillance consisting of sheathing filler material inspection, tendon lift-off force measurement, anchorage component inspection, tendon wire inspection and tensile testing, grease leakage check, and tendon datensioning and retensioning and rescaling for a number of selected tendons. For the fifth surveillance, in addition to the three control tendons (one for each group), you randomly selected two dome, two vertical and four hoop tendons and subjected them to lift-offs, with one tendon in each group being detensioned and retensioned. You performed the surveillance in accordance with the requirements of the original plant TS for tendon surveillance and Regulatory Guide (RG) 1.35 Revision 3. On the basis of your surveillance and inspection of the various elements of the posttensioning system, you concluded that the surveillance results demonstrate the integrity of the containment tendon system.

On the basis of our raview of your submittel, we concur with your conclusion with cartain exceptions. Your surveillance revealed grease leakage, corrosion of anchorheads and bearing plates and spailing and cracking of concrete, all of which could be detrimental to the containment tendon system. These conditions are evaluated below.

### I. Grease Valds

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From the data on grease removed from and grease replaced into the tendon sheathings, there appeared to be an unusually high amount of grease voids or leakage. The amount of grease added ranged from 9.5% to as high as 30.5%. In a letter dated September 22, 1996, we indicated that the loss of grease appears to be unusually high in comparison to other plants with similar prestressed concrete containments and post-tensioning systems. Your response indicated that the losses closely match those of previous surveillances, and a thorough investigation had not determined a root cause for the abnormality. However, from the physical test of individual tendon wires, the chemical tests of the grease itself, and the lift-off tests, the tendon system is maintaining its integrity. Furthermore, there has been no grease leakage observed on the outside surface of the containment. On the basis of these observations, you reiterated that, in spite of the abnormally high amount of grease voids, the structural integrity of the tendons has not been affected.

We find your response to be reasonable. However, in view of the detrimental effects of potential grease leakage, you should monitor more closely the grease injection procedure in future surveillances and perform a thorough root cause investigation for grease loss.

2. Anchorage Assembly and Tendon Wire

Your surveillance revealed high levels of corrosion on the anchor heads on five of the tendons (three on the field and and two on both ends) under surveillance. A pitting condition existed on localized areas of these anchor heads, with no signs of active oxidation or buildup of crust or rust. No free moisture was observed within the spaled caps of any terion. The bulk filler grease covered all tendon stressing anchor heads except for the top end of one

Calculation S-35-0082 Attachment A Page A6

- 2 -

vertical tendon. You believe that this condition has existed since original installation. You concluded that the observed conditions do not indicate abnormal degradation and will not affect the function of the anchor heads.

Your surveillance also discovered high levels of corrosion on bearing plates outside the sealed area of the tendon end caps of six tendons (on one end of three tendons and on both ends of another three). The corrosion occurred exterior to the O-ring seal and has not progressed to the point of breaching the integrity of the O-ring and affecting the tendon anchorage components. Repairs were made to the bearing plates to stop further degradation. The protection of the anchorage components is assured and the function and integrity of the bearing plates is maintained.

However, based on our review of tendon surveillance reports of a number of plants, we find that the types of corrosion of anchorage components have not been observed in other facilities and are unique to CR3. Therefore, we believe that it is necessary for you to expand the inspection to anchorage assemblies, especially the bearing plates, of other tendons not under surveillance to ensure timely repair of any adverse conditions.

You indicated that the cracking and spalling of concrete are insignificant. However, this requires repair before causing a further deterioration of concrete and reinforcement. It should also be also noted that your report provided only general statements regarding moisture content and the detrimantal chamical contents and does not give details of water content for each of the grease samples taken from the specific tendons and free water discovered at and anchorages and grease cans. RG 1.35 requires such detailed information and should be provided in future surveillance reports.

One wire from each of the detensioned done, hoop and vertical tendons was tested. In addition, ineffective wires and broken wires were removed for sample selection and testing. All of the tested samples exceeded the required minimum values for yield strength and elongation. All but one exceeded the required minimum ultimate strength. The cause for the broken wires was determined to be of a machanical nature not due to stress corrosion. The buttonheads were inspected for their physical condition and were found to be effective and acceptable.

#### 3. Tendon Lift-off Forces

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We have reviewed the lift-off forces of three dome, three vertical and five hoop tendons and also the information on the correlation of force and miongation of the three detensioned and retensioned tendons. With the exception of one hoop tendon (46H29) which had only 68.1% of the base value (lass than the 90% of the base value as required), the lift-off forces of other tendons were above the lower bound values established for these tendons. Additional hoop tendons were lifted off to meet the requirements in RG 1.35 under such a situation. The forces and the corresponding elongations for the three detensioned and ratensioned tendons were reviewed, and for each tandon thore is no imparity salation between the two. It appears to us that more AUG 03 195 02:52PM NUC ADMIN BLDG

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careful elongation measurements could have provided the required correct information and assurance of the quality of the averall tendon surveillance performed.

The purpose of tandom surveillance is to determine if the time dependent prestress losses such as creap and shrinkage of concrete and relaxation of tandom wires are within the predicted range. The trend of such losses can be obtained by performing a regression analysis of the tendom lift-off forces for the tendoms in a group from all the surveillances conducted to date after the SIT. Before performing the analysis it is necessary to correct the tendom seating force. This is because during tendom installation and teneidning it is not possible to anchor all the tendoms in a group at the same force level and at the same time. The tendoms are installed sequentially. When the containment is subjected to the tendom force, there will be elastic deformation. The tendom tensioned first will have lower force at completion of tensioning for the group than those tensioned last. Therefore, the seating force must be corrected to reflect the tendom anchor force for the elastic shortening, taking into consideration the tendom tensioning sequence. On the theory that the containment design is based on the average tendom force of the group, an average force by each individual corrected tendom force, a socalled normalizing factor (NF) is obtained. This NF is used to modify the lift-off force of the tendom to obtain the average force tendom is a constant and will be used throughout all the surveillances. This appears to be the procedure used by a number of wtilities. Theoretically, after normalization, all tendoms in a group should have the same average value. Due to the method used in establishing the NF and in obtaining the lift-off forces, the normalized tendom force is at best approximate; but it should not vary appreciably from the average value of the tendom force that the normalized tendom force is at best approximate; but it should not vary appreciably from the average value for the group.

In contrast to the NF approach, the RG 1.35 approach to consider the prestress losses is through the use of upper bound and lower bound of tendon forces as discussed in RG 1.35.1 and shown in Fig.2 therein. The average of the tendon anchor forces which are the tendon seating forces corrected for elastic losses can be used as the initial prestressing force. A graph similar to that shown in Fig.2 of RG 1.35.1 should be first constructed. The lift-off forces obtained for the group of tendons represented by the graph should be plotted on the graph without any correction. By plotting the lift-off forces from consecutive tendon surveillance of the group of tendons, it becomes possible to perform a trending analysis of the tendon forces.

In response our request for additional information on normalization, you provided a formula for the NF, which is actually a tendon force correction and includes not only prestress loss due to elastic deformation, but also the relaxation of the tendon wire. In view of this, the NF will be different for each surveillance since it involves the time factor. This only complicates the normalization procedure and does not improve the accuracy. If the NF involves relaxation of tendon wire, it appears the other time-dependent prostress cost due to creep and shrinkage should slap be included. It is to AUG 09 155 02:53PM NUC ADMIN BLOG

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be noted that correction is made to the seating force only for the elastic loss which is not time dependent and the normalization factor which is based on the corrected tendon anchor forces is used to modify the lift-off force to the everage tendon force of the group. The NF procedure is based on the fact that after correction for elastic shortening loss each of the tendon forces and the sverage of these tendon forces for the group of tendons are large compared to the time-dependent prestress losses. Therefore, the ratio, 1.e. the KF, between each tendon force and the average tendon force for the group after correction for elastic shortening loss will not very significantly from that after correction for the time-dependent inducts. The NF procedure is based on this premise.

In response to our concerns regarding your normalization procedure and use of the average of lift-off forces for the trend analysis, you performed analyses for each of the following cases for each group of tendons:

- 1) Using lift-off averages, normalized
- 2) Using all data points, normalized 3) Using lift-off averages, unnermalized
- 4) using all data points, unnormalized

The information for each case was plotted on a graph the same as that shown in Fig. 2 of RG 1.39.1 and a regression analysis was performed for each case in each group. From the results of these analyses, we observed insignificant differences between the normalized cases (1) and (2) or the unnormalized cases (3) and (4), and appreciable differences between the normalized and the unnormalized cases. However, based on the trend of all groups of tendons, no group of tendons would be expected to go below its minimum required during the 40-year plant life.

In spite of the favorable outcome of the results as summarized above, we believe that for future surveillances, the lift-off forces should be used for the trend analysis without averaging and normalization. Each tenden lift-off force should be compared with the predaternined values of base, 95% base, and 90% base as required by RG 1.35.

In conclusion, we concur with your conclusion that the results of the surveillance damonstrated the integrity of the containment tendon system. However, before the next surveillance you should resolve the problem of missing grease and should undertake a program of inspection of the anchorage system which consists of the anchor heads and the bearing plates to assure that the pitting of the anchor heads and the corrosion of the bearing plates uncovered in the surveillance are not widespread and would not jaopardize the integrity of the tendon anchorage system. You should repair the cracking and spalling of concrete so that there will be no further deterioration of concrete or reinforcement. For future surveillances, the trend study of the tendor forces should be based on the lift-off forces without averaging and normalization. In retensioning tendons, the elongations corresponding to the forces though be carefully measured so that the fineerity between the two is - preserved. This can serve as annedditional check-on the accuracy of the measurements performed.

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Calculation S-95-0082 Attachment A Page A9

Their is a copy of the Electronic file form The NRC approval letter for postponament of The Eight exempted tondons. Xuette

Mr. Percy M. Beard, Jr. Senior Vice President, Nuclear Operations (SAZA) Florida Power Corporation ATTN: Manager, Nuclear Licensing 15760 M Power Line Street Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER NUCLEAR GENERATING PLANT UNIT 3 - POSTPONEMENT OF SURVEILLANCE OF EIGHT TENDONS EXEMPTED FROM THE FIFTH TENDON SURVEILLANCE (TAC NO. M94056)

#### Dear Mr. Beard:

By letter dated October 23, 1995, you requested staff approval for postponing surveillance of eight tendons which were exempted from the fifth tendon surveillance performed in 1993 to the sixth tendon surveillance. You had committed to include the eight tendons in your sixth tendon surveillance which was originally scheduled to be performed in 1996. You now propose to perform the sixth tendon surveillance in 1998 which is less than 5 years from the fifth tendon surveillance which was performed in Movember 1993. Accordingly, you are requesting staff approval to postpone the surveillance of the eight tendons to the 1998 sixth tendon surveillance.

By letter dated May 15, 1995, you submitted results of your fifth tendon surveillance to demonstrate integrity of the containment tandon system. In a letter dated July 28, 1995, we forwarded our evaluation of the Fifth Tendon Surveillance Report, and concluded that the trend of all groups of tendons is such that no group of tendons will go below its minimum required lift-off forces before the 40-year plant life. Our July 28, 1995 letter also identified certain undesirable conditions such as grease leakage, anchorage bearing plate corrosion, cracking and spalling of concrete. In response to these concerns, you committed to perform, during Refuel 10 (in 1996), a complete walkdown of 549 tendons comprising the containment post-tensioning system. You also committed to perform visual inspection to monitor external corrosion, grease leakage, and monitor for spalling of concrete and take appropriate corrective actions where warranted.

On the basis of the fifth tendon surveillance results and your commitment to perform visual inspection during the Refuel 10, we find it acceptable to perform the surveillance of the eight tendons during the sixth tendon surveillance scheduled for Refuel 11 in 1998, which is within the 5 year surveillance frequency.

In this matter, we also would like to draw your attention to the following. In November 1976, you performed the structural integrity test (SIT) on the Crystal River 3 (CR3) prestressed concrete containment. Per Regulatory Guide " MAR 27 '96 09:42PM NUC ADMIN BLDG

Colculation S-75-0082 Attachment A Page A10

Mr. Percy N. Beard, Jr.

- 2 -

(RG) 1.35, the tendon surveillances are to be performed 1. 3. and 5 years after SIT and every 5 years thereafter. You have committed to follow the RG 1.35 criteria. However, a review of the history of your tendon surveillance indicates that your 3rd. 4th and 5th tendon surveillances have been performed on an approximately 6-year interval. While plant technical specifications allow schedule flexibility (a 25% inspection interval extension for conducting surveillances), such a schedule extension should not be continued on a longterm basis. Also, the general industry practice has been a plus or minus 6 months schedule variance.

This completes our effort under TAC No. N94056 and the TAC is closed. If you have any questions, please call me at [301] 415-147].

Sincerely,

L. Raghavan, Project Manager Project Directorate 11-1 Division of Reactor Projects - I/II Office of Muclear Reactor Regulation

Docket No. 50-302

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	Engineering Instruction P	io. 1	Attachment A Page A12
	PROJECT Crystal River Unit 3	w.o. 04-5520-152	IDENTIFIER DI-6520-152.0 SE
)	PUT RECORD SUBJECT Tendon Su of Mise. Calculations		paration fure SP-182
1	DISCIPLINE Structural 2241		PAGE 1 OF 2 6

REVISIÓN	0	1	2	3
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DATE	8 Oct 93	2701793	17 164,93	1
REVIEW	Dorrause_	28 Krause	Fiter	
DATE	BOCT93	270ct 93	21 Nov 73	•
APPROVAL (DCE)	M. Partack	Ron Park	N. fatall	
DATE	10-8-93	10-27-93	Mrv. 21, 1985	•
FUTURE CONFIRMATION REQUIRED?	No	No	No	
MICROFILMED / DATE				•

INSTRUCTIONS: USE "N/A" FOR ITEMS NOT APPLICABLE. IDENTIFY ITEMS REQUIRING FUTURE CONFIRMATION BY CIRCLE. OR CLOUD. IDENTIFY REVISED INFORMATION BY VERTICAL LINE IN RIGHT MARGIN AND REVISION NUMBER. USE ADDITIONAL SHEETS AS NECESSARY.

REVISION 1 - BEVISED TEXT AS NOTED, BEVISED ATTACHARTZ & ADDED ATTACHARTS 3,4, REVISION 2-REVISED TEXT AS NOTED, REVISED ATTACHART 2.

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,	DESIGN INPUT FOR: CR3	PAGE: 2 of 6
1	DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
ł		DATE: 17NOV93

# 1. SCOPE OF THIS DIR; BASIC FUNCTIONS OF SYSTEM, STRUCTURE, OR COMPONENT:

This DIR presents Design Input documentation related to the 5th Tendon Surveillance Program for Crystal River Unit 3. The scope of this DIR is for the preparation of Force/Time Curves for individual tendons, misc. calculations supporting surveillance activities, as well as for the revision of Surveillance Procedure, SP-182, for the performance of site inspection activities.

Revision 1 of this DIR will address the change in inputs required as a result of the NRC not accepting the FPC proposed Tech Spec revision for the CR3 Tendon Surveillance Program to comply with the requirements of ASME Section XI, Subsection IWL. FPC's discussions with the NRC concluded that the FPC program requirements should be based on Reg Guide 1.35, Revision 3, issued July 1990.

Revision 2 of this DIR will address the change in inputs required as a result of several meetings at the CR3 site. FPC's discussions with the NRC concluded that the new FPC Tech Spec Program may not be implemented as soon as expected and that the current Tech Spec requirements are to be be addressed for this surveillance within the acceptance criteria of SP-182, Revision 11.

#### 2. CLASSIFICATION; DESIGN CODE(S) AND STANDARDS:

Nuclear Safety Related Classification Existing Tech Spec 3.6.1.6 and 4.6.1.6, Amendment 29 & 31. FSAR 5.2 Reg Guide 1.35, Revision 3, July 1990.

#### 3. PERFORMANCE REQUIREMENTS AND SOURCE:

The Tendon Surveillance Program is controlled by Tech Spec Sections 3.6.1.6 and 4.6.1.6. However, FPC is currently going through a Tech Spec Improvement Program and will possibly be implementing this Program in mid November in the middle of the surveillance. The new Tech Spec (See Attachment 1) will commit the Surveillance Program to Regulatory Guide 1.35, Revision 3 criteria. FPC has discussed this with the NRC, and it was agreed that the new acceptance criteria is acceptable for use for this entire surveillance period. Therefore, the Reg. Guide criteria will be the basis for a revision to the existing Revision 10 of Surveillance Procedure SP-182. Per FPC-direction; the requirements of the current existing Tech Spee will not-be included in the existing current Tech Spec requirements will have to be addressed in SP-182, Revision 11 until the actual implementation of the new Tech Spec program takes place. This acceptance criteria is to be worked into SP-182 in addition to the Reg. Guide 1.35 acceptance criteria already built into the draft version.

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		Engineering instruction No. 1	Attachment A Page A13
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1			DATE: 17NOV93

#### 4. DESIGN MARGINS OR SAFETY FACTORS:

Design margins and safety factors are as included in the above Codes and Standards.

#### 5. DESIGN CONDITIONS AND SOURCE:

There are no design activities.

#### 6. OPERATING CONDITIONS AND SOURCE:

This surveillance will be performed during normal plant operation. Tendons in the area between Buttresses 1 and 3, (0° to 120°) must be avoided due to the safety hazard of the main steam vents in that area. After numerous discussions with the site, it was determined that outside tendons with the following group/buttress numbers are to be considered inaccessible due to the steam venting problem: 13HXX, 42HXX, 51HXX, 53HXX, 62HXX. Inside tendons accessiblity must be individually confirmed through an FPC walkdown/concurrance. Radiological conditions, safety, and interference with safety related systems and components may affect the selection of tendons inside the plant. Adequate consideration must be given to the potential effects on safety related systems from any surveillance activity.

FPC has been informed by G/C that the tendon selection process can be successfully completed for this surveillance using the limitations on the tendon population as noted above, however, the next several surveillances <u>cannot</u> be performed during plant operation because of these effects on the random tendon selection process.

In addition, the exempted tendons from the selection process of this surveillance must be reviewed and considered for inclusion in the next surveillance. The exact position for the resolution of many exempted tendons will depend on the final accepted position taken by the NRC on the proposed Tech Spec position taken by FPC. See the Attachment 3 letter, Attachment 1. This position will not affect remaining work for this surveillance but will need to be considered in future work.

#### 7. AMBIENT CONDITIONS AND SOURCE:

Ambient temperatures and pressures of the Reactor Building during normal operation of the plant are to be considered. Elevated temperature effects on the tendons may need to be considered.

#### B. MATERIAL(S):

Most tendon materials are replacement of original materials. A summary of tendon related materials can be found in FSAR Section 5.2.2.3.3 and in the CR3 Reactor Building Design Basis Document.

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		Engineering Instruction No. 1	Attachment A Page A14
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)		DESIGN INPUT FOR: CR3	PAGE: 4 of 6
		DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
	1		DATE: 17NOV93

## 9. OTHER REQUIREMENTS:

The requirements of Reg Guide 1.35, Revision 3, are essentially the same as the requirements of ASME Section XI, Subsection IWL. In many places, the ASME Code provides a greater level of detail than the requirements of the Reg Guide. The ASME Code document will be utilized as a reference in the interpretation of some Reg. Guide requirements and criteria.

FPC administrative procedures noted in References 16, 17, and 18 are to be followed for the revision of SP-182.

The normal 40 year plant life is to be considered. As yet, no consideration for plant life extension has been requested from FPC. Future retensioning or other tendons work may need to consider any FPC plant life extension plans or considerations.

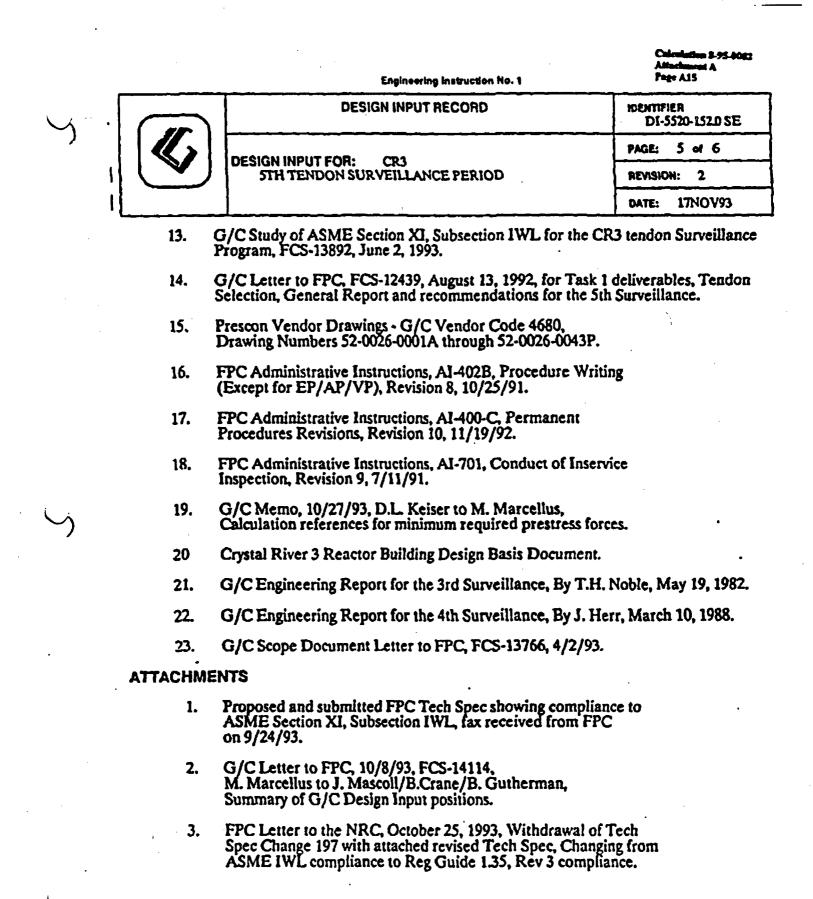
### 10. REFERENCES:

- 1. Design Input 5500-528-1, Revision to SP-182 Procedure for Tendons and Calculations for Force-Time Curves for Surveillance 4, Revisions 0 and 1, Jan. 87 and Sept. 87.
- 2. Calculation 5500-528-1, Tendon Loss Calculations for Surveillance 4, Revisions 0 and 1 Jan. 87 and Sept. 87.
- 3. J. Fulton and G. T. DeMoss Calculation 04-4762-099, Tendon Loss Calculations and Appendices for CR3 Tendons, 3/6/87 and 1980 calculations.
- 4. Vertical Tendon History Sheets
- 5. Hoop Tendon History Sheets
- 6. Dome Tendon History Sheets
- 7. SP-182, Revision 10.
- 8. SP-182, Revision 7. (Last surveillance proven revision)
- 9. ASME B & PV Code, Section XI, Subsection IWL
- 10. Regulatory Guide 1.35, Revision 3, Issued July 1990.
- 11. Regulatory Guide 1.35.1, Revision 0, Issued July 1990.
- 12. G/C Engineering Study on the CR3 Tendon Surveillance Program, FCS-13670, March 5, 1993.

Gilbert/Commonwealth

### THIS IS A PERMANENT DESIGN RECORD

na 5.95.0083



Gilbert/Commonwealth

THIS IS A PERMANENT DESIGN RECORD

DO NOT DESTROY

GAI-523 2-92\*C

	Engineering Instruction No. 1	Colcalation 8-95-0082 Attachment A Page A16
$\prec \cdot \boxed{c}$	DESIGN INPUT RECORD	DENTIFIER DI-5520-152.0 SE
		PAGE: 6 of 6
	DESIGN INPUT FOR: CR3 STH TENDON SURVEILLANCE PERIOD	REVISION: 2
		DATE: 17NOV93

4. G/C Letter to FPC, 10/12/93, FCS-14119, M. Marcellus to J. Mascoll/B.Crane/B. Gutherman, Revised summary of G/C Design Input positions.

5. G/C Letter to FPC, 10/27/93, FCS-14158, M. Marcellus to J. Mascoll/B.Crane, with G/C comments on the proposed Tech Spec.

ONLY ATTACH MEDIT 4 WAS INCLUDED IN CALC 5 95-0082

THIS IS A PERMANENT DESIGN RECORD

Calculation 5-75-0082 Attachment A Page A17

DI-6820-152.0 SE ATTACHMENT 4 Page 1

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#### Gilbert/Commonwealth mannes and constants

Green Hills Corporate Center, PL 10 & Pheasant Rd., Resong, PA 19607

ROY W. AOLER Project Manager Nuclear Services

October 12, 1993

FCS-14119 Work Order #04-5520-152 Contract NPM00AD, WA 152

Mr. R. T. Bowles Nuclear Project Management Engineer Florida Power Corporation P. O. Bor 14042/C21 St. Petersburg, Florida 33733

' XEV I Note - THIS LETTLY SUPER 10205 POSITION: 1,2 53 IN FES-1444 13/8193 ATTAching The D.J.

Attention: J. O. Mascoll, B. Crane, B. Gutherman

'Re: **Crynal River 3 Tendon Surveillance Program** 

Ref: FCS-14114 Dated October 7, 1993

Action By: FPC - October 13, 1993 Review and Comments, Unless N/A

Dear Mr. Bowles:

Key issues and criteria for the tendon surveillance program were reviewed with you in the above referenced letter. Since then, the direction for implementation of our work has significantly changed based upon the NRC rejection of the Tech Spec for the Tendon Surveillance Program. Based on discussions with Bruce Crane, we will now perform all related tendon surveillance tasks based on the following:

- Revision 11 of SP-182 will now be performed to comply with Reg. Guide 1.35 Revision 3, not ASME Section XI, Subsection IWL. An earlier review of the Reg. Guide versus the CR3 program concluded there were no significant issues or disadvantages to committing to Reg. Guide, Revision 3. However, until our review and revision is complete, G/C is recommending that FPC consider that there are some exceptions likely to be taken spainst the full compliance to the Reg. Guide by FPC. G/C will notify FPC as any significant exception is identified.
- 2. The documentation of the above position, acceptance items and specific interpretations of the Reg. Guide acceptance criteria has not been decided at this time. It may be within CP-145. However, an interim place is to include these positions within SP-182. G/C will now include some of the general positions in the SP-182 document, but is uncertain whether all engineering/licensing positions and acceptance criteria can be properly placed in SP-182. SP-182 has basically addressed site inspection activities in the past and has not addressed engineering/licensing issues to any level of detail.

Maling Address: P.O. Box 1498, Resong. PA. 19603-1498 + Telecroner: 215775-2600 + Far: 215775-2670 + Teles: 173-228 Southeast Reports Huseosciences: 1055 Continence Park Drive, Suite 200, Oak Ridget, Th 37820 + Talechone; 615 482-1434 + Far: 615 482-1783

Calculation 6-95-8082 Attachment A Page A18

DI-5820-152.0 SE ATTACHMENT 4 Poge 2

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Page 2

**C** 

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3. It is assumed that the Tech Spec Improvement Program will be in place and accepted by the NRC by November 22nd. With the surveillance rapidly approaching, a Tech Spec revision prior to that date is impractical. The acceptance criteria for the interim period up to November 22 was discussed. Based on the established CR3 Tendon Surveillance Program as defined by SP-182 and other documents, it is assumed that this entire tendon surveillance can be performed against the new criteria. Therefore, the acceptance criteria within SP-182 which is related to the existing Tech Spec positions will be removed and replaced by the Reg. Guide 135, Revision 3 positions. This will involve new enclosures and calculations within SP-182.

Note that the above direction significantly changes most positions noted in the reference letter. However, items 4, 5, 6 and 7 of that letter are unchanged for O/C to implement the required scope of work.

FPC concurrence with the above positions by October 13 is required for G/C to complete our tasks in support of the surveillance. Any revision to the above will impact our completion of SP-182. Additional rework, enclosures and verification resulting from this change in criteria, as discussed above, has impacted the schedule. Assuming no further change in basic criteria, SP-182 Revision 11 will be electronically transmitted to FPC on October 26 for review and comments. In addition, a copy of the document will be Federal Expressed at the same time.

Should there be questions or discussion on any of the above items, please feel free to contact us at your convenience.

Very truly yours,

W/arcelle

M. D. Marcellus Structural Task Engineer

R. W. Adler Project Manager

R. T. Bowles J. Mascoll B. Gutherman B. Crane FPC Records Management (CL Only) R. W. Adler (2) C. N. Rentschler D. D. Krause



DOCUMENT IDENTIFICATION NO.

Florida

Power corporation

# DESIGN ANALYSIS/CALCULATION

**Crystal River Unit 3** 

Calculation S-95-0082

# **ATTACHMENT B**

TENDON HISTORY SHEETS FOR 6TH SURVEILLANCE .

Page B1

1

Flor Pov	VET REACTOR BUILDING	R UNIT NO. 3 PRE-IRESSING SYSTEM INISTORY	Calcal Attack Page J	intian 5-75-0082 Maxim B 12
/ TENDON IDENTIFIC	ATION NUMBER DI		ENCTH 142 - 7	, ·
	PC 121 CR 469			
	r inspection cover letter nu			
	received on-site <u>3-18-</u>			· · · · ·
	ed in conduit 5-1-7			
	d Wires teplaced			
4. Date buttonh	eaded 10-1-74	Buttonheading NCR's		
Bad wires	O Accept. Reheads	O Total I	neffective wires	0
5. Date stress	d <u>12-9-74</u>	Stressing NCR's _		
Date restres	sed	Restressing NCR's		****
L A Elongation	(1500 psi to 80% ult.)-Pred.	SHOP END	FIELD END	TOTAL 9519
/	ssure - Predicted/Actual	•	684017000	
Shim Thickne	ess/80% Vitimate Pressure		• • • • • • • • • • • • • • • • • • • •	N/A
•	oken WircsT			163
	illed <u>3-25-75</u> B			
Time since	Installation <u>10 3/4 months</u> I	nlet Pressure 50	SI Outlet Tem	. <u>140°</u>
	ps refilled: Shop			
7. Data compil	ed by <u>D</u> . Malla			
		Date3	130/11	
8. Additional	Comments:		•	
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	Florida Power	CRYSTAL RIVER REACTOR BUILDING PI TENDON I	RE: FRESSING SYSTEM	Calculu Attacku Page Bi	tion 5-95-0082 new 8
TEN	DON IDENTIFICATION NUM	Ner <u>D113</u>	CUT 1	ENCTI 144 - 6	·
SHO	P WASHER ID: PC 1 11	CR F	IELD WASHER ID: PC	121 CR_	1075
1.	GAI/QA vendor inspect:	ion cover letter num	ber-FPC 1	DATE	4/1/24
2.	Date tendon received	on-site <u>3-18-</u>	74 RMR Numbe	r <u>.37984</u>	
3.	Date installed in con	duite <u>5-2-</u>	74 Installation	NCR'S	
	Wires removed	Wires replaced	O Total	Ineffective wires	. 0
4.	Date buttonheaded	<u>10-1-74</u> B	uttonheading NCR's	·	
	Bad wires	Accept, Reheads	O Total 1	ineffective wires	0
5.	Date stressed	11-21-74	Stressing NCR's J	בור	
	Date restressed		Restressing NCR's	·	
$\overline{)}$	<pre>Slongstion (1500 psi Lift-Off Pressure - F</pre>	•		<u>FIELD END</u> <u>478",434"</u> 26840"6850pt	
•*	Shim Thickness/80% UI	timate Pressure		658"17790p	
•	Unsested/Broken Wires			-	•
6.	Date Bulk-filled	<u>3-25-75</u> But	lk-Filling NCR's		·····
	Time since installati	ion 1034 months In	let Pressure 50 g	ST_ Outlet Temp	. <u>140°</u>
	Date end caps refille	d: Shop	Field		
7.	Data compiled by	. Malla	Organizatio	a Selem	
			Date	130/77	•
8.	Additional Comments:				<u>.</u>
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5	Florida Power	CRYSTAL R. REACTOR BUILDIN TENI		ESSING SYSTEM	Att	culation 8-95-0082 achiment B re B4
teni	DON IDENTIFICATION NUMBER	R	/3	OUT LE	NCTH	مرجع برج معدوري با الله في الأنف
SHO	P WASHER ID: PC	_ CR	FIELD	WASHER ID: PC_	CR	······································
1.	GAI/QA vendor inspection	n cover letter	number-F	ec /	DATE	·
2.	Date tendon received on	-site		RHR Number	·	
	Date installed in condu					
•	Wires removed	Wires repla	ced	Total	Ineffective wir	es
4.	Date buttonheaded		Button	heading NCR's	·	
	Bad wires A	ccept. Reheads	·	Total I	neffective wires	
5.	Date stressed		Stre	ssing NCR's		
• •	Date restressed		Rest	ressing NCR's		
_		•		SHOP END		TOTAL
	Elongation (1500 psi to	80% ult.)-Pre	d./Act.			
مر	Lift-Off Pressure - Pre	dicted/Actual				<u></u>
	Shim Thickness/802 Ulti	imate Pressure	•			<u>N/A</u>
	Unseated/Broken Wires	·	_ Total e	fective wires	after stressing	
6.	Date Bulk-filled	·	Bulk-Fil	iling NCR's	·	
	Time since installation	a	_ Inlet Pr	casure	Outlet Ter	ap
	Date end caps refilled:	: Shop		Pield		
7.	Data compiled by	Malle		_Organization	Sulim	· · · · · · · · · · · · · · · · · · ·
				Date 11	11/77	•
8.	Additional Comments:	Dome Repo	<u>ic - · ·</u>	· ·		
	Degreesing - Shop					
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103 FGWEY REACTOR BUILDING PRES	RESSING SYSTEM		Attachment B
			3/. 4
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	_		
2. Date tendon received on-site 3-18-74	RMR Numbe	r <u>37984</u>	·
3. Date installed in conduit <u>5-2-74</u>	Installation	NCR's	
Wires removed Wires replaced	O Total	Ineffective wir	es <u>0</u>
i. Date buttonheaded 10-1-74 Butt	onheading NCR's		·
Bad wires Accept. Reheads	) Total I	neffective wires	0
5. Date stressed St	ressing NCR's _	1726,1727	<u> </u>
			•
	SHOP END	FIELD END	TOTAL
ongation (1500.psi to 80% ult.)-Pred./Act.	478158	4 78 , 4 5/8	914 1934
) Lift-Off Pressure - Predicted/Actual		<b>•</b> •	N/A
Shim Thickness/80% Ultimate Pressure			N/A
Unseated/Broken Wires / Total	•		_
		Osi Outlet Ter	np. 140°
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B Additional Compents: AL Links			1. End
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Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PRECT TENDON HISTO	RESSING SYSTEM	Page	<mark>intien 5-95-0082</mark> Innent B B6
TENDON IDENTIFICATION NU	HOBER DIIH	at L	ENGTH	
SHOP WASHER ID: PC	CR FIELD	WASHER ID: PC	CR	
1. GAI/QA vendor inspec	tion cover letter number-	FPC #	DATE	
2. Date tendom received	on-site	RHR Numbe	er	
3. Date installed in co	onduit	_ Installation	NCR's	
Wires removed	Wires replaced	Total	Ineffective wir	es
4. Date buttonheaded	Butto	onheading NCR's	·	
Bad wires	Accept. Reheads	Total )	Ineffective wires	· · · · · · · · · · · · · · · · · · ·
5. Date stressed	Str	ressing NCR's	<u> </u>	
Date restressed	Rei	stressing NCR'	B	
-		SHOP END	FIELD END	TOTAL
Elongation (1500 ps	1 to 80% ult.)-Pred./Act.			/
Lift-Off Pressure -	Predicted/Actual			<u>N/A</u>
Shim Thickness/802	Ultimate Pressure			<u></u>
Unseated/Broken Wir	es Total (	effective wire	s after stressing	s
6. Date Bulk-filled	Bulk-F	illing NCR's _		
Time since installa	tion Inlet	Pressure	Outlet Ter	"p
	led: Shop			
7. Data compiled by	D Malle	Organizatio	n Salan	
	•	Date 🥣 🗡	11/12	
8. Additional Comments	: Dome Repair -	•		
Regressing -	Shop End (7/10/16) Fi	celd End (	1/15/16)	•
	t of f Pressure - Shop			176)-
> Legrissing - (11/2	4/16) 200 "SIG NCR 250	81 190° N	ICR 2582	-
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	Florida Power	CRYSTAL RIV REACTOR BUILDING TENDO		SSING SYSTEM	. · ·	Calculation 5-95-0082 Attachment B Page B7
) Tend	ON IDENTIFICATION NUMB	er	5	OUT L	ENCTH	1/2
SHOP	WASHER ID: PC	CR5	FIELD 1	ASHER ID: PC	122	CR 1231
1.	GAI/QA vendor inspecti	on cover letter n	umber-Fl	PC 1 101	90 DA	TE 4/1/74
	Date tendon received o					
	Date installed in cond				•	,
	Wires removed	,		•		
	Date buttonheaded					
	Bad wires					
5.	Date stressed/					
-	Date restressed					
					FIELD END	
	Restion (1500 psi )	to 80% ult.)-Pred.	/Act.			
~)	Lift-Off Pressure - P					
•	Shim Thickness/802 Ul					
•	Unseated/Broken Wircs					•
6.	Date Bulk-filled					· ····································
	Time since installati					emp. 140°
				•	· · · · · · · · · · · · · · · · · · ·	
7.	Date end caps refille Data compiled by <u></u>	Waller		Organization	Saler	-
				Date 3	3/30/77	•
8.	Additional Comments:					· .
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CRYSTAL RIVER WHIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY Calculation S-95-0082 Attachment B Page BB

)				
ENI	DON IDENTIFICATION NUMBER D115	OUT LE	NGTH	
HOI	P WASHER ID: PC CR FIELD	WASHER ID: PC_	CR	, 
•	GAI/QA vendor inspection cover letter number-F	PC I	DATE	alelan
•	Date tendon received on-site	RMR Number	·	
3.	Date installed in conduit	Installation	NCR'\$	
	Wires removed Wires replaced	Total	Ineffective wir	es
i.	Date buttonheaded Button	nheading NCR's		
	Bad wires Accept. Reheads	Total Ir	effective wires	·
5.	Date stressed Stre	essing NCR's		
~	Date restressed Res	tressing NCR's		
		SHOP END	FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred./Act.			
)	Lift-Off Pressure - Predicted/Actual		·····	<u>N/A</u>
	Shim Thickness/80% Ultimate Pressure			<u></u>
	Unseated/Broken Wires Total e	ffective wires	after stressing	s
5.	Date Bulk-filled Bulk-Fi	lling NCR's		
	Time since installation Inlet P	ressure	Outlet Te	mp.
	Date end caps refilled: Shop	_ Field		
7.	Data compiled by Donially	Organization	Satim	, 
		Date	/11/77	<u></u>
8.	Additional Comments: <u>Pome Repair -</u>		، 	•
	Degreasing - Shop End (7/15/16)	Cop reinst	lled	•
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	Florida Power	CRYSTAL RIVER UNIT REACTOR BUILDING PREFTI TENDON HITTO	RESSING SYSTEM		Calculation 5-95-0082 Attackment B Page 39
ZND	ON IDENTIFICATION NUMB	TR		encth	
	-	CR FIELD			
		on cover letter number-			
		n-site		•	
3.	Date installed in cond	uit	_ Installation	NCR's	روی کا میں میں اسر میں اعداد ہے اکسی <sup>اری</sup>
	Wires removed	Wires replaced	Total	Ineffective wi	res
4.	Date buttonheaded	Butto	nheading NCR's		·····
	Bad wires	Accept. Reheads	Total I	neffective wire	
5.	Date stressed	Str	essing NCR's		- <u></u>
. •	Date restressed	Res	tressing NCR's		
	•	• •	SHOP END	FIELD END	TOTAL
	Elongation (1500 psi t	o 80% ult.)-Pred./Act.			
4	Lift-Off Pressure - Pr	edicted/Actual			N/A
	Shim Thickness/80% Vit	imate Pressure			<u>N/A</u>
	Unseated/Broken Wires	Total (	effective wires	after stressi	
6.	Date Bulk-filled	Bulk-F	illing NCR's		·
	Time since installation	on Inlet 1	Pressure	Outlet T	emp
	Date end caps refilled		Field		
7.	Data compiled by	). J. Juffin		FPC	
			Date <u>93</u>		
8.	Additional Comments:	DJ PREPARATION	J FOR 1	SURVEI	LANCE
	•	······		,	<u> </u>
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	Florida Power
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Calculation S-95-0002 CRYSTAL RIVER USIT NO. 3 A Harden Page BIG REACTOR BUILDING PRI. TRESSING SYSTEM TENDON HISTORY TENDON IDENTIFICATION NUMBER D116 CUT LENGTH 148 - 10% SHOP WASHER ID: PC 121 CR 946 FIELD WASHER ID: PC 121 CR 734 1. GAI/QA vendor inspection cover letter number-FPC # 10190 DATE 4/1/74 2. Date tendon received on-site 3-18-74 RMR Number 37984 3. Date installed in conduit \_\_\_\_\_\_\_\_ Installation NCR's \_\_\_\_\_\_ Wires removed \_\_\_\_\_ Wires replaced \_\_\_\_\_ Total Ineffective wires \_\_\_\_\_ 4. Date buttonheaded 9-30-79 Buttonheading NCR's Bad wires / Accept. Reheads O Total Ineffective wires / 5. Date stressed 12-5-74 Stressing NCR's Date restressed \_\_\_\_\_\_ Restressing NCR's \_\_\_\_\_ SHOP END FIELD END TOTAL Elongation (1500 psi to 80% ult.)-Pred./Act. 5"14-4" 5"15-4" 10194 676016950, 680016750 N/A Lift-Off Pressure - Predicted/Actual די אוא אר סבררו"ד איז איז איז איז Shim Thickness/80% Ultimate Pressure Unseated/Broken Wires \_\_\_\_\_ Total effective wires after stressing \_\_\_\_\_\_ 6. Date Bulk-filled <u>3-25-75</u> Bulk-Filling NCR's Time since installation 10 mulls Inlet Pressure 50 DSI Outlet Temp. 140° Date end caps refilled: Shop · Field 7. Data compiled by D. Mally Organization Salan Date 3/30/17 8. Additional Comments:

10	Florida Power	CRYSTAL RIVER REACTOR BUILDING PI TENDON I	E. FRESSING SYSTEM	Calculation 8-95-0002 Attachment B Page B13
TEND	ON IDENTIFICATION NUM	ber_ <u>]130</u>	CUT LENGT	142 - 7/2
Shop	WASHER ID: PC 121	CR 424 FI	IELD WASHER ID: PC	<u>72</u> cr 1360
1.	GAI/QA vendor inspect	ion cover letter num	ver-FPC 1 _10202	DATE 4/1/24
2.	Date tendon received	on-site <u>3.32-7</u>	4 RMR Number	38020
3.	Date installed in con	duit <u>5-/3-74</u>	Installation NCR	<sup>1</sup> 8
•	Wires removed	Wires replaced	O Total Ine	ffective wires
4.	Date buttonheaded	9-20-74 B	uttonheading NCR's	
	Bad wires <u>8</u>	Accept. Reheads	8 Total Ineff	ective wires
5.			Stressing NCR's	
•	Date restressed	······································	Restressing NCR's	·····
7.	Lift-Off Pressure - I Shim Thickness/802 U Unseated/Broken Wires Date Bulk-filled Time since installat Date end caps refill Data compiled by	Predicted/Actual Itimate Pressure B	ict. <u>434"/.5"</u> 4         6870/6550       68         553"/78/0       5         ial effective wires after       5         ik-Filling NCR's	510/ 6800 N/A 3/1/7780 N/A er stressing 163 Outlet Temp. 140 Salim 177
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRESS TENDON HIS	TRESSING SYSTEM	Cule Atta Page	nintion \$-95-0082 classes B 1812
LENDON	IDENTIFICATION NUMBE	R	CUT LENG	m <u>140'-</u>	47/8
SHOP WA	SHER ID: PC )21		D WASHER ID: PC	121 CR	470
	**	on cover letter number			
	:	n-site 3-22-74	•		
	•	uit <u>5-13-74</u>			
		Wires replaced			· · ·
4. Dat	s buttonheaded	9-20-74 Butt	conheading NCR's	1616	
Bad	i vires	Accept, Reheads	7 Total Ine	Ifective wires	2
5. Dat	te stressed	<u>2.5-74</u> st	ressing NCR's		
Dat	te restressed	Re	estressing NCR's _		
	·		SHOP END	FIELD END	TOTAL
El el	ongation (1500 psi t	o 80% ult.)-Pred./Act.	13/145"	134",475"	9'2'1939'
) ы	[t-Off Pressure - Pr	edicted/Actual	67101 6700 1	74016600	
Sh	im Thickness/80% Vit	imate Pressure	64"17660 -	64",7700	<u>N/A</u>
Un	seated/Broken Wires		effective wires a	fter stressing	_161 .
6. Da	te Bulk-filled	<u>4-4-75</u> Bulk-1	Filling NCR's	<u></u>	
TI	me since installatio	n 10 34 months Inlet	Pressure 31.ps	<u>r</u> _Outlet Tem	p. <u>160°</u>
Da	te end caps refilled	: Shop	Field	·	
7. Da	ta compiled by 🧾	Wallen	Organization	Salem	·····
			Date	50/17	•
8. Ad	ditional Comments:	·	•		
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	Florida Power	CRYSTAL RIVER UNIT REACTOR BUILDING PRESE TENDON HISTO	ESSING SYSTEM	Cul Atta Pag	relativa 5-95-6082 relativa 8 2 813
TEND	ON IDENTIFICATION NUMB	er <u>D131</u>	OIT LE	NGTH	
		CR FIELD			
	••	on cover letter number-1			
	•	n-site			
		luit		•	
•		Wires replaced			•
4.		Butto		-	
		Accept. Reheads			
5.	•	Str			
•		Res			
			SHOP END		TOTAL
	Elongation (1500 psi	to 80% ult.)-Pred./Act.			
5	Lift-Off Pressure - P				
	Shim Thickness/80% VI			/	
	Unseated/Broken Wires	Total	effective wires	after stressing	•
6.		Bulk-F			
		lon Inlet 1	*		
•		ed: Shop			
7.	Data compiled by		Organization	5 Salum	
			Date	4/1/27	
8.	Additional Comments:	Dome Repair -		•	
	Deorcasing - She	p (7/19/74) Field	(1/19/16)		- 
	Reorcosing - (12)	p (7/19/14) Field	CR 2582	180° NCR	2581
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	· · · · · · · · · · · · · · · · · · ·	<u> </u>			•

WON IDENTIFICATION NUMBER 2 HOP WASHER ID: PC 12/ CR 9		ຒາ ນ		-
HOP WASHER ID: PC 121 CR 9	28 FIFID		ENCTH	11
		WASHER ID: PC	<u>121</u> cr	955
GAI/QA vendor inspection cover 1	etter number-	FPC 1 1020	2 DAT	4/1/14
. Date tendon received on-site	3-22-74	RMR Numbe	38020	· ·
J. Date installed in conduit			•	_
Wires repoved Wires	replaced	2 Total	Ineffective with	res
. Date buttonheaded $9-20-7$	U Buite	onheading NCR's		
Bad wires Accept. Re	heads <u>0</u>	Total I	neffective wire:	5 _/
i. Date stressed	Str	essing NCR's	• 	
Date restressed	Ree	tressing NCR's	· · · · · · · · · · · · · · · · · · ·	
		SHOP END	FIELD END	TOTAL
Slongation (1500 psi to 80% ult.	)-Pred./Act.	43145	45%,418	931958
) .ift-Off Pressure - Predicted/Ac	tual .	<u>676016,700</u>	6800,6700	N/A
Shim Thickness/80% Ultimate Pres	ISUTE	6"17,720	648 17,750	N/A
Unseated/Broken WiresO		-		8 162
. Date Bulk-filled 11.4.1.	5Bulk-F	illing NCR's		
Time since installation 10 mm	the Inlet	Pressure 200	5/ Outlet Te	mp. <u>160°</u>
Date end caps refilled: Shop			A	
". Data compiled by <u>D. Mali</u>	h	Organization	Salem.	
•		Date	3/39/17	•
1. Additional Comments:				
	•			,
·	- <u></u>			
, <u>A</u>	•			• •
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.<		ه <u>د محمد محمد محمد محمد محمد محمد محمد مح</u>		
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Florida CRYSTAL RIVER FOLIGI REACTOR EUILDING PR TENDON II	ESTTESSING SYSTEM	Colvulation 8-95-0082 Atlachment B Page B15
HUN IDENTIFICATION NUMBER	OIT LENGTH 142	-01/2
OP WASHER ID: PC 121 CR 487 FI	ELD WASHER ID: PC 122	CR 1268
GAI/QA vendor inspection cover letter numb	er-FPC 1 DZ45 D	ATE 4/10/14
Date tendon received on-site	4 RMR Number 382	46
Date installed in conduit 5-30-74	Installation NCR's	•
Wires recoved Wires replaced	O Total Ineffective	vires <u>O</u>
Date buttonheeded 10-17-74 Bu	ittonheading NCR's	· · · · · · · · · · · · · · · · · · ·
Bad wires Accept. Reheads	O Total Ineffective w	lres O
Date stressed 10-30-74	Stressing NCR's1681,168	3
Date restressed	Restressing NCR's	
•	SHOP END FIELD END	
rngation (1500 psi to 60% ult.)-Pred./Ac	a. <u>47154" 5",5%</u>	<u>6' 9% 1/0%</u>
Lift-Off Pressure - Predicted/Actual	681017100ps; 6,870, 7,00	
Shim Thickness/80% Ultimate Pressure	55 17,780 6. 781	
. Unseated/Broken Wires Tota	al effective wires ofter stres	sing 162.
	k-Filling NCR's	
Time since installation <u>934 month</u> Inl	et Pressure <u>50 pri</u> Outlet	Temp32
Date end caps refilled: Shop		
. Data compiled by Dovalla	Organization Solon	•
	Date 3/29/17	· · · · · · · · · · · · · · · · · · ·
. Additional Coments: One wire	not seated in u	rile.
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<b>م</b> ر	· · ·	• .
<u>بر</u>	•	•
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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY Culculation S-95-0082 Attachment B Page B16

HOP	WASHER ID: PC CR	_ FIELD	WASHER ID: PC_	CR	• · · · · · · · · · · · · · · · · · · ·
•	GAI/QA vendor inspection cover letter	number-F	PC I	DATE	
•	Date tendon received on-site		RMR Number		
•	Date installed in conduit		Installation	NCR'S	
	Wires removed Wires replace		Total	Ineffective wire	
•	Date buttonheaded	Buttor	heading NCR's		
	Bad wires Accept. Reheads		Total In	effective wires	
<b>.</b>	Date stressed	Stre	essing NCR's		
	Date restressed	Res	tressing NCR's		
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pre	d./Act.			
	Lift-Off Pressure - Predicted/Actual	:			<u> </u>
	Shim Thickness/80% Ultimate Pressure	_	<u> </u>		<u>N/A</u>
	Unseated/Broken Wires	Total e	ffective wires	after stressing	
5.	Date Bulk-filled	Bulk-Fi	lling NCR's		
	Time since installation	Inlet P	ressure	Outlet Ter	P•
	Date end caps refilled: Shop				
7.	Data compiled by Dowalla-		_ Organization	Sala	1
	·	, .	Date	4/11/22	
8.	Additional Comments: <u>Porme Repair</u>	<u>;</u>	· 		
	Degreasing - Shop (7/15/16)			· · ·	
			······································	•	<b>-</b> ·
2					
	• 		· · · · · · · · · · · · · · · · · · ·		
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FORICA CRYSTAL RIVER UNI REACTOR EUILDING PRESE TENDON HIST	FESSING SYSTEM Page BI7
:DON IDENTIFICATION SUBBR D212	CUT LENGTH _ 144 - 3
OP WASHER ID: PC 121 CR 10.92 FIELD	
GAI/QA vendor inspection cover letter number-	EPC 7 10245 DATE 4/10/74
Date tendon received on-site 3-29-74	RMR Number 38246
Date installed in conduit6-4-74	Installation NCR's 1410
Wires replaced Wires replaced	O Total Ineffective wires O
Date buttonheaded 10-17-74 Butto	nheading NCR's
Bad wires Accept. Reheads	D Total Ineffective wires
Date stressed 12-3-74 Str	essing NCR's
Date. restressed Res	tressing NCR's
	· SHOP END FIELD END TOTAL
ingation (1500 psi to 60% ult.)-Pred./Act.	43,14 36" 54",4 78" 9519%
Lift-Off Pressure - Predicted/Actual	6,77016600psz 6,77016,700psz KIA
Shim Thickness/80% Ultimate Pressure	6% 17,730 6% 17720 NIA
. Unseated/Broken Wires Total e	effective wires after stressing
	illing NCR's
Time since installation <u>934 months</u> Inlet H	ressure <u>47psi</u> Outlet Temp. <u>1240</u>
Date end caps refilled: Shop	
. Data compiled by <u>Donalla</u>	Organization Salem
	Date 3/21/17
. Additional Coments:	•.
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CETATAL RIVER UNIT NO. 3
REACTOR BUILDING PRESTRESSING SYSTEM
TENDON SURVEILLANCE PECONS

TENDOR NO. \_\_\_\_\_\_

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35-00E2

				T 077 0000					RETENSION					
Inspection Period and Date	location	forca (kips)	Avg. Vorce (kipe)	Shin Thichdes (is)	<pre>&amp;long- ation (in)</pre>	Total Effective Viree	Force (kipe)	Avg. Force (tipe)	Shim Thickness (ia)	Elong- ation (jp)	Totsl Effectiva Viree	Tumper	r Bidg. Iture OF Est.	Comente
	2	3			6				10		12	15	<u>Bat.</u>  4	15
Original Stressing		1588		6 <u>3/8</u> 4	4 5/8"		. <u>W</u> A		<u>¥/4</u>	<u>#/A</u>				-
12/3/74		1612	1600	6 <u>3/8</u> -	4 7/8*	162	<u>.</u> E/A.	<u>¥/4</u>	<u>¥/4</u>	<u>. W/A</u>	<u>¥/A</u>	<u></u>	<u>#/4</u>	
1 rd		1392		6 <u>3/8</u> ª	<u>¥/A</u>	<u></u>	<u>¥/A</u> Þ/Å		#/A	<b>B/A</b>		<del></del>	<u> </u>	1. Life-off only
10/26/81	<u> </u>	1285	1338	6_3/8*	¥/A	162	»/Å	<u>#/A</u>	¥/A	H/A	162	82	83	
ATH	5-1	1292		6.54	NIA	·	NIA		<u>ula</u>	NIA		85°70	567%	I. IZGAL OF GREASE NET
1 <u>0/26/87</u>	E-3	1260	1276	6 1/2	Pla	<u>K2</u>	NIA	<u>NIA</u>	<u>م</u> لير	нΙА	<u>~</u> /4		_E 720	
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	Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRES TENDON H13	STRESSING SYSTEM	Atta	Whition 5-95-0082 ichnest B e B19
TENI	DON IDENTIFICATION NU	BER <u>D213</u>	OIT LE	NGTH	2 14
		CR <u>984</u> FIE			
		tion cover letter numbe			
		on-site <u>3-29-71</u>			· · · ·
		nduit <u>6-10-74</u>	· ·		
	•	Wires replaced			
		<u>10-16-74</u> But			
		_ Accept. Reheads _ O		•	
5.	Date stressed	<u>11-18-74</u> s	tressing NCR's		
	Date restressed	I	lestressing NCR's		
			SHOP END		TOTAL
	) !ongation (1500 psi	to 80% ult.)-Pred./Act	. <u>5%"1434"</u>	43,434	9/2",9/2"
	·	Predicted/Actual			
	Shim Thickness/80% 1	Iltimate Pressure	658 17.790	63/8 17,770	<u>N/A</u>
-	Unseated/Broken Wire	BB Total	l effective wires	after stressing	<u></u>
6.		3-26-75 Bulk	· · · · · ·	-	
	Time since installa	cion <u>92 months</u> Inle	t Pressure <u>510</u>	ST_ Outlet Tem	. 122°
		· •			
7.	Data compiled by <u></u>	P. Malle	Organization	Salem	
				7	
8,	Additional Comments	: yellow shine	•		,
	•••	0		•	
	•				1 <b>.</b>
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	)			•	
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	• -	۵	· · · · · · · · · · · · · · · · · · ·	•	
	ويستخذ ويصور وينفر وموالي فيستان والمتكافية والمتكافية والمتكافية	الجاذ تفصيحه معنية بالعاد مستجريها الشاطية ليشمه الأكراني	والوادي الانتصار بالمتكاف المتراوين المتوافر المتعادي المتعادي المتعادي المتعادي المتعادي المتعادي المتعادي ال		



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TENDON IDENTIFICATION NUMBER_	D213	CUT LENG	TH	
SHOP WASHER ID; PC	CR FIELD 1	ASHER ID: PC	CR	<del>و</del>
1. GAI/QA vendor inspection	cover letter number-Fi	ec #	DATE	•
2. Date tendon received on-s	ite	RMR Number		
3. Data installed in conduit		Installation NC	R's	
Wires removed	Wires replaced	Total In	effective wire	
4. Date buttonheaded	Button	heading NCR's	·····	
Bad vires Acc	ept. Reheads	Total Ine	Efective wires	
5. Date stressed	Stre	ssing NCR's	· · · · · · · · · · · · · · · · · · ·	
Date restressed	Rest	ressing NCR's		
		SHOP END	FIELD END	TOTAL
Elongation (1500 psi to 8	02 ult.}-Pred./Act.	· / _ ·		
Lift-Off Pressure - Predi	lcted/Actual			N/A
Shim Thickness/80% Ultima	ite Pressure			<u></u>
Unseated/Broken Wires	Total ef	factive wires a	fter stressing	
6. Date Bulk-filled	Bulk-F11	ling NCR's	. <u>.</u>	

Time since installation \_\_\_\_\_ Inlet Pressure \_\_\_\_\_ Outlet Temp. \_\_\_\_ Date end caps refilled: Shop Field

CRYSTAL RIVER UNIT NO. 3

REACTOR BUILDING PRETTRESSING SYSTEM

7. Data compiled by \_\_\_\_\_\_ Organization \_\_\_\_\_ Date H/11/7

100 R26

8. Additional Comments: Dome Repair -Degreesing - Shop - (7/15/16)

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Chindred 5-95-0082 FOR CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTONSSING SYSTEM TENDON HISTORY Chindred 5-95-0082 Affaretment B Page B22
DON IDENTIFICATION NUMBER D214 OUT LENGTH 147'-11'14
WASHER ID: PC - CR 765 FIELD WASHER ID: PC $\frac{121}{CR}$ CR 964(YW)
GAI/QA vendor inspection cover letter number-FPC # 10245 DATE 4/10/34
Date tendon received on-site 3-29-74 RMR Number 38246
Date installed in conduit 6-10-74 Installation NCR's
Wires repoved Wires replaced Total Ineffective wires
Date buttonheaded 10-16-74 Buttonheading NCR's
Bad wires Accept. Reheads Total Ineffective wires
Date stressed 12-6-74 Stressing %CR's
Date-restressed Restressing KCR's
SHOP END FIELD END TOTAL
ngacion (1500 psi co 60% ult.)-Pred./Acc. 541494" 498", 478" 956"1958
Lift-Off Pressure - Predicted/Actual 66701680005167406800051 N/A
Shim Thickness/80% Ultimate Pressure <u>7*17600 738,7680</u> N/A
. Unseated/Broken Wires Total effective wires after stressing
. Date Bulk-filled <u>3-26-75</u> Bulk-Filling NCR's
Time since installation <u>92 months</u> Inlet Pressure <u>48psi</u> Outlet Temp. <u>134°</u>
Date end caps refilled: Shop Field
. Data compiled by Donally Organization Salen
Date <u>3/29/77</u>
Additional Coments: * Yellow slims used with yellow washer.
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# CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRE:: RESSING SYSTEM TENDON HISTORY

Calculation S-95-0082 Attachment B Page B22

HO	P WASHER ID: PC CR	FIELD	WASHER ID: PO	CR	
•	GAI/QA vendor inspection cover letter m	umber-l	FPC /	DATE	
2.	Date tendon received on-site			۴	
3.	Date installed in conduit		_ Installation	NCR's	
	Wires removed Wires replace	ed	Total	. Ineffective wir	es
4.	Date buttonheaded	Butto	nheading NCR's	·	
	Bad wires Accept. Reheads		Total 1	ineffective wires	;
5.	Date stressed	Str	essing NCR's _	•	
	Date restressed	Res	tressing NCR <sup>1</sup>	·	
-			SHOP END	FLELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred	./Act.			/
	Lift-Off Pressure - Predicted/Actual	•		/	<u>N/A</u>
	Shim Thickness/80% Ultimate Pressure				<u></u> N/A
	Unsested/Broken Wires	Total e	ffective wire	s after stressing	<u>،</u>
6.	Date Bulk-filled	Bulk-F1	lling NCR's		
	Time since installation				
	Date end caps refilled; Shop		_ Field		
7.	Data compiled by D. Mall	, Z	Organizatio	a Saling	
	· · · · · · · · · · · · · · · · · · ·		Date	Alutra	
8.	Additional Comments: Dome Leps	<u>ir</u>	•		
	Degreesing - Shop (7/11/26)	Field	7/9/76)	·	:
	Lift - aff Readings - Stop 5600 (2)	(13/76)	Field 6350	(1/10/126)	·
	Legreasing - Field 200 PAG NCE	×258	1,2582	1900-1900 (	12/1/16)
			•		

	CRYSTAL RIVER UNIT REACTOR BUILDING PRESTR TENDON 111510	Essing system	· · · · ·	hirulation 8-95-0082 Hackment 8 nge 1923
) TEND	ON IDENTIFICATION NUMBER D 214	· OT L	ENGTH	
	WASHER ID: PC 121 CR FIELD			
	GAL/QA vendor inspection cover letter number-H			
	Date tendon received on-site			
	Date installed in conduit		• •	
	Wires removed Wires replaced			
•	Date buttonheaded Button			
	Bad wires Accept. Reheads			
5.	Date stressed Stre	essing NCR's	· · · · · · · · · · · · · · · · · · ·	
	Date restressed Res			_
			FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred./Act.			/
5	Lift-Off Pressure - Predicted/Actual		· .	<u></u>
	Shim Thickness/80% Ultimate Pressure		~	N/A_
	Unseated/Broken Wires Total e	ffective vire	s after stressi	ng
6.	Date Bulk-filled Bulk-Fi	lling NCR's _		
	Time since installation Inlet P	Lezenie	Outlet T	emp.
	Date end caps refilled: Shop	_ Tield		. <u></u>
7.	Data compiled by D. F. Siffis	Organizatio	FPC	· · · · · · · · · · · · · · · · · · ·
		Date	- 30-77	•
	Additional Comments: IN PREPARATION	1 00-0	AST SAMA	1/#

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C a 8-95-00ez Atlache HINK B Page \$24

Y	ter Power	TENDO	N HISTO			
(END	ON IDENTIFICATION NUMB	er	15	CUT LER	NGTH _149'- 3	3/41
	WASHER ID: PC 121					
	GAI/QA vendor inspecti					
2.	Date tendon received o	n-site	7-74	RMR Number	38246	
3.	Date installed in cond	uit6-10	-74	Installation	NCR's	
•	Wires removed	Wires replac	ed	Total	Ineffective wires	0
4.	Date buttonheaded	10-16-74	Button	heading NCR's		·
` <b>.</b>	Bad wires	Accept. Reheads	0	Total In	effective wires _	8
5.	Date stressed	1-4-74	Stre	ssing NCR's		
	Date restressed		Rest	ressing NCR's		
	•			SHOP END	FIELD END	TOTAL
5	ongation (1500 psi	to 80% ult.)-Pred	l./Act.	476"14"2"	4%,5%"	9741958
*	Lift-Off Pressure - P					
	Shim Thickness/802 Ul	timate Pressure	-	7" 17800	64, 7,810	N/A
•	Unsested/Broken Wires		•	÷		<sup>1</sup>
6.	Date Bulk-filled	3-26-75	Bulk-Fi	lling NCR's		
	Time since installati	on <u>92 months</u>	Inlet P	ressure 55	ST Outlet Temp	. <u>132°</u>
	Date end caps refille	d: Shop	• 			
7.	Data compiled by Z	Mille.		_ Organization	Silim	
	ſ			Date 3/29/	77	······
8.	Additional Comments:			•		
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CRYSTAL RIVER UNIT NO. 3

Colculation S-95-0082 Attachment B

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CRYSTAL RIVER UI REACTOR BUILDING PRES TENDON HIS			iga 825
ENDON IDENTIFICATION NUMBER 215	CUT LI	ENGTH	
HOP WASHER ID: PC CR FIE	LD WASHER ID: PC	CR	
. GAI/QA vendor inspection cover letter numbe	r-FPC /	DATE	:
. Date tendon received on-site	RNR Numbe	۲	
. Date installed in conduit	Installation	NCR's	·
Wires removed Wires replaced	Total	Ineffective with	res
. Date buttonheaded But	tonheading NCR's		سب میں میں م
Bad wires Accept. Reheads	Total 1	neffective wire	\$
. Date stressedS	tressing NCR's _		
Date restressed I	Restressing NCR's	·	
• •	SHOP END	FIELD END	TOTAL
Elongation (1500 psi to 80% ult.)-Pred./Act	t		
Lift-Off Pressure - Predicted/Actual			N/A
Shim Thickness/80% Ultimate Pressure			<u></u>
Unseated/Broken Wires Tota	1 effective wire	s after stressin	ng
5. Date Bulk-filled Bulk	-Filling NCR's _		
Time since installation Inle	t Pressure	Outlet To	eap
Date end caps refilled: Shop	Field		
7. Data compiled by D. Mally		" Sala	**
	Date		<b>}</b>
8. Additional Comments: Dome Lepair -	•		•
Degreasing - Stop (7/15/16)		•	
	•		•
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Calculation S-95-0082 Attachment B Page B26



# CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY

TEN	DON IDENTIFICATION NUMBER D-215 OUT LENGTH
	P WASHER ID: PC CR FIELD WASHER ID: PC CR
1.	GAI/QA vendor inspection cover letter number-FPC / DATE
2.	Date tendon received on-site RMR Number
	Date installed in conduit Installation NCR's
	Wires removed Wires replaced Total Ineffective wires
• 4.	Date buttonheaded Buttonheading NCR's
	Bad wires Accept, Reheads Total Ineffective wires
5.	Date stressed Stressing NCR's
	Date restressed Restressing NCR's
	SHOP END FIELD END TOTAL
G	Elongation (1500 psi to 80% ult.)-Pred./Act. /
	Lift-Off Jecoure - Predicted/Actual (KTPS) 1336.6/1612 1336.6/1675.5 N/A
	Shim Thickness/80% Ultimate Pressure / N/A
•	Unseated/Broken Wires Total effective wires after stressing
٤.	Date Bulk-filled Bulk-Filling NCR's
	Time since installation Inlet Pressure Outlet Temp
	Date end caps refilled: Shop 2-8-78 Field 2-9-78
7.	Data compiled by D.F. Kiff Organization FR
	10 Date 5-15-78
8.	Additional Comments: INSPECTED FIRST SURVETILANCE (2-3-78)
	1) NO INDICATION OF RUST - CORROSION
•	2) LOCK-OFF PORCE (SHOP-SAME AS LIFT-OFF; FIELD-1654K)
Ú	3) NO CRACKING AT ANCHORAGE
フ	

CETETAL	FIANE DELL	: 10, 3
REACTOR SUILDI	NG PRESTRE	SSING STRING
TENDON SU	<b>NYETLLAHCE</b>	120010

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TEHDON NO. 0215

			LI	T. OFT COMD						10					
Isopoction Period and Date	Location	Torce (tips)	Avg. Torce (tipe)	Shin Thickness ((n)	Elong-	Total Effective Vired	Yarça (hipe)	Avg. Force (Lipe)	Thickness (is)	<u>(la)</u>	Iffactive Vires	Tesper	er 31dg. Aturo 9 <u>Ret.</u> 14	Comments	
	2	3							10	_11_	12			15	,
Original Streasing	<b>گ</b>	<u>.1663</u>		<b></b>	<u>44*</u>		<u>W/A</u>		<u>₩/A</u>	<u>#/A</u>					
11/4/74	1	1670	1667	6_3/4=	5 1/8"	163	<u></u>	<u>14</u>	<u>¥/A</u>	M/A.	<u> </u>	<u>¥/A</u>	<u>#/A</u>	•	
,st	 	1612		_ <u></u>	H/A		1612		<u></u>	<u>H/A</u>					
2/3/78	<u>.</u>	1676	2644	6 3/4"	<u>N/A</u>	163	1654	1633	6 3/4"	<u>#/A</u>	163	92	46		
, rd	_ <u>\$_</u>	1568			<u>₩/٨</u>		<u>»/A</u>		7"	W/A				1. Lift-off only	
10/27/81	- <b>I</b>	<u>1619</u>	_1594	<i>حکا</i> ت	X/A	_163	H/A	MA	6_3/4"	<u>N/A</u>	163	82	85		
5TH 11/9/93	<u>5</u>	<u>145</u> 8		74	NIA		NIA		NIA	NIA				32 GALLONS OF ADDED OVER LET	
11/9/93	F	1579	1518	6 7/8	NIA	<u>163</u>	NA	. NIV	HA	NA	N/A	/ <u>23</u> °	72°		70000
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													<del>~~</del>		
•															Affordament   Page 837
•													•		<b>6</b>



	CRYSTAL RIVER UNIT NO. 3 Attach	
CEND	DON IDENTIFICATION NUMBER $D216$ out length $150'-6^3$	4
	WASHER ID: PC 121 CR 912 FIELD WASHER ID: PC 122 CR 1	
ι.	GAI/QA vendor inspection cover letter number-FPC / 10245 DATE	4/10/74
2.	Date tendon received on-site <u>1-1-74</u> RMR Number <u>38273</u>	
3.	Date installed in conduit6-10-74_ Installation NCR's	<u></u>
•	Wires removed Wires replaced Total Ineffective wires	0
4.	Date buttonheaded 10-15-74 Buttonheading NCR's	
	Bad wires Accept. Reheads Total Ineffective wires	0
5.	Date stressed 12-3-74 Stressing NCR's	
	Date restressed Restressing NCR's	
	SHOP END FIELD END Congation (1500 psi to 80% ult.)-Pred./Act. <u>544"/5" 45"/5"</u>	TOTAL 936"1 10"
$\sim$ )	Lift-Off Pressure - Predicted/Actual <u>680016700xr 6810 16700 psr</u>	
	Shim Thickness/80% Ultimate Pressure <u>74"17770</u> <u>6<sup>3</sup>4"17780</u>	
•	Unseated/Broken Wires Total effective wires after stressing	
6.	Date Bulk-filled 3-26-75 Bulk-Filling NCR's	
	Time since installation 9/2 months_ Inlet Pressure 55 por_ Outlet Temp.	132°
	Date end caps refilled: Shop Field	
7.	Data compiled by D. Walk Organization Salam	
	Date 3/29/77	
8.	Additional Comments:	
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Calculation \$-95-0082

Florida Forida	CRYSTAL RIVER UN REACTOR EUILDING PERSI TENDON HIST	TESSING SYSTEM	A	alculation 5-95-0082 Hachment B Ige \$29
DON IDENTIFICATION NUM	er D 303		NGTH	···
P WASHER ID: PC 121	CR 447 FIEL	D WASHER ID: PC_	121 CR	836(YW)
GAI/QA vendor inspecti	.on cover letter number	-FPC 15	7 . DATE	4/30/74
Date tendon received o	n-site <u>4-10-74</u>	RMR Number	_38726_	
Date installed in cond	luir <u>6-20-74</u>	Installation	NCR'5	•
Wires repoved	Wires replaced	O Total	Ineffective wirc	s <u>0</u> .
Date buttonheaded	10-11-74 Butt	onheading NCR's		
Bad vires	Accept. Reheads	Total In	effective wires	
Date stressed	11-14-74 St	ressing NCR's	1704	
Date restressed	Re	stressing NCR's	· · · · · · · · · · · · · · · · · · ·	
Anngation (1500 psi )	to 60% ult.)-Pred./Act.	<u>SHOP E::D</u> 341/41/4"		<u>. 151 AL</u> 75/8"
Lift-Off Pressure - Pr	redicted/Actual .	6760167000	6770,703000	i N/A
Shim Thickness/80% Ul	Limate Pressure	64 17720	6% 17.730	<u> </u>
Unseated/Broken Nires	Total	effective wires	after stressing	_161
Date Bulk-filled	<u>3-27-75</u> Bulk-F	illing NCR's	180	
Time since installation	on 94 months Inler	Pressure: 950	J_ Outlet Temp	. 1240
Date end caps refille		Field		
Data compiled by Z	? Maller	Organization	Salan	
•		Date 4/1		
Additional Coments:	Broken un			
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CRYSTAL RIVER UN REACTOR BUILDING PRE:: TENDON HIST	RESSING SYSTEM		inten 8-95-8082 Uncet B 130
) TENDON IDENTIFICATION NUMBER <u>0303</u>	at u	ength	
SHOP WASHER ID: PC CR FIEL			
. GAI/QA vendor inspection cover letter number			
2. Date tendon received on-site			
3. Date installed in conduit			
Wires removed Wires replaced			
4. Date buttonheaded Butt			-
Bad wires Accept. Reheads			
5. Date stressed St	ressing NCR's		
Date restressed Re	stressing NCR's		
		FIELD END	TOTAL
Elongation (1500 psi to 80% ult.)-Pred./Act.			
Lift-Off Pressure - Predicted/Actual	_		
Shim Thickness/80% Vitimate Pressure			
Unseated/Broken Wires Total	·····		
6. Date Bulk-filled Bulk-F			
Time since installation Inlet	-		
• · · · · · ·	Field		ميرين المتح <u>يث المحرية</u>
		Salam	-
	Date 1	<b>A</b>	
8. Additional Comments: Dome Repair -			
Degreesing - Shop (1/2/16) Field (	Intre) Gunha	>	
Regressing - 200 "51" NCR #2582 1			· ·
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Florida Power	CRYSTAL RIVER REACTOR BUILDING PR TENDON II	ESTRESSING SYSTEM	Cali Atta Pag	rulation 8-95-8083 schment B r 833
) NDON IDENTIFICATION NUM	JER <u>D304</u>	OUT LE	NGTH	4 1/2
OP WASHER ID: PC 121	• · · · ·		•	
	lon cover letter numb	er-FPC 1	Z DATE	4/30/14
Date tendon received	on-61te	RMR Number	_ 38726	
Date installed in con	duite <u>5-23-79</u>	Installation	NCR'S	
Wires removed	Wires replaced	O Total	Ineffective wir	es <u>0</u>
, Date buttonheaded	10-11-74 Bu	ittonheading NCR's		
Bad wires O			_	
Date stressed	12-6-74	Stressing NCR's	1764	
Date restressed		Restressing NCR's		
Riongation (1500 psi	to 80% ult.)-Pred./Ad	<u>SHOP END</u> 	FIELD END 37/4"	TOTAL 74 18 18
Lift-Off Pressure - P				
Shim Thickness/80% VI	•	· · ·	6 4 7770	
Unseated/Broken Wires		al effective wires	after stressing	
Date Bulk-filled	3-27-75 Bull	k-Filling NCR's		
Timé since installati	on 10 months Inl	et Pressure 35 p	ST Outlet Ten	P. 120°
Date end caps refille	ed: Shop	Field		~ <u></u> ~
. Data compiled by Z	? Walls.	Organization	Salam	
	•	Date <u>4/11</u>	27	
. Additional Comments:	•			
••••••••••••••••••••••••••••••••••••••				·
<b>A</b>		·····		
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	Florida Power	CRYSTAL RIVER REACTOR BUILDING P TENDON	RESTRE	SSING SYSTEM	Chiculatio Attachmen Page B32	n 8-95-0082 H B
) Tend	ON IDENTIFICATION NU	Ber <u>D 30</u>	4	OUT LE	NCTH	
Shop	WASHER ID: PC	CR I	FIELD V	ASHER ID: PC	CR	<u></u>
۱.	GAI/QA vendor inspec	tion cover letter num	aber-Fl	c I	DATE ·	
2.	Date tendon received	on-site		RMR Number		
3.	Date installed in co	nduit		Installation	NCR's	
	Wires removed	Wires replaced		Total	Ineffective wires	·
4,	Date buttonheaded	······································	Button	heading NCR's		
	Bad wires	Accept. Reheads		Total I	effective wires _	
5.	Date stressed		Stre	ssing NCR's		
	•					
	•	•		SHOP END	FIELD END	TOTAL
	Elongation (1500 ps	L to 80% ult.)-Pred./	Act.			
)		Predicted/Actual				
	Shim Thickness/802	Ultimate Pressure		<u> </u>		N/A
	Unseated/Broken Wir	ES To	otal e	fective wires	after stressing	
6.	Datc Bulk-filled	Do	1 <b>1k-F1</b>	ling NCR's		
		tion Ii				
						•
7.	Data end caps refil Data compiled by	D Maller		Organization	Salam.	
					1/11/17	
8.	Additional Comments	: Dome Lepon	· ·			
		Field (1/1/16)				
•			•			•
2	······································	•				•
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l						
				<del>نار ی شنان استین میکرد</del>		

Chicadadan 5.95 4062 CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDON HISTORY Calculation 5.95 4062 Attachance B Page B33	
an Identification summer D305 ait Length 124'-9'4	
IP WASHER ID: PC 120 CR 172, FIELD WASHER ID: PC 121 CR 541	
GAI/QA vendor inspection cover letter number-7PC 1 10357 DATE 4/30/74	
Date tenden received on-site <u>4-10-74</u> RMR Number <u>38726</u>	
Date installed in conduit <u>5-22-74</u> Installation NCR's <u>1386</u>	
Wires recoved Wires replaced Total Ineffective wires	
Date buttonheaded 10-11-74 Buttonheading NCR's	
Bad wires 3 Accept. Reheads / Total Ineffective wires 2	
Date stressed Stressing NCR's	
Date restrosset Restressing NCR's	
- SHOP END FIELD END TOTAL	
Jongation (1500 psi to 60% ult.)-Pred./Act. 4/4/14/8 4/8/14/16 8/4/18/16	; • 2_
Just - Off Pressure - Predicted/Actual 670016900psi 68016650psi N/A	
Shim Thickness/80% Ultimate Pressure 6"17630 5% 17620 N/A	
•Unseated/Broken Wires Total effective wires after stressing 160	
Date Bulk-filled <u>3-27-75</u> Bulk-Filling NCR's	
Time since installation 10 Months Inlet Pressure 25 psi Outlet Temp. 126°	_
Date end caps refilled: Shop Field	
Data compiled by D. Malla Organization Salam	_
Date <u>4/11/77</u>	
Additional Coments:	
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Power	CRYSTAL RIVER UNI REACTOR BUILDING PRESS TENDON HIST	RESSING SYSTEM		theyd 9 134
,' TENDON IDENTIFICATION NU	BER <u>1305</u>		ength	
SHOP WASHER ID: PC	CR FIELD	WASHER ID: PC	CR	
1. GAI/QA vendor inspec	tion cover letter number-	-FPC I	DATE	•
2. Date tendon received	on-site	RMR Numbe	۲	
3. Date installed in co	nduit	Installation	NCR'S	
Wires removed	Wires replaced	Total	Ineffective wire	es
4. Date buttonheaded	Butt	onheading NCR's	)	
Bad wires	_ Accept. Rehcads	Total 1	Ineffective wires	
5. Date stressed	St	ressing NCR's		
Date restressed	Re	stressing NCR's	B	
		SHOP END	FIELD END	TOTAL
Elongation (1500 psi	to 80% ult.)-Pred./Act.			
) Lift-Off Pressure -	Predicted/Actual			N/A
Shim Thickness/80%	Ultimate Pressure			<u></u> N/A
Unseated/Broken Wird	Total	effective wire	s after stressing	· ·
6. Date Bulk-filled	Bulk-F	illing NCR's _		
Time since installs	tion Inlet	Pressure	Outlet Ter	np
Date end caps refil	led: Shop	Field		
7. Data compiled by	D. Malle	Organizatio	n Salam	
		Date	11/27	· · · · · · · · · · · · · · · · · · ·
8. Additional Comments	: Dome Repair			·····
Degreasing -	Shop (7/8/14) Field	1 (2/8/10) (2/	11/26)	
Regressing - 20	0 1516 NCR 2582	164 NCR"	2581	·
<u>ے</u>				<u>.</u>
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Calculation \$-95-0002

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Florida Power REACTOR BUILDING PRES TENDON HIS	TRESSING SYSTEM		intion 5-95-0082 histori B B35
LON IDENTIFICATION NUMBER	CUT LE	ICTH 140'- 11	•
P WASHER ID: PC 121 CR 1069 FIEL			
GAI/QA vendor inspection cover letter number	-FPC 1 1035	DATE-	4/30/77
Date tendon received on-site	RHR Number		
Date installed in conduit <u>5-22-74</u>	Installation	NCR's	
Wires removed Wires replaced	O Total	Ineffective wire	
Date buttonheaded But	tonheading NCR's		
Bad wires Accept. Reheads	O Total In	effective wires	1
Date stressed S	tressing NCR's	·	
Date restressed R	estressing NCR's		
Plongation (1500 psi to 80% ult.)-Pred./Act	SHOP END 4715"	FIELD END 45,45"	<u>TOTAL</u> 94 192
)	67701680000	6770,680055	N/A
Shim Thickness/80% Ultimate Pressure	6"17720	6" 177.30	<u>N/A</u>
Unseated/Broken Wires Total	effective wires	after stressing	1/22_
Date Bulk-filled 3-27-75 Bulk-	Filling NCR's		
Time since installation 10 months Inlet	Pressure 30 pr	ST. Outlet Temp	• <u>138°</u>
Date end caps refilled: Shop	Field		
Data compiled by <u>D. Malley</u>			
	Date	/77	<u></u>
Additional Comments: Sift Off	est Simul	tancous_	
			· · · · · · · · · · · · · · · · · · ·
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Ĺ		Florida Power	CRYSTAL RI REACTOR BUILDIN TENI		SSING SYSTEM	Attac	<b>intice 5-95-0082</b> Ament B B36
:	) Teni	DON IDENTIFICATION NUM	BER <u>23</u>	10	OT L	ENGTH	······································
	Shor	P WASHER ID: PC	CR	FIELD V	WASHER ID: PC		R
	1.	GAI/QA vendor inspect	ion cover letter	number-Fl	PC /	DATI	E
	2.	Date tendon received	on-site		MR Numbe	r	
	3.	Date installed in cor	iduit		Installation	NCR's	
•		Wires removed	Wires repla	ced	Total	Ineffective wi	res
	4.	Date buttonheaded	٩	Button	heading NCR's		
		Bad wires					
	5.	Date stressed		Stre	ssing NCR's		
		Date restressed	•	Rest	ressing NCR's	B	
		•				FIELD END	TOTAL
1	$\mathbf{\hat{c}}$	Elongation (1500 psi	to 80% ult.)-Pre	d./Act.			
$\bigcirc$	)	Lift-Off Pressure - 1	Predicted/Actual				К/А
		Shim Thickness/80% U	ltimate Pressure				N/A
		Unseated/Broken Wire	F	Total ef	fective wire:	s after stressin	۱ <b>۵</b>
	6.	Date Bulk-filled		_ Bulk-Fil	ling NCR's _		
		Time since installat	1on	Inlet Pr	.esente	Outlet To	emp
		Date end caps refill					•
	7.	Data compiled by Z	? malley		Organizatio	1 Sulan	• •
					Date <u>4</u>	11/17	<u></u>
	8.	Additional Comments:	Dome Ripe				
•		Degrosing -					
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Florida Power	CRYSTAL RIVER UN EACTOR BUILDING PRES TENDON 1115	TRESSING SYSTEM	Ca At Pa	iculation 8-95-0082 factorized B je B37
: JON IDENTIFICATION NUMBER	D311	CUT LE	ENGTH 14/3 - 5	*
HOP WASHER ID: PC 121				
GAI/QA vendor inspection		-		
2. Date tendon received on-				•
3. Date installed in condui	t5-22-74	Installation	NCR's	
Wires removed	Wires replaced	O Total	Ineffective wire	
i. Date buttonheaded	10-9-74 Butt	onheading NCR's		
Bad wires O Ac	cept. Reheads	2 Total I	neffective wires	
i. Date stressed	_			
Date restressed	Re	stressing NCR's		
		SHOP END		TOTAL
Flongation (1500 psi to	80% ult.)-Pred./Act.	4 3/4/4/6	4341458	931976
) wift-Off Pressure - Pred		<b>a</b> - <sup>1</sup>		
Shim Thickness/802 Vitim	nate Pressure	63817770	6317790	<u> </u>
Unseated/Broken Wires				
. Date Bulk-filled <u>3</u>				
Time since installation		•	· · · · ·	•
Date end caps refilled: 1. Data compiled by <u></u>	Shop	Field		
1. Data compiled by D.	Maller	Organization	Dalen	
•			27	•
J. Additional Comments:				
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	Florida Power	CRYSTAL RIVER UNIT REACTOR BUILDING PRESTR TENDON NISTO	ESSING SYSTEM RY	Color Atlac Page	
	•	BER <u>D 311</u>			
	••	CR FIELD		•	
	•••	ion cover letter number-1			
	• •	on-site			
3. 1	Date installed in con	duit	_ Installation	NCR's	
1	Wires removed	Wires replaced	Total	Ineffective wire	
4. 1	Date buttonheaded	Butto	nhesding NCR's	·	
:	Bad wires	Accept. Reheads	Total I	neffective wires	
5.	Date stressed	Str	essing NCR's		
	Date restressed	Rea	tressing NCR's	·	
			SHOP END	FIELD END	TOTAL
<b>`</b>	Elongation (1500 psi	to 80% ult.)-Pred./Act.		/	/_
)	Lift-Off Pressure - 1	Predicted/Actual			<u></u> N/A
	Shim Thickness/80% U	ltimate Pressure			<u>N/A</u>
	Unseated/Broken Wire	B Total (	effective wire	s after stressing	3
6.	Date Bulk-filled	Bulk-F	Liling NCR's _		
	Time since installat	ion Inlet 1	Pressure	Outlet Te	mp
	Date end caps refill	ed: Shop	Field		
7.	Data compiled by _2	D. Mallu	Organizatio	a Salam	
		• •	Date	4/11/2	
8.	Additional Comments:	Dome Repair		; 	
,	Percessing -	Field (7/15/12)			
		<u> </u>			
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	Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRES TENDON 1115	STRESSING SYSTEM	Cale Atta Pag	velative 5-95-4082 clament 6 : BJ9
С. Г.	ON IDENTIFICATION NUMB	er <u>D312</u>	CUT LE	NGTH	5 3/4
5H01	WASHER ID: PC	_ CR _ 1052 FIE	LD WASHER ID: PC_	<u>121</u> cri	<u>h55</u>
ł.	GAI/QA vendor inspecti	on cover letter numbe	T-FPC 1	57 DATE	4/30/14
2.	Date tendon received o	n-site <u>4-12-74</u>	RMR Number	38757	• 
3.	Date installed in cond	luit <u>5-22-74</u>	Installation	NCR'S	
	Wires removed 0	Wires replaced	O Total	Ineffective wire	
<b>;.</b>	Date buttonheaded	10-9-74 But	tonheading NCR's		
	Bad wires 0	Accept. Reheads	O Total In	neffective wires	
<b>j.</b>	Date stressed	12-6-74 s	tressing NCR's	,	
	Date restressed	1	lestressing NCR <sup>®</sup> S		
~	Elongation (1500 psi )	to 802 ult.)-Pred./Act		FIELD END	TOTAL 95/971
U.	) lft-Off Pressure - P:				
	Shim Thickness/802 Ul	•	•	•	•
	Unsested/Broken Wires	-			
•	Date Bulk-filled				
	Time since installati	· · · · · · · ·			
	Date end caps refille	d: Shop	Field	•	
•	Data compiled by Z	Malla	Organization	Salam	
		•	Date <u>4/1/</u>	77	•
;.	Additional Comments:				
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_	Florida Power	CRYSTAL RIVER U REACTOR BUILDING FRE TENDON HI	STRESSING SYSTEM	A	Henhatina 5-95-0082 Inchanest B Ige B48
) TENI	OON IDENTIFICATION NUM	BER 42H17		ENGTH 155 - 8	r*
• • •		CR 674 FIE		•	
1.	GAI/QA vendor inspect	ion cover letter numbe	er-FPC #98	61 DATE	2/12/14
		on-site <u>12-29-7</u>		•	
	•	duit74	•		
		Wires replaced			
4.		6-17-74 But	· · ·	-	
		Accept. Reheads			
5.		6-75			
	Date restressed		Restressing NCR's		
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Prod./Ac	t. 5/18 15 78	51/8 , 45/8	10/4 , 10/4
$\cup$		Predicted/Actual			
	Shim Thickness/802 U	ltimate Pressure	7 01851 7	6 ,7780	<u>N/A</u>
	Unseated/Broken Wire	Tota	l effective wire	s after stressing	s <u>163</u>
6.	Date Bulk-filled7	-26-74 Bulk			• •
	Time since installat	ion E months Inle	t Pressure 9	J/ Outlet Te	np. 142
	Date end caps refill	ed: Shop	Field		<i></i>
7.	Data compiled by-2	ed: Shop D. Mulla	Organizatio	n ala	· ·
			Date <u>11</u>	4/77	
8.	Additional Compents:	·			
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Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRES TENDON 1115	TRESSING SYSTEM	Culculari Attochans Page B41	m 5-75-8082 at 10
TENDON IDENTIFICATION NUM			•	
SHOP WASHER ID: PC 121	CR FIE1	D WASHER ID: PC	<u>121</u> CR_	906
. GAI/QA vendor inspect	lon cover letter number	-FPC 1992	DATE	2/2014
2. Date tendon received	on-site <u>12-20-73</u>	RHR Number	35528	
3. Date installed in con	•			
Wires removed	Wires replaced	O Total	Ineffective wires	
4. Date buttonheaded	-			
	Accept. Reheads			·
5. Date stressed3				
	R			
		SHOP END	FIELD END	
S Elongation (1500 psi	to 80% ult.)-Pred./Act	. 51/8-15	518 ,53/8	10/4/103/8
	Predicted/Actual			
Shim Thickness/80% U			63/8,7750	
- · · ·	s 0 Total			
6. Date Bulk-filled	· · · · · · · · · · · · · · · · · · ·			
Time since installat	ion <u>Comenths</u> Inle	t Pressure 13	Outlet Tem	. 148
Date end caps refill	ed: Shop	Field	•	
7. Data compiled by <u>/</u>	W. Ilm	Organization	Sall	m
		Date	/77	
8. Additional Comments:	· · ·		•	
6. Norstand Comerce	· ·····			
		<u>، المحمد المانية من معامل من المحمد من معامل من المحمد من المحمد من المحمد من المحمد من المحمد من المحمد من</u>	······	
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	Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PRUST TENDON HIST	RESSING SYSTEM	Calcul Attachi Page B	
) TEND	ON IDENTIFICATION NUME	ER <u>42419</u>	OUT LI	ENGTH 155-	1/2
SHOP	WASHER ID: PC /2/	CR 555 FIELD	WASHER ID: PC	12.1 CR	1013
1.	GAI/QA vendor inspects	lon cover letter number-	FPC 1 99	2/DATE	2/20/14
2.	Date tendon received (	on-site <u>12-28-73</u>	RMR Number	35528	
3.	Date installed in con	jult <u>/-22-74</u>	Installation	NCR's	
	Wires removedO	Wires replaced	O Total	Ineffective wire	. 0
4.	Date buttonheaded	6-18-74 Butto	onheading NCR's	<b></b>	
	Bad wires 0	Accept. Reheads	O Total I	neffective wires	0
5.	Date stressed2-	6.75 St	ressing NCR's _		
	Date restressed	Re	stressing NCR's	·	
	Elongation (1500 psi	to 80% ult.)-Pred./Act.	فحصية فتعتكم وتحصير التفتهيية	FIELD END	TOTAL 10/4110/4
$\cup$	Lift-Off Pressure - P			6810 ,6850	
	Shim Thickness/80Z UI			6/8 ,7780	N/A
	Unseated/Broken Wires	Total	effective wire	s after stressing	163 .
6.	Date Bulk-filled _7	-26-74 Bulk-B	illing NCR's		•
	Time since installat:	lon Gmonths Inlet	Pressure 2	Outlet Tem	p. 154"
		ed: Shop			
7.	Data compiled by	Malla	Organizatio	n <u>Salle</u>	21
			Date	1/17	
8.	Additional Comments:			•	•
			· · · · · · · · · · · · · · · · · · ·		
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	Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRE- TENDON 111	STRESSING SYSTEM	Culo Atta Page	ulation 5-95-0082 Ingeni B 1943
) _iend	ON IDENTIFICATION NUMB	ER <u> </u>	ע דע מיד ע	engtri <u>155'-</u>	7 /14
SHOP	WASHER ID: PC 121	_ CR _ <u>368</u> _ FIE	LD WASHER ID: PC		1233
1.	GAI/QA vendor inspecti	on cover letter numbe	r-FPC 1 9285	DATE	11/5/13
2.	Date tendon received o	n-site <u>10-4-7</u>	9 RMR Numbe	33356	
•	Date installed in cond	,		•	
	Wires removed 0	Wires replaced	O Total	Ineffective vire	
4.	Date buttonheaded				
	Bad wires 0	Accept. Reheads	O Total I	neffective wires	0
5.	Date stressed2	13-75	tressing NCR's _		
	Date restressed	J	Restressing NCR's	· <u></u>	
-			SHOP END	FIELD END	TOTAL
3	Elongation (1500 psi	to 80% ult.)-Pred./Ac	. 5/18 15/14	5/8,47/8	10/14 10/18
$\smile$	Lift-Off Pressure - P	redicted/Actual	6870 17000	6810,6800	<u>N/A</u>
	Shim Thickness/80% Vl	timate Pressure	61/16 17810	578, 380	<u>N/A</u>
	Unseated/Broken Wires	Tota	1 effective wire	after stressing	163
6.	Date Bulk-filled	<u>7-31-74</u> Bulk	-Filling NCR's		
		on <u>Gerronths</u> Inle			P. 128°
	Date end caps refille	d: Shop	Field		
7.	Data compiled by	Walla	Organizatio	a Salem	
	•		Date <u>+/+/</u>		
8.	Additional Comments:	••	· · · · · · · · · · · · · · · · · · ·	•	
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PRIST TENDON HIST	RESSING SYSTEM		Calculation 5-75-0082 Attachment B Page 844
) tene	ON IDENTIFICATION NUME	ER <u> </u>	OT LI	ENGTH	6
Shop	WASHER ID: PC /Z/	CR FIELI	D WASHER ID: PC	<u>120</u> cr	123
1.	GAI/QA vendor inspects	ion cover letter number	-FPC 199	20 DATE	2/20/14
2.	Date tendon received of	on-site <u>1-9-74</u>	MR Numbe	T <u>3578</u>	8
3.	Date installed in con-	Juit	Installation	NCR's	
	Wires removed	Wires replaced	O Total	Ineffective win	res
4.	Date buttonheaded	6-27-74 Butt	onheading NCR's		
	Bad wires O	Accept. Reheads	O Total I	neffective wire	
5.	•	2-28-75St			
		Re			
	Elongation (1500 psi	to 80% ult.)-Pred./Act.		FIELD END 51/8 , 51/8-	TOTAL 101/4 1078
$\cup$	Lift-Off Pressure - P			6790,6800	
	Shim Thickness/80% VI	timate Pressure	63/8,7810	63/8,7750	. N/A
	Unseated/Broken Wires	O Total	effective wire	s after stressin	8 163
6.		F-9-74 Bulk-1			
		ion 7 months Inlet			mp. <u>157</u>
	·	ed: Shop			
7.		? Malle.		" Sala	<u> </u>
		· · · ·	Date	4/17	
8.	Additional Comments:	· · · · · · · · · · · · · · · · · · ·			
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Calculation 8-95-0082
Attachment S
Page 245

REAL	CRYSTAL RIVER UNI CTOR BUILDING PREST TENDON HIST	RESSING SYSTEM	Atta • Page	ingent 9 945
) JENDON IDENTIFICATION NUMBER	42H33	OT LI	ENGTH	
SHOP WASHER ID: PC_121C				
. GAI/QA vendor inspection c	over letter number-	FPC 1 99	DATE	2/20/74
2. Date tendon received on-si				
3. Date installed in conduit				
Wires removedO	Wires replaced	O Total	Ineffective wire	
4. Date buttonheaded <u>6-</u>	27 -74 Butt	onheading NCR's	· · · · · · · · · · · · · · · · · · ·	
Bad wires O Acco				_
5. Date stressed <u>Z-14</u> .				
Date restressed			•	
· · ·		SHOP END	FIELD END	TOTAL
Elongation (1500 psi to 8	OX ult.)-Fred./Act.	5/14 153/8	518 15/4	10 1/4 , 10
) Lift-Olf Pressure - Predi			6810 6900	N/A
Shim Thickness/80% Ultima			7 3/8 1780	N/A
Unseated/Broken Wires				163
6. Date Bulk-filled 5-1				
Time since installation 2		_		np. 160°
Date end caps refilled:		Field		
7. Data compiled by De			n Sale	m
	and a second		1/77	
8. Additional Comments:				
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<del>مرد بر کوار دار بر مربوع با <sup>20</sup> نیز بر کار بر کار بر کار میں دی</del> ر .				
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	Florida Power	CRYSTAL RIVER UN REACTOR BUILDING PREST TENDON 1115	RESSING SYSTEM	Ca At Fa	iculation 8-95-0082 Inclament B Ice B46
ر. TEND، ـــ	ON IDENTIFICATION NUMB	ER 42H4	<u>3</u> at u	ансти <u>/55</u>	- 6 3/4
		CR FIEL			
1.	GAI/QA vendor inspects	on cover letter number	-FPC 199	<u>20</u> DAT	2/20/14
2.	Date tendon received of	on-site	RMR Number	36031	
3.	Date installed in cond	luit74	Installation	NCR'\$	
-	Wires removed	Wires replaced	O Total	Ineffective wi	res <u>O</u>
4.	Date buttonheaded	7-8-74 Butt	conheading NCR's		
	Bad wires O	Accept. Reheads	O Total I	neffective wire	s
5.	Date stressed2	-19-75 St	ressing NCR's		
	Date restressed	R4	stressing NCR's		
			SHOP END	FIELD END	TOTAL
	Elongation (1500 psi	to 80% ult.)-Fred./Act	5/18/5/2	5/18 ,5/18	10/4 10/8
~)	Lift-Off Pressure - P	redicted/Actual	6870 16750	6810 ,6700	<u>N/A</u>
	Shim Thickness/80% V1	timate Pressure	7/16 17810	6/14 17780	<u>N/A</u>
	Unseated/Broken Wires	Total	effective wires	s after stressi	ng <u>163</u> .
6.		7-31-74 Bulk-	· · · · · · · · · · · · · · · · · · ·		
	Time since installati	on <u>6 months</u> Inlet	Pressure 10 P	Outlet T	emp. <u>136</u>
	Date end caps refille	ed: Shop	Pield		
7.	Data compiled by I	? Malla	Organizatio	<u>Sal</u>	em
			Date <u>4/4/</u>	117	•
8.	Additional Comments:			· · ·	
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Florida CRYSTAL RIVER Power REACTOR BUILDING P TENDON	RI:STPESSING SYSTEM	Calcol Atlack Page 2	ntion 3-95-8082 Saeni B 147
) •TENDON IDENTIFICATION NUMBER 42 H	44 OT LE	NGTH 155-	6"
SHOP WASHER ID: PC / 22 CR / 230 F		· •	
1. GAI/QA vendor inspection cover letter num		•	
2. Date tendon received on-site /-/7			
3. Date installed in conduit			
Wires removed Wires replaced			
4. Date buttonheaded 7-10-74			
Bad wires O Accept. Reheads	-	•	
5. Date stressed 2-26-75			
Date restressed			
	SHOP END	FIELD END	TOTAL
Elongation (1500 psi to 80% ult.)-Pred./	Act. 5 1/8 , 51/8		10/4, 50%
) Lift-Off Pressure - Predicted/Actual		_	N/A
Shim Thickness/80% Ultimate Pressure	6/4 17250	7 , 7790	N/A
Unseated/Broken Wires To	tal effective wires	after stressing	163 .
6. Date Bulk-filled 7-31-74 Bu	•		· · · · · ·
Time since installation <u>6 months</u> In	let Pressure 14 P.	S/ Outlet Tem	np. 140°
· · · · · · · · · · · · · · · · · · ·			
Date end caps refilled: Shop 7. Data compiled by <u>D. Malla</u>	Organization	Sale	
		17	
8. Additional Comments:	•		
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	Florida Power	CRYSTAL RIVER UNI REACTOR BUILDING PREST TENDON HIST	RESSING SYSTEM	Atta	aistion 5-95-0082 clument 3 : 1748
) . TEND	ON IDENTIFICATION NUME	ER 4-2144	5 OT LE	NGTH 155'- 7	)
SHOP	WASHER ID: PC 121	CR _ <u>566</u> FIELD	WASHER ID: PC_	122_ CR	1194
1.	GAI/QA vendor inspecti	lon cover letter number-	FPC 17957	DATE .	2/25/74
		on-site			
	•	duit74			
	Wires removed	Wires replaced	O Total	Ineffective wire	s
4.	Date buttonheaded	7-10-74 Butto	onheading NCR's	•	
	Bad wires 0	Accept. Reheads	2 Total I	neffective wires	0
5.	Date stressedZ	- 20 - 75 St	ressing NCR's _		
	Date restressed	Re	stressing NCR's		•
			SHOP END	FIELD END	TOTAL
		to 80% ult.)-Pred./Act.			
·).	Lift-Off Pressure - H			6810 16900	<u>N/A</u>
	Shim Thickness/80% U			678,1780	<u>N/A</u>
	Unseated/Broken Wires	O Total	effective wire:	s after stressing	163
6.		<u>-31-74</u> Bulk-F			•
,	Time since installat:	ion <u>6 months</u> Inlet	Pressure 12	Outlet Ter	np. <u>140</u>
	Date end caps refill	· · · · · · · · · · · · · · · · · · ·	Field		7
7.	Data compiled by 📿	Malla	Organizatio	"_Sal	em
·			Date <u>4/4/</u>	<u>h1</u>	
8.	Additional Comments:				
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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRUSTRESSING SYSTEM TENDON HISTORY

C 8-75-00E2 Attach **X 3** Tage B49

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) Ju	DON IDENTIFICATION NUMBER 46420 CUT LENGTH 155-	1/4
Shoi	WASHER ID: PC 120 CR 78 FIELD WASHER ID: PC 122 CR	1138
1.	GAL/QA vendor inspection cover letter number-FPC / 9245 DATE	10/31/13
2.	Date tendon received on-site <u>1-17-73</u> RHR Number <u>32681</u>	
3.	Date installed in conduit <u>4-15-74</u> Installation NCR's	
	Wires removed Wires replaced Total Ineffective wires	0
4.	Date buttonheaded Buttonheading NCR's	
	Bad wires 13 Accept. Reheads 12 Total Ineffective wires	1
5.	Date'stressed 3-5-75 Stressing NCR's	
	Date restressed Restressing NCR's	
	SHOP END FIELD END	TOTAL
	Elongation (1500 psi to 80% ult.)-Pred./Act. 5. 15/14. 5/14. 5/18	10/4/10/8
$\cup$	Lift-Off Pressure - Predicted/Actual 6640 6930 6600	N/A
	Shim Thickness/80% Ultimate Pressure 73/817700 65/817610	<u>N/A</u>
•	Unseated/Broken Wires Z Total effective wires after stressing	160
6.	Date Bulk-filled 11-4-74 Bulk-Filling NCR's	· · ·
	Time since installation is incrite Inlet Pressure 50 poir Outlet Temp	• <u>130°</u>
	Date end caps refilled: Shop <u>414-75</u> Field <u>4-14-75</u>	
7.	Data compiled by D. Millin Organization Salem	
	Date 4/4/77	· ·
8.	Additional Comments:	······································
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	Florida Power	CRYSTAL RIVER U REACTOR BUILDING PRU TENDON H1	STRESSING SYSTEM	At	irulation 8-95-8082 Inchanent B ge B50
NE	OON IDENTIFICATION NU	HBER 46H2	OIT 1	ENGTH	4
SHOP	WASHER ID: PC /20	CR FIE	LD WASHER ID: PO	<u>122.</u> ci	1141
1.	GAI/QA vendor inspec	ction cover letter number	er-FPC I N/A	L DATE	
		i on-site 10-13-7			•
3.	Date installed in c	onduit 4-23-74	Installation	NCR's	
		Wires replaced			
4.		7-14-74 But			
		Accept. Reheads			
5.	• _	-7-75		•	
	. ,				_
			SHOP END	FIELD END	TOTAL
2	Elongation (1500 ps	i to 80% ult.)-Pred./Ac	2. 5/15/5/18	51/8 ,51/4	10/14/103/8
$\smile_{j}$	Lift-Off Pressure -			6730 16950	
	Shim Thickness/802	Vitimate Pressure	5 Str 17700	51/16 ,7640	<u>N/A</u>
. •	Unscated/Broken Wir	es Tota	1 effective wire	s after stressin	<u>8 162 </u>
6.	Date Bulk-filled	11-4-74 Bulk	-Filling NCR's	•	
	Time since installa	ation 6 12 months Inte	t Pressure <u>50.</u>	Oni. Outlet Te	mp. 130°
		11ed: Shop <u>4-14-74</u>			
7.		D. Malla			
			Date	14/11	
8.	Additional Comment	5;			
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CRYSTAL RIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM Calculation 6-95-00#2 Attachment B Page BS1

	WASHER ID: PC CR			•	
	AI/QA vendor inspection cover				
. 1	ate tendon received on-site _		RMR Numbe		<u></u>
, I	ete installed in conduit		Installation	NCR!s	· · ·
ĩ	Mires removed Wire	s replaced	Total	Ineffective wir	es
, I	ate buttonheaded	Butt	onheading NCR's	•	•
2	ad wires Accept.	Reheads	Total J	neffective wires	
. <b>I</b>	ate stressed	5t	ressing NCR's		••
	Date restressed				•
•	·····		• .	FIELD END	TOTAL
I	Clongation (1500 psi to 80% ul				
	Ift-Off Pressure - Predicted/	Actual (STPS)	1425.6 1 1457.5	1425.6, 1546	
S	Shim Thickness/80% Ultimate Pr	ressure	5%;	· · · · · ·	N/A
U	(- 440 Inseated/Broken Wires <u>D- M</u>	******		_	162
D	ate Bulk-filled	Bulk-F	illing NCR's		
	ime since installation				
T	Data end caps refilled: Shop Data compiled by $\underline{A}$ .	Full-		FAC	•
ų		- AD		1L-7R	. •
	Heren alebe	· ·			-781
•	dditional Comments: INSPE				5-10)
	NO INDICATION				
	2) LOCK-OFF FORCE				
2	3) NO INDIRATION	OF CRACK	ING AT	ANCHOR AGE	5
		x			• •

CETETAL BIVER UNIT NO. 3 REACTOR BUILDING PRESTRESSING SYSTEM TENDOM PORVEILLANCE RECORD TENDOM NO. 46H21								DOM NO46H21							
hapettick brief and bate	Locetion	Porce (kipe)	LIF Avg. Torce (tipe)	t off comp Shim Thickness (in)	Eleng-	Total Iffective Wires	Porca (tipo)	Avg. Verte (tipe)	BETENDIOUT Sbin Thickness (in)	Eleng- aclen (in)	Total S(foctive Vires	Toupere	e Bldg. Jeurs 97 Exe.	Comonto	
	2	3	4			7		9	10		12	- 13	14	15	
Driginal Stressing	5-6	1624	-	5_5/8	5 1/0		<u>#/A</u>	-	<u> </u>	¥/A	•				
<u>1-1-15</u>	<u>r-4</u>	1682	1653	5_9/16	<u>5 1/4</u>	162	<u>#/4</u>	1/1	<u>. 16/4.</u>	<u>#/A</u>	<u> 11/4</u>	<u>#/a</u>	<u>#/a</u>		
lat	8-6	1458	~~ <u>~</u> ~~~	5 3/4	<b>X/</b> A	<u> </u>	1458		5 3/4	¥/A	162	<u> </u>	<u></u>		
-10-78	<u>r-4</u>	1546	1502	5 9/16	<u>#/A</u>	163	1514	1536	5 9/16	¥/A	145	106	41		
5 TH 17/93	<u>5-6</u> E-4	<u>1423</u> 1427	1425	<u>5%</u> 5%	NIA NIA	142	NA NIA	NA	rla rla	NIA NIA	م/بر	120	_ <u>68</u> °	15 GALANE OF GRONSE ADDO G TEMOVED.	
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# ATTACHMENT 1 Sheet 1 of 1 QA or Vital Records Change Form

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FORM RDC-NGGC-0001-1-15

Original Document Number/Description: \_\_\_\_\_ Or K ORDER No. (081043-01

Original Record Number (RMS (Record Nbr), STAIRS (Din Nbr), SEEK (RAN Nbr):

NOTE: When transmitting the Correction or Supplement add "Supplement" to the document title field.

## QA RECORD

RDC-NGGC-0001	Day, 47	
	Rev. 17	Page 35 of 66

## Evaluation and Acceptance of PSC Tendon Surveillance Results (30<sup>th</sup> Year)

The surveillance was conducted by Precision Surveillance Corporation (PSC) between October and November 2007 with CR-3 site overview utilizing SP-182 as the controlling site procedure. The actual procedures used for testing activities were contained in the PSC In-Service Inspection Manual for Progress Energy Crystal River Unit 3 (N1002) Revision 0. This 30<sup>th</sup> year surveillance met all the requirements of ASME Section XI, subsection IWL as modified by 10CFR50.55(a). The results of this surveillance have shown that the CR-3 containment structure has not experienced abnormal degradation and is projected to meet its minimum design criteria until the end of its current forty-year life.

### Code Compliance.

#### IWL-2400: Schedule

CR-3 performed the Structural Integrity Test in November of 1976. The code required the 30<sup>th</sup> year surveillance is to be performed in November of 2006 +/- 1 year. Since the 30<sup>th</sup> surveillance was performed between October and November 2007 this requirement was met.

## IWL-2510: Examination of Concrete

The concrete was visually examined (VT-3) during the 30<sup>th</sup> surveillance period. For areas that required further evaluation, a detailed visual exam (VT-1) was performed. The data was reviewed by the Responsible Professional Engineer (RPE) and found to be acceptable.

## IWL-2520: Examination of Unbonded Post-Tensioning Systems

The random selection for CR-3 resulted in three Dome, three Vertical and 5 Horizontal tendons being selected. These tendons were D129, D212, D238, 12V01, 45V20, 61V17, 46H21, 42H46, 51H34, 62H30 and 13H36. It was later determined that 12V01 (identified as a control tendon) was retensioned during the prior surveillance. Per IWL-2521 (b), 61V08 was selected as a substitute control tendon. Although not identified as an exempted tendon the IWL-2524 and IWL-2525 examinations were performed on the original selected tendon (12V01).

## IWL-2522: Tendon Force Measurements

Tendon force measurements were performed on the selected sample and adjacent tendons as required. All vertical and dome tendons tested this inspection period were found to have forces greater than 95% of the corresponding predicted force. Of the hoop tendons, 42H46 and 51H34 were observed with forces above 95% of their predicted force. Tendons 62H30, 46H21 and 13H36 were found to have forces below 95% but above 90% of their corresponding predicted forces. While monitoring the forces of tendons adjacent to the respective surveillance tendons, PSC NCR's FN1002-001, 002, 003, 006, 007, 008, 009, 011 and 012 were generated to document the conditions and were dispositioned by CR03ENG in AR's 251318 and 252558. After the completion of testing the adjacent tendons, all tendons with an as-found force below 95% were restored to an as-left force –0%, +6% of their corresponding predicted force in accordance with PSC Procedure SQ9.0. The acceptance criteria of IWL-3221.1 were met for all the tendons with the exception of tendon 62H30, 13H36, and 46H21. The analysis of the as-found lift-off forces contained in the PSC final report, demonstrates that the as-found condition is acceptable for these tendons. Part of the analysis is a



discussion on the calculation of the predicted base value for each tendon. Historically CR-3 has found numerous tendons below the 95% of predicted base value, but demonstrated the acceptability of the containment with the as-found condition.

IWL-2523: Tendon Wire and Strand Sample Examination and Testing Tendons D238, 61V17 and 51H34 were detensioned and a wire removed for testing. The acceptance criteria of IWI-3221.2 were met for all wire samples.

## IWL-2524: Examination of Tendon Anchorage Areas

A VT-1 visual examination was performed for all tendons when the end cap was removed. The detailed inspections did not reveal any cracks in the concrete adjacent to the bearing plates nor in any of the anchorage components. There were several instances of missing or broken wires observed. These instances were compared against the acceptance criteria contained in IWL-3321.3 and SP-182 and found to be acceptable. Therefore no further analysis was required for these conditions.

IWL-2525: Examination of Corrosion Protection Medium and Free Water There were no instances of free water in the corrosion protection medium. The acceptance criteria of IWL-3221.4 were met for all samples taken.

IWL-2526: Removal and Replacement of Corrosion Protection Medium The amount of grease removed and replaced was recorded for each tendon.

10CFR50.55(a)(b)(viii) Examination of Concrete Containments

- (a) During the visual exam, all grease caps were examined for leakage and deformation. No grease leakage or deformation was observed. Minor weepage continues to be observed on the intermediate building buttresses. See (d) (3) below for further discussion.
- (b) The evaluation of the trend data does not indicate an adverse trend.
- (c) The elongation of any tendon during restressing did not vary from previously recorded results by more than 10% and therefore was acceptable.
- (d) The following items shall be included in the RFO 15 NIS-1 report:
  - (1) The presence of water in the grease sample. There was no water recorded for this surveillance.
  - (2) The absolute difference between the amount of grease removed and the amount replaced did not exceed 10% of the net duct volume in any of the tendons.
  - (3) Detection of grease leakage (if found). During the tendon accessibility walkdown PSC noted that small grease/oil leaks were occurring on multiple tendon caps, which were located inside existing structures that adjoin the containment building (adjacent to main steam and feedwater penetrations). The substance displacing from the tendon cap is actually the oil portion from the original P2 grease that has separated. This is a common occurrence that we has been noted throughout many plants which perform tendon surveillances. This condition does not correspond to the system's degradation. A small amount of oil can cause a large aesthetically unpleasing condition. On buttresses without any coating, the oil is absorbed into the concrete, leaving very little signs of leakage. However, in the existing condition, the coated surface does not allow for the absorption to occur.

Therefore, the oil continues to displace down the buttress face. PSC recommends this condition be monitored and cleaned on a periodic. Gasket replacement can be performed on the tendon cap, however the oil will continue to leak from the cap based on PSC's experience. The labor and material required for the gasket replacement is not cost effective and PSC does not recommend performing such task.

Based on the evaluation of the In-Service Inspection results of the 30<sup>th</sup> Year Containment IWL Tendon Surveillance performed at CR-3 have been determined to meet the code requirements and that the containment structure has experience no abnormal degradation of the post-tensioning system. The containment post-tensioning system is performing in accordance with the design requirements and is expected to continue to do so for the remaining life of the unit.

Rick Portmann (IWE/IWL Program Owner)

**Reviewed By:** 

Prepared By:

Joe Lese (Designated CR3 IWE/IWL RPE)

**Reviewed By:** 

NBIZSGTANI Loyd Larramore (ANII)

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F		30 <sup>14</sup> YEAR TENDON SURVEIL	LANCE AT CRYSTAL RIVER	DATE: <u>01/24/08</u>	- Progress Energ
		ABS	STRACT		
nergy	Florida Crystal Rive	s to present the results of the results of the er Unit 3 Containment Struct the body of this report and ar	ture post tensioning syste	m. The results of this	
1.	(Chlorides, Nitrates neutralization numb	r (grease) samples were tes s, and Sulfides). All tendon bers were above the IWL re grease was noted either by	ends had a moisture cont equirement of 0.0 mg KOH	tent within acceptable I/g value and acceptat	limits. All ble. No visible
<b>2</b> .	No tendon end exh anchorage.	nibited water during remova	I of the grease cap, deten	sioning or around the t	endon
3.		on levels were found on all cks in the concrete surround			
4.		or protruding buttonheads en reported via NCR's FN1 osition.			
5.	The subsequent reperiod. However, a	concrete examination for U equired examination of the c all of the examinations asso ilts are reviewed and report	containment concrete was ociated with this IWL requi	performed during this	30 <sup>th</sup> Year
6.		s used for liftoffs, detension le variation of +/- 1.5%.	ing and retensioning tend	ons were calibrated an	id found to be
7.	95% of the corresp until one tendon, or	idons monitored for forces to conding predicted force OR in both sides of the original ent found below 95% were r	, if found below 95%, had scope tendon, met the lift-	their adjacent tendons off force criteria. All to	inspected endons, both
8.		endons were retensioned w d from detensioned tendons nd tensile tests.			
<b>9</b> .		esealed and regreased to a edure, which is included in A		lance with SQ12.1 of the	he PSC
<b>10</b> .	evidence of system	As-found" force levels to the n degradation. The amoun plants of this age and does	t of force loss since the or	iginal installation is cor	nparable to
onclus	sion is reached that i	d during the 2007 30 <sup>th</sup> Year no abnormal degradation o er Unit 3 Containment Struc	of the Post Tensioning Sys		
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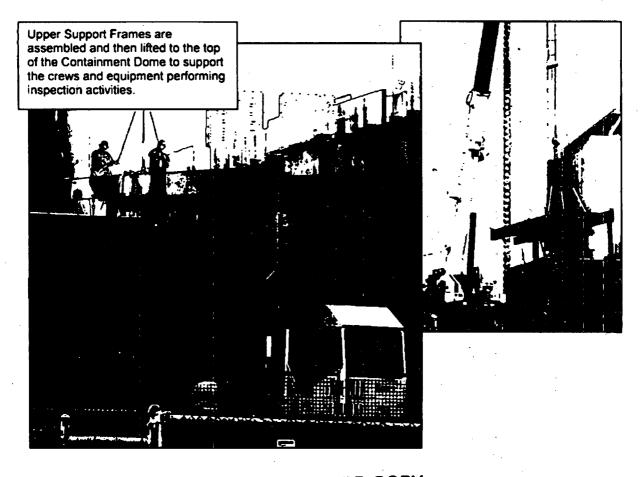
### **1.0 INTRODUCTION**

This report details the 30<sup>th</sup> Year Containment IWL Inspection of the Progress Energy Florida Crystal River Unit 3 containment structure. The Containment Structure surveillance program is a systematic means of assessing the quality and structural performance of the post tensioning system and exterior concrete surface.

The tendon surveillance program consists of a periodic inspection of the condition of a selected group of tendons. This program provides confidence in the condition and functional capability of the system, and an opportunity for timely corrective measures if adverse conditions are detected. Physical tendon surveillance consists of: sheathing filler inspection and testing, anchorage inspection, force monitoring, inspection and tensile testing of removed wire samples (for detensioned tendons), retensioning of detensioned tendons and replacement of sheathing filler after completion of all inspections.

Crystal River Unit 3 is currently committed to meet the requirements of the American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section XI, 1992 Edition with 1992 Addenda, Sub-Section IWL "Requirements for Class CC Concrete Components of Light-Water Cooled Plants". This program is also subject to the limitations and modifications of 10 CFR 50.55a(b)(2), 10 CFR 50.55a(g)(4), and 10 CFR 50.55a(g)(6).

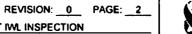
The 30<sup>th</sup> Year tendon surveillance at the Crystal River Unit 3 began on October 8, 2007 and ended on December 6, 2007. This surveillance period consisted of a Physical Inspection on Unit 3. The Crystal River Reactor Building Structural Integrity Tendon Surveillance Program (SP-182), PSC Surveillance Procedures, the Code of Federal Regulations 10 CFR 50.55a and ASME Section XI, Sub-Section IWL, define the specific requirements for selection of the inspection tendons as well as specific requirements and acceptance criteria for the performance of the inspection. A copy of the PSC Surveillance Procedures is included in Appendix F of this Surveillance Report. The tendon selection for the Surveillance is listed in the following Tables 1 and 2.



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	-			ISUA			7	PHYS		_		
TENDON	END	SQ6.0	SQ6.1	SQ7.0	SQ8.0	SQ8.3	SQ9.0	SQ10.2	SQ10.3	SQ11.0	SQ12.1	COMMENTS
12V01	D&G	•	•	•	•	•	•				•	STEAM ZONE @ DOME
45V20	D&G		•	٠	•	•	•				•	ORIGINAL SCOPE
61V17	D&G	•	•	•	•	•	•	•	•	•	•	DETENSION
61V08	D&G	•	•	•	•	•	•				•	COMMON (REF. FCR-FN1002-001)
13H36	BT. 1 & 3	•	•	•	•	•	•				•	
42H46	BT. 2 & 4	•	•	•	•	•	•				•	STEAM ZONE @ BT2
46H21	BT. 4 & 6	•	•	•	•	•	•	<b> </b>	ļ		•	COMMON
51H34	BT. 5 & 1	•	•	•	•	•	•	•	•	•	•	DETENSION, STEAM ZONE @BT1
62H30	BT. 6 & 2	٠	•	•	•	•	•				•	STEAM ZONE @BT 2
46H07	BT. 4 & 6		[			<u> </u>	<u> </u>		<b> </b>			ALTERNATE
D129	BT. 3 & 5	•	•	•	•	•	•				•	STEAM ZONE @BT3
D212	BT. 1 & 3	•	•	•	•	•	•				•	COMMON
D238	BT. 4 & 6	•	•	•	•	•	•	•	•	•	•	DETENSION
D337	BT. 1 & 5											ALTERNATE

LEGEND

H

SQ 6.0 - GREASE CAP REMOVAL SQ 6.1 - INSPECTION FOR WATER SQ 7.0 - AQUIRE GREASE SAMPLES

SQ 8.0 - ANCHORAGE INSPECTION SQ 8.3 - CONCRETE INSPECTION SQ 9.0 - MONITOR TENDON FORCE SQ 10.2 - TENDON WIRE INSPECTION SQ 10.3 - TESTING TENDON WIRES SQ 11.0 - RETENSION TENDONS

SQ 12.1 - GREASE REPLACEMENT

Once Installed on the Containment Dome, the Frames support the work platform and a hoist for the hydraulic ram.

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·	TABLE	230	<sup>гн</sup> ҮЕ,	AR AI	DDITI	OŃĄL	SCO	PE O	F WO	RK	ÀDUÁ	CENT TIENDONS
			٧	ISUA	L			PHYS	SICAL			
TENDON	END	SQ 6.0	SQ 6.1	SQ 7.0	SQ 8.0	SQ 8.3	SQ 9.0	SQ 10.2	SQ 10.3	SQ 11.0	SQ 12.1	COMMENTS
13H33	BT. 1 & 3	•	٠		•		•				•	DUE TO LOW LIFT OFF ON 13H38
13H34	BT. 1 & 3	•	•		٠	{	•			•	•	DUE TO LOW LIFT OFF ON 13H38
13H35	BT. 1 & 3	•	•		•		.•			•	•	DUE TO LOW LIFT OFF ON 13H36
13H37	BT. 1 & 3	•	٠		•	Î – – – – – – – – – – – – – – – – – – –	•			•	•	DUE TO LOW LIFT OFF ON 13H36
13H38	BT. 1 & 3	•	•		•		•				•	DUE TO LOW LIFT OFF ON 13H38
46H19	BT. 4 & 6	•	٠		•		٠				•	DUE TO LOW LIFT OFF ON 46H21
46H20	BT. 4 & 6	•	•		•		•			•	•	DUE TO LOW LIFT OFF ON 46H21
46H22	BT. 4 & 6	•	•		٠		٠			•	•	DUE TO LOW LIFT OFF ON 46H21
46H23	BT. 4 & 6	•	•		•		•			•	•	DUE TO LOW LIFT OFF ON 46H21
46H24	BT. 4 & 6	•	•		•		•			•	٠	DUE TO LOW LIFT OFF ON 46H21
62H29	BT. 6 & 2	•	٠		•		٠				•	DUE TO LOW LIFT OFF ON 62H30
62H31	BT. 6 & 2	•	•		•		٠			•	•	DUE TO LOW LIFT OFF ON 62H30
62H32	BT. 6 & 2	•	•		•		•			•	•	DUE TO LOW LIFT OFF ON 62H30
62H33	BT. 6 & 2	•	•		•		٠			•	•	DUE TO LOW LIFT OFF ON 62H30
62H34	BT. 6 & 2	•	•		•	1	•				•	DUE TO LOW LIFT OFF ON 62H30
						İ						

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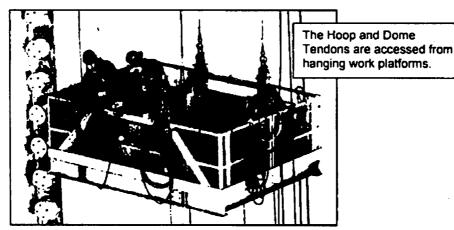
Physical inspection of 62H31 & 62H32 were only performed on the Buttress 2 end. Access restrictions limited the Buttress 6 to visual inspections only

LEGEND

SQ 6.0 - GREASE CAP REMOVAL SQ 6.1 - INSPECTION FOR WATER SQ 7.0 - AQUIRE GREASE SAMPLES SQ 8.0 - ANCHORAGE INSPECTION

SQ 8.3 - CONCRETE INSPECTION

SQ 9.0 - MONITOR TENDON FORCE SQ 10.2 - TENDON WIRE INSPECTION SQ 10.3 - TESTING TENDON WIRES SQ 11.0 - RETENSION TENDONS SQ 12.1 - GREASE REPLACEMENT



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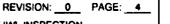
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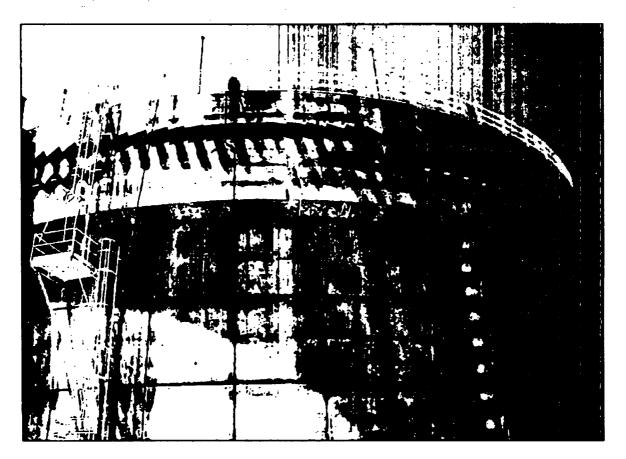
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## 2.0 SURVEILLANCE PROCEDURES

Appendix F of this Surveillance Report contains the detailed procedures for conducting the tendon surveillance. The surveillance consists of the following steps:

- 2.1 Visual examination of sheathing filler grease.
- 2.2 Analytical testing of sheathing filler grease samples.
- 2.3 Inspection of the anchorage assembly of each of the surveillance tendon ends for deleterious conditions such as corrosion, cracks, broken or missing wires or buttonheads.
- 2.4 Inspection of concrete surrounding the bearing plate.
- 2.5 Measurement of the liftoff force for each physical surveillance tendon.
- 2.6 Removal of one wire from surveillance tendons, which are detensioned for examination and testing.
- 2.7 Retensioning of detensioned tendons and measuring the corresponding tendon elongation.
- 2.8 Visual inspection for corrosion, pitting, or any significant physical change of the removed wires.
- 2.9 Testing of wires removed from tendons for yield strength, ultimate strength, and percentage elongation at failure.
- 2.10 Resealing tendon caps and replacement of lost sheathing filler into the tendon duct and cap.
- 2.11 Evaluation of test and inspection results to assess the general condition of the post tensioning system.





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#### SHEATHING FILLER ANALYSIS 3.0

- 3.1 A sample of sheathing filler (grease) was removed from each end of the surveillance tendons. Chemical tests were performed on each sample by Suburban Laboratories, Inc. The results are presented in Appendix B and are summarized in Tables 3 thru 5. In Tables 3 thru 5, "N/A" indicates that samples were not required for testing.
- 3.2 The maximum acceptable limits are: 10 percent by weight for water content and 10 parts per million for water-soluble chlorides, nitrates and sulfides. All samples that were tested met the acceptance criteria as stated above.
- 3.3 The sample testing report also includes the neutralization number of each grease sample. This test is generally performed by grease manufacturers on new batches of the product and is a method of determining the overbase additives in the grease. Degradation of the sheathing filler will yield a change in the acidity of the filler material as well as an increase in the ion content. The required neutralization number for the mixture of grease at Crystal River Unit 3 is greater than 0.0 mg KOH/g. This requirement was achieved by all samples tested.
- 3.4 No detrimental condition was noted on any grease samples, and no visible breakdown of the grease by either color or consistency was noted on any of the tendons tested.

TAB	TABLES VERTICALS LABORATORY ANALYSIS OF SHEATHING FILLER										
TENOON			CENTRATIO	N (PPM)	WATER	NEUTRAL					
TENDON	END	CHLORIDE	SULFIDE	NITRATE	CONTENT (%wt)	No. (mg KOH/g)					
12V01	TOP	<0.50	<0.50	<0.50	0.19	71.5					
12401	BOT	0.50	<0.50	<0.50	0.31	51.9					
45V20	TOP	<0.50	<0.50	<0.50	0.19	72.3					
43470	BOT	0.50	<0.50	<0.50	0.34	60.2					
CA1/20	TOP	0.50	<0.50	<0.50	0.16	68.4					
61V08	BOT	0.50	<0.50	<0.50	<0.10	<u>48.0</u>					
641/47	TOP	0.50	<0.50	<0.50	<0.10	61.5					
61V17	BOT	0.50	<0.50	<0.50	<0.10	43.4					

#### ACCEPTANCE LIMITS

TEST WATER SOLUBLE CHLORIDE WATER SOLUBLE NITRATES WATER SOLUBLE SULFIDES WATER CONTENT NEUTRALIZATION NO.

LIMITS LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10% DRY WEIGHT GREATER THAN 0.0 mg KOH/

After the grease cap is removed, samples of grease are taken for all tendons requiring a visual or physical inspection.



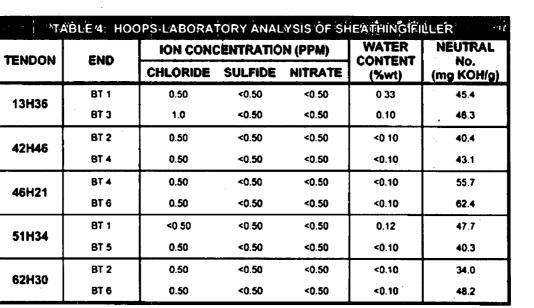
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#### ACCEPTANCE LIMITS

TEST WATER SOLUBLE CHLORIDE WATER SOLUBLE NITRATES WATER SOLUBLE SULFIDES WATER CONTENT NEUTRALIZATION NO. LIMITS LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10% DRY WEIGHT GREATER THAN 0.0 mg KOH/

· т/	TABLE 5: DOMES-LABORATORY ANALYSIS OF SHEATHING FILLER										
TENDON	END	ION CON	ENTRATIO	% WATER	NEUTRAL						
IENDUN	GNU	CHLORIDE	SULINCE		CONTENT (%wt)	No. (mg KOH/g)					
D129	BT 3	0.50	<0.50	<0.50	0.91	50.2					
0129	BT 5	0.50	<0.50	<0.50	0.48	42.9					
D212	BT 1	0.50	<0.50	<0.50	0.17	54.3					
0212	BT 3	0.50	<0.50	<0.50	0.18	. 44.0.					
D238	8T 4	0.50	<0.50	<0.50	0.17	45.2					
D230	BT 6	0.50	<0.50	<0.50	<0.10	43.3					

#### ACCEPTANCE LIMITS

TEST WATER SOLUBLE CHLORIDE WATER SOLUBLE NITRATES WATER SOLUBLE SULFIDES WATER CONTENT NEUTRALIZATION NO. LIMITS LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10.0PPM LESS THAN 10% DRY WEIGHT GREATER THAN 0.0 mg KOH/



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- 1		•					

### 4.0 ANCHORAGE COMPONENTS

In the following discussion, all procedures referred to are included in Appendix F of this report and all data sheets are included in Appendix A.

- 4.1 SQ6.0 GREASE CAP REMOVAL
- 4.1.1 Inspection of the anchorage components began by removing the grease cap (PSC Procedure SQ 6.0). Complete grease coating (100%) was found on all tendon ends inspected. The percentage of grease coverage was recorded on Data Sheet SQ 6.0 with the results tabulated in Tables 6 thru 11.

HIN AT A HAR HABLE 6: VERTICALS ISOGIO HOREASEIGAPIREMOVAL + + +										
			GREASE COATING (%)							
TENDON	END	GREASE CAP	BUTTON HEADS	ANCHOR HEAD	SHIMS	BEARING PLATE				
12V01	TOP	100	100	100	100	100				
12401	BOT	100	100	100	100	100				
45V20	TOP	100	100	100	100	100				
45720	BOT	100	100	100	100	100				
61V08	TOP	100	100	100	100	100				
01400	BOT	100	<u>,</u> 100	100	100	100				
641/47	TOP	100	100	100	100	100				
61V17	BOT	100	100	100	100	100				



Before the Grease Cap is removed, a plastic bag is taped to the concrete in order to catch any grease that might fall during removal.

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12.50 TABLE 7: HOOPS SQ6:0 SGREASE CAPIREMOVAL , 1 **GREASE COATING (%)** TENDON END GREASE BUTTON ANCHOR BEARING SHIMS HEAD CAP HEADS PLATE BT 1 100 100 100 100 100 13H36 BT 3 100 100 100 100 100 BT 2 100 100 100 100 100 42H46 **BT 4** 100 100 100 100 100 BT 4 100 100 100 100 100 46H21 BT 6 100 100 100 100 100 BT 1 100 100 100 100 100 51H34 BT 5 100 100 100 100 100 BT 2 100 100 100 100 100 62H30 BT 6 100 100 100 100 100

1 to 1		TABLE 8: DOM	ES - SQ6.0 - GR	EASE CAPPREN	OVAL	
			GR	EASE COATING	(%)	
TENDON	END	GREASE CAP	BUTTON HEADS	ANCHOR HEAD	SHMS	BEARING PLATE
D129	BT 3	100	100	100	100	100
0129	BT 5	100	100	100	100	100
D242	BT 1	100	100	100	100	100
D212	BT 3	100	100	100	100	100
	BT 4	100	100	100	100	100
D238	BT 6	100	100	100	100	100



Grease Cans are removed using an impact wrench. While workers take care to support the weight of the can filled with grease.

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Percenta -								
			GR	EASE COATING	(%)			
TENDON	END	GREASE CAP	BUTTON HEADS	ANCHOR HEAD	SHIMS	BEARING PLATE		
421122	BT1	100	100	100	100	100		
13H33	<b>BT3</b>	100	100	100	100	100		
13H34	BT1	100	100	100	100	100		
	873	100	100	100	100	100		
401105	BT1	100	100	100	100	100		
13H35	BT3	100	100	100	100	100		
	BT1	100	100	100	100	100		
13H37	<b>BT3</b>	100	100	100	100	100		
421120	BT1	100	100	100	100	100		
13H38	BT3	100	100	100	100	100		

14	TABLE 10: 46H21 ADJACENTHOOPS SOG OF GREASE CAP REMOVAL								
			GREASE COATING (%)						
TENDON	END	GREASE CAP	BUTTON HEADS	ANCHOR HEAD	Shims	BEARING PLATE			
46H19	8T4	100	100	100	100	100			
401119	BT6	100	100	100	100	100			
	BT4	100	100	100	100	100			
46H20	BT6	100	100	100	100	100			
401100	BT4	100	100	100	100	100			
46H22	BT6	100	100	100	100	100			
	BT4	100	100	100	100	100			
46H23	BT6	100	100	100	100	100			
	BT4	100	100	100	100	100			
46H24	BT6	100	100	100	100	100			



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E TABLE #1: 62H30 ADJACENT HOOPS - SQ6.0 = GREASE CAP REMOVAL 19 - 1 - 19 - 19 **GREASE COATING (%)** TENDON END GREASE BUTTON ANCHOR BEARING SHIMS PLATE HEADS HEAD CAP BT2 100 100 100 100 100 62H29 BT6 100 100 100 100 100 BT2 100 100 100 100 100 62H31 BT6 100 100 100 100 100 BT2 100 100 100 100 100 62H32 8T6 100 100 100 100 100 BT2 100 100 100 100 100 62H33 BT6 100 100 100 100 100 BT2 100 100 100 100 100 62H34 **BT6** 100 100 100 100 100

#### 4.2 SQ6.1 - INSPECT FOR WATER

4.2.1 Water Inspections were recorded on Data Sheet SQ 6.1 and are summarized in Tables 12 and 13. No water was found in any tendon inspected or around the tendon anchorage either during removal of the grease cap or detensioning.

	TABLE	12: ORIGINAL S	OPE - SQ6.1 - INSPECT FO	RWATER	•
SURVE	EILLANCE T	ENDONS	SURV	EKLANCE TE	HOONS
TENDON	END	WATER QUANTITY (oz.)	TENDON	END	WATER QUANTITY (oz.)
12V01	TOP	0	46H21	BT 4	0
	BOT	0	401121	BT 6	0
45V20	TOP	0	51H34	BT 1	0
43470	BOT	0	51134	BT 5	o
61V08	TOP	0	62H30	BT 2	0
01400	BOT	0	021130	BT 6	, <b>O</b>
61V17	TOP	0	D129	BT 3	0
01411	BOT	0	0129	BT 5	0
13H36	BT 1	0	D212	BT 1	0
13030	BT 3	0		BT 3	0
42H46	BT 2	0	D238	BT 4	0
421140	BT 4	0	0236	BT 6	0



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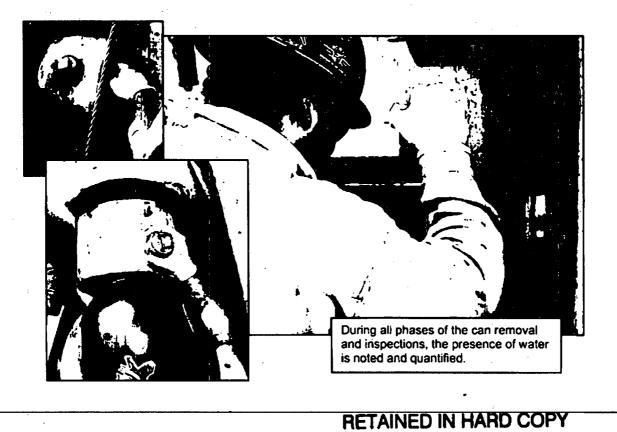
30<sup>TH</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL RIVER



•	TABLE	3. ADDITIONAL	SCOPESSO
AD.	JACENT TEN	DONS	
TENDON	END	WATER QUANTITY (oz.)	
13H33	BT 1	0	
101100	BT 3	0	
13H34	BT 1	0	
13134	8T 3	0	
13H35	BT 1	0	
13/135	BT 3	0	
13H37	BT 1	0	
131137	BT 3	0	
13H38	8T 1	0	
13/130	BT 3	· 0	
46H19	BT 4	0	
401113	BT 6	0	
46H20	BT 4	0	·
401120	BT 6	0	
46H22	BT 4	0	]
401122	BT 6	0	

TENDON	END	WATER QUANTITY (02.)
46H23	' BT 4	0
40123	BT 6	0
46424	BT 4	0,
46H24	BT 6	o
62H29	BT 2	0
021129	BT 6	0
62H31	BT 2	Ó
021131	BT 6	0
62H32	BT 2	0
021132	BT 6	0
62H33	BT 2	0
02033	BT 6	0
62H34	BT 2	0
021134	BT 6	0

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4.3		AGE CORROSION CONDITON	nected for

4.3.1 The anchorage components (anchorhead, buttonheads, shims and bearing plate) were inspected for corrosion level and cracks per PSC Procedure SQ 8.0. The results were recorded on Data Sheet SQ 8.0 and are summarized in Tables 14 thru 19. In Tables 14 thru 19, "N/A" indicates the Anchor I.D. was not detected.

4.3.2 The corrosion level for all of the inspected anchorage assemblies and wire was either:

1 - Bright metal; no visible oxidation.

INDICATES CORROSION LEVEL

Or

2 – Metal reddish brown color, no pitting.

4.3.3 No evidence of cracking was observed on any of the anchorage components.

44									
		ANCHOR		CORR	CORROSION LEVEL, CRACKS				
TENDON	END	I.D.	BUTTON HEADS	ANCHOR HEAD	SHIMS	BEARING PLATE			
12V01	TOP	CR650	1	1, NONE	2, NONE	2, NONE			
12401	BOT	N/A	1	1, NONE	2, NONE	2, NONE			
451/00	TOP	CR850	2	2, NONE	2, NONE	2, NONE			
45V20	вот	CR260	1	2. NONE	2, NONE	2, NONE			
CA1/00	TOP	CR933	1	1, NONE	2, NONE	2, NONE			
61V08	BOT	CR300	1	1. NONE	2, NONE	2, NONE			
	TOP	CR943	1	1, NONE	2, NONE	2, NONE			
61V17	BOT	CR256	. 1	2, NONE	2, NONE	2, NONE			

🗩 1, NONE ሩ 🗸

INDICATES # OF CRACKS

1 – Bright metal, No visible oxidation.

2 - Metal reddish brown color, no pitting.

3 - Metal having patches of red oxide



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TABLE 15: HOORS - SQB:0 - ANCHORAGE CORROSION CONDITION **CORROSION LEVEL, CRACKS** ANCHOR BUTTON TENDON END ANCHOR BEARING HEADS **I.D**. SHIMS HEAD PLATE BT 1 CR618 2. NONE 2, NONE 2, NONE 1 13H36 BT 3 CR1167 2. NONE 2. NONE 1 2. NONE BT 2 CR1170 1 1, NONE 2, NONE 2, NONE 42H46 **BT 4** CR529 1, NONE 2, NONE 1 2, NONE BT 4 CR1141 1, NONE 2, NONE 1 2, NONE 46H21 BT 6 CR167 1 1, NONE 2, NONE 2, NONE **BT** 1 CR459 1 1, NONE 2, NONE 2, NONE 51H34 BT 5 CR943 1 1, NONE 2, NONE 2, NONE BT 2 **CR96** 1 1, NONE 2, NONE 2, NONE 62H30 **BT 6** CR609 1, NONE 2. NONE 2, NONE 1

INDICATES CORROSION LEVEL

🗩 1, NONE 🖛

~ INDICATES # OF CRACKS

1 - Bright metal, No visible oxidation.

2 - Metal reddish brown color, no pitting.

3 - Metal having patches of red oxide.

	TABLE	16: DOMES	- SQ8.0 <sup>1</sup> -AN	CHORAGE CORF	ROSION CONDIT	ION
:		ANCHOR	BUTTON	CORR	DSION LEVEL, C	RACKS
TENDON		I.D.	HEADS	ANCHOR HEAD	SHIIAS	BEARING PLATE
D129	BT 3	CR996	1	1, NONE	2, NONE	2, NONE
0129	BT 5	CR866	2	2. NONE	2. NONE	2, NONE
D242	BT 1	CR1032	1	2, NONE	2, NONE	2. NONE
D212	BT 3	CR1214	1	1. NONE	2, NONE	2. NONE
0000	BT 4	CR657	1	1, NONE	2, NONE	2, NONE
D238	8T 6	CR1029	1	1, NONE	2, NONE	2, NONE

🗩 1, NONE 🖛

#### INDICATES CORROSION LEVEL ~

- INDICATES # OF CRACKS

1 - Bright Metal, No visible oxidation.

2 - Metal reddish brown color, no pitting.

3 - Metal having patches of red oxide.



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		ANCHOR	BUTTON	CORRO	SION LEVEL, CR	ACKS
TENDON	END	I.D.	HEADS	ANCHOR HEAD	SHIMS	BEARING PLATE
13H33	BT 1	CR518	1	1, NONE	2, NONE	2, NONE
13833	BT 3	CR1200	1.	2, NONE	2, NONE	2, NONE
49094	BT 1	CR514	1	1, NONE	2, NONE	2. NONE
13H34	BT 3	CR1159	1	1, NONE	2, NONE	2, NONE
	BT 1	CR510	1	1, NONE	2, NONE	2, NONE
13H35	BT 3	CR1158	1	2. NONE	2, NONE	2. NONE
40.00	BT 1	CR509	1	1. NONE	2. NONE	2, NONE
13H37	BT 3	CR1272	1	1. NONE	2, NONE	2. NONE
401100	BT1	CR614	1	1, NONE	2, NONE	2, NONE
13H38	BT 3	CR710	1	2, NONE	2, NONE	2. NONE

\_\_\_\_ 1, NONE 🔫

INDICATES CORROSION LEVEL

- INDICATES # OF CRACKS

1 - Bright Metal, No visible oxidation

- 2 Metal reddish brown color, no pitting.
- 3 Metal having patches of red oxide.

(8.2.2.1) Bearing Plate	Level:	<u>)</u> (1)	(8.2.1 & 8.2.2) Cracks	U Yes "	X No	□ N/A
(8.2.2.1) Shims	Level:	2 "	(8.2.1 & 8.2.2) Cracks		No No	
(8.2.2.1) Anchorhead	Level:	1 (0)	(8.2.1 & 8.2.2) Cracks		No No	
8.2 & 8.3 - CORROSION & (8.2.1.1) Buttonheads	Level:	1 00	(8.2.1 & 8.2.2) Cracks		DX No	

Corrosion Inspection for Tendon 61V08/Top





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TABLE	18: 46H2	ADJACENT	HOOPS - IS	Q810 - ANCHOR	AGE CORROSION	CONDITION 1				
		ANCHOR	BUTTON	CORROSION LEVEL, CRACKS						
TENDON	END	I.D.	HEADS	ANCHOR HEAD	SHIMS	BEARING PLATE				
46H19	BT 4	CR1218	1	2. NONE	2. NONE	2. NONE				
40113	BT 6	CR380	1	2, NONE	2, NONE	2, NONE				
461420	BT4	CR1138	2	2. NONE	2, NONE	2, NONE				
46H20	BT 6	CR78	1	1, NONE	2, NONE	2, NÔNE				
461100	8T 4	CR1140	1	2. NONE	2. NONE	2, NONE				
46H22	BT 6	CR41	1	2, NONE	2, NONE	2. NONE				
461100	BT4	CR903	1	2, NONE	2. NONE	2, NONE				
46H23	BT 6	CR40	1	2, NONE	2, NONE	2, NONE				
45404	BT 4	CR1157	1	2, NONE	2, NONE	2, NONE				
46H24	BT 6	CR14	1	2. NONE	2. NONE	2, NONE				

INDICATES CORROSION LEVEL -

🚚 1, NONE 🔫

- INDICATES # OF CRACKS

1 - Bright Metal, No visible oxidation.

2 - Metal reddish brown color, no pitting.

3 - Metal having patches of red oxide.

	Corrosion Inspection for Tendon D238/E				
				``````````````````````````````````````	
8.2 & 8.3 - CORROSION &	CRACK INSPECTION		a 		<u> </u>
(8.2.1.1) Buttonheads	Level: 1 <sup>(1)</sup>	(8.2.1 & 8 2.2) Cracks	🗌 Yes (2)	🔀 No	
(8.2.2.1) Anchorhead	Level: 1 (1)	(8.2.1 & 8.2.2) Cracks	🗌 Yes <sup>(2)</sup>	🔀 No	
(8.2.2.1) Shims	Level: 2 (1)	(8.2.1 & 8.2.2) Cracks	( Yes (2)	🔀 No	
(8.2.2.1) Bearing Plate	Level:	•	🗌 Yes <sup>(2)</sup>	No.	
	<sup>(1)</sup> - Corrosion Lave - Compose a sketch of the cr	ls of 3, 4, 5 or 6 required an NC acks on Sketch Sheet 8.0 and i	CR. Indiate an NCR		
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TABLE 19: 462H30ADJACENTHOOPS - SQ8.0 - ANCHORAGE CORROSION CONDITION 44 н **CORROSION LEVEL, CRACKS** ANCHOR BUTTON TENDON END ANCHOR BEARING I.D. HEADS SHIMS HEAD PLATE BT2 CR393 1, NONE 2, NONE 2, NONE 1 62H29 BT 6 CR1113 1, NONE 2, NONE 2, NONE 1 **BT 2** CR164 1 1, NONE 2, NONE 2. NONE 62H31 1, NONE 8T 6 CR958 2, NONE 2, NONE 1 BT 2 **CR75** 1 1, NONE 2, NONE 2. NONE 62H32 BT 6 CR960 1 1, NONE 2, NONE 2, NONE **BT 2** CR77 1 1, NONE 2, NONE 2, NONE 62H33 BT 8 CR538 1 1, NONE 2, NONE 2, NONE BT 2 **CR25** 1, NONE 2, NONE 1 2, NONE 62H34 8T 6 1, NONE CR900 1 2, NONE 2, NONE

🗩 1, NONE 🖘

INDICATES CORROSION LEVEL

INDICATES # OF CRACKS

1 - Bright Metal, No visible oxidation.

2 - Metal reddish brown color, no pitting.

3 - Metal having patches of red oxide.

3.2 & 8.3 - CORROSION & C					
8.2.1.1) Buttonheads	Level: / <sup>(1)</sup>	(8.2.1 & 8.2.2) Cracks	2 Yes (2)	🖌 No	🗋 N//
(8.2.2.1) Anchorhead	Level: ) (1)	(8.2.1 & 8.2,2) Cracks	🗌 Yes (2)	🔀 No	🗆 N//
(8.2.2.1) Shims	Level: 🔔 😗	(8.2.1 & 8.2.2) Cracks	🗋 Yes <sup>(2)</sup>	🛛 No	🗌 N//
8.2.2.1) Bearing Plate	Level: 🜙 🕚	(8.2.1 & 8.2.2) Cracks	□ Yes <sup>(2)</sup>	🔀 No	🗆 N//
		or 6 required an N atch Sheet 8.0 and			
		Corrosion Inspection for Tendon D212/B1		•	

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#### 4.4 SQ8.0 – BUTTONHEAD COUNT

- 4.4.1 The inspection for protruding and missing buttonheads was performed and documented per PSC procedure SQ 8.0. The buttonheads were inspected for their physical condition. This inspection is performed to acquire information on the function of the tendon, since the original installation or previous surveillance. A missing and/or protruding buttonhead decreases the amount of effective wires in the tendon. All conditions for buttonheads and wires, whether missing or defective, have been documented. The results of these inspections are recorded on Data Sheet SQ 8.0, and are summarized in Tables 20 thru 25. In Tables 20 thru 25, "N/A" indicates no inspection was performed.
- 4.4.2 No additional protruding/missing buttonheads were detected on any of the inspected tendon ends except tendons 12V01 both ends and 61V17 shop (top) end. 12V01 shop was found with 1 wire protruding that was not previously reported, NCR FN1002-010 was written to document this finding. The field end of 12V01 was identified as having 3 missing buttonheads not previously reported and was documented on NCR FN1002-004. 61V17 had one (1) additional missing buttonhead that was recorded on NCR FN1002-005. The stated conditions have been submitted to CR03ENG for disposition.
- 4.4.3 All of the other tendon ends with missing or protruding wires have been previously documented and accepted, either at original installation or during a previous inspection.
- 4.4.4 In addition to the nominal 163 stressed wires, the anchorheads have another hole in which a test wire was originally installed on some tendons. The cases in which the surveillance test wire was found to be missing or not installed has been documented for all tendons, however a missing test wire has no bearing on the ability of a tendon to carry force. The documentation of this condition is purely for informational purposes.

TABLE 20: VERTICALS - SOB.0 - BUTTONHEAD COUNT										· _ 51
		ORIC	SINAL	AS F	ound		AS LEF	T	Ш.,	Bt in
TENDON	end	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSUNG	PROTRUDE	BROKEN /	REMOVED FOR TESTING	EPPECTWC WINES AS FOUND	EFFECTIVE WIRES AS LEFT
12V01	TOP	1	0	2	0	2	0	0	161	161
12401	BOT	· 0	2	0	5	0	5	0	158	158
45V20	TOP	0	0	0	0	0	0	0	163	163
43420	BOT	0	0	0	0	O	0	0	163	163
61V08	TOP	0	0	0	0	0	0	0	163	163
01400	BOT	O	0	o	0	O	0	0	163	163
61V17	TOP	0	1	C	2	0	2	1	161	160
01417	BOT	0	0	o	0	0	0	1	163	162



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	TA	BL'E (24)	HOOP	s <mark>l_</mark> (soa	3!0 - BU	TTÖNHI	EÁD CO	UNT	1	
		ORIG	INAL	AS F	OUND		AS LEFT	r i i	Щ.,	ш.,
TENDON	END	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	REMOVED FOR TESTING	EFFECTIVE WIRES AS FOUND	EFFECTIVE WRES AS LEFT
13H36	BT 1	0	0	0	0	0	0	0	163	163
131130	BT 3	0	0	0	· 0	0	0	0	163	163
42H46	BT 2	0	0	0	0	0	0	0	163	163
421140	BT 4	0	0	0	0	0	0	0	163	163
461124	BT 4	0	0	0	0	0	0	0	163	163
46H21	BT 6	0	0	O	0	0	0	o	163	163
E41174	BT 1	0	0	0	0	0.	0	1	163	162
51H34	BT 5	0	0	0	0	_0	0	1	163	162
621120	BT 2	0	0	0	0	0	0	0	163	163
62H30	BT 6	0	0	o	0	0	0	o	163	163

		ORIC	SINAL	AS F	AS FOUND		AS LEFY			Ψ.S
TENDON	END	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSNIG	REMOVED FOR TESTING	EPPECTIN MIRES A FOUND	EFFECTIVE WRES AS LEFT
D129	BT 3	0	1	0	1	0	1	0	162	162
0123	BT 5	1	1	1	1	1	1	· 0	161	161
D212	BT 1	0	1	0	1	0	1	0	162	162
	BT 3	0	1	0	1	0	1	0	162	162
D238	BT 4	0	0	0	0	0	0	1	163	162
0230	BT 6	0	0	0	0	0	0	1	163	162





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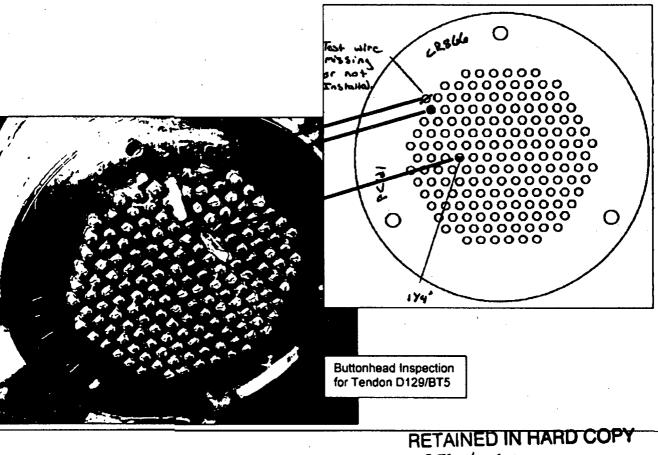
 FINAL REPORT FOR THE 30<sup>TH</sup> YEAR CONTAINMENT INL INSPECTION

NDON SURVEILLANCE AT CRYSTAL RIVER DATE: 01/2





		ORIG	SINAL	AS F	AS FOUND		AS LEFT			
TENDON	END	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	REMOVED FOR TESTING	EFFECTIVE WRES AS FOUND	EFFECTIVE WRES AS LEFT
13H33	BT 1	0	0	0	0	0	0	0	163	163
101100	BT 3	0	0	0	0	0	0	0	163	163
13H34	BT 1	0	0	0	0	0	0	0	163	163
131134	BT 3	0	0	o	·0	0	0	0	163	163
13H35	BT 1	0	0	0	0	0	0	0	163	163
13033	BT 3	0	1	o	1	0	1	0	162	162
421127	BT 1	0	0	0	0	0	0	0	163	163
13H37	BT 3	0	0	0	0	0	0	0	163	163
401120	BT 1	0	0	0	0	0	0	0	163	163
13H38	BT 3	0	0	0	o	0	ò	0	163	163



REC # 3831069

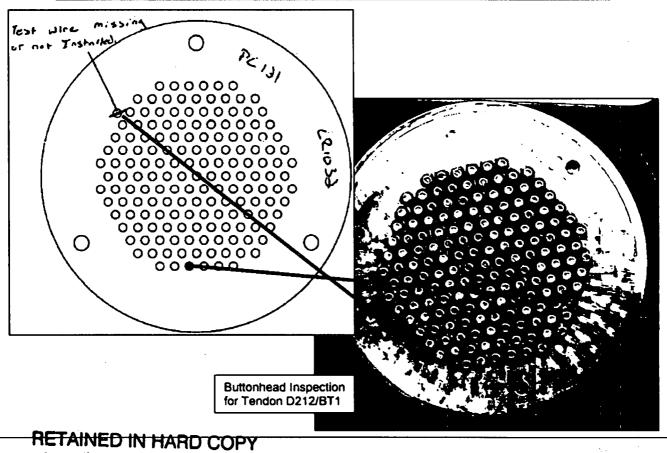


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		ORK	SINAL	AS F	OUND		AS LEF	r	Ша	HI .a
TENDON	END	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	REMOVED FOR TESTING	EFFECTIVE WIRES AS FOUND	EFFECTIVE WIRES AS LEFT
46140	BT 4	0	. 0	0	0	0	0	0	163	163
46H19	BT 6	0	0	0	0	0	0	0	163	163
48420	BT 4	3	0	3	0	3	0	0	160	160
46H20	BT 6	0	0	o	0	0	0	0	163	163
46422	BT 4	0	0	0	0	0	0	0	163	163
46H22	BT 6	O	0	o	0	o	0	0	163	163
46422	BT 4	0	2	0	2	0	2	0	161	161
46H23	BT 6	O	0	o	0	o	0	0	163	163
	BT 4	0	0	0	0	0	0	0	163	163
46H24	BT 6	0	0	0	0	o	o	o	163	163



REC # 3831069



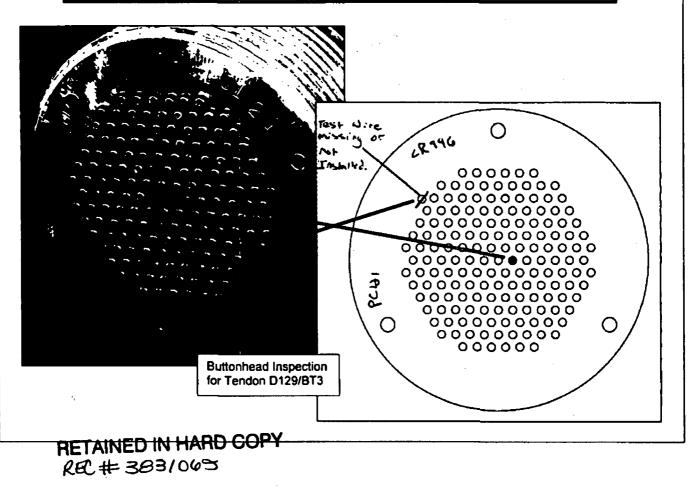
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DOCUMENT TITLE:	FINAL REPORT FOR THE 30 <sup>1H</sup> YEAR CONTAINMENT	
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		ORIC	SINAL	AS F	OUND		AS LEF	r		Wt.e	
TENDON	END	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	PROTRUDE	BROKEN / MISSING	REMOVED FOR TESTING	EFFECTIVE WIRES AS FOUND	EFFECTIVE WRES AS LEFT	
62H29	BT 2	0	0	0	0	0	0	0	163	163	
021129	BT 6	0	0	0	0	0	0	0	163	163	
621424	BT 2	0	0	0	0	0	0	0	163	163	
62H31	BT 6	O	0	0	0	0	0	0	163	163	
001120	BT 2	0	0	0	0	0	0	0	163	163	
62H32	BT 6	0	0	o	0	a	0	0	163	163	
621122	BT 2	. 0	0	0	0	0	0	0	163	163	
62H33	BT 6	1	0	1	0	1	0	0	162	162	
60424	BT 2	0	0	0	0	0	0	0	163	163	
62H34	BT 6	0	1	o	1	o	1	0	162	162	





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						Energy

## 5.0 SQ8.3 - CONCRETE INSPECTION

- 5.1 A VT-1C Detailed inspection in accordance with PSC Procedure SQ8.3 was performed on the 24° around the bearing plate. This detailed inspection is performed in order to detect any cracks in the concrete greater than 0.010° in width. The results were recorded on Data Sheet SQ 8.3 and summarized in Table 26.
- 5.2 None of the inspected tendon ends exhibited concrete cracks exceeding 0.010° around any bearing plate inspected.

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		BEARING PLATE	CRACKS	WITH WIDTHS	> 0.010"
TENDON	END	I.D.	QUANTITY	MAXIMUM LENGTH (IN)	MAXIMUM WIDTH (IN)
12V01	TOP	NONE FOUND	0	0	• 0
	BOT	NONE FOUND	0	0	0
45V20	TOP	NONE FOUND	0	0	0,
45720	BOT	PC58	0	0	0
61V08	TOP	NONE FOUND	0	0	0.
01400	BOT	NONE FOUND	0	0	0
61V17	TOP	NONE FOUND	0	0	0
01417	BOT	NONE FOUND	0	0	0
401426	BT 1		0	0 <sup>.</sup>	0
13H36	BT 3	NONE FOUND	0	o	o
471446	BT 2	NONE FOUND	0	0	0
42H46	8T 4	NONE FOUND	0	o	o
461104	BT 4	NONE FOUND	0	0	0
46H21	BT 6	NONE FOUND	0	· 0 ·	o
51H34	BT 1	NONE FOUND	0	0	0
511134	BT 5	NONE FOUND	0	o	0
621120	BT 2	NONE FOUND	0	0	0
62H30	BT 6	NONE FOUND	o	0	o
D400	• BT 3	NONE FOUND	0	0	0
D129	BT 5	NONE FOUND	o	O	0
0040	BT 1	NONE FOUND	0	0	0
D212	BT 3	NONE FOUND	0	0	0
<b>D</b> 220	BT 4	NONE FOUND	0	0	0
D238	BT 6		0 `	D	0



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### 6.0 TENDON ACCESSIBILITY

- 6.1 The PSC field personnel performed a general examination for tendon accessibility during this surveillance period. This examination was performed in order to assist CR03ENG in the planning of future surveillances. The results are summarized in Tables 27 thru 38.
- 6.2 During this examination it was noted that small grease/oil leaks were occurring on multiple tendon caps, which were located inside existing structures that adjoin the containment building. The substance displacing from the tendon cap is actually the oil portion from the original P2 grease that has separated. This is a common occurrence that has been noted throughout many plants during tendon surveillances. This condition does not correspond to the system's degradation. A small amount of oil can cause a large aesthetically unpleasing condition. On buttresses without any coating, the oil is absorbed into the concrete, leaving very little signs of leakage. However, in the existing condition, the coated surface does not allow for the absorption to occur. Therefore, the oil continues to displace down the buttress face. PSC recommends this condition be monitored and cleaned on a periodic basis. Gasket replacement can be performed on the tendon cap, however the oil will continue to leak from the cap based on our experience. The labor and material required for the gasket replacement is not cost effective and PSC does not recommend performing such task.

	ТАВ	E 27: 12V & 2	3V SERIES -	TENDON ACC	ESSIBILITYIMA		
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
12V 01	Т&В			23V 01	T&B		· · · · · · · · · · · · · · · · · · ·
12V 02	T&B			23V 02	ТАВ		
12V 03	Т&В			23V 03	T & B		
12V 04	T & B			23V 04	Т&В	- t	
12V 05	T & B			23V 05	T & B		
12V 06	ТАВ			23V 06	T&B		
12V 07	T & B			23V 07	Т&В		
12V 08	T&B			23V 08	Т&В		
12V 09	T & B			23V 09	T & B		
12V 10	T&B			23V 10	T&B		
12V 11	ТАВ			23V 11	T & B		
12V 12	T&B			23V 12	TAB		
12V 13	T&B			23V 13	T&B		
12V 14	T&B			23V 14	T&B	[	
12V 15	.T&B	[		23V 15	T & B		
12V 16	T&B			23V 16	T & B		
12V 17	T&B	] _ [		23V 17	T&B		
12V 18	T&B	1 1		23V 18	T&B		
12V 19	T&B	] [		23V 19	T&B		
12V 20	ТАВ	1 1		23V 20	T&B		
12V 21	T&B	i î		23V 21	T&B	]	:
12V 22	T&B			23V 22	T&B		1
12V 23	T&B	Ì Ì		23V 23	T&B		
12V 24	T&B	11		23V 24	Т&В		



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TABLE 28: 34V & 45V SERIES - TENDON ACCESSIBILITY MATRIX 5.5 ACCESSIBLE FOR VISUAL INSPECTION ONLY ACCESSIBLE FOR COMPLETE INSPECTION ACCESSIBLE FOR VISUAL INSPECTION ONLY COMPLETEL Y NACCESS. COMPLETEL Y INACCESS. ACCESSIBLE COMPLETE **TENDON** TENDON Rof 34V 01 45V 01 T & B Т&В T& 8 T&B 45V 02 34V 02 T & B T&B 34V 03 45V 03 T&B T&8 34V 04 45V 04 T & B T&B 34V 05 45V 05 T&B T& B 45V 06 34V 06 T & B T&B 45V 07 34V 07 T&8 T&B 34V 08 45V 08 T&B T & B 34V 09 45V 09 T& 8 34V 10 T&B 45V 10 T&B T & B 34V 11 45V 11 T&B T&B 45V 12 34V 12 T & B T&B 34V 13 45V 13 T & B T&B 34V 14 45V 14 T&B T&B 34V 15 45V 15 T & B 34V 16 T&B 45V 16 T&B T&B 45V 17 34V 17 T&B 45V 18 T & B 34V 18 T&B T & B 34V 19 45V 19 T&B T&B 34V 20 45V 20 T & B T&8 45V 21 34V 21 T&B T&8 45V 22 34V 22 T & B 45V 23 T&B 34V 23 T & B 45V 24 T & B 34V 24 T = TOP CAN **B = BOTTOM END** 



F
D

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	TABL	E 29: 56V & 6	1V SERIĖS – 1	TENDON ACCE	SSIBILITY MA	TRIX : Protection	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETEL Y INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETEL Y INACCESS.
56V 01	T & B			61V 01	T & B		
56V 02	T&B			61V 02	T&B		
56V 03	T&B			61V 03	T&B		
56V 04	T&B			61V 04	T&B		•
56V 05	T 8 8			61V 05	Т& В		
56V 06	T&B			61V 06	T&B		
56V 07	T&B			61V 07	T & B		
56V 08	T&B			61V 08	Т&В		
56V 09	T & B			61V 09	T&B		
56V 10	T&8			61V 10	T & B		
56V 11	T&B			61V 11	T&B		
56V 12	T&B			61V 12	T&B		
56V 13	T& B			61V 13	T&B		
56V 14	T&B			61V 14	T&8		
56V 15	T&B			61V 15	T&B		
56V 16	T& B		1	61V 16	T&B		
56V 17	T&B			61V 17	T&B		
56V 18	T&B		,	61V 18	T & B		
56V 19	T&B			61V 19	T & B		
56V 20	T&B	, I		61V 20	T& B		
56V 21	T&B			61V 21	ТАВ		
56V 22	T&B			61V 22	тав		
56V 23	- T&B	·		61V 23	Т & В		
56V 24	T&B			61V 24	T & B		

T = TOP CAN

B = BOTTOM END



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	Т	ABLE 30: 13H	SERIES – TEN	IDON ACCESS	BILITY MATR	IX − ₽ SS	1
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL NISPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
13H 01	83	81		13H 25	B1 & B3		
13H 02	B1 & B3			13H 26	B1 & B3		
13H 03	B1 & B3			13H 27	B1 & B3		
13H 04	B1 & B3			13H 28	B1 & B3		
13H 05	B1	83		13H 29	B1 & B3		
13H 06	81	· 83		13H 30	B1 & B3	, ·	
13H 07			B1 & B3	13H 31	B1 & B3		
13H 08			B1 & B3	13H 32	B1 & B3		
13H 09	<b>B</b> 3	B1		13H 33	B1 & B3		
13H 10	<b>B</b> 3		B1	13H 34	B1 & B3		
13H 11	83	. B1		13H 35	B1 & B3		
13H 12	83	B1		13H 36	B1 & B3		
13H 13	83	B1		13H 37	B1 & B3		
13H 14	B3	B1		13H 38	B1 & B3		
13H 15	B3	81		13H 39	B1 & B3		
13H 16	B3		B1	13H 40	B1 & B3		
13H 17		83	B1	13H 41	81 & 83		
13H 18	B1	B3		13H 42	B1 & B3	ł	
13H 19	B1	В3		13H 43	B1 & B3		
13H 20	B1 & B3			13H 44	B1 & B3		
13H 21	B1 & B3	·		13H 45	B1 & B3	1	
13H 22	B1 & B3			13H 46	B1 & B3		
13H 23	B1 & B3			13H 47	B1 & B3		
13H 24	B1 & B3				1	х	
					L		1

81 = BUTTRESS 1 END

83 = BUTTRESS 3 END

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RIVER	DATE. 0/124/00	Energy

	T	ABLE 31: 35H	SERIES - TEN	IDON ACCESS	BILITYMATR	l <b>ķ</b>	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
35H 01	B3 & B5			35H 25	B3 & B5		
35H 02	B3 & B5			35H 26	B3 & B5		
35H 03	B3 & B5			35H 27	B3 & B5		
35H 04	B3 & B5	[		35H 28	B3 & B5		
35H 05		83 & B5		35H 29	B3 & B5		
35H 06		B3	B5	35H 30	B3 & B5		
35H 07			83 & B5	35H 31	B3 & 85	:	-
35H 08	B5		<b>B</b> 3	35H 32	B3 & B5		
35H 09	B3 & B5			35H 33	B3 & B5		
35H 10	B3 & B5			35H 34	B3 & B5		
35H 11	B3 & B5			35H 35	83 & 85		
35H 12	B3	85		35H 36	B3 & B5		
35H 13	B3		85	35H 37	B3 & B5		
35H 14	B3		B5	35H 38	B3 & B5		
35H 15	B3 & B5	· ·		35H 39	B3 & B5		
35H 16	B3 & B5			35H 40	B3 & B5		
35H 17	B3 & B5			35H 41	B3 & B5		
35H 18	B3 & B5			35H 42	B3 & B5		
35H 19	B3	B5		35H 43	B3 & B5		
35H 20	<b>B</b> 3 <sup>-</sup>	B5		35H 44	B3 & B5		
35H 21	B3		B5	35H 45	B3 & B5		
35H 22	83		B5	35H 46	B3 & B5		
35H 23	B3 & B5			35H 47	B3 & B5		
35H 24	B3 & B5						

B3 = BUTTRESS 3 END

B5 = BUTTRESS 5 END

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1	: <del>.</del> .						·····
	<u>т</u>	ABLE 32: '51H			IBILITY MATR	<b>IX</b>	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY MACCESS.
51H 01		B1	B5	51H 25*	B1 & B5		
51H 02	B1		B5	51H 26	B1 & B5		
51H03	B1		85	51H 27*	B1 & B5		
51H 04	B1		B5	51H 28	B1 & B5		
51H 05	B1		85	51H 29	B1 & B5		
51H 06	81		<b>B</b> 5	51H 30	. B1 & B5		
51H 07		B1	85	51H 31	B1 & B5		
51H 08			B1 & B5	51H 32	,B1 & B5		
51H 09		81		51H 33	B1 & B5		
51H 10	B5	B1		51H 34	B1 & B5		
51H 11	B1 & B5			51H 35	B1 & B5		
51H 12	B1	B5		51H 36	B1 & B5		
51H 13	B1	B5		51H 37	B1 & B5		
51H 14	81		B5	51H 38	B1 & B5		
51H 15		B1	85	51H 39	B1 & B5		
51H 16	B1 & B5			51H 40	B1 & B5		,
51H 17	B1 & B5			51H 41	B1 & B5		
51H 18	B1 & B5			51H 42	B1 & B5		
51H 19	B1 & B5			51H 43	B1 & B5		
51H 20	B1	85		51H 44	B1 & B5		
51H 21	B1	B5		51H 45	B1 & B5		
51H 22	81		B5	51H 46	B1 & B5		
51H 23	81 & 85		× ·	51H 47	B1 & B5	· · ·	
51H 24	B1 & B5	·					

B1 = BUTTRESS 1 END

B5 = BUTTRESS 5 END

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	้ จัง	ABLE 33: 42H	SERIES - TEN	IDON ACCESS	SIBILITY MATR	IX F€+	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY MACCESS.	TENDON	ACCESSIBLE FOR COMPLETE NSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
42H 01	B2 & B4			42H 25	B2 & B4		
42H 02	82 & 84			42H 26	B2 & B4		
42H 03	B4	82		42H 27	82 & B4		
42H 04	84	82		42H 28	82 & B4		
42H 05	82	B4		42H 29	B2 & B4		
42H 06		B2 & B4		42H 30	B2 & B4		
42H 07		82	84	42H 31	B2 & B4		
42H 08	84	B2	•	42H 32	B2 & B4		
42H 09	B4	82		42H 33	B2 & B4		
42H 10	B4	B2		42H 34*	B2 & 84		
42H 11		B2 & B4		42H 35	B2 & B4		
42H 12	B4	B2		42H 36	B2 & B4		
42H 13	B4	82		42H 37	82 & B4		
42H 14	B4	B2	1	42H 38	B2 & B4		
42H 15	B4	B2		42H 39	B2 & B4		Ī
42H 16	B4		B2	42H 40	82 & B4		· ·
42H 17	B2 & B4			42H 41	B2 & B4		
42H 18	B2 & 64			42H 42	B2 & B4		
42H 19	B2 & B4			42H 43	B2 & B4		
42H 20	B2 & B4			42H 44	B2 & B4		
42H 21	82 & 84	ł		42H 45	B2 & B4		]
42H 22	B2 & B4	[		42H 46	B2 & B4		
42H 23	B2 & B4	i ·		42H 47	B2 & B4	}	
42H 24	B2 & B4	1		[	82 & B4		

82 = BUTTRESS 2 END

B4 = BUTTRESS 4 END



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	Ť,	ABLE 34: 46H	SERÏES İ	IDON ACCESS	BILITY MATR	<b>X</b> 2 S	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTYON ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE MSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
46H 01		84	B6	46H 25	B4 & B6		
46H 02	B4 & B6			46H 26	B4 & B6		
46H 03	B4 & B6			46H 27	B4 & B6		
46H 04	B4 & B6			46H 28	B4 & B6		
46H 05	B4 & B6			46H 29	B4 & B6		
46H 06		84 & B6		46H 30	B4 & B6		
46H 07		86	B4	46H 31	B4 & B6		
46H 08			B4 & B6	46H 32	84 & B6		
46H 09	B4 & B6			46H 33	B4 & B8		
46H 10	B4 & B6			46H 34	B4 & B6		
46H 11	B4 8 B6			46H 35	B4 & 85		
46H 12	B4		<b>B6</b>	46H 36	B4 & B6		
46H 13	B4 & B6			46H 37	B4 & B6		
46H 14	B4 & B6			46H 38	B4 & B6		. I
46H 15	<b>B4</b>	<b>B6</b>		46H 39	B4 & B6		
46H 16	B4		B6	46H 40	B4 & B6		
46H 17	B4		B6	46H 41	B4 & B6		
46H 18	B4 & B6		ξ.	46H 42	B4 & B6		
46H 19	B4 & B6			46H 43	B4 & B6		
46H 20	B4 & B6			46H 44	B4 & B6		
46H 21	B4 & B5			46H 45	84 & B6		
46H 22	B4 & B8			46H 46	B4 & B6		
46H 23	B4 & B6			46H 47	B4 & B6		
46H 24	B4 & B6						

B4 = BUTTRESS 4 END

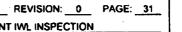
B6 = BUTTRESS 6 END



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CR-N1002-504 FINAL REPORT FOR THE 301" YEAR CONTAINMENT IWL INSPECTION

30<sup>TH</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL RIVER DATE: 01/24/08





. 11	···· (17	ABLE 35: 62H	SERIES - TEN	IDON ACCESS	BILITYMATR	K va b≮ter	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL MSPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
62H 01	82 & 86			62H 25	B2 & B6		
62H 02	82 & 86			62H 26	B2 & B6		
62H 03	82 & B6			62H 27	B2 & B6		
62H 04	86	82		62H 28	82 & B6		
62H 05		B2 8 B6		62H 29	82 & B6		
62H 06	1	B2 & B6		62H 30	82 & B6		
62H 07	B6		B2	62H 31	. 82	86	
62H 08		B6	B2	62H 32	82	B6	
62H 09	B2	B6		62H 33	B2 & B6		
62H 10	B2	. <b>B</b> 6		62H 34	B2 & B6		
62H 11	B2	86		62H 35	B2 & B6		
62H 12		B2 & B6		62H 36	B2 & B6		
62H 13	82		<b>B6</b>	62H 37	B2 & B6		
62H 14	B2		<b>B6</b>	62H 38	82 & 86		
62H 15		62	86	62H 39	B2 & B6		
62H 16	86		B2	62H 40	B2 & B6		
62H 17	86		62	62H 41	B2 & B6		
62H 18	B2 & B6			62H 42	B2 & B6		
62H 19	B2	B6		62H 43	B2 & B6		
62H 20	B2		86	62H 44	B2 & B6		
62H 21	B2 & B6	1		62H 45	82 & B6		
62H 22	B2 & B6	]		62H 46	B2 & B6	· · ·	
62H 23	B2 & B6			62H 47	B2 & B6		
62H 24	82 8 86						

B2 = BUTTRESS 2 END

86 = BUTTRESS 6 END



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PROJECT TITLE:	30 <sup>1H</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL	RIVER	ÐATE	: <u>01/2</u> 4	1/08



and the second second	ТА	BLE 36: D100		NDON AGES	SIBILITY MATR	RIX MARS - I WELL	an an Ngalasta
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY MACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
D 101	B2/3 & B5/6			D 125	B2/3 & B5/6		
D 102	B2/3 & B5/6			D 126	B2/3 & B5/6		
D 103	82/3 & 85/6			D 127	B2/3 & B5/6		
D 104	82/3 & 85/6			D 128	B2/3 & B5/6		
D 105	B2/3 & B5/6			D 129	82/3 & 85/6	•	
D 106	B2/3 & B5/6			D 130	B2/3 & B5/6		
D 107	B2/3	B5/6		D 131	B2/3 & B5/6		
D 108	B2/3 & B5/6			D 132	B2/3	85/6	•
D 109	B2/3 & B5/6			D 133	B2/3	B5/6	
D 110	B2/3 & B5/6			D 134	B2/3		85/6
D 111	B2/3 & B5/6			D 135	82/3		<sup>•</sup> B5/6
D 112	B2/3 & B5/6			D 136	B2/3	1	B5/6
D 113	B2/3 & B5/6			D 137	B2/3		85/6
D 114	B2/3 & B5/6			D 138	B2/3	85/6	
D 115	B2/3 & B5/6			D 139	82/3 & 85/6		
D 116	B2/3 & B5/6			D 140	B2/3 & B5/6		
D 117	B2/3 & B5/6			D 141	82/3 & 85/6		
D 118	82/3 & B5/6			]			
D 119	B2/3 & B5/6						
D 120	B2/3 & B5/6						1
D 121	B2/3 & B5/6	]	· ·	1	1		]
D 122	B2/3 & B5/6		]				1
D 123	B2/3 & B5/6					{ ·	
D 124	B2/3 & B5/6		1			<b>)</b> ,	

B2/3 = BUTTRESS 2-3 END

B5/6 = BUTTRESS 5-6 END



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30<sup>TH</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL RIVER DATE: 01/24/08



Burne Com	ገጉዶ	BUE 37 D200	SERIES - TEI	NDON ACCES	SIBILITY MATR	RIX ≈ ) 🗄 🦂	Ser Stratt
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL MSPECTION ONLY	COMPLETELY INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETELY INACCESS.
D 201	B1/6 & B3/4			D 225	B1/6 & B3/4		
D 202	B1/6 & B3/4			D 226	B1/6 & B3/4		
D 203	B1/6 & B3/4			D 227	B1/6 & B3/4		
D 204	B1/6 & B3/4			D 228	B1/6 & B3/4		
D 205	B1/6 & B3/4			D 229	B1/6 & B3/4		
D 206	B1/6 & B3/4			D 230	B1/6 & B3/4		
D 207	81/6 & 83/4			D 231	B1/6 & B3/4		
D 208	81/6 & 83/4			D 232	B1/6 & B3/4		
D 209	B1/6 & B3/4			D 233	B1/6 & B3/4		
D 210	B1/6 & B3/4			D 234	B1/8 & B3/4		
D 211	B1/6 & B3/4			D 235	81/6 & B3/4		
D 212	B1/6 & B3/4			D 236	B3/4	B1/6	
D 213	B1/6 & B3/4			D 237	B1/6 & B3/4		
D 214	B1/8 & B3/4			D 238	B1/6 & B3/4		
D 215	B1/6 & B3/4			D 239	B1/6 & B3/4		
D 216	B1/6 & B3/4			D 240	B1/6 & B3/4		
D 217	B1/6 & B3/4			D 241	B1/6 & B3/4		
D 218	B1/8 & B3/4						
D 219	B1/6 & B3/4						
D 220	B3/4	B1/6					
D 221	B1/6 & B3/4	]	1				
D 222	B1/6 & B3/4		Į .				
D 223	B1/6 & B3/4						
D 224	B1/6 & B3/4						

B1/6 = BUTTRESS 1-6 END

B3/4 = BUTTRESS 3-4 END



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¥age ant second	া ু গাঁঠ	(BLE-38+ 10300	Series ÷រាមែរ	DONACCES	SIBILITY MATR	ix i s kadd ed.	
TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETEL Y INACCESS.	TENDON	ACCESSIBLE FOR COMPLETE INSPECTION	ACCESSIBLE FOR VISUAL INSPECTION ONLY	COMPLETEL Y INACCESS.
D 301	B1/2 & B4/5			D 325	B1/2 & B4/5		
D 302	B1/2 & B4/5			D 326	B1/2 & B4/5		
D 303	B1/2 & B4/5			D 327	B1/2 & B4/5		
D 304	B1/2 & B4/5			D 328	B1/2 & B4/5		
D 305	B1/2 & B4/5			D 329	B1/2 & B4/5		
D 306	B1/2 & B4/5			D 330	B1/2 & B4/5		
D 307	B1/2 & B4/5			D 331	B1/2 & B4/5		
D 308	B1/2 & B4/5			D 332	B1/2 & B4/5		
D 309	B1/2 & B4/5			D 333	B1/2	B4/5	
D 310	B1/2 & B4/5			D 334	81/2		B4/5
D 311	B1/2 & B4/5			D 335	B1/2		B4/5
D 312	B1/2 & B4/5			D 336	B1/2		B4/5
D 313	B1/2 & B4/5			D 337	B1/2		B4/5
D 314	B1/2 & B4/5	•		D 338	B1/2	B4/5	
D 315	81/2 & 84/5			D 339	B1/2 & B4/5		
D 316	B1/2 & B4/5			D 340	B1/2 & B4/5		
D 317	B1/2 & B4/5			D 341	B1/2 & B4/5		
D 318	B1/2 & B4/5						
D 319	B1/2 & B4/5	]			ľ		·
D 320	B1/2 & B4/5	1					
D 321	B1/2 & B4/5						
D 322	B1/2 & B4/5	1				· ·	
D 323	B1/2 & B4/5						
D 324	81/2 & B4/5	· · · · · · · · · · · · · · · · · · ·					

B1/2 = BUTTRESS 1-2 END

B4/5 = BUTTRESS 4-5 END



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					Energy

## 7.0 HYDRAULIC JACK CALIBRATIONS

- 7.1 Precision Surveillance Corporation has developed a program for calibrating hydraulic jacks utilizing regression analysis (PSC Procedure QA 12.8 G-W). This is a process where a straight line is mathematically best fit to a set of data points (in this case, force versus gauge pressure). This results in a linear equation which relates the ram area (slope) and constant (y-intercept) for each jack calibration, allowing the conversion of pressure to force and vice versa. Completed calibrations for all of the hydraulic jacks used are contained in Appendix G and are summarized in Table 39.
- 7.2 A before and after comparison of the stressing jacks' ram areas revealed that none of the hydraulic jacks' calibrations varied by more than 1.46%, indicating that they were in a properly calibrated status. Acceptable variation is 1.5%
- 7.3 The wire-testing ram, I.D.#7702, was also found within the acceptable variation.
- 7.4 Note that the force exerted by a jack can be calculated as follows:

Force	= Area	X	Pressure	+	Constant
(F)	(in²)		(KSI)		(K)

	BEF	ORE SUF	RVEILLAI	NCE	AF	TER SUR	VER.LAN	CE		Z
JACK I.D.	DATE	AREA (Mn²)	CONSTANT (KIPS)	FORCE F, (KIPS)	DATE	AREA (m)	CONSTANT (KIPS)	FORCE F, (KIPS)	MAX Pressure	% VARIATION
8780	9/24/07	335.282	-5.022	1906.09	12/11/07	336.220	-4 344	1912.11	5700	-0.316
8784	9/24/07	337.287	-5.060	1917.48	12/12/07	335.547	-13.489	1899.13	5700	+0.96
9501	9/25/07	372.057	+3.814	1938.51	12/13/07	366.254	+5.666	1910.19	5200	+1.46
7702	05/08/07	1.590	+0.146	13.661	11/30/07	1.579	+0.303	13.725	8500	-0.464



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### 8.0 TENDON LIFTOFFS

#### 8.1 MONITOR TENDON FORCES

- 8.1.1 A liftoff is defined as the force required to lift the anchor head off the shim stack and is representative of the force held by that tendon. A liftoff is performed on each physical surveillance tendon to monitor the force exerted by the tendon onto the structure. PSC Procedure SQ 9.0 in Appendix F details the steps taken to perform a liftoff. The results were documented on Data Sheet SQ 9.0 and are summarized in Tables 40 thru 45.
- 8.1.1.1 It should be noted that performing a liftoff has only a localized effect on a tendon; therefore, it is acceptable to use the same jack for both ends of a tendon by executing the liftoff on separate occasions.
- 8.1.2 All of the vertical and dome tendon liftoffs were found to be above the minimum design and above 95% Predicted Force as required by IWL-3221.1. Three of the five horizontal surveillance tendons were found to be below 95% Predicted Force but above 90% Predicted Force. The liftoff requirement stated in IWL is:
  - Tendon forces are acceptable if:
  - (a) The average of all measured tendon forces, including those measured in IWL-3221.1(b)(2), for each type of tendon is equal to or greater than the minimum required prestress specified at the anchorage for that type of tendon;
  - (b) The measured force in each individual tendon is not less than 95% of the predicted force unless the following conditions are satisfied.
    - the measured force in not more than one tendon is between 90% and 95% of the predicted force;
    - (2) The measured forces in two tendons located adjacent to the tendon in IWL-3221.1(b)(1) are not less than 95% of the predicted forces; and
    - (3) The measured forces in all the remaining sample tendons are not less than 95% of the predicted force.
- 8.1.3 Based upon the unacceptable horizontal tendon liftoffs, adjacent tendons were monitored for force until an acceptable liftoff reading was obtained on both sides of the selected tendon. 13H36 required testing of 5 adjacent tendons, 46H21 and 62H30 also required testing of five adjacent tendons. Of these tendons, six were above 95%, five were between 95% and 90% and four fell just below 90%. All tendons below 95% were restored to Predicted Force 0%, + 6% and locked off. The restoration of these tendons is summarized in Table 46.
- 8.1.4 The average of the As-Found normalized liftoff values was above the minimum requirement, despite the low liftoffs, and deemed acceptable per PSC Procedure SQ9.0 Section 10.4.
- 8.1.4.1 The average normalized tendon force in Unit 3 for each group and their respective minimum design are:

Vertical Tendon: Group Average = 1535.2 Kips	Minimum Design = 1149 Kips
Hoop Tendon: Group Average = 1347.4 Kips	Minimum Design = 1252 Kips
Dome Tendon: Group Average = 1367.3 Kips	Minimum Design = 1215 Kips

- 8.1.4.1.1 As depicted above, all group averages are above the required group minimum and are therefore acceptable. The actual values for each tendon and its corresponding group are summarized in Table 47.
- 8.1.5 Upon completion of the liftoff, a visual verification is performed to identify any changes in the condition of the tendon end. No additional or broken wires were noted during or after liftoffs.

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30<sup>TH</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL RIVER



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											per l'ing	
TENDON	END	SHIM STACK HEIGHT (In)	<b>EFFECTIVE</b> <b>WIRES</b>	JACKI.D.	LJFT-OFF (kips)	AALV (kips)	.9.4.7.8 (KIPS)	95% B.V.P.F. (KIPS)	90% B.V.P.F. (KIPS)	ADJACENTS REQUIRED	# OF ADJACENTS MONITORED	AS-FOUND ACCEPTANCE
12V01	TOP BOT	14.75 4.00	161 1 <b>58</b>	8784 N/A	1559.95 N/A	1559.95	1525	1449	1372	NO	0	YES
45V20	top Bot	12.50 4.00	163 163	8780 N/A	1456.80 N/A	1456.80	1507	1432	1357	NO	0	YES
61V08	TOP BOT	13.00 4.00	163 163	8784 N/A	1505.98 N/A	1505 98	1491	1416	1342	NO	o	YES
61V17	TOP BOT	12.00 4.00	161 163	8784 N/A	1580.18 N/A	1580.18	1498	1423 ·	1348	: NO	0	YES

		3°, • •	ABLE 41		s – soja	0 – MON	ITORING	S TENDO	NIFÓRCI	È 🕬 🛛 🛉	100 M 100 - 1	
NOONEL	CNE	SHIM STACK HEIGHT (In)	EFFECTIVE WRES	JACK I.D.	LIFT-OFF (itipe)	(sidpi) ATVV	(S <b>4</b> 04) '4'4'/1'8-	<b>95% B.V.P.F.</b> (KOPS)	90% B.V.P.F. (KIPS)	ADJACENTS REQUIRED	# OF ADJACENTS MONITORED	AS-FOUND ACCEPTANCE
13H36	BT,1 BT 3	6.50 7.25	163 163	8784 8780	1344.08 1426.63	1385.23	1484	1410	1336	YES	5	NO
421146	BT 2 BT 4	5.75 6.00	163 163	8784 8780	1546.46 1570.80	1558.63	1456	1383	1310	NO	0	YES
46H21	BT 4 BT 6	5.75 6.00	163 163	8780 8784	1319.34 1340.71	1330.02	1441	1369	1297	YES	5	NO
51H34	9T 1 8T 5	8.00 7.00	163 163	8784 8780	1532.96 1396.45	1464.70	1487	1413	1339	NO	0	YES
62H30	BT 2 BT 6	6.75 6.75	163 163	8784 9501	1249.64 1332.05	1290.84	1413	1342	1272	YES	5	NO



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TENDON	END	SHIM STACK HEIGHT (In)	EFFECTIVE WIRES	JACK I.D.	LiFT-OFF (kips)	AALV (kips)	B.V.P.F. (KIPS)	95% B.V.P.F. (KIPS)	90% B.V.P.F. (KIPS)	ADJACENTS REQUIRED	# OF ADJACENTS MONITORED	AS-FOUND ACCEPTANCE
D129	BT 3 BT 5	6.25 6.00	162 161	8780 8784	1289.16 1290.12	1289.64	1287	1223	1159	NO	0	YES
D212	BT 1 BT 3	6.38 6.50	162 162	8784 8780	1259.76 1295.87	1277.81	1305	1240	1175	NO	0	YES
D238	BT 4 BT 6	7.00 6.00	163 163	8780 8784	1527.21 1495.86	1511.53	1348	1281	1213	NO	0	YES

	• • • •	TABLE 4	3: / <b>13H36</b>	ADJACE	NTS – SC	9.0 – MO	NITORING	S'ITENDO	N FORCE	391 ° -	
TENDON	END	SHIM STACK HEIGHT (In)	EFFECTIVE WRES	JACK I.D.	LUET-OFF (Mps)	AALV (Hdps)	B.V.P.F. (KQPS)	96% B.V.P.F. (KOPS)	90% B.V.P.F. (KIPS)	ADJACENTS REQUIRED	AS FOUND ACCEPTANCE
13H33	BT 1 BT 3	7.00 6.75	163 163	8784 8780	1310.35 1302.57	1306.46	1366	1298	1229	NO	YES
13H34	BT 1 BT 3	7.00 7.00	163 163	8784 8780	1350.83 1386.39	1368.61	1475	1402	1328	YES	NO
13H35	BT 1 BT 3	6.56 6.38	163 162	8784 8780	1249.64 1238.87	1244.25	1373	1304	1235	YES	NO
13H37	BT 1 BT3	6.88 5.75	163 163	8784 8780	1367.69 1212.05	1289.87	1368	1299	1231	YES	NO
13H38	BT 1 BT 3	6.50 7.00	163 163	8784 8780	1411.54 1378.57	1395.05	1444	1372	1300	NO	YES

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porter de ,		TABLE 4	4:-i46H21	ADJÁCE	NTS - SO	9.0 <b>-∮</b> MQ	NITORING	SATENDO	ŅŢOŖĊÈ	t no dese	7- 6-91 A
TENDON	END	SH <b>IM STA</b> CK HEIGHT (in)	EFFECTIVE WRES	JACK I.D.	LFT-OFF (Klps)	AALV (kips)	B.V.P.F. (KIPS)	95% B.V.P.F. (KIPS)	90% B.V.P.F. (KIPS)	ADJACENTS REQUIRED	AS-FOUND ACCEPTANCE
46H19	BT 4 BT 6	7.00 7.50	163 163	8780 8784	1352.87 1364.35	1358.61	1402	1332	1262	NO	YES
46H20	BT 4 BT 6	6 75 7.25	160 163	8780 8784	1269.04 1327.22	1298.13	1467	1394	1321	YES	NO
46H22	BT 4 BT 6	5.75 6.38	163 163	8780 8784	1315.98 1306.98	1311.48	1486	1412	1337	YES	NO
46H23	BT 4 BT 6	6.00 5.75	161 163	8780 8784	1336.10 1323.85	1329 97	1425	1354	1283	YES	NO
46H24	BT 4 BT 6	6.75 7.50	163 163	8780 8784	1419.92 1431.78	1425.85	- 1472	1398	1325	NO	YE\$

		TABLE 4	5: 62H30	ADJACE	NTIS – SC	9.0 - MOI	NITORIN	G*TENDO	NFORCE		
TENDON	ENO	SHIM STACK HEIGHT (in)	EFFECTIVE WRES	JACKI,D.	1.1877-07F (Man)	AALV (kips)	B.V.P.F. (KDS)	96% B.V.P.F. (K(PS)	90% B.V.P.F. (KJPS)	ADJACENTS REQUIRED	AS-BOUND ACCEPTANCE
62H29	BT 2 BT 6	6.50 6.38	163 163	8780 - 9501	1366.28 1372.98	1369.63	1421	1350	1279	NO	YES
62H31	BT 2 BT 6 *	6.25 6.00	163 163	8780 N/A	1269.04 N/A	1269.04	1475	1401	1328	YES	NO
62H32	8T 2 BT 6 •	7.00 6 50	163 163	8780 N/A	1332.75 N/A	1332.75	1455	1382	1310	YES	NO
62H33	617 2 617 6	6.19 6.50	163 162	8780 8784	1242.22 1384.56	1313.39	1481	1388	1315	YES	NO
62H34	BT 2 BT 6	7.00 6.75	163 162	8780 8784	1393.10 1364.32	1378.71	1432	1360	1289	NO	YE\$

\* TENDON NOT ACCESSABLE AT BUTTRESS 6.



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PROJECT TITLE:	30

R-N1002-504 REVISION: 0 PAGE: 40 NAL REPORT FOR THE 30TH YEAR CONTAINMENT IWL INSPECTION 1<sup>TH</sup> YEAR TENDON SURVEILLANCE AT CRYSTAL RIVER

. DATE: 01/24/08



		2 3 M	BLE 46	ADJAÇEÑ	its - têi	DON FOR	CE RESI	ORATION			
-		AS-FOUND LIFTOFF			R	RESTORATION			P.F.	re 7	
TENDON	END	JACK	LIFT-OFF (kips)	AALV (kips)	JACK	LIFT-OFF (kips)	AALV (kips)	B.V.P.F. (KIPS)	% VARIATION ABOVE B.V.P.F	ACCPETABLE	
13H34	BT 1	87 <b>84</b>	1350.83	1368.61	8784	1479.00	1508.13	1475	+2.2%	YES	
19/134	BT 3	8780	1386.39	1000.01	8780	1537.27	1000.15	1413	· 2.2 /2		
13H35	BT 1	8784	1249.64	1244.25	8784	1411.54	1417.40	1373	+3.2%	YES	
(31133	BT 3	8780	1238.87	1211.20	8780	1423.27				1	
13H36	BT 1	8784	1344.08	1385.23	8784	1546.46	1555.27	1484	+4.8%	YES	
15/150	BT 3	8780	1426.63	1565.25	8780	1564.09	1333.27	1404			
13H37	BT 1	8784	1367.69	1289.87	8784	1394.68	1415.68	1368	+3.5%	YES	
131137	BT 3	8780	1212.05	1209.07	8780	1436.69	1413.00	1300	*0.070	123	
46H20	BT 4	8780	1269.04	1298.13	8780	1486.98	1494.79	1467	+1.9%	YES	
401120	BT 6	8784	1327.22	1200.10	8784	1502.61			- 1.374	125	
46H21	BT 4	8780	1319.34	1330.02	8780	1503.74	1501.49	1441	+4.2%	YES	
	BT 6	8784	1340.71		8784	1499.24					
46H22	BT 4	8780	1315.98	1311.48	8780	1567.45	1538.40	1486	+3.5%	YES	
	BT 6	8784	1306.98		8784	1509.35			0.0 #		
46H23	BT 4	8780	1338.10	1329.97	8780	1486.98	1481.30	1425	+4.0%	YES	
40/125	BT 6	8784	1323.85	1540.07	8784	1475.62		1425	.4.0 %	125	
62H30	BT 2	8784	1249.64	1290.84	8780	1443.39	1467.71	1413	+3.9%	YES	
UZHJU	BT 6	9501	1332.05	1250.04	9501	1492.04		1413	• 5.5 /4		
62H31	BT 2	8780	1269.04	1269.04	8780	1488.98	1486.98	1475	+0.8%	YES	
UZNJI	BT 6 *	N/A	N/A	1205.04	N/A	N/A	1400.50	1475	TU.070	163	
62H32	BT 2	8780	1332.75	1332.75	8780	1497.04	1497.04	1455	+2.9%	VEC	
JENJE	8T 6 *	N/A	N/A	1002.10	N/A	N/A		1⇒00 	*4.074	YES	
62422	BT 2	8780	1242.22	1312 20	8780	1488.98	1494 70	1461	+2 3H	VEC	
62H33		8784	1384.56	1313.39	8784	1502.61	1494.79	1461	+2.3%	YES	

\* TENDON NOT ACCESSABLE AT BUTTRESS 6 - RESTORATION ONE END ONLY.



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ł						



		BLE 47: AVERAGE			MINIMUM	
TENDON	AALV (KIPS)	NORMALIZING FACTOR	NORMALIZED AALV (KIPS)	NORMALIZED GROUP AVE.	REQUIRED NORMALIZED FORCE	ACCEPT.
12V01	1559.95	-9	1550.95			
45V20	1456.80	7	1463.80	1535,23	1149	YES
61V08	1505.98	23	1528.98	1000.20	145	125
61V17	1580.18	17	1597.18			
13H33	1306.48	62	1368.46			-
13H34	1368.61	-47	1321.61			
13H35	1244.25	56	1300.25			
13H36	1385.23	-56	1329.23			
13H37	1289.87	61	1350.87			
13H38	1395.05	-17	1378.05			
42H46	1558.63	-28	1530.63			
46H19	1358.61	25	1383.61			
46H20	1298.13	-39	1259.13	1347.36	1252	YES
46H21	1330.02	-12	1318.02	( (347.30	1252.	163
46H22	1311.48	-57	1254.48			
46H23	1329.97	4	1333.97			
46H24	1425.85	-44	1381.85			
51H34	1464.70	-59	1405.70			
62H29	1369.63	7	1376.63			
62H30	1290.84	14	1304.84			
62H33	1313.39	-32	1281.39			
62H34	1378.71	-5	1373.71	1		
D129	1289.64	34	1323.64			
D212	1277.81	15	1292.81	1367.33	1215	YES
D238	1511.53	-26	1485.53			