June 1981
Tendon Surveillance Program
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JUNE, 1981 SURVEILLANCE PROGRAM

1.0 INTRODUCTION

The June 1981 tendon surveillance program is presented in detail. The program includes the liftoff of fourteen (14) tendons including the four (4) tendons with load cells. The data collection system required will not only confirm the liftoff data, but it will also obtain data needed to continue the investigation into the larger than predicted tendon losses. The inspection and selection process discussed in the Proposed Revision 3 to USNRC Regulatory Guide 1.35 are followed. The measured force for each tendon will be evaluated with respect to its predicted lower limit force discussed in this guide. These predicted lower limit forces are obtained using the loss calculation methodology described in the Proposed USNRC Regulatory Guide 1.35 Position 1.

2.0 OBJECTIVES

The June, 1981 surveillance program is required to verify that the tendon forces are within the technical specifications and to provide further information as to why tendons have experienced prestress losses in excess of their predicted values. This surveillance program as outlined herein has four objectives:

1. To measure lift-off forces in selected tendons.

2. To compare lift-off forces with those predicted, using either the existing relaxation data and/or retensioned wire data from the testing currently underway at Lehigh University.

3. To compare the two force measuring systems:

    a. Strain gaged stressing rod.

b. Pressure gauge and effective ram area.

4. To test the 6% overstress effect.

The following surveillance program is intended for use only in June 1981. It is expected that the detail data gathering proposed will not be necessary on subsequent surveillances.

3.0 TENDON SELECTION

3.1 The tendon selection process will:

1. Verify that tendon force losses have stabilized.

2. Survey enough tendons to extend present data base.

3. Include all four tendons with load cells.

4. Include tendons retensioned at 1000 hours after initial stressing.

5. Include tendons from each tendon mark category.

3.2 Table 1 contains the complete list of selected tendons.

3.3 To verify that the tendon force loss has stabilized, tendons 62 and 76 are selected because they experienced large losses during the first eleven (11) years. Tendon 51 is selected as an average loss tendon and 155 as a minimal loss tendon.

3.4 To extend the data base, tendons 17 and 84 are selected because they each have four (4) recorded data points.

3.5 Load cells are present under tendons 13, 53, 93, and 133, therefore, these are selected for surveillance. Tendons 133 and 13 will be used to evaluate the 6% overstress effect.

3.6 To include tendons retensioned at 1000 hours, four are selected; two surveyed previously (36 and 111) and two not surveyed (33 and 116).

4.0 TEST PROCEDURE FOR LIFT-OFF

4.1 Initial Conditions

1. Plant may be in any phase of operation.

2. Pressure gauge has been calibrated.

3. Hydraulic ram area has been calibrated.

4. Hydraulic pump and ram are functional and ready for operation.

5. Load cells and stressing rod have been calibrated.

6. All tendons to be stressed have been inspected for broken wires and corrosion.

7. Containment structure has been inspected for cracks, spalling, etc.

4.2 Precautions

1. Observe all RG&E safety rules and regulations.

2. Do not exceed 6560 psi gauge pressure for jack and tendons.

3. Whenever hydraulic pump is operating, the reservoir vent valve must be open.

4. Do not extend ram more than 8 inches.

4.3 General Instructions

1. Fill in line 1-4 on the data sheet (See Appendix I) and record comments from the visual inspection on line 5.

2. Move assembled hydraulic jack to position for coupling to the anchor head and place the pump in a convenient location for operation.

   a. Carefully thread stressing adaptor onto tendon anchor head.

   Note: Leave a minimum of one thread and maximum of three threads on tendon anchor exposed below the lower edge of the stressing adaptor.

   b. Place jack assembly on tendon base plate.

   c. Center jack chair carefully over tendon head and thread stressing rod into stressing adaptor.

   d. Center compression shims and tighten jack rod nut at top (ram) end of jack being careful not to damage strain gaged area and the electrical connector on top of the jack rod.

3. Make the appropriate strain gage connections and check for malfunctions.

4. Before attaching hoses to jack for the first tendon, check pump and hoses by performing the following:

   a. Set valves to pump position.

   b. Start pump at the same time depress the ball valve.

c. Pump slowly to fill hose with oil until it comes out of the hose free of bubbles.

d. Release ball valve and start pumping again. Continue pumping; hose will become stiff; gauge pressure will rise rapidly and then hold constant.

5. Reduce pressure and connect hoses to jack.

6. Record all initial readings in the appropriate columns on the data sheet.

7. Start pump and increase pressure to 2,000 psi.

   a. Record stressing rod reading in column 3a on data sheet.

   b. Record load cell reading in column 4a on the data sheet if tendon has load cell.

   c. Record ram position in inches in column 5 on data sheet.

   d. Calculate and record force values for the stressing rod, pressure gauge and load cell.

8. Increase pressure up to 4,000 psi and hold.

   a. Inspect for leakage of hydraulic fluid and note if leakage is excessive.

   b. Record stressing rod and load cell (if tendon has load cell) readings in the appropriate columns on the data sheet.

   c. Calculate and record force for the stressing rod, pressure gauge and load cell.

9. Increase pressure until a 0.035 (1/32) inch thick feeler shim can be inserted into the shim stack at two equally spaced positions around the shim stack.

10. Reduce ram pressure 1000 psi or until the feeler shims cannot be removed. Increase pressure until both feeler shims can be removed. Note in the comment section if there is a large difference in the load at which each feeler shim can be removed. This is defined as liftoff.

    a. Record the pressure gauge reading on the data sheet in column 2a.

    b. Record the stressing rod reading on the data sheet in column 3a.

    c. Record the load cell reading for load cell tendons in column 4a.

    d. Record the ram position in column 5 of the data sheet.

    e. Calculate and record force values.

11. Stress tendons 13 and 133 an additional 6% over recorded liftoff pressure.

    a. Record computed 6% overstress pressure on data sheet in column 2a.

    b. Increase pressure to computed 6% over stressing pressure and record stressing rod reading, load cell reading and ram position on the data sheet.

    c. Place two .035 (1/32) inch thick feeler shims in the shim pack and reduce ram pressure to approximately 2900 psi.

d. Slowly increase pressure until the feeler shims can be withdrawn from shim stack. This is defined as liftoff. Record load cell, pressure gauge, strain gage and ram position on data sheet.

e. Calculate and record force values on data sheet.

12. Decrease pressure to approximately 4,000 psi.

a. Record stressing rod reading, load cell and ram position on the data sheet.

b. Calculate and record force values on data sheet.

13. Decrease pressure to approximately 2,000 psi.

a. Record stressing rod reading, load cell reading and ram position on the data sheet.

b. Calculate and record force values on the data sheet.

14. Decrease pressure until all load is removed from jack rod.

a. Record stressing rod reading, load cell reading and ram position on the data sheet.

15. Remove jack assembly from tendon.

a. Disconnect strain gage equipment.

b. Unthread stressing rod from coupler.

c. Remove jack chair and stressing rod assembly.

d. Remove adapter from tendon head.

16. Record any comments concerning liftoff on the data sheet.

17. Move to next tendon.

5.0 DATA COLLECTION PROCEDURES

5.1 Test Data - Record all data as required in 4.0, Test Procedure for Liftoff

5.2 Data sheet - The proposed data sheet is presented in Appendix I.

5.3 Strip chart recordings of force from load cell tendons will begin when the jack assembly is moved from that tendon and continue for 500 hours.

6.0 TENDON SURVEILLANCE SEQUENCE

The schedule is presented in Table 2.

7.0 ACCEPTANCE CRITERIA

The measured liftoff forces will be evaluated in accordance with the present "Ginna Technical Specifications."

Table 1

TENDON SELECTION

Tendon Number	Tendon Mark	Comments
13	A	Load cell
17	C	Maximum recorded data
33	GS	Retensioned at 1000 hours
36	HT	Retensioned at 1000 hours
51	A	Average 11 year loss
53	A	Load cell
62	A	Large 11 year loss
76	B	Large 11 year loss
84	A	Maximum recorded data
93	A	Load cell
111	A2	Retensioned at 1000 hours
116	FR	Retensioned at 1000 hours
133	A	Load cell
155	A	Small 11 year loss

Table 2

TENDON SURVEILLANCE SEQUENCE

Sequence Number	Tendon Number	Special Instructions
1	13	Load cell and 6% overstressing
2	17	
3	33	
4	36	
5	51	
6	53	Load cell
7	62	
8	76	
9	84	
10	93	Load cell
11	111	
12	116	
13	133	Load cell and 6% overstressing.
14	155	

Appendix I

Data Sheet - June 1981 Tendon Surveillance

DATA SHEET 1 - JUNE, 1981 TENDON SURVEILLANCE
RG&E GINNA NUCLEAR POWER STATION
ROCHESTER GAS AND ELECTRIC CORPORATION

1) Date _____ Tendon No. _____ Shim Stack Thickness _____

2) Hydraulic Jack No. _____ Ram Area* _____

3) Hydraulic Pump No. _____ Pressure Gauge No. _____

4) Load Cell Factor** _____ Stressing Rod Gage Factor*** _____

5) Tendon Inspection Comments _____

(1) Condition	(2) Pressure Gauge		(3) Stressing Rod		(4) Load Cell		(5) Ram Position	(6) Comments
	(a) Pressure (psi)	(b) Force* (lbs)	(a) Strain (m in/in)	(b) Force** (lbs)	(a) Strain (m in/in)	(b) Force*** (lbs)	inches	
Initial	0							
Increasing	2000							
Increading	4000							
Liftoff								
Liftoff + 6% (Tendons 13 & 133)								
Liftoff								
Decreasing	4000							
Decreasing	2000							
Decreasing	0							

DATA SHEET 1 (Cont'd)

Notes: (*) Ram area to be used to calculate ram force in column 2b: Force = Ram Area x Pressure

(**) Load Cell Factor to be used to calculate force in column 4b: Force = Load Cell Factor x (Strain Reading - Initial Strain Reading)

(***) Stressing Rod Gage Factor to be used to calculate force in rod in column 3b: Force = Stressing Rod Gage Factor x (Strain - Initial Strain Reading)