Attachment C

SURVEILLANCE TEST PROCEDURE COVER SHEET

STP NO. [illegible] TITLE [illegible]

	Prepared By	Date	Reviewed By	Date	POSRC	Date	Approved By	Date
Original	H. McCall	7-11-78	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7-11-78
Revision								

PERFORMANCE OF SURVEILLANCE TEST

Approved John Hill Date 7 Aug 78
Shift Supervisor

Test Results in Spec? YES X NO __ Malfunctions Indicated? YES __ NO X
Adjustments Performed? YES __ NO X MR Submitted? YES __ NO X
All ADJUSTMENTS ARE PER PROCEDURE
Remarks, Nature of Malfunctions, or Adjustments Performed and Results:
Did not record grease installation temperatures

Test Completed By: Bernard C [illegible] Date 5/15/79

REVIEW OF COMPLETED TEST

Follow up Action :

Foreman/Shift Supervisor John [illegible] Date 8/14/79
Action Taken or Analysis Results:

Surveillance Test Engineer [illegible] Date 8/15/79
*POSRC ______ Meeting ______ Date ______
*Approved [illegible] Date 8/15/79
Chief Engineer

*Required only if changes made to [illegible]

Note: [illegible]

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PDR ADOCK 05000317
P PDR

Attachment C

SURVEILLANCE TEST PROCEDURE COVER SHEET

STP NO. 1-T-2 TITLE Unit 1 Containment Tendon Surveillance

	Prepared By	Date	Reviewed By	Date	POSRC	Date	Approved By	Date
Original	H. McCall	7-11-78	[illegible]	7/12/78	78-1?3	[illegible]	[illegible]	7-11-78
Revision								

PERFORMANCE OF SURVEILLANCE TEST

Approved ______________________ Date ______________
Shift Supervisor

Test Results in Spec? YES ___ NO ___ Malfunctions Indicated? YES ___ NO ___
Adjustments Performed? YES ___ NO ___ MR Submitted? YES ___ NO ___

Remarks, Nature of Malfunctions, or Adjustments Performed and Results:

Test Completed By: ______________________ Date ______________

REVIEW OF COMPLETED TEST

Follow up Action : ______________________

Foreman/Shift Supervisor ______________________ Date ______________

Action Taken or Analysis Results: ______________________

Surveillance Test Engineer ______________________ Date ______________

*POSRC ______________ Meeting ______________ Date ______________

*Approved ______________________ Date ______________
Chief Engineer

*Required only if changes made to procedure

Note: Use back of sheet for additional comments.

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I. GENERAL PRECAUTIONS

1. Temporary protection shall be provided for the tendons during the surveillance.
2. The elapsed time between removal and replacement of sheathing filler should not exceed two weeks, although no deleterious effects should be expected if all exposed surfaces are coated with Visconorust 2090P or Amber 1601.

II. TENDONS TO BE INSPECTED

1. A list of tendons to be inspected will be obtained from the surveillance test Engineer and recorded on data sheet II.1. This list will consist of 10 horizontal, 5 vertical and 6 dome tendons. The list will include definition of which of these surveillance tendons are to have a wire removed for inspection and tensile strength testing. If for any reason any of the Surveillance tendons so designated by the Surveillance Test Engineer are inaccessible or otherwise not able to be tested, alternate surveillance tendons will be designated and such will be indicated on data sheet II.1, with the reasons for the required change.
2. Prior to commencement of the surveillance Data sheet VI.1 page (1) will be completed as per steps (1) thru (4) of the data sheet instructions.

III. ADMINISTRATION OF PROCEDURES DURING SURVEILLANCE

1. A copy of the procedure will be maintained by each of the two crews performing the surveillance. (Any procedural changes must be controlled in a similar manner for each copy). In addition to this copy of the procedure, each crew will have with them the

data package for the tendon under test. This data package, consisting of data sheets IV.1, V.1, VI.1 (pages 1 & 2 and instructions), VI.2 (pages 1 & 2) VI.3 (page 1, 2 or 3) and VII.1 will have all information required from past records and all appropriate computational data required for acceptance criteria entered into them prior to commencement of the tendon surveillance.

Upon completion of each data package (with the possible exception of the regreasing information, if a delay is foreseen) the results will be entered into the summary sheet (see section XII) reviewed by the shop foreman and forwarded to the Surveillance Test Engineer (STE). The STE will promptly review the data and return it to the foreman to be assembled into the procedural package for the entire surveillance.

IV. SHEATHING FILLER INSPECTION

The sheathing filler (Visconorust 2090P-2 or P-4 or its equivalent) may be liquid, gel or solid. All states may occur at a particular tendon. Only sufficient filler should be removed, as to allow the required inspection of the stressing washer, buttonheads etc.

1. Record the air temperature both inside and outside Containment For tendons which end inside the Auxiliary Building the temperature will be measured in the vicinity of the tendon end. For all others, any temperature representative of ambient in the vicinity of containment is sufficient. (It is not intended that a thermometer be carried in the skyclimber just for this purpose). Record temperatures on data sheet IV.1.

2. Upon removal of the grease cap from each end of the tendon, collect 2 - 1 quart samples of filler (preferably one quart from each end). Drain any grease removed into a barrel in order that an estimate of the volume of grease lost may be entered into data sheet IV.1.

3. Perform an examination of the tendon ends to determine the extent of coverage of the sheathing filler and note any apparent presence of water in the filler indicated by emulsification or milky appearance. Indicate on data sheet IV.1 how the color of the filler compares with a sample of new filler.

4. Submit one sample of sheathing filler from each tendon for chemical examination as per Appendix (3) the "Specification for Laboratory Testing of Sheathing Filler"(Visconorust 2090P)

V. <u>VISUAL INSPECTION OF ANCHORAGE COMPONENTS</u>

1. Thoroughly clean the anchorage components with Viscosity Oil Company's Industrial solvent #16 (or equivalent). Note: Chlorinated hydrocarbon solvents shall not be used.

2. Inspect all buttonheads for shape and size using a Go-No-Go gauge with end inside diameters of $0.3906^{+0.000}_{-0.005}$ and $0.3594^{+.0005}_{-.0000}$ (see attachment 1). Compare buttonhead status with that obtained from the original stressing records i.e. the stressing cards, Appendix F of the prestressing report, or previous surveillance reports. All defective buttonheads will be indicated on the end anchorage and stressing washer inspection sheet (Data sheet V.1). If their number is different from the number of defective buttonheads previously reported, this will be indicated on the inspection sheet.

3. All anchorage components will be visually examined for any indications of corrosion, pitting cracking, distortion or damage. Record all findings on the end Anchorage and Stressing washer inspection sheet (Data sheet V.1).

- NOTE -

The shims do not have a machined surface - they will seem to have a "scale" somewhat like mill-scale. This is not necessarily indicative of any corrosion. Rusting and pitting will probably look different.

4. Identify any broken tendon wires - these will be readily identified by buttonhead "pop-up". This inspection for buttonhead pop-up should also be conducted after the distress/restress cycle is complete and the tendon is reshimmed, in case friction should somehow present any broken tendon wires from relaxing sufficiently, as to be visible.

5. Any defects found during the End Anchorage Assembly inspection will be immediately brought to the attention of the Surveillance Test Engineer in order that any special investigatory or reporting requirements may be satisfied. A sketch will be made of any defects which cannot be clearly shown on the End Anchorage and Stressing washer inspection sheet. (Data Sheet V.1)

VI. DESTRESSING AND LIFT-OFF MEASUREMENT

A. Initial Conditions

1. Record the serial numbers for all gauges and jacks used on data sheet VI.1. Verify that gauges are undamaged and check for zero deviation.

- CAUTION -

All personnel on work platforms during tensioning operations should be familiar with and abide by the following rules:

a. When on the skyclimber, safety belts will be used at all practicable times.

b. Whenever the rams are being handled, all people not directly involved with the rigging will stand well clear.

c. No-one shall stand behind the jacks when they are pressurized.

d. All fingers must be kept away from the tendon and jack, except when required to determine lift-off forces or remove or install shims.

- NOTE -

For general hints in techniques to be used during destressing and restressing see Appendix 1.

B. Detensioning

1. Measure the depth of the existing shims and record on data sheet VI.2.

2. Attach the jack to the anchorage plate and install the pressure gauges. Check gauges for a zero reading.

3. Destress tendons (horizontal and dome) simultaneously from each end and verticals from the upper end. Increase hydraulic pressures in increments of about 1000 psi. When 1000 psi below the expected lift-off pressure (as per Data sheet VI.1) begin tapping on the shims with a small hammer (about 4 taps per second) and very slowly increase the hydraulic pressure until lift-off is indicated by a change in tone of tapping sound. Definite lift-off will be indicated by movement of the accessible shims.

   This operation will be repeated until three consecutive readings are received within a spread of 200 psi. Record on data sheet VI.2. The average lift-off pressure will be calculated and the value entered into data sheet VI.1 page (2). Acceptance of the data will be obtained by following step 5 of the data sheet VI.1 instructions. If evidence is given of lift-off being unsatisfactory, three more verifying lift-off pressures should be taken.

4. Detension to zero psi.
5. Retension until the wire stress is 0.8f's and record the pressure gauge reading, together with the elongation on data sheet VI.2.

- NOTE -

Elongation is always measured between the bearing plate and the internal face (bearing side) of the stressing washer.

6. Remove and clean the shims and reduce the tensioning force to zero.
7. Increase tensioning force to 1 kip per wire and record the elongation.
8. Detension to zero. If a wire is to be recorded from tendon, remove the jack. If no wires are to be removed, proceed to section VIII.

VII. WIRE SURVEILLANCE

This section is to be performed only for the tendons so designated on data sheet II.1.

The tendon wires shall be removed and inspected as follows:

1. Remove test wires from the three predetermined surveillance tendons. The location of each end of the wire in the stressing washer shall be recorded on the End Anchorage and Stressing washer inspection sheet. The corresponding ends can be identified by pulling one end and observing the buttonhead movement at the other.
2. Pull the test wire at the end to be cut and notch approximately

2" from the end. Record which end is cut and the distance from the notch to the outside of the buttonhead

3. Cut the wire between the buttonhead and the notch.

4. Remove the remaining portion of the wire and clean it with solvent. Inspect and sketch the wire, showing the location of any corrosion or damage. Rate the corrosion level as indicated below. Measure the distance from the notch to the outside of the buttonhead with an accuracy of ± 0.25 inch.

5. Compare the present corrosion level with the previous corrosion rating listed on stressing cards or in previous tests.

If the corrosion has progressed one or more levels, remove one additional wire at approximately 120° from the first wire, repeating sub-paragraphs 2 through 5. If the second wire has progressed one or more levels, repeat this procedure for a third wire selected at approximately 120° from the first two. Do not remove more than three wires from any one tendon during one surveillance period. Three tensile test specimens each approximately 30 inches long, shall be taken from near the center and each end of the wire. Additional specimens shall be taken from the portions of wire that appear to have a corrosion rating one or more levels greater than the average description of the wire.

Definitions of corrosion levels for tendon surveillance are as follows:

Corrosion Level	Description
1	No visible corrosion
2	Reddish-brown color; no pitting
3	$0.000 < \text{pitting} \leq 0.003"$
4	$0.003 < \text{pitting} \leq 0.006"$
5	$0.006 < \text{pitting} \leq 0.010"$

If pitting is found, determination of pitting depth shall be made by person qualified to Level II (NDE), and the Surveillance Test Engineer shall be notified.

7. Reapply a coating of Visconorust 2090P-4 or 1601 amber (or equivalent) and place the wire in a dry and well ventilated place for storage.

VIII. RESTRESSING TENDON

Vertical tendons will be stressed from the upper end, Dome and horizontals will be stressed simultaneously from each end.

1. Calculate the new jacking forces as shown on data sheet VI.1. page (2). Enter values into "objective" column of data sheet VI.2.
2. Install the jacks if not already in place.
3. Increase hydraulic pressures to values corresponding to jacking forces of 1 kip per wire.
4. Measure the elongation (Note: This can indicate a negative value, if the washer is inside the trumpet). Record pressure and elongation on data sheet VI.2.
5. Increase the hydraulic pressure to values corresponding to 0.8f's (see data sheet VI.2), measure elongation and record elongation and pressure on data sheet VI.2.
6. Reduce the hydraulic pressure to about 1000 psi below the original lift-off hydraulic pressure then increase to a value 500 psig above the original lift-off value (deduct 50 psig for each test wire removed or new discontinuous wire found during the surveillance).
7. Measure the distance from the bottom of the stressing washer to the bearing plate and subtract one eighth inch (1/8 in.). This is defined as full shim depth and is the depth of the new shims to be installed.

8. Measure the new lift-off force as done in step VI.B.3. This value should as a minimum equal the original lift-off force. If the new lift-off force is below the initial lift-off force increase the tendon force to 1000 psig above original liff-off, determine the full shim depth as in step 7 above and reshim the tendon. Verify acceptability of the lift-off force. Record all data on data sheet VI.2.

9. Remove the stressing ram and apply a coating of Viscosity Oil Co. 2090P-4 or 1601 Amber (or equivalent) to the tendon end anchorage. Reinstall the grease cap.

IX. REGREASING TENDONS

- NOTE -

Record all data on data sheet IV.1

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JC

1. From data sheet IV.1 determine the volume of grease removed.

2. Refill the tendon system with Viscosity Oil Co. Visconorust 2090P-4 sheathing filler. ~~The temperature of the filler at the filler pump shall be 170° and at least 120° at outlet.~~ Do not reuse filler that has been removed from the tendon. A method which may be used to regrease the tendon is given in Appendix (1). Alternate methods may be indicated by the vendor of the pump or filler material, at the time of supply of the equipment.

- NOTE -

It may not be possible to force grease through the tendon if the sheath is full of cold grease - in which case pumping may be required from each end until the approximate value of the grease lost, is returned to the system.

3. If approximately 7 gallons or less of filler has been removed at each end of the tendon, filler may be replaced by pumping or

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J.C 8-17-78

pouring, provided the ends are vented to provide bleeding out air.

4. Check and record the temperature and the volume of sheathing filler used at each surveillance tendon.

X. TENSILE TESTING OF TENDON WIRE SAMPLES

1. Tensile tests shall be made on at least three specimens from each surveillance wire removed. Tensile test specimens, each approximately 30 inches long, shall be taken from near the center and each end of the wire. Additional specimens shall be taken from the portions of the wire that appear to have a corrosion rating one or more levels greater than the average description of the wire.

   The wires not used for testing shall be protected against corrosion and retained until test results have been finalized.

2. Tensile tests also shall be made on at least one specimen from each discontinuous wire removed. The test specimen shall be taken near the break and shall be approximately 30 inches long.

3. All tensile tests shall be done in accordance with the "Specification for Tension Testing of Post-Tensioning Wire" (ASTM A-421), Appendix 2.

4. Verification that all samples exceed the specified minimum yield strength of 192 ksi at 1% elongation and the specified minimum ultimate strength of 240 ksi will be indicated by recording "satisfactory" or "not satisfactory" on the surveillance summary sheet XII.1.

XI. CHEMICAL EXAMINATION OF SHEATHING FILLER

1. One of each pair of samples of filler obtained in section IV will be analysed in accordance with the Specification for Laboratory Testing of Sheath Filler (Visconorust 2090P) (Appendix (3))

2. The results of this examination will be evaluated to ensure that the concentration of water soluble impurities and water in the sampled do not exceed the following:

   Chlorides - 10 ppm

   Nitrates - 10 ppm

   Sulphides - 10 ppm

   Water - 10% Dry weight

   Hold the second sample only until it is determined that filler acceptance criteria are satisfied.

3. Verification that the tests are/are not satisfactory will be indicated on the Surveillance Summary sheet, data sheet XII.1.

4. If the first sample is proven unsatisfactory the second sample for that tendon will be submitted to the same test.

XII. SURVEILLANCE SUMMARY SHEET

A surveillance summary sheet will be completed as per data sheet XII.1.

DATA SHEET II-1

10 HORIZONTAL, 5 VERTICAL, 6 DOME

#	TENDON	REMOVE WIRE	REASON FOR NON-TEST	VERIFIED BY
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
#	SUBSTITUTES			
1				
2				
3				
4				
5				
#	ADDITIONS			
1				
2				
3				
4				

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No.

Closest Buttress ______

Grease Removal ______

Date Filler CAP Removed ______

Date Grease Removal Started ______

Exterior Temp. ______

Interior Temp. ______

Total Volume Removed ______

Date Filler Cap Reinstalled ______

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon

Presence of Water Indicated

% (Approximate) Coverage of Components

Sample Taken ______ Container Identification ______

Data Recorded By: ______

TENDON GREASE INSTALLATION

Date Installed ______

Delete Grease Temp. Recording

BCR 8-17-78

RFC 8-17-78

Exterior Temp. ______

Interior Temp. ______

Filler Temp. @ Inlet Cap ______

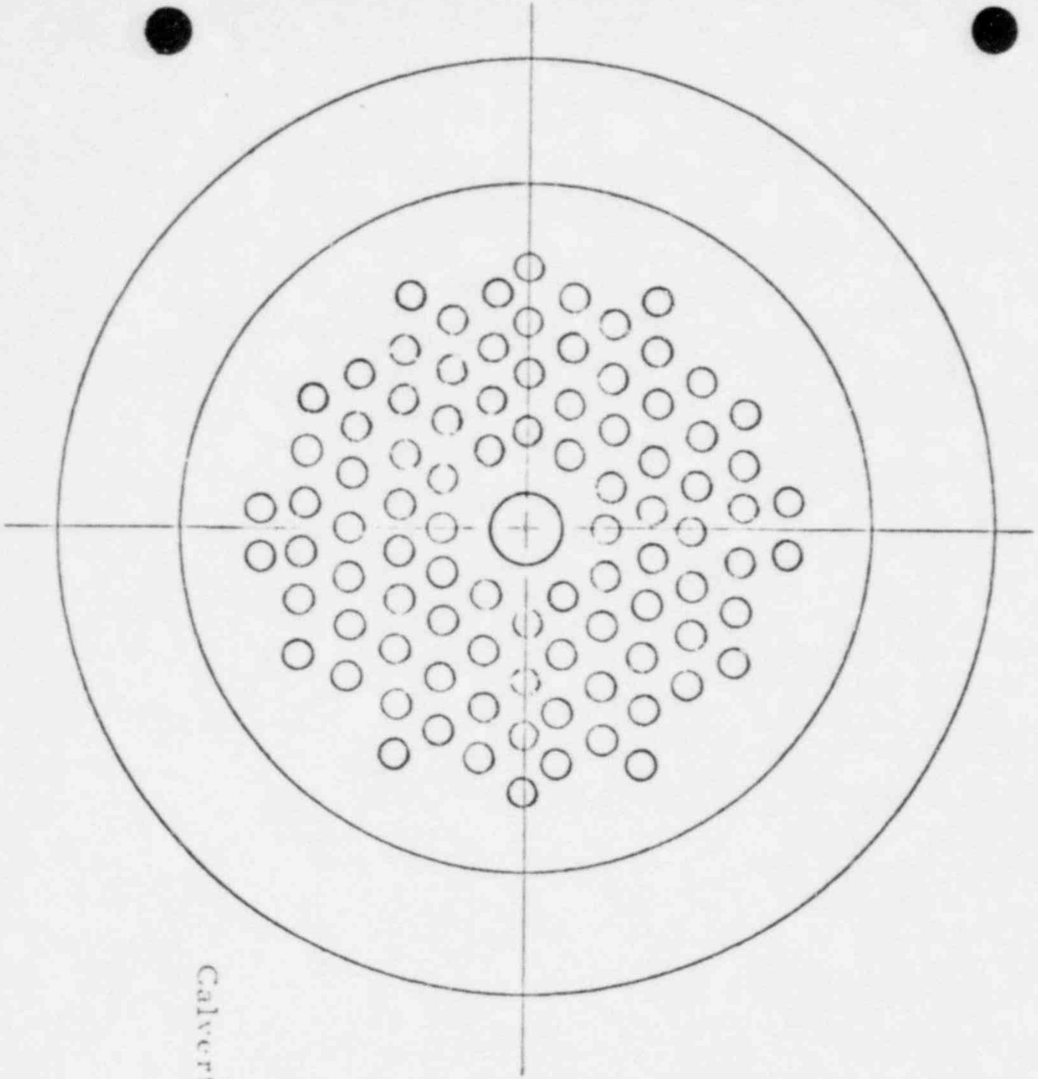
Filler Temp. @ Outlet Cap ______

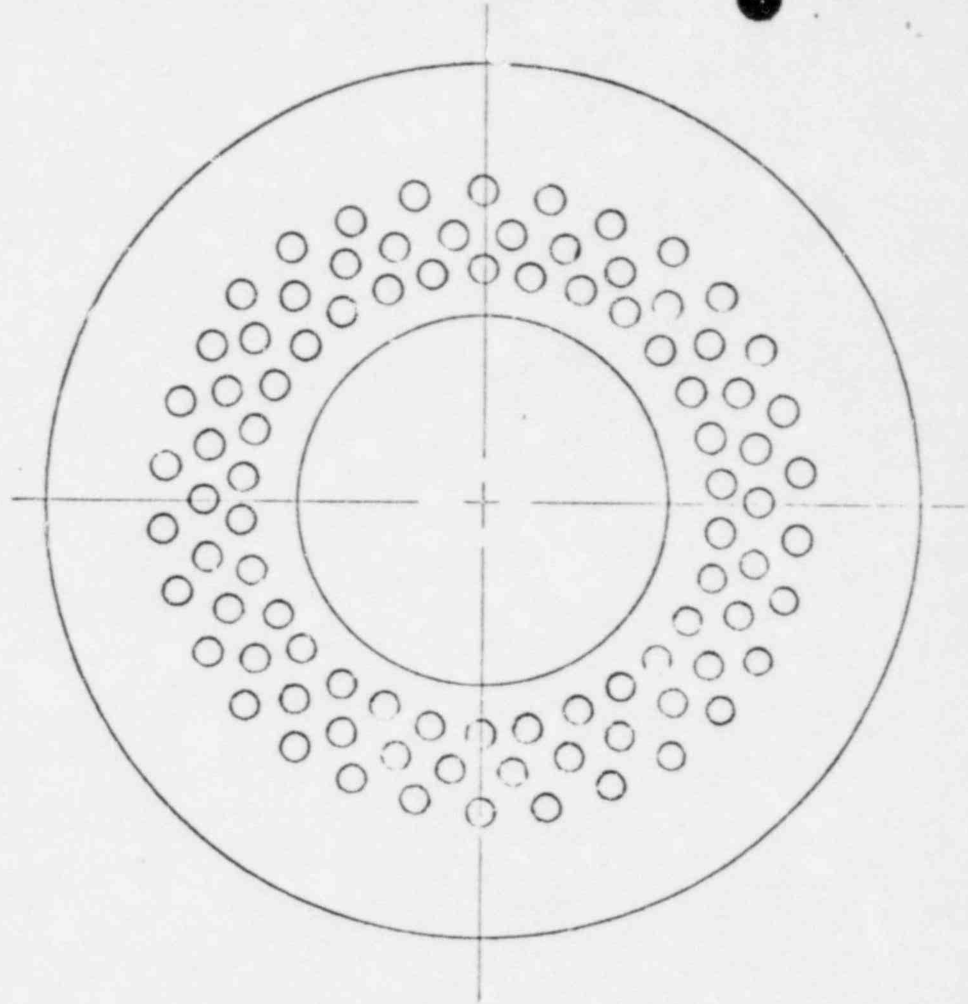
Indicate if pumped or poured

Total Volume Installed ______

Installation Pressure (if poured, N/A) ______

Data Recorded By: ______ Date ______





WIRE ANCHORAGE

Closest Buttress ________

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA FOR STRESSING/RESTRESSING/LIFT OFF ACCEPTABILITY INSTRUCTIONS

- NOTE -

Complete appropriate sections of data sheets VI.1 and VI.3 as these instructions are followed.

A. Determination of Objections during Destressing

1. From the initial Prestressing Report or previous Surveillance Tests determine the initial value to be plotted on the Force-Time Curve.

(a) For tendons not previously part of any surveillance test or repair.

Find the point of entry into the Force-Time Curve as follows. From the Prestressing Report, Appendix A, column (e) determine σ, the wire stress at seating. Subtract off the following losses which are expected to occur in the first 4 days (.01 yrs)

Vertical - (-) 7.12 ksi

Horizontal - (-) 5.48 ksi

Dome - (-) 6.82 ksi

$\sigma_4 = \sigma -$ (4 day loss)

Convert σ_4, the wire stress after four days to F_4, force per wire after four days

$F_4 = \sigma_4 \times A_w = 0.04909\sigma_4$ (A_w = Area of wire = .04909 in^2)

Enter this value (.01 yrs, F_4) into the Force-Time Curve. (data sheet VI.3)

DATA SHEET VI.1 INSTRUCTIONS

(b) For tendons previous part of a surveillance or repair, where tendon has been stressed since its initial stressing. Determine, σ, the seating stress at restressing. Convert the seating stress, σ, to force per wire, F, at the time of restressing.

$$F = \sigma \times A_W = 0.04909\,\sigma \quad (A_W = \text{Area of Wire} = .04909\ in^2)$$

Determine the time between initial stressing and the restressing. Plot the values of force and time calculated above, onto the Force-Time Curve (Data Sheet VI.3)

2. From the point entered into the Force Time Curve, lay a line parallel to the one shown for the predicted minimum effective prestress. The intersection of this line with the time ordinate for the surveillance will give F_{LE}, the expected Lift-off Force/wire. Convert F_{LE}, the expected lift off force per wire to F_L, the expected lift off force, by multiplying by the number of effective wires in the tendon. (See Appendix A, column (g) of Prestressing report or previous surveillance tests).

$$F_L = F_{LE} \times N_e \quad (N_e = \#\ \text{effective wires})$$

3. From the Force-Time Curves determine the force per wire at:
   (a) Maximum Effective Prestress
   (b) Predicted minimum effective prestress for this surveillance
   (c) Absolute minimum effective prestress

4. (a) The 80% minimum ultimate strength (0.8f's) of the tendon is 9.43 kips per wire.
   (b) The initial elongation measurement is performed at a force of 1 kip per wire.

5. Convert the forces per wire in steps 3 and 4 above to total forces by multiplying by N_e, the number of effective wires.

6. From the calibration curves for the stressing rams to be used for the surveillance of this tendon determine the hydraulic pressures corresponding to the forces determined in step 5 above.

B. Acceptability Of Lift-Off

1. If both average hydraulic pressures obtained during determination of lift-off have the following relationship to the hydraulic pressures determined in step A.5 of these instructions, they may be considered acceptable and steps B.2 thru B.7 need not be completed until later. If the below conditions are not satisfied, steps B.2 thru B.7 must be completed immediately to verify acceptable lift-off forces. Steps B.2 thru B.7 will be completed for all tendons.

If both of the average hydraulic pressures (for vertical tendons only one is obtained) are within the limits described tendon lift-off may be considered acceptable.

(a) below the maximum effective prestress
and
(b) above the minimum effective prestress
and
(c) above the predicted minimum effective prestress for this surveillance.

2. Determine the lift-off forces as shown below

(a) For horizontal and dome tendons. Convert the average lift-off hydraulic pressure measured on each end of the tendon to corresponding forces by use of the stressing ram calibration curves. Average the two forces to determine the lift-off force.

(b) For vertical tendons since stressing is performed from only the upper end, lift-off is determined by directly converting the average hydraulic pressure at lift-off to force by using the stressing ram calibration curves.

3. Convert the lift-off force to force per wire at lift off. This is done by dividing the lift off force determined in step 2 above by the number of effective wires in the tendon.

4. On the Force-Time curve (Data sheet VI.3) plot the value of force per wire obtained in step 3 above, with the time ordinate corresponding to the time of the surveillance.

5. From the point plotted in section A of these instructions draw a line through the point plotted in step B.4 above and extrapolate to 40 years.

6. If this line intersects the upper or lower bounds of the Force-Time curve (i.e. prediction exceeds the maximum effective prestress or goes below the minimum effective prestress) or if the point plotted in step B.4 above fall below the lower bound of the force time curve the Surveillance Test Engineer will determine whether tendon degradation exists or whether this condition indicates a need for further surveillance in the future. If tendon degradation is indicated the two adjacent tendons will be tested.

   If both adjacent tendons are acceptance the single deficiency may be considered unique and acceptable (but must be handled in accordance with QAP 26). However, if either adjacent tendon is defective or if more than one tendon out of the original sample population is defective, abnormal degradation of the containment structure may be indicated and is reportable in accordance with CCI-118.

Basis for Force-Time Curve Limits

1. Upper bound: 8.70 Kips/wire

   From page 5.44 of FSAR, max. lift off force of 775 kips. Since it is possible that a 1% measurement error could be introduced, the maximum force should be 782.75 Kip. For a 90 wire tendon this gives:

   $\frac{782.75}{90}$ Kips per wire = 8.697 Kip/wire

2. Lower bound is based on the tendon with the lowest net effective force after 40 years as given in Appendix A of the Prestressing Report.

Horizontal	- 13H67 -	6.83 Kips/wire
Dome	- 1D20 -	6.97 Kips/wire
Verticals	- 12V24 -	6.96 Kips/wire

3. Predicted minimum effective stress line is based on the following:

   1. For verticals - 40 yr. loss is 21.94 Ksi (FSAR P. 5-43)
   2. For Domes - 40 yr. loss is 22.22 Ksi (FSAR P. 5-43)
   3. For Hoops - 40 yr. loss is 25.15 Ksi (FSAR P. 5-43)

   70% of this loss occurs in the first year (Bechtel Civil)

We now have two points to plot the curve. Based on the extrapolation of this line, the intercepts for 0.01 years can be found, and thus the losses for the first 0.01 yrs can be found.

1. The assumption has been made that all losses are equal for all tendons in the first 0.01 years.

2. The line as plotted is a straight line, ie. losses are a fixed exponential rate. It is possible that the initial losses after seating are lost at a greater exponential rate than at any other time. The error introducted by this factor, however, should not be significant since the time interval after time zero is small.

DATA RECORDED BY ____________________

DATE ____________________

TENDON NUMBER DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires N_e	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimum effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	Kips
	Force at 1 kip per wire (1 x N_e)	Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ____________

Date ____________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________

Date ____________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure,, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ___________

CLOSEST BUTTRESS ___________

DATE: ______________ DATA RECRODED BY: ____________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
VI.B.3	Lift Off	**	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
VIII.8	Lift Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
	New Lift-Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

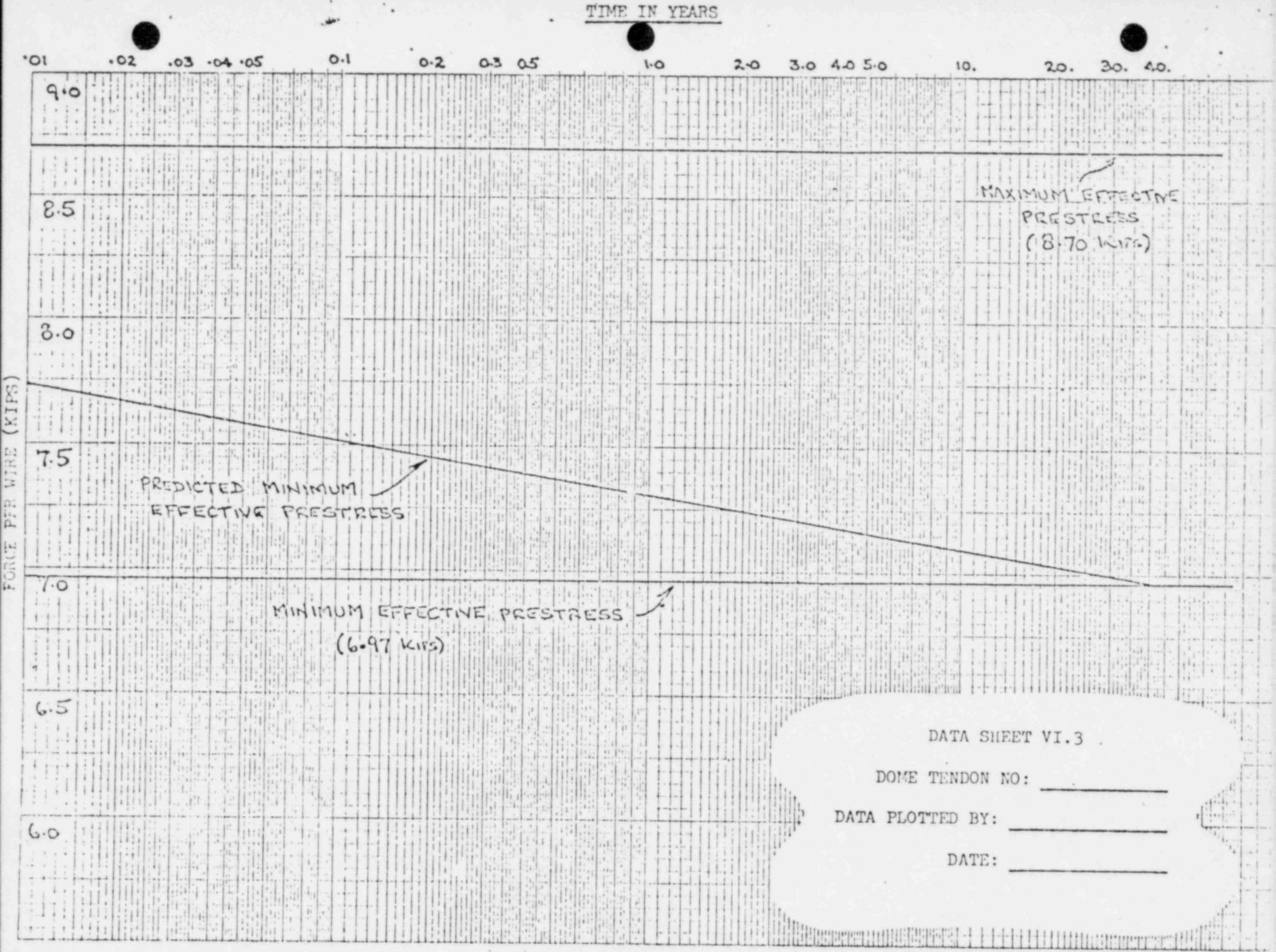
From Page (1)

1. Find Elongation:

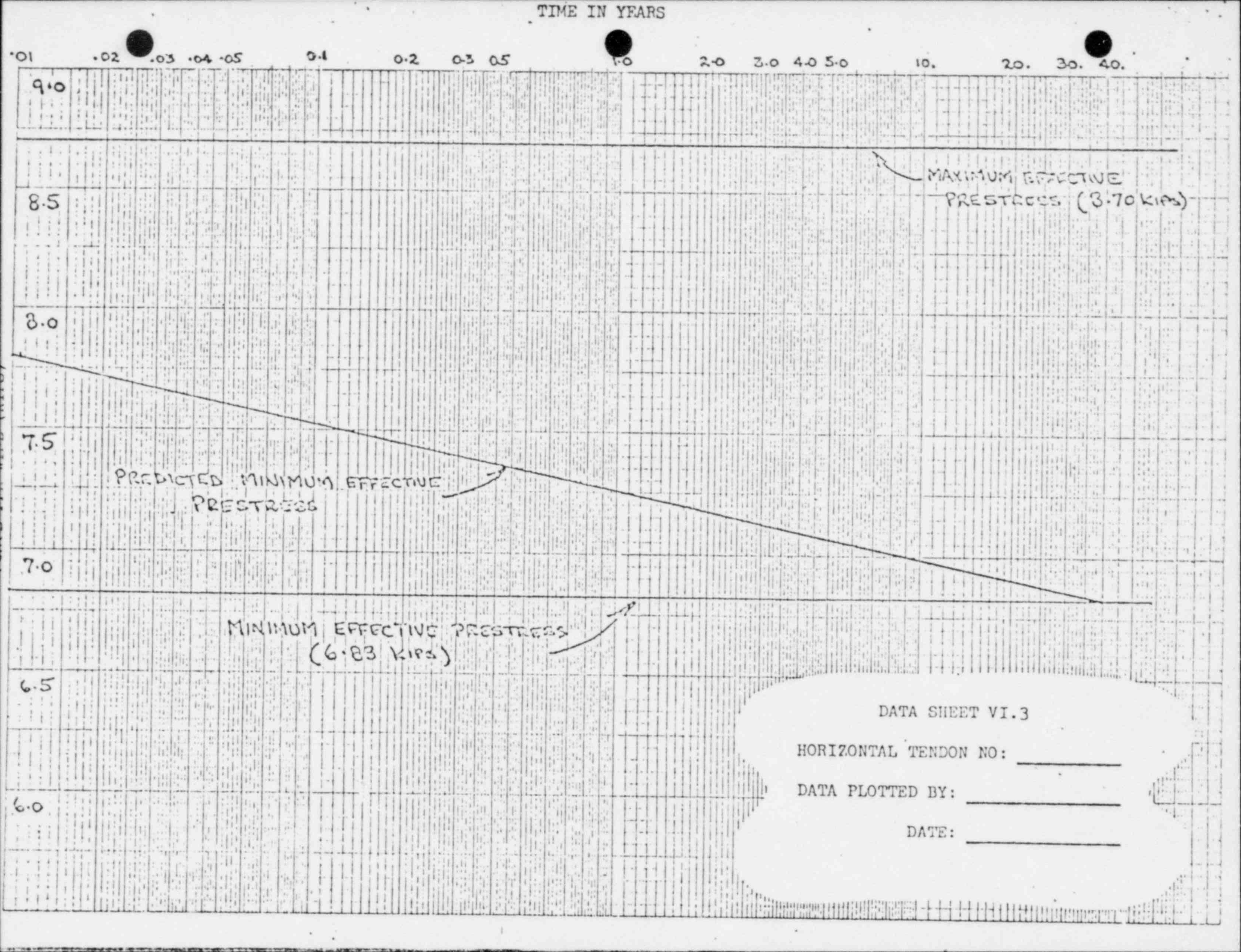
Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



TIME IN YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
FORCE PER WIRE (KIPS)
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 KIPS)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.97 KIPS)
DATA SHEET VI.3
DOME TENDON NO:
DATA PLOTTED BY:
DATE:


TIME IN YEARS
.01
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0.1
0.2
0.3
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3.0
4.0
5.0
10.
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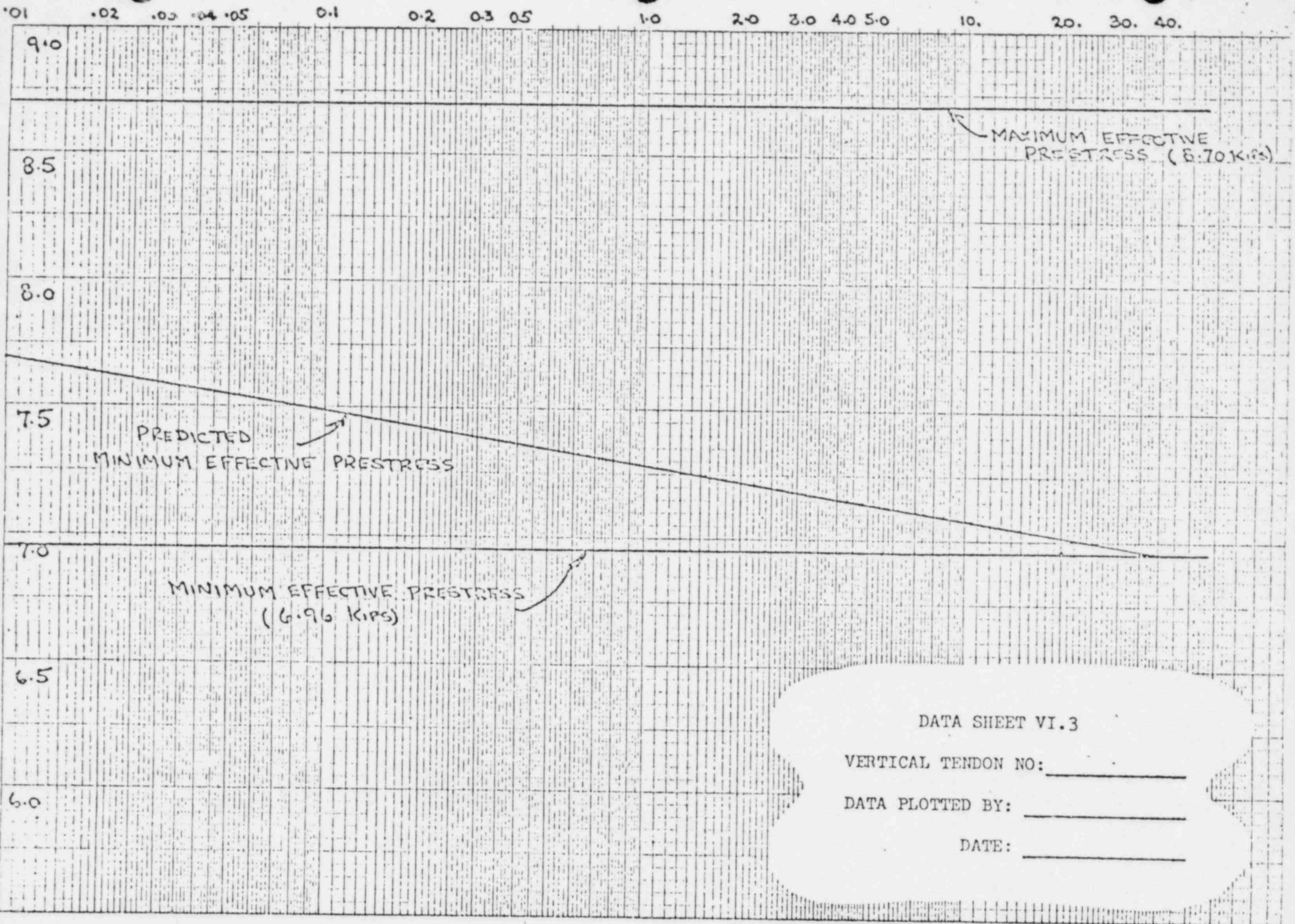
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 KIPS)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: ____
DATA PLOTTED BY: ____
DATE: ____



.01
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0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 Kips)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.96 Kips)
DATA SHEET VI.3
VERTICAL TENDON NO: ______
DATA PLOTTED BY: ______
DATE: ______

TENDON NUMBER: CLOSEST BUTTRESS:

INSPECTION PERFORMED BY: DATE:

LENGTH: BUTTON HEAD TO SCRIBE ________________

Cut End 0 — 25'

25' — 50'

50' — 75'

75' — 100'

100' — 125'

125' — 150'

150' — 175'

Scale 1/4' = 1'-0"

Corrosion Level ____________

Indicate above:
- a. All Corrosion levels
- b. Any scratches resulting from removal
- c. Sample locations
- d. Button head
- e. Any pertinent information indicating wire condition

CORROSION LEVELS

1. No visible oxidation
2. Visible oxidation, no pitting
3. 0 < pitting ≤ 0.003"
4. 0.003" < pitting ≤ 0.006"
5. 0.006" < pitting ≤ 0.010"

☆ Damage resulting from removal

	DESTRESS				RESTRESS				FILLER		WIRE (REMOVED)		
Tendon Ident.	Previous Lift-Off	Meas'd. Lift-Off	Previous Elong.	Meas'd Elong.	Effect. Wires	Final Lift-Off	Meas'd Elong.	Shims Installed	End Anchorage Inspect.	Filler Chem.	Tensile Tests	Wire Cond. or Change	Date Retension

For inspections above indicate Satis./Not Satis.

Data Recorded by ____________________

APPENDIX 1

Appendix (1) is intended to be a guide in performing this surveillance, not an official procedure to be followed step-by-step. All information given is believed true, and reflects past experience. No sketches are to scale and since most are drawn from memory, may contain inaccuracies. If specific information is required it will have to be obtained from prints or from the stressing ram manufacturer/vendor.

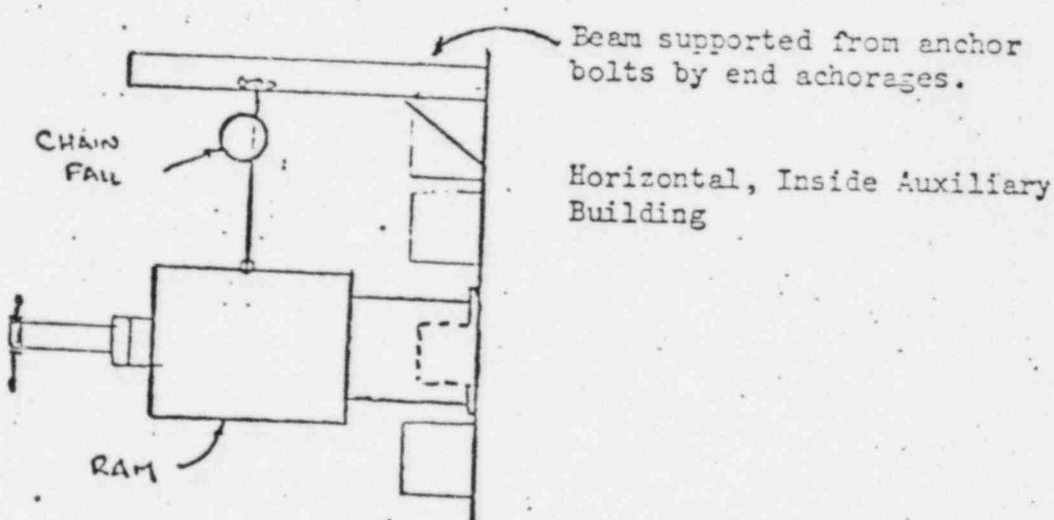
Communications

During all stressing, destressing, wire removal and greasing operations it is extremely critical that exclusive communications be established between each tendon end. Each end should have two headsets, one for each stressing ram operator and one for each of the engineers/technicians who are determine lift-off etc. The best method for communication is a locally strung sound-powered system. Radio communication should also be available for use in times of emergency (for control room personnel to notify the tendon crews of impending steam releases etc. or to allow workers on stranded sky-climbers to signal for assistance).

STRESSING RAMS TO BE USED

1. For horizontal tendons inside the auxiliary building the short ram will allow maximum utilization of the space available.

   Hung as shown below:



2. For horizontals outside containment a long or short ram may be used. For horizontals, close to ground level the ram can be hung from the sky-climber instead of trying to use a beam (as shown above for the inside ends).

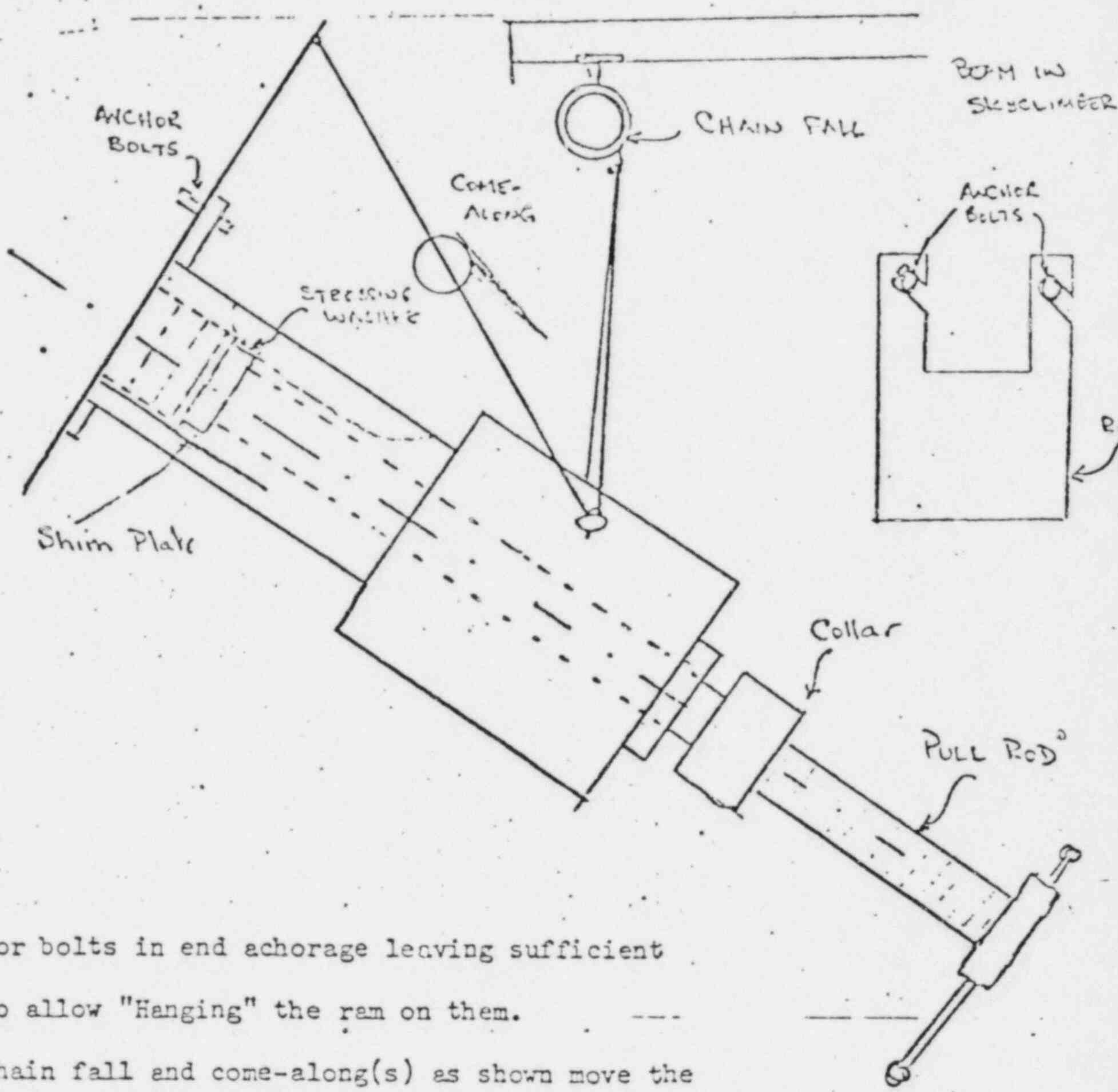
3. A long ram is required to stress a tendon which has an externally threaded stressing washer because of the donut adapter. Since the dome tendons have externally threaded washers on one end and internally threaded washers on the other, and identification of which end is which can only be made by examination, a long ram should be used on each end. The adapter should be available for use on each end

4. The verticals are stressed from the upper end only, so a very long ram will be needed (24" stroke) to handle the complete elongation If a 24" ram is not available, it may require that destressing be completed in two steps. Remove some of the shims, depressurize the ram, readjust the pull rod collar and then repressurize to allow removal of the remaining shims.

5. A crane will be required to lift the stressing rams and pumps onto the containment dome, This is a lift of about 125'

ATTACHMENT OF STRESSING RAMS

HORIZONTAL AND DOMES (SHOWN IN SKETCH)



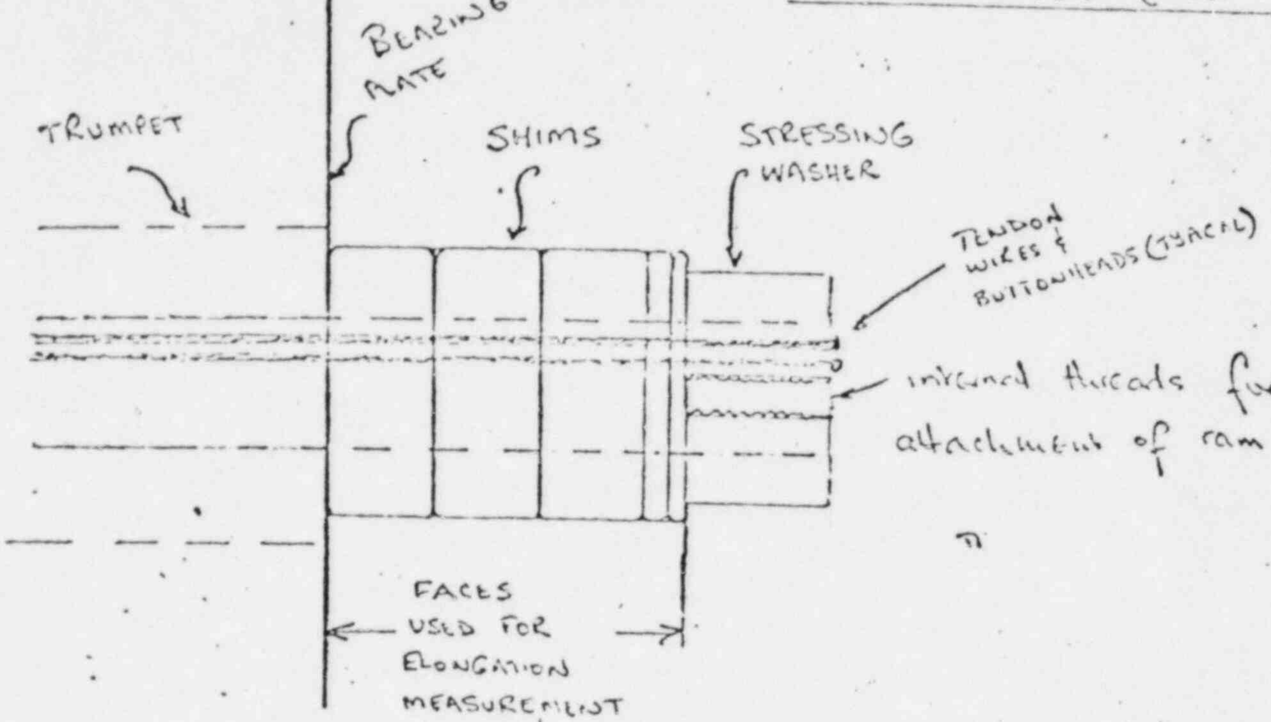
1. Insert anchor bolts in end achorage leaving sufficient clearance to allow "Hanging" the ram on them.
2. Using the chain fall and come-along(s) as shown move the ram up to the anchorage plate and slip it over the two anchor bolts. Harden up the bolts, but maintain ; strain on the chain fall to support the weight.
3. Back down the collar on the pull-rod and push the pull rod up to the stressing washer. Engage the threads and screw the pull rod all the way in. Back it out about a turn or so to prevent any chance of binding.

4. Run the collar down the pull rod until it is about 1/2" clear of the ram piston, to ensure that there will be sufficient clearance to prevent its maintaining a bearing load when the tendon is destressed, and thus preventing any "binding".

   With a dome tendon (NOTE: shown in sketch) it may be necessary to use a come-along to take the weight of the pull rod as it is threaded into the stressing washer.

For any tendons which have externally threaded washers, prior to attaching the ram the "donut" adapter must be screwed into the stressing washer. It is important that this goes in far enough to allow the threads to withstand the forces during stressing, but not so far that it can contact the shims and transmit bearing loads which will cause binding and prevent its removal at completion of stressing.

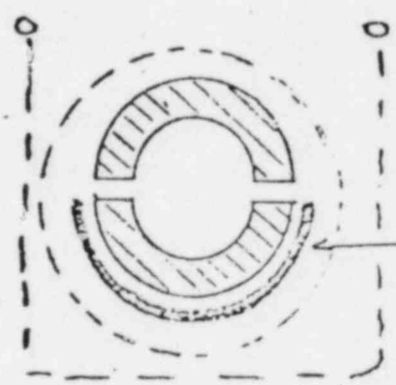
TYPICAL TENDON (HOOP SHOWN)



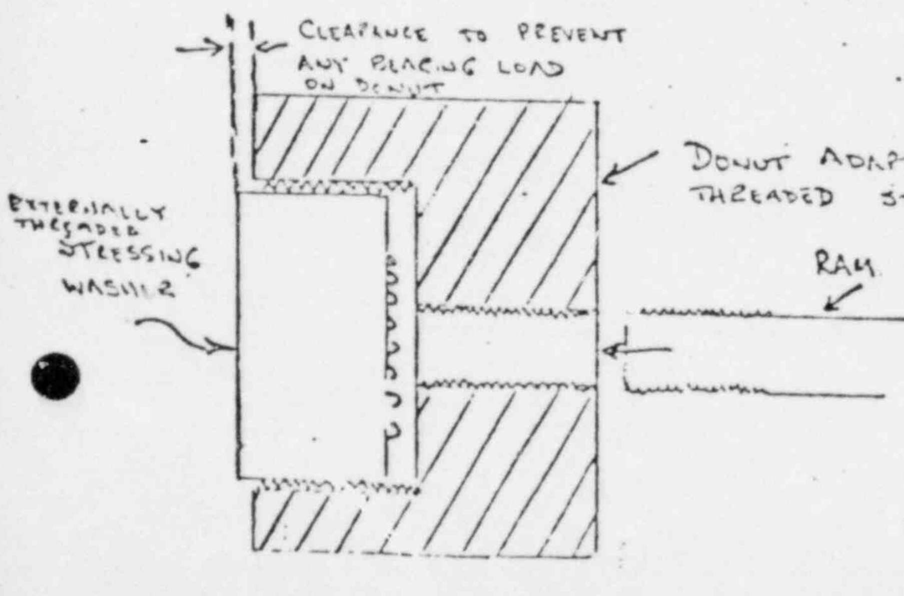
Note: at 1kip/wire the stressing washer may be inside the trumpet, hence the elongation measurement may be negative

Shim Installation

Shims must be oriented as shown



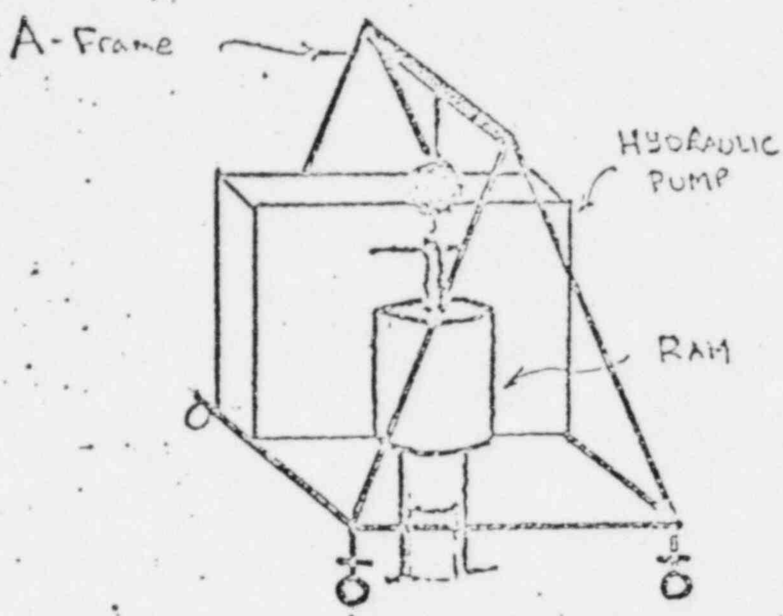
Shim plate on stressing ram must be adjusted to hold lower shims in position during tensioning and detensioning evolutions



TYPICAL
DOME OR HOOP TENDON
RAM ATTACHMENT

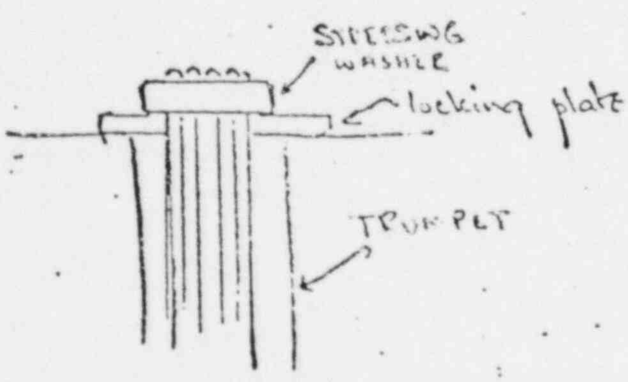
NOTE: DOMES ARE FITTED WITH BOTH EXTERNALLY AND INTERNALLY

Vertical Tendons



The hydraulic pump and ram are supported on the A-Frame as shown above.

Stressing will be done in one step if a 24" stroke ram is used, or in two steps if an 18" is used. After stressing it is important that the tendon be supported on the stressing washer to prevent its falling down into the trumpet if the ram is to be removed for wire pulling. The locking plate supplied by the vendor should be used.



Locking Plate

(Thickness ~1")

Wire Removal

1. Identification of wire

   Drive in the stressing washer as far as possible to give as much clearance as possible between the button-heads and the stressing washer (a block of hard wood can be used for this.) The wire puller should be attached to a wire and then pulled and pushed until the wire is identified at the far end. It should be pushed in as far as possible to give maximum working room on the far end. The wire puller must be left on the near end. When it is sufficiently clear of the other tendon wires at the far end, the button head should be ground or cut-off.

   CAUTION

   Take care not to damage adjacent tendon wires or button-heads.

2. Removal of the wire

   When the button head is ground off the far end the tendon wire can be pulled out with a "come-along". Whenever the wire clamp is placed on the wire, tape should be used to minimize any damage to the wire. (past methods of removal have included pulling with a pickup truck for the horizontal tendons where this can be done.)

Installation of Grease Cap

After the tendon is stressed and the data sheets completed, the permanent grease cap with a grease cap gasket may be installed. Even if the greasing operation is not to follow immediately the permanent grease cap and gasket will serve to protect the stressing washers, shims and wires from corrosion. Nuts should be torqued to hand tighten only.

Greasing By the "POUR" Method

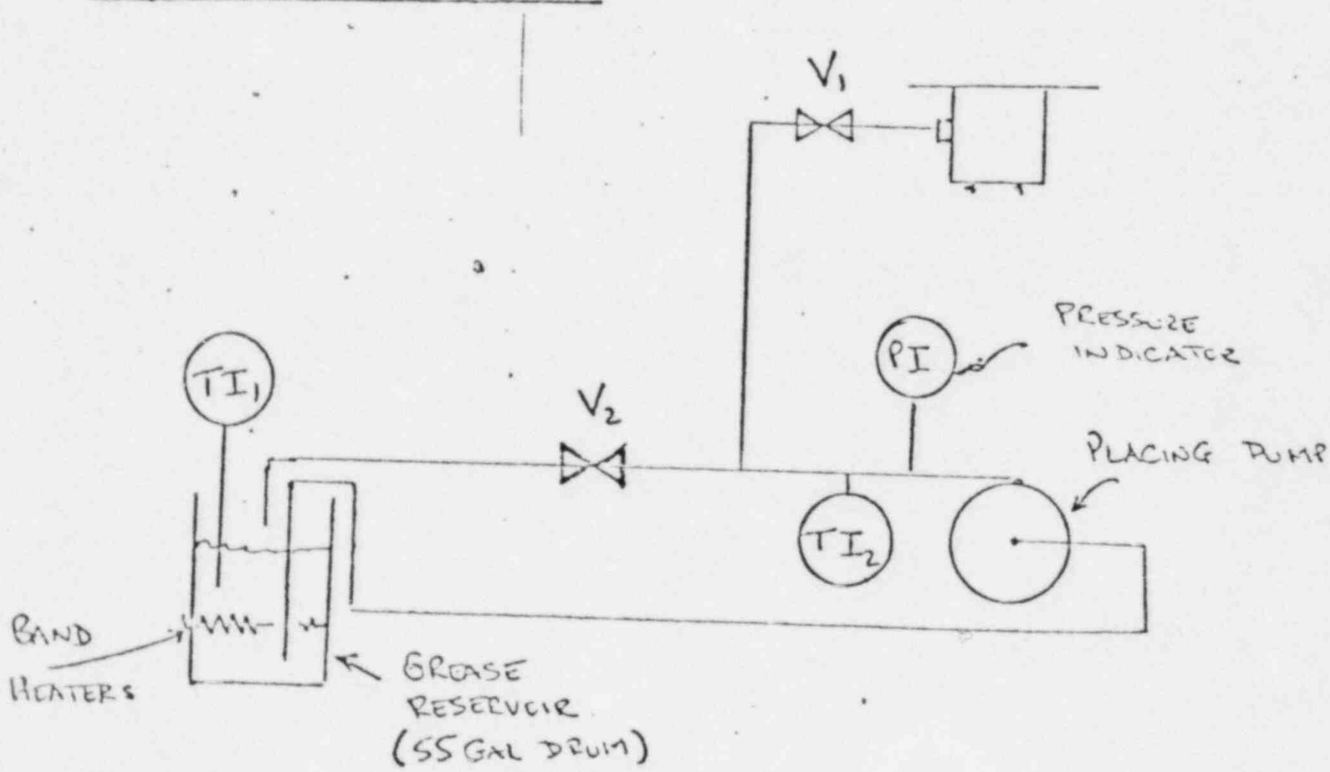
1. Remove plug from filler on grease cap and wedge open the fill check valve with a screwdriver.

- CAUTION -

Hot Grease will cause severe burns if contacted with the skin.

2. Using grease which is about 150°F to 170°F pour from a bucket into a funnel held over the filter on the grease cap. Pour slowly to allow any air to vent out from the cap. Pouring should continue until it is felt that as much as possible fo the grease removal for the surveillance has been replaced

Greasing using the Placing Pump



1. Vent grease cap on the other end of tendon and establish communications with the vent man.
2. Initiate recirculation flow with V_1 Closed, V_2 Open.
3. Verify that the drum temperature is about 170°F and that the pump discharge temperature is at least 120°F; if the pump discharge does not have a thermometer installed, the temperature may be measured

4. Close V_2 slowly until pump discharge pressure is about 15 psi.
5. Slowly open V_1
6. Slowly close V_2 and increase the pump discharge pressure until it reaches a value of apporximately 75 psi. This pressure should be sufficient to lift the grease to the top of the tendon. (Tendon is ~175' long, grease is 7.6 lb/gal) As the pressure is increasing monitor the drum level to ensure that grease is entering the tendon. If the level is not decreasing be careful not to increase the pump discharge pressure too rapidly, in case the gasket on the grease cover is blown out. (This makes a terrible mess!)
7. When the vent man sees grease coming out of the vent (suggest holding the valve open with a screwdriver) he immediately notifies the pump man, the upper vent is c osed, the pump is stopped. Valve V_1 is closed and V_2 is opened. The p p is returned to the recirculate mode and then stopped.
8. If the pump is not to be immediately reused for another tendon it is important that the lines be drained and blown clear and the pump casing drained before the grease cools and solidifies.
9. The caps on the grease cap connections are replaced.

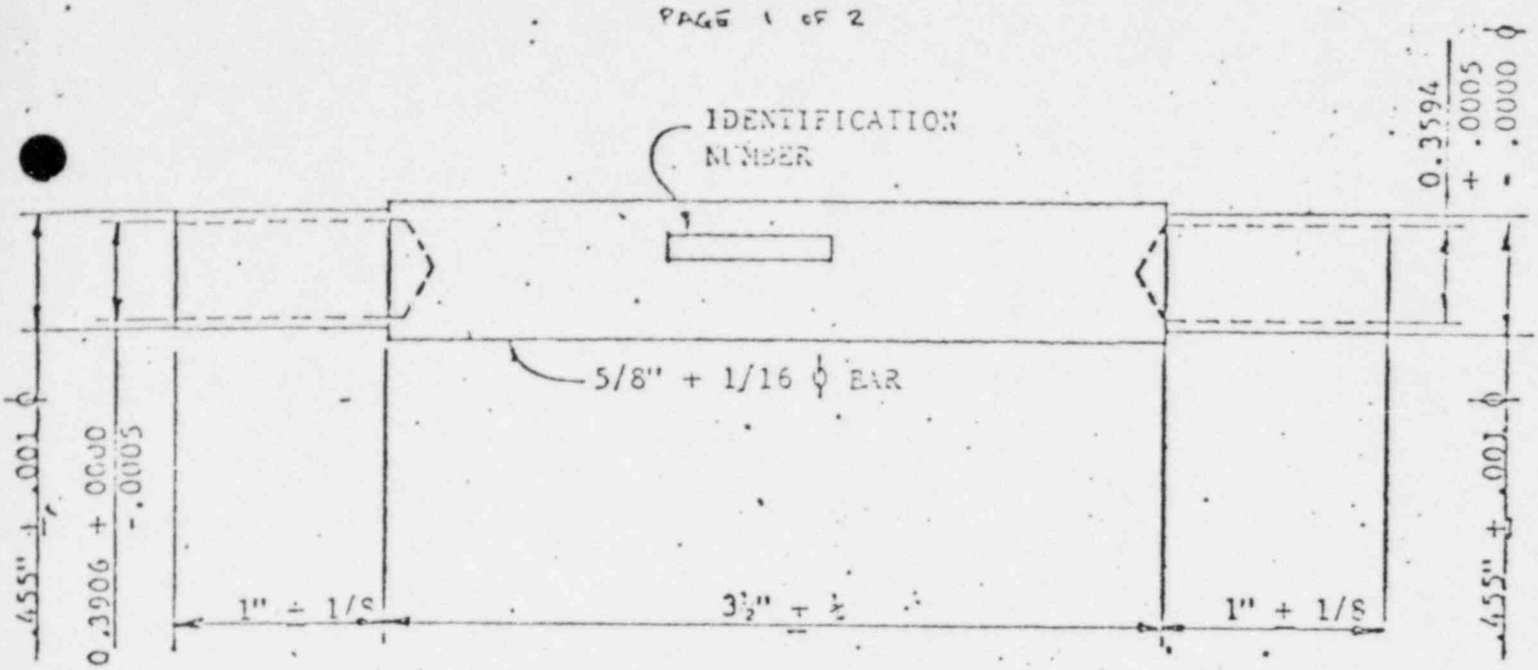
1. Safety belts must be used whenever possible.
2. Care should be taken to minimize any damage to the protective sheathing around the top of the containment - the wheels should always be turned to correspond to the direction of travel.
3. Safety equipment should include a means of getting down from the sky-climber if stuck up in the air.
4. A set of ear protectors must be readily available for all people on the sky climber and should be immediately put on if a steam release (safety valves or dumps) should occur.
5. When leaving the sky climber on the side of the containment:
   (1) Ensure that it is not left in front of the diesel generator exhaust pipe, the heat could possibly start a fire on the sky-climber if the diesels are started.
   (2) Ensure that the sky climber is securely tethered whenever there is a wind in excess of 15 mph, otherwise it may get blown around the containment.
6. In cold wet weather cover the sky climber motors with plastic when not in use. If water gets into them and freezes it may cause damage to the drive mechanisms.
7. Whenever the sky climbers are moved around the containment, extreme care must be taken when passing the 500 KV high lines and transformers. The safety lines hanging below the sky-climber must be controlled, preferably by coiling them up and carrying them on the platform itself. At the closest point (above the equipment hatch) the high lines are approximately (verify this!) 43' from the containment.

TOOL LIST

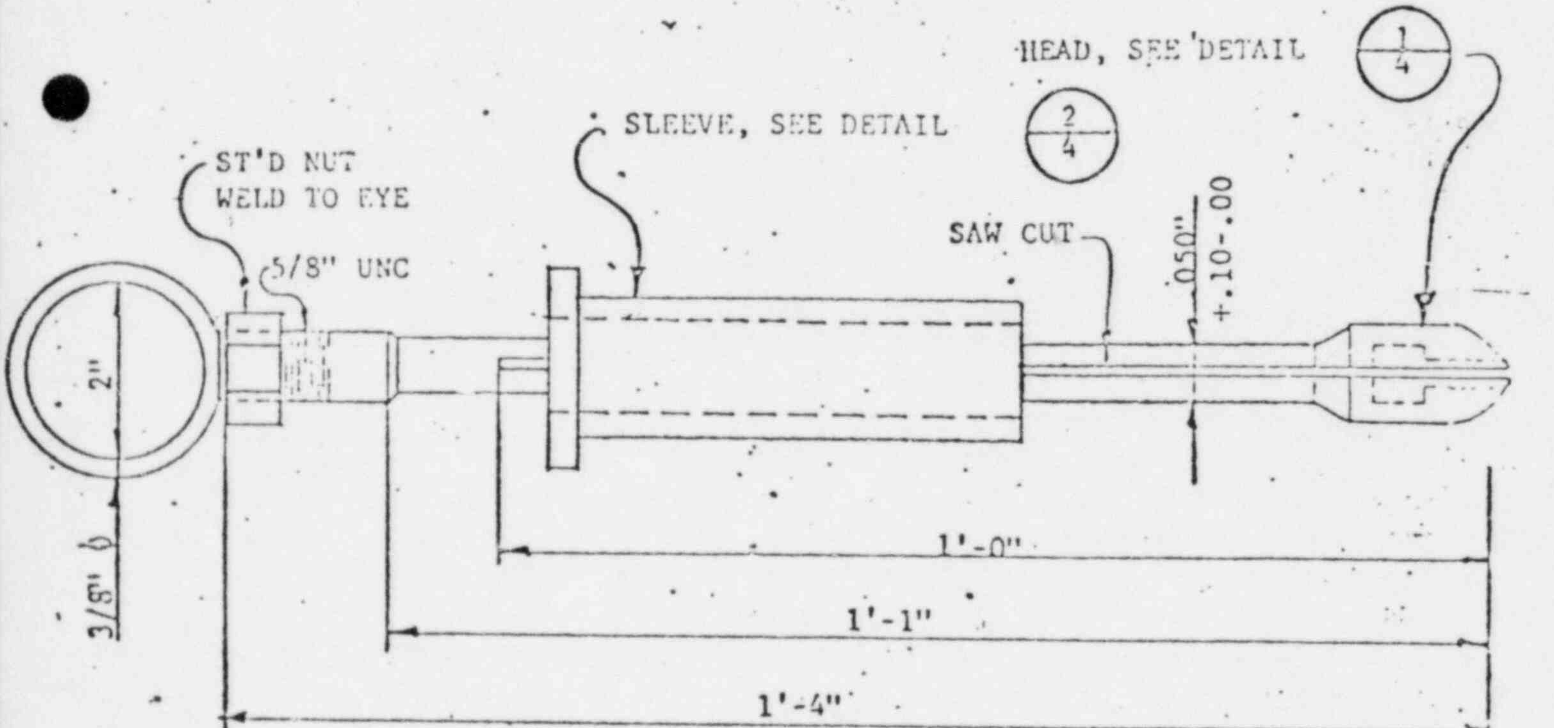
The following is a list of tools probably required during the Surveillance.

3/4" Deep Socket	-	2 ea
5/8" Deep Socket	-	2 ea
Ratchet Drive	-	2 ea
Screwdriver	-	2 ea
Teflon Tape	-	2 rolls
Crowbars	-	2 ea
Hacksaws	-	2 ea
Files	-	2 ea
Channel-locks	-	2 pair
Duct Tape	-	2 rolls
3/4" Eye Bolt	-	4 ea
1/2" All-Thread	-	100 ft
Wire Pullers (end)	-	2 ea

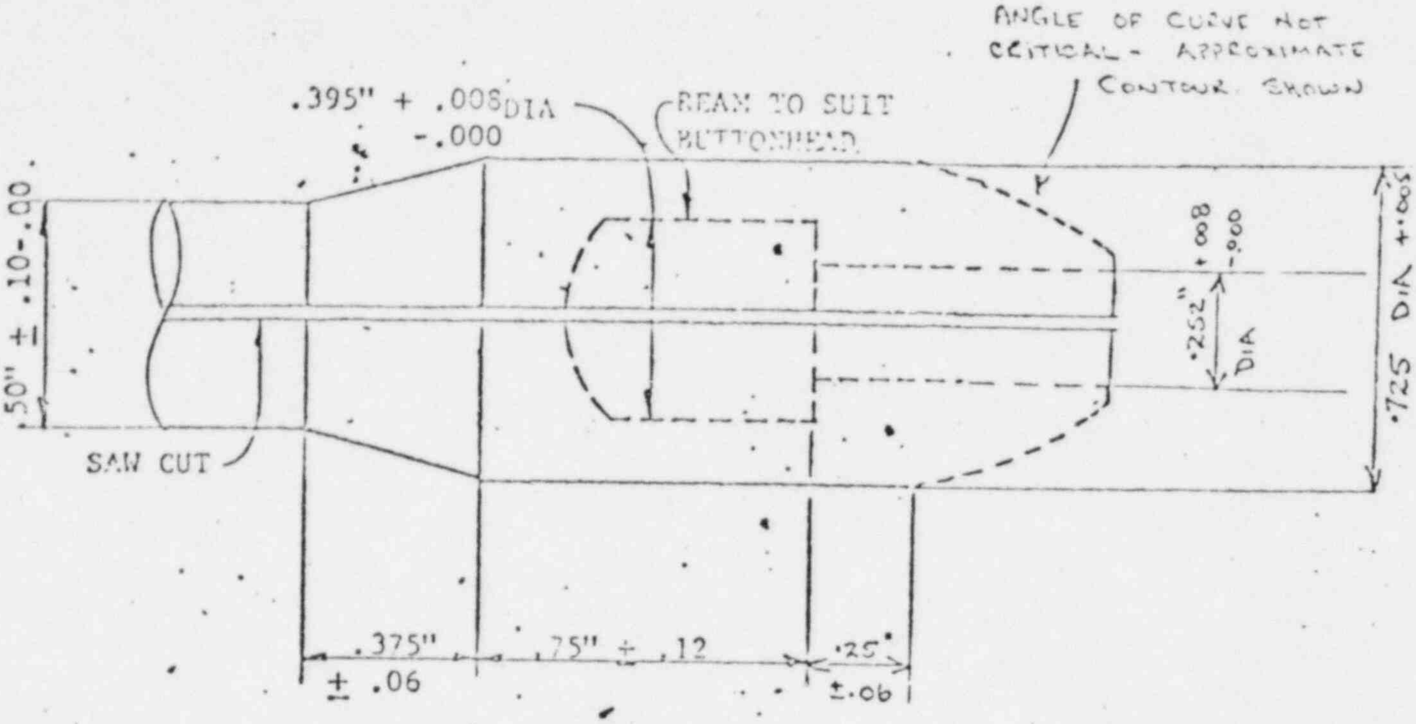
Wire Clamps		2 ea
Scraper	-	4 ea
Varsol	-	20 gal
Sprayers for Varsol	-	2 ea
3/4" Bolt	-	4 ea
3/4" Tap	-	2 ea
1/2" Tap	-	2 ea
1/2" Die Nut	-	2 ea
1 ton come-along-		4 ea
7/8" Socket	-	2 ea
2 lb Hammer	-	2 ea
14" Crescent Wrench	-	2 ea



Tendon Surveillance
Go/No-Go Gage

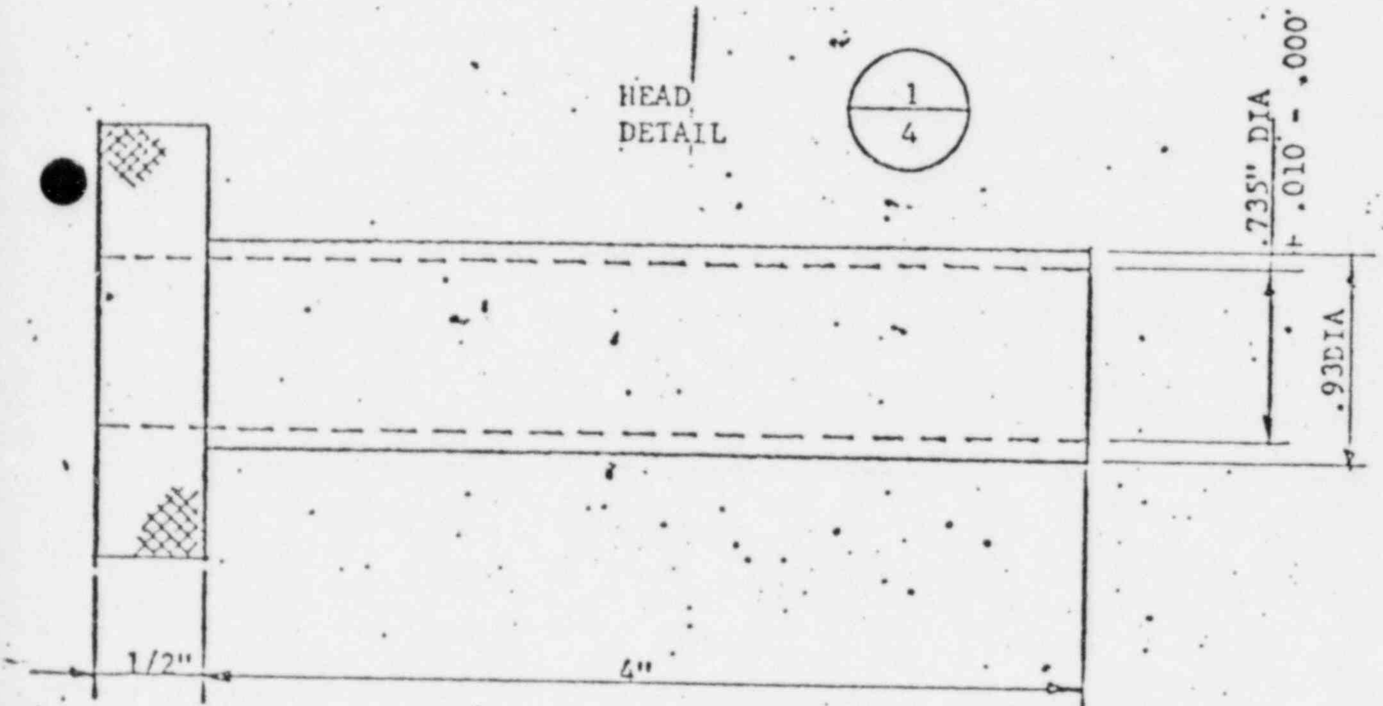


Tendon Surveillance
Wire Puller



HEAD DETAIL

1
4



MOVABLE SLEEVE DETAIL

2
4

Tendon Surveillance
Wire Puller

STP-M-672 ← 1-T-2

APPENDIX (2)

SPECIFICATION

FOR

TENSILE TESTING

OF

POST-TENSIONING TENDON WIRE (ASTM A-421)

FOR

BALTIMORE GAS & ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT

UNITS 1 & 2

POST-TENSIONING SYSTEM

1.0 GENERAL

This document specifies the general procedures which shall be used for the tensile testing of the 1/4"-diameter post-tensioning tendon wires (ASTM A-421, Type BA). This document does not relieve the testing laboratory of responsibility for conducting the tensile tests in a manner consistent with the industry standards.

2.0 WORK INCLUDED

Thirty (30) 1/4"-diameter wire specimens, approximately 10'-4" long, will be sent to the laboratory for testing in accordance with Section 3.0. Each of these specimens will have an identification tag attached close to one end; this tag will identify the tendon from which the wire was removed and the location of the specimen with respect to the tendon wire. Specimens shall be disposed of in accordance with Section 4.0 and a report meeting the requirements of Section 5.0 shall be prepared.

3.0 TEST DESCRIPTION

Tendon wires shall be tested in accordance with ASTM A-421-65, "Standard Specification for Uncoated Stress-Relieved Wire for Prestressed Concrete", This test shall include the following:

3.1 Measurement of wire diameter with an accuracy of $\pm$0.0005".

3.2 Measurement of gage length with an accuracy of $\pm$ 0.05".

3.3 Application of an initial load corresponding to 29,000 psi.

3.4 Application of additional load to obtain the force corresponding to 1.0 percent extension.

3.5 Application of additional load and obtaining load at failure and elongation under load at failure ($\pm$ 0.05").

4.0 DISPOSAL OF TESTED SPECIMENS

A sample approximately 6" long on each side of the break of each specimen shall be bound and returned as a unit with the identification tag attached. Specimens shall be returned to:

REPORT

Three (3) copies of the report on tendon wire testing shall be submitted to:

Surveillance Test Engineer
Electric Production Department
Baltimore Gas & Electric Co.
Calvert Cliffs Nuclear Power Plant
Lusby, Maryland 20657

The report shall contain the following information:

5.1 Testing machine calibration report.

5.2 Wire identification.

5.3 Wire diameter (± 0.0005 inches).

5.4 Gage length (± 0.05 inches).

5.5 Force and elongation (± 0.001 inches) at initial load.

5.6 Force and elongation (± 0.01 inches) at 1% extension.

5.7 Force and elongation under load (± 0.05 inches) at failure.

5.8 Location of failure relative to the grip in the moving head (± 0.05 inches).

STP-M-672

APPENDIX (3)

SPECIFICATION

FOR

LABORATORY TESTING

OF

SHEATH FILLER (VISCONORUST 2090P)

BALTIMORE GAS & ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT

UNITS 1 & 2

1.0 GENERAL

This document specifies the procedures which shall be used for laboratory testing of sheath filler Visconorust 2090P to determine:

a. The amount of water soluble chlorides, nitrates and sulfides which are leached from a given contact area between water and the sheath filler under standard conditions.

b. The water content of the sheath filler.

c. The reserve alkalinity of the sheath filler.

This document does not relieve the testing laboratory of responsibility for conducting the necessary laboratory tests in a manner consistent with the industry standards.

2.0 WORK INCLUDED

Eighteen (18) one-quart test smaples will be sent to the laboratory for testing in accordance with Section 3.0. The concentration of water soluble impurities and water in these samples will likely not exceed the following:

2.1 Chlorides - 10 ppm

2.2 Nitrates - 10 ppm

2.3 Sulfides - 10 ppm

2.4 Water (H_2O) - 10% Dry Weight

A report meeting the requirements of Section 4.0 shall be prepared.

3.0 TEST DESCRIPTIONS

Each sample of sheath filler shall be mixed and then tested as follows:

3.1 Water Soluble Impurities

A water extraction of each sample of sheath filler shall be made and tested as indicated below:

3.1.1 Using a spatula, coat the inside (bottom and sides) of a 1 liter glass beaker with a 1/4-inch layer of sheath filler.

3.1.2 Fill the beaker with distilled water at room temperature.

3.1.3 Heat the water to a controlled temperature of 100°F and maintain for four hours. Do not heat on a hot plate. Heat either in an oven or by use of an immersion heater so that the water will remain clear for tests.

3.1.4 Run a blank on distilled water. If titrate, use a microburet, 1 ml or 5 ml, with 0.01 - 0.05 ml graduation intervals.

3.1.5 Decant water and analyze for soluble ions. Test only for salts in leached water. The water analyses shall be as follows:

3.1.5.1 Chlorides (Cl) by ASTM D-512.

3.1.5.2 Nitrate (NO_3) by ASTM D-992, Brucine Method or Cadmium Reduction Method by Hach Chemical Co., Ames, Iowa.

3.1.5.3 Sulfides (S) by APHA (American Public Health Association) Standard Method - Methylene Blue - or the method by Hach Chemical Company, Ames, Iowa.

3.2 Water Content

Water content (H_2O as percent of dry weight) shall be determined in accordance with ASTM D-95.

3.3 Neutralization Number

Neutralization number shall be determined in accordance with ASTM D-664.

4.0 <u>REPORT</u>

Three copies of the report on laboratory testing of the sheath filler shall be submitted to:

Surveillance Test Engineer
Electric Production Department
Baltimore Gas & Electric Company
Lusby, Maryland 20657

The report shall contain the following information:

4.1 Sample identification.

4.2 Concentration of water soluble chlorides, nitrates and sulfides within an accuracy of 0.1 ppm.

4.3 Concentration of water (H_2O) within an accuracy of 0.1 percent of dry weight of the filler.

4.4 Neutralization number within an accuracy of 0.01 mg reagent per gram of filler.

DATA SHEET II-1

10 HORIZONTAL, 5 VERTICAL, 6 DOME

U1 - 5 Yr Tendon

#	TENDON	REMOVE WIRE	REASON FOR NON-TEST	VERIFIED BY
1	62H70			✓ BCR
2	24H55			✓ BCR
3	31H50			✓ BCR
4	51H45			✓ BCR
5	35H65			✓ BCR
6	31H2			✓ BCR
7	24H28		Can Not Move Equipment In	BCR
8	53H5		Could Not Rig To This	BCR
9	26H4			✓ BCR
10	64H40			✓ BCR
11	3D43			✓ BCR
12	1D40			✓ BCR
13	1D24			✓ BCR
14	2D21			✓ BCR
15	3D14	yes		✓ BCR
16	2D45			✓ BCR
17	12V31			✓ BCR
18	61V17		Could Not Rig To This	BCR
19	65V28			✓ BCR
20	54V14			✓ BCR
21	43V8	yes		✓ BCR

#	SUBSTITUTED			
1	53H4	53H5		✓ BCR
2	24H37	24H28		BCR
3	61V1	61V17		✓ BCR
4				
5				

#	ADDITIONS			
1	31H1			✓ BCR
2	23V8	2 Wires Broken - Removed		✓ BCR
3	56V12		End Cap Inspection Only (Top)	✓ BCR
4	23V9		End Cap Inspection Only (Bottom)	✓ BCR

SPARE PARTS UTILIZED CONTINUATION SHEET

MR #/Other # STP 1-T-2

Nomenclature	Mech. #	SRI Tag #
shims (sets) 1"	N/S	76524 thru 76529
shims (sets) 1/4"	N/S	76545 thru 76552
Shims (sets) 1/4"	N/S	76555 thru 76564
Shims (sets) 1/2	N/S	76565 thru 76575
shims (sets) 1/2"	N/S	76582 thru 76584
Gaskets	N/S	136529 & 136530
Gaskets	N/S	136533 thru 136535
Gaskets	N/S	136975 & 136976
Gaskets	N/S	136979 thru 136982
viscomorous casing filler	N/S	147157
Viscomorous casing filler	N/S	147168 thru 147171
Gaskets	N/S	136974

Stressing Ram

Pressure Gauge Combinations

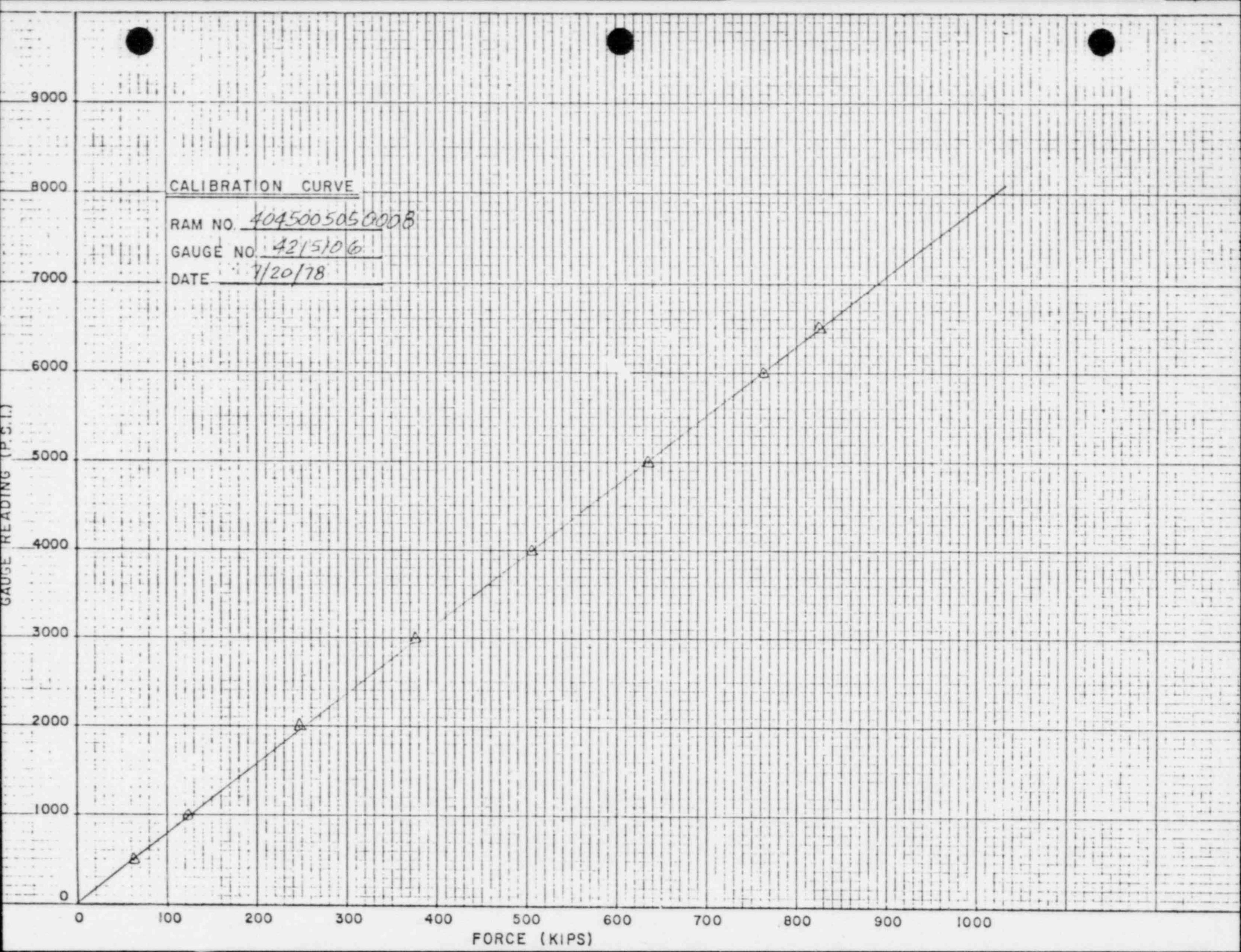
Calvert Cliffs

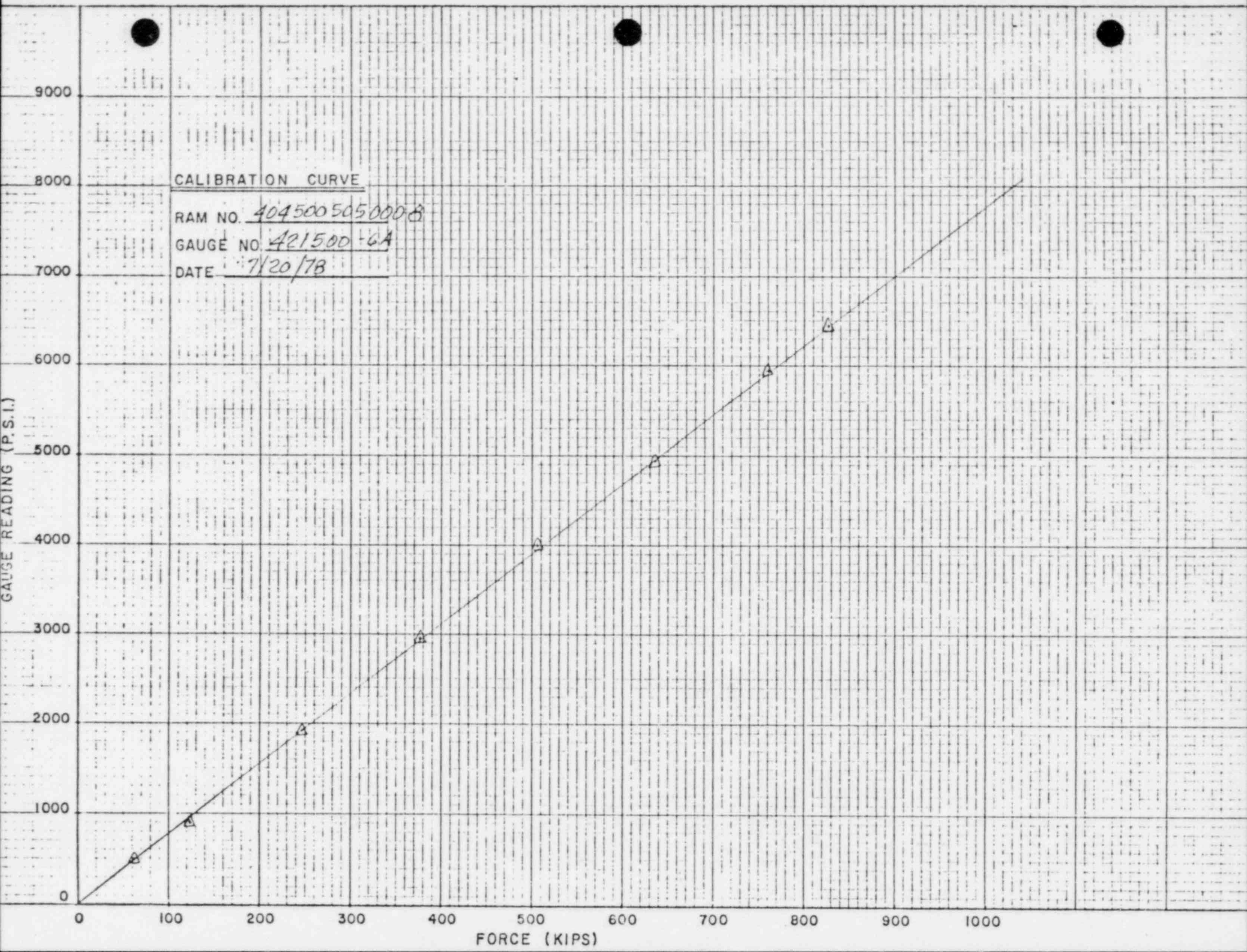
July 20, 1978

TABLE OF CONTENTS

Stressing Ram - Pressure Gauge Combinations

Ram:	4045005050008
Gauges:	4215106 421500-6A

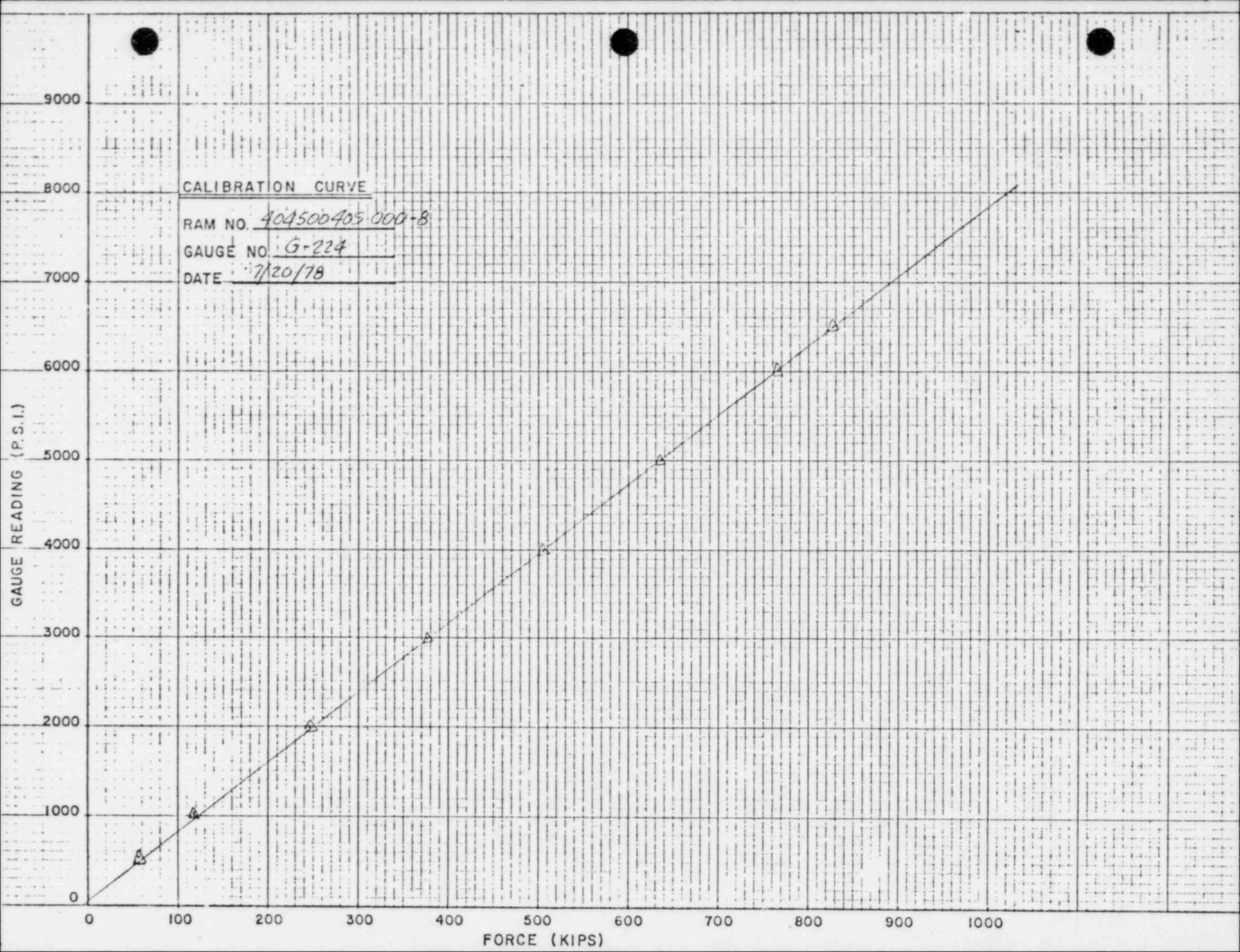

CALIBRATION CURVE
RAM NO. 404500505000B
GAUGE NO. 421510 6
DATE 7/20/78
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
GAUGE READING (P.S.I.)
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

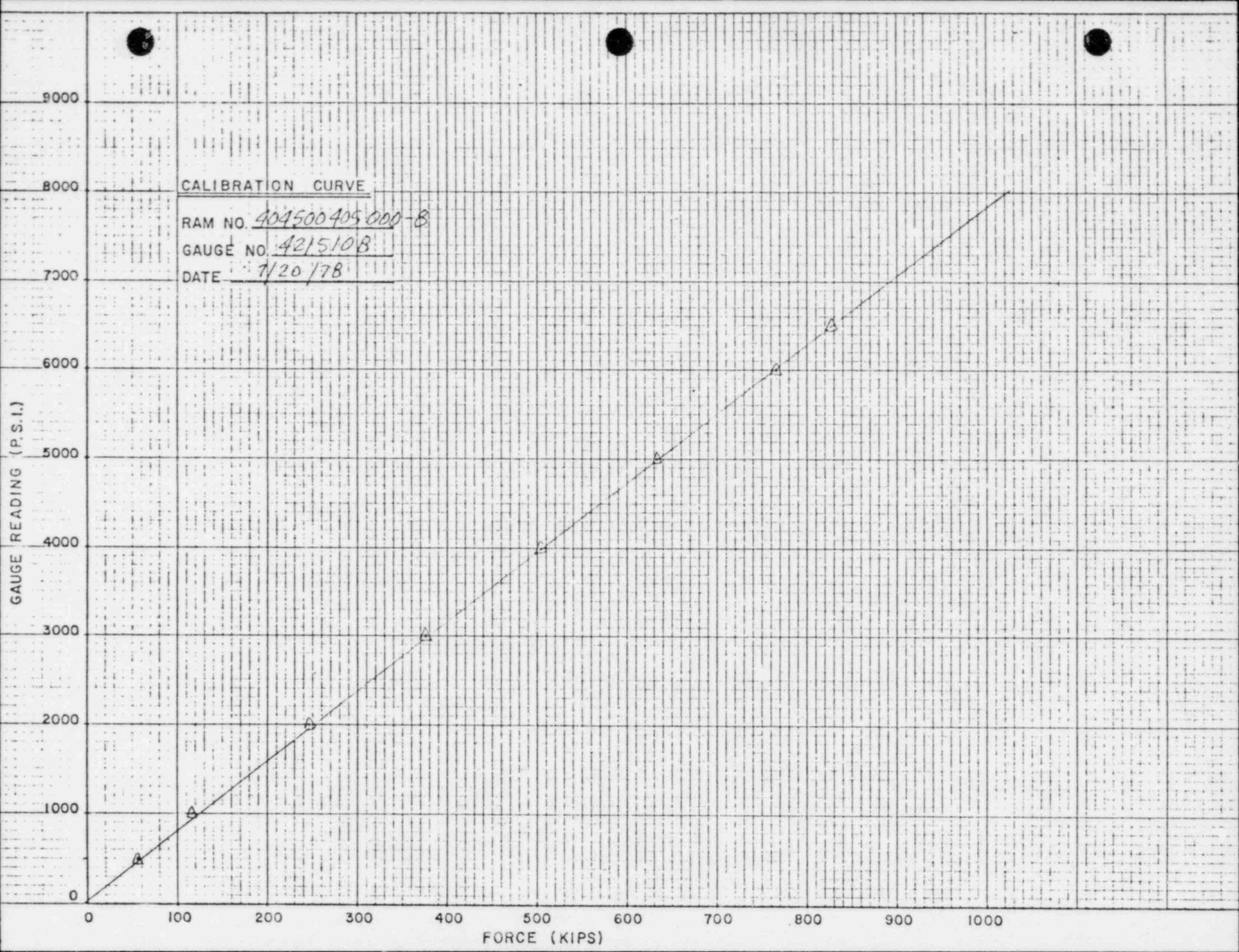


CALIBRATION CURVE
RAM NO. 404500505000-B
GAUGE NO. 421500-6A
DATE 7/20/78
GAUGE READING (P.S.I.)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
FORCE (KIPS)
0
100
200
300
400
500
600
700
800
900
1000

Stressing Ram - Pressure Gauge Combinations

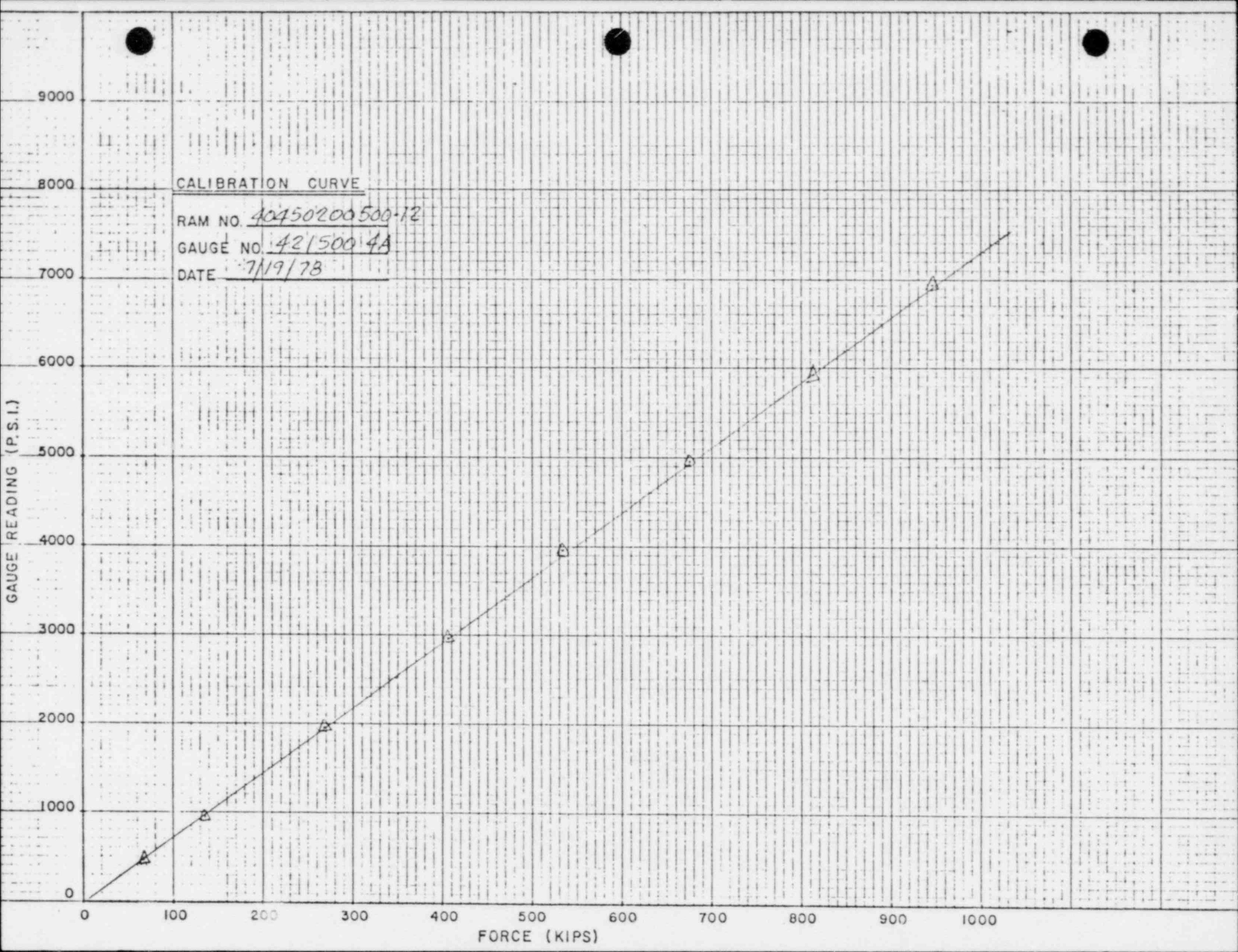
Ram:	404500405000-8
Gauges:	G-224 4215108


CALIBRATION CURVE
RAM NO. 404500405 000-8
GAUGE NO. G-224
DATE 7/20/78
GAUGE READING (P.S.I.)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

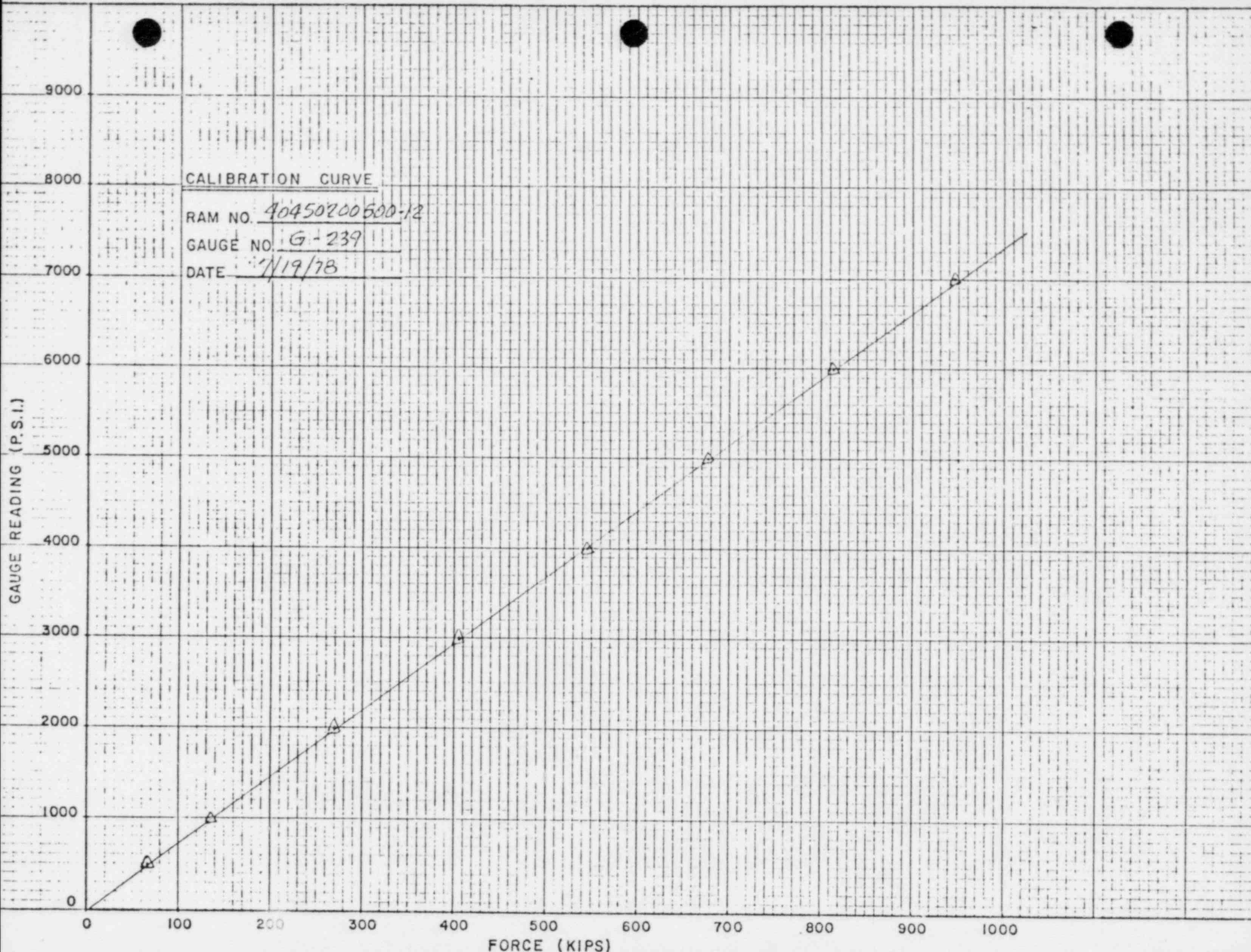

CALIBRATION CURVE
RAM NO. 404500 405 000-8
GAUGE NO. 421510B
DATE 7/20/78
GAUGE READING (P.S.I.)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
FORCE (KIPS)
0
100
200
300
400
500
600
700
800
900
1000

Stressing Ram - Pressure Gauge Combinations

Ram:	40450200500-12
Gauges:	4215004A G-239



CALIBRATION CURVE
RAM NO. 40450200500-12
GAUGE NO. 42/500 4A
DATE 7/19/78
GAUGE READING (P.S.I.)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)


CALIBRATION CURVE
RAM NO. 40450200600-12
GAUGE NO. G-239
DATE 7/19/78
GAUGE READING (P.S.I.)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
FORCE (KIPS)
100
200
300
400
500
600
700
800
900
1000

Dead Weight Calibration Certificate

Gauges: 4215106
4215006A
G-224
4215108
4215004A
G-239

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 10,000 psi Gauge Deco-Helicoid

Gauge Number: 4215106

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1125
2100	2125
3100	3175
4100	4100
5100	5100
6100	6125
7100	7125
8100	8150
9100	9200

This gauge was checked for calibration accuracy on Amphor Dead Weight Testor Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R Hernandez
Technician

7/20/78
Date

Bruce Mahl QA Mgr 7/20/78

QC Form C-03

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 0-10,000 psi Gauge ACCO Helicoid

Gauge Number: 4215006 A

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1100
2100	2175
3100	3100
4100	4050
5100	5025
6100	6050
7100	7050
8100	8050
9100	9050

This gauge was checked for calibration accuracy on Amphor Dead Weight Testor Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R Hernandez 7/20/78
Technician Date

[signature] 7/20/78

QC Form C-03

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 0-10,000 psi Gauge - Heco Helicoid

Gauge Number: G 224

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1125
2100	2100
3100	3100
4100	4100
5100	5050
6100	6075
7100	7100
8100	8100
9100	9150

This gauge was checked for calibration accuracy on Amphor Dead Weight Testor Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R Hernandez — Technician

7/20/78 — Date

Gene Mahito QA Mgr. 7/20/78

QC Form C-03

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 10,000 PSI Gauge- Acco Helicoid

Gauge Number: 4215108

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1100
2100	2100
3100	3100
4100	4100
5100	5075
6100	6075
7100	7100
8100	8100
9100	9125

This gauge was checked for calibration accuracy on Amphor Dead Weight Tester Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R Hernandez — Technician — Date 7/20/78

[signature] QA Agt 7/20/78

QC Form C-03

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 0-10,000 PSI Gauge Acco Helicoid

Gauge Number: 4215004A

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1075
2100	2000
3100	7075
4100	4050
5100	5075
6100	6075
7100	7050
8100	8050
9100	9100

This gauge was checked for calibration accuracy on Amphor Dead Weight Testor Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R Hernandez — 7/20/78

Technician — Date

Bruce Mulotis — 7/20/78

THE PRESCON CORPORATION

1338 North W. W. White Road
San Antonio, Texas 78219

CALIBRATION CERTIFICATE

Instrument: 0-10,000 PSI Gauge ACCO Helicoid

Gauge Number: G239

Range: 1100 - 9100 psi

Reading of Calibration Instrument (psi)	Reading of Instrument Under Test (psi)
1100	1050
2100	2050
3100	3050
4100	4100
5100	5075
6100	6125
7100	7125
8100	8125
9100	9150

This gauge was checked for calibration accuracy on Amphor Dead Weight Testor Serial No. 72804 which is calibrated to ± .50%. The above is a true record of that calibration check.

Tommy R. Hernandez
Technician

7/20/78
Date

[illegible] QA Mgr 7/20/78

QC Form C-03

Calibration Certificate

Dead Weight Tester

Pacific ---PACIFIC SCIENTIFIC COMPANY-----

1616 W. Loop South
Suite 305
Houston, Texas 77027

Certificate

SUBMITTED FOR CALIBRATION BY Prescon Corp.

TYPE OF INSTRUMENT Dead Weight Tester

SERIAL NO. 72804

MODEL NO.

MFGR. Amthor

[illegible]ED ACCURACY ± 1.0%

CALIBRATION INTERVAL 2 years Done: 6-13-77 Due: 6-13-79

INDICATED	ACTUAL	REMARKS
1000	1000	
2000	2000	
3000	3000	
4000	4000	
5000	5000	
6000	6000	
7000	7000	
8000	8000	
9000	9000	

CALIBRATED BY COMPARISON WITH THE FOLLOWING STANDARDS Aschcroft Dead Weight Tester SN: 5-58-100

RECEIVED
JUN 14 1977
PRESCON CORP.

A[illegible] INSTRUMENTS USED TO ACCOMPLISH ABOVE CALIBRATION HAVE DIRECT TRACEABILITY TO THE [illegible]IONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

CALIBRATION BY Preston Girod APPROVED BY [signature]

1 QA

Instrument Craftsmen

Hildebrandt Engineering Co., Inc.

7707 PINEMONT
HOUSTON, TEXAS 77040

SEPTEMBER 3, 1976

PACIFIC SCIENTIFIC COMPANY
1616 W. LOOP SOUTH
HOUSTON, TEXAS 77027

RE: P.O. 5186
HECO INV. 13176

ATTENTION: D.J. MINNICH

C E R T I F I C A T I O N

THIS IS TO CERTIFY THAT YOUR ASHCROFT DEAD WEIGHT TESTER, 0-10,000#, SERIAL NUMBER 5-58-100, WAS CALIBRATED WITH STANDARDS WHICH ARE ACCURATE AND TRACEABLE TO THE NATIONAL BUREAU OF STANDARDS, AS FOLLOWS:

LABORATORY STANDARD (P.S.I.)	INSTRUMENT READING (P.S.I.)
1000	1000
2000	2000
3000	3000
4000	4000
5000	5000
6000	6000
7000	7000
8000	8000
9000	9000
10000	10000

NBS TEST #
167720
174192

CERTIFIED BY: J.P. Hildebrandt
J.P. HILDEBRANDT, P.E.

JPH/LB

Calibration Certificate
Loadcell #PCL 78L57

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050

214 – 262-3008

Certificate of Verification

This is to certify that *the following described testing machine has been calibrated by this company. The loading range shown below has been found to be within a tolerance of* .5 %.

Machine LOAD CELL S/N 4387 INDICATOR
BUDD S/N 1565
(Make & type of)
(Serial No.)

Location PRESCON CORPORATION
SAN ANTONIO, TEXAS

Date of Verification Month 2 Day 22 Year 78

Machine Range	Loading Range
0-1,500,000	100,000-1,500,000

Method of Verification and pertinent data are in accordance with A.S.T.M. Specification E4-74 and TEXAS CALIBRATION. "Procedure for Calibrating Tension and Compression Testing Machines" dated 1-2-71.

Attest:

Name ____________________

Title ____________________

Company ____________________
(Company Representative)

TEXAS CALIBRATION

By W W Strand
Field Representative

FORM 71

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050

214 – 262-3008

Capacity	Serial No.	Date	Order No.
1,500,000 Lb.	4387	2-22-78	

Location

PRESCON CORPORATION

SAN ANTONIO, TEXAS

Machine Reading Lb.	~~Proving Ring Reading Lb~~ LOAD CELL	Machine Error Lb.	Machine Error %	Remarks
100,000	99,850.00			
200,000	200,250.00			
400,000	400,510.00			
600,000	600,420.00			
800,000	800,180.00			
1,000,000	1,000,275.00			
1,250,000	1,250,340.00			
1,500,000	1,500,175.00			

Calibrated using Budd Indicator
S/N 1565
Budd Readings X30 Indicate
True Load In Lbs.

Gauge Factor Set AT.15-

Calibration
60K Resistor
Gives a readign of 38560
Black P1, Red S2
or 1,156,800 #

N.B.S. #213.09/216746

FORM 73

BY FIELD REPRESENTATIVE W.W. Strand

AVG LOAD	AVG READING 4215106	AVG READING 421500 6A
60540	500	500
121850	1000	992
248960	2000	1933
376310	3000	2975
506780	4000	4000
635080	5000	4942
762380	6000	5967
825140	6500	6458

- DATA ANALYSIS -
RAM 404500 5050008
GAUGES - 4215106
421500-6A

THE PRESCON CORPORATION

SUBJECT DATA AVERAGES

JOB NO.
FILE NO. CALVERTS CLIFF
DATE 7/24/78
BY T. CASTELLAW
FORM NO. 241

SHEET NO
OF

4215106
4215006A RAM - GAUGE CALIBRATION

RAM No. 404 500505 0008 AREA 120 IN²

Date 7/20/78

Piston Extension 2"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215004A	GAUGE No. G239	GAUGE No. 4215106	GAUGE No. 4215006A	GAUGE No. G224	GAUGE No. 4215108
2000 1984	59520	450	450	500	500	550	475
4000 4007	120210	925	925	1000	1000	1025	950
8000 8266	247980	1925	1925	2000	1925	2000	1950
12000 12523	375690	2950	2925	3000	2975	2975	2950
16000 16828	504840	4000	3950	4000	4000	4000	3975
20,000 21200	636000	5000	5000	5000	4975	5000	5000
24000 25310	759300	5950	6000	6000 (720,000#)	5950	6000	5975
26000 27468	824040	6450	6500	6500	6450	6500	6475

Recorder

Pump Operator Alfonso Alvarado

Witnesses

4215106
4215006A RAM - GAUGE CALIBRATION

RAM No. 404 500 505 0008 AREA 120 in²

Date 7/20/78

Piston Extension 4"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 421500 4A	GAUGE No. G 239	GAUGE No. 4215106	GAUGE No. 4215006A	GAUGE No. G224	GAUGE No. 4215108
2000 2040	61200	425	450	500	500	525	450
4000 4168	125040	950	975	1000	1000	1050	1000
8000 8282	248460	1900	1900	2000	1925	2000	1950
12000 12558	376740	2950	2925	3000	2975	3000	2950
16000 16900	507000	4000	3975	4000	4000	4000	4000
20,400 21090	632700	4975	4950	5000	4925	5000	4925
24000 25478	764340	6000	6000	6000	6000	6000	6000
26000 27446	823380	6450	6500	6500	6450	6475	6450

Recorder

Pump Operator Alfonso Alvarado

Witnesses

RAM No. 404 500 505 0008

Piston Extension 4"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565	
LOAD CELL READING	ACTUAL LOAD
2000 2040	61200
4000 4168	125040
8000 8282	248460
12000 12558	376740
16000 16900	507000
20,000 21090	632700
24000 25478	764340
26000 27446	823380

4215106
4215006A RAM - GAUGE CALIBRATION

AREA 120 in²

Date 7/20/78

GAUGE READING P.S.I.

1 GAUGE No. 421500 4A	2 GAUGE No. G 239	3 GAUGE No. 4215106	4 GAUGE No. 4215006A	5 GAUGE No. G224	G. 421.
425	450	500	500	525	450
950	975	1000	1000	1050	1000
1900	1900	2000	1925	2000	1950
2950	2925	3000	2975	3000	2950
4000	3975	4000	4000	4000	4000
4975	4950	5000	4925	5000	4925
6000	6000	6000	6000	6000	6000
6450	6500	6500	6450	6475	6450

Recorder
Pump Operator Alfonso Alvarado
Witnesses

Information Only

AVG. LOAD	AVG. READING 4215106	AVG. READING 4215006A
129520	1008	1000
254670	2000	1983
382350	3000	3000
510160	4000	4000
639180	5000	4983
767070	6000	6000
832320	6525	6525

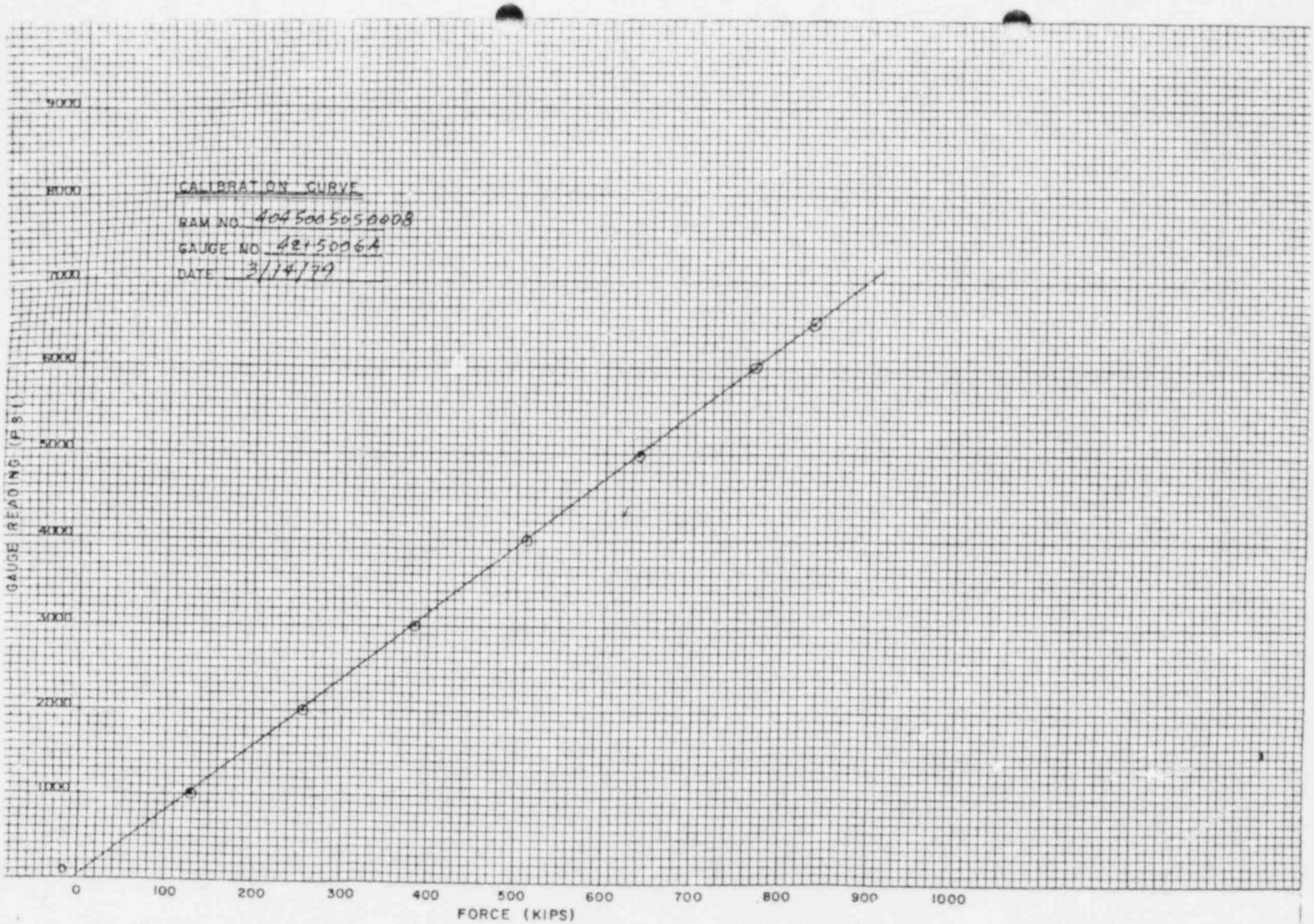
RAM # 404500505000 8
GAUGES: 4215106
4215006A

THE PRESCON CORPORATION

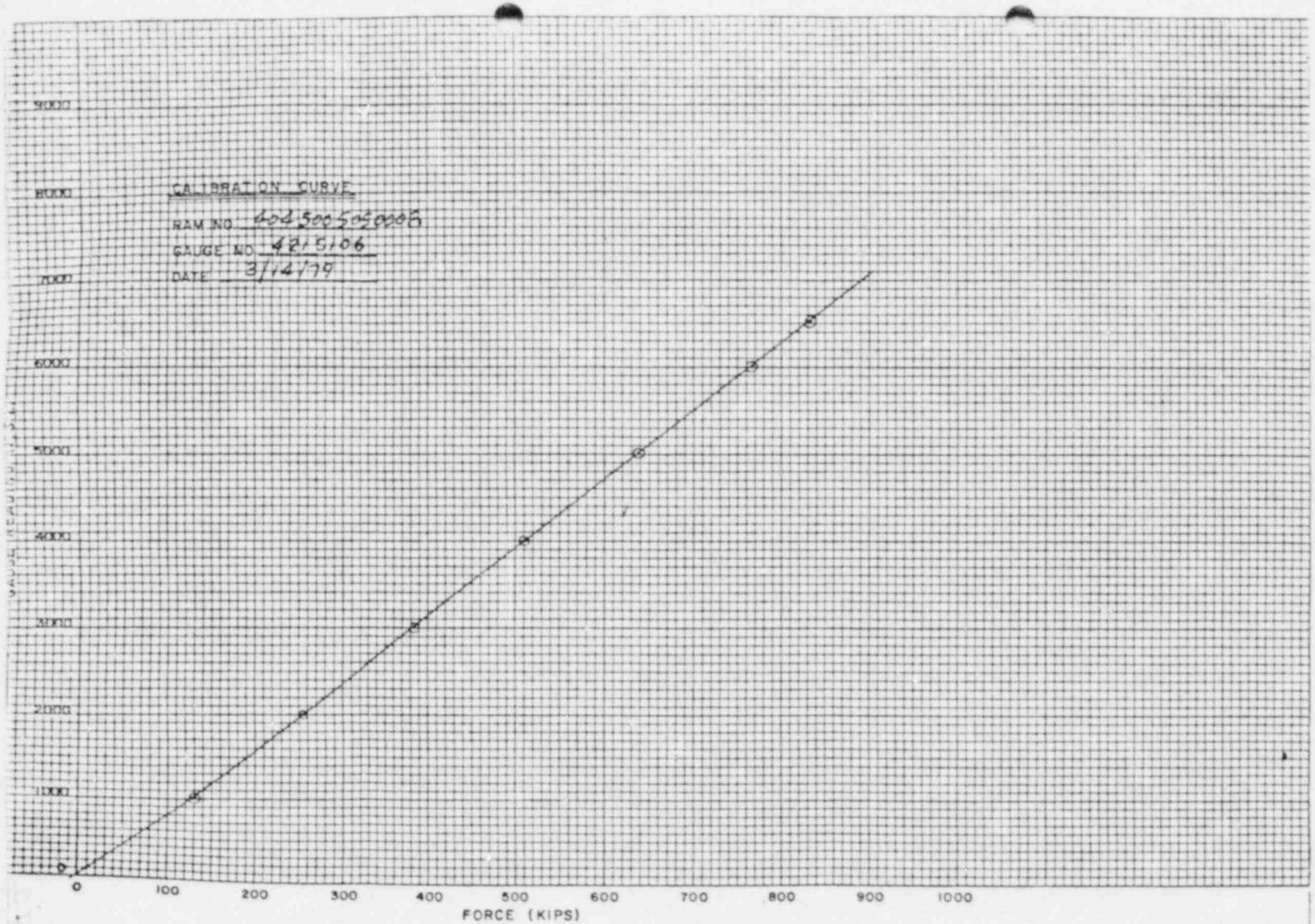
SUBJECT DATA AVERAGE - CURVE PLOTS

JOB NO. CALVERT CLIFFS
FILE NO.
DATE 3/14/79
BY J. CASTELLAW
FORM NO. 241

SHEET NO. 1
OF



CALIBRATION CURVE
RAM NO. 404500505000 8
GAUGE NO. 42+5006A
DATE 3/14/79
GAUGE READING (PSI)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)


CALIBRATION CURVE
RAM NO.
GAUGE NO.
DATE 3/14/79
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

4215106
4215006A RAM - GAUGE CALIBRATION

RAM No. 404500505008 AREA = 120 in²

Date 3/14/79

Piston Extension 2"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4272	128160	1000	1025	1050	1000	1000	1000
8544	256320	2000	2050	2000	2000	2000	2050
12775	383250	3000	3050	3000	3000	3000	3050
17046	511380	4000	4050	4000	4000	4000	4050
21327	639810	5000	5050	5000	5000	5000	5050
25610	768300	6000	6050	6100	6000	6000	6050
27710	831300 [illegible]	6500	6550	6600	6550	6550	6500

Recorder T. CASTELLAW
Pump Operator
Witnesses

4215106
4215006A RAM - GAUGE CALIBRATION

RAM No. 404500505000B AREA = 120 IN²

Date 3/14/79

Piston Extension 4"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4382	131460	1025	1050	1050	1000	1000	1000
8440	253200	2000	2000	2000	1975	1975	2000
12742	382260	3000	3025	3000	3000	3000	3025
16970	509100	4000	4025	4000	3975	4000	4000
21281	638430	5000	5050	5000	5000	4975	5025
25553	766590	6000	6050	6000	6000	6000	6050
27722	831660	6525	6600	6550	6500	6500	6500

Recorder T. CASTELLAW

Pump Operator

Witnesses

4215106
4215006A RAM - GAUGE CALIBRATION

RAM No. 404500505000B AREA = 120 IN2

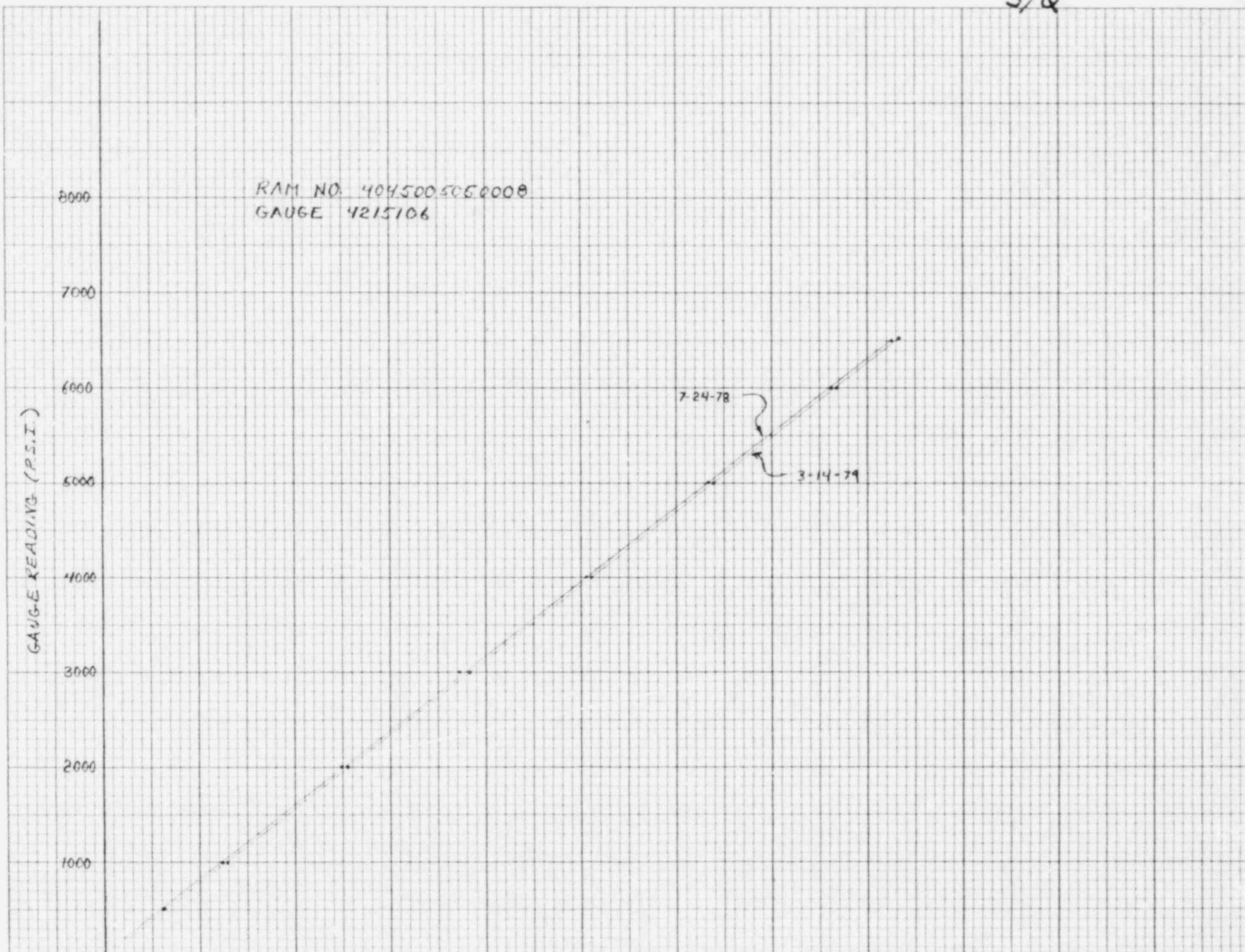
Date 3/14/79

Piston Extension 6"

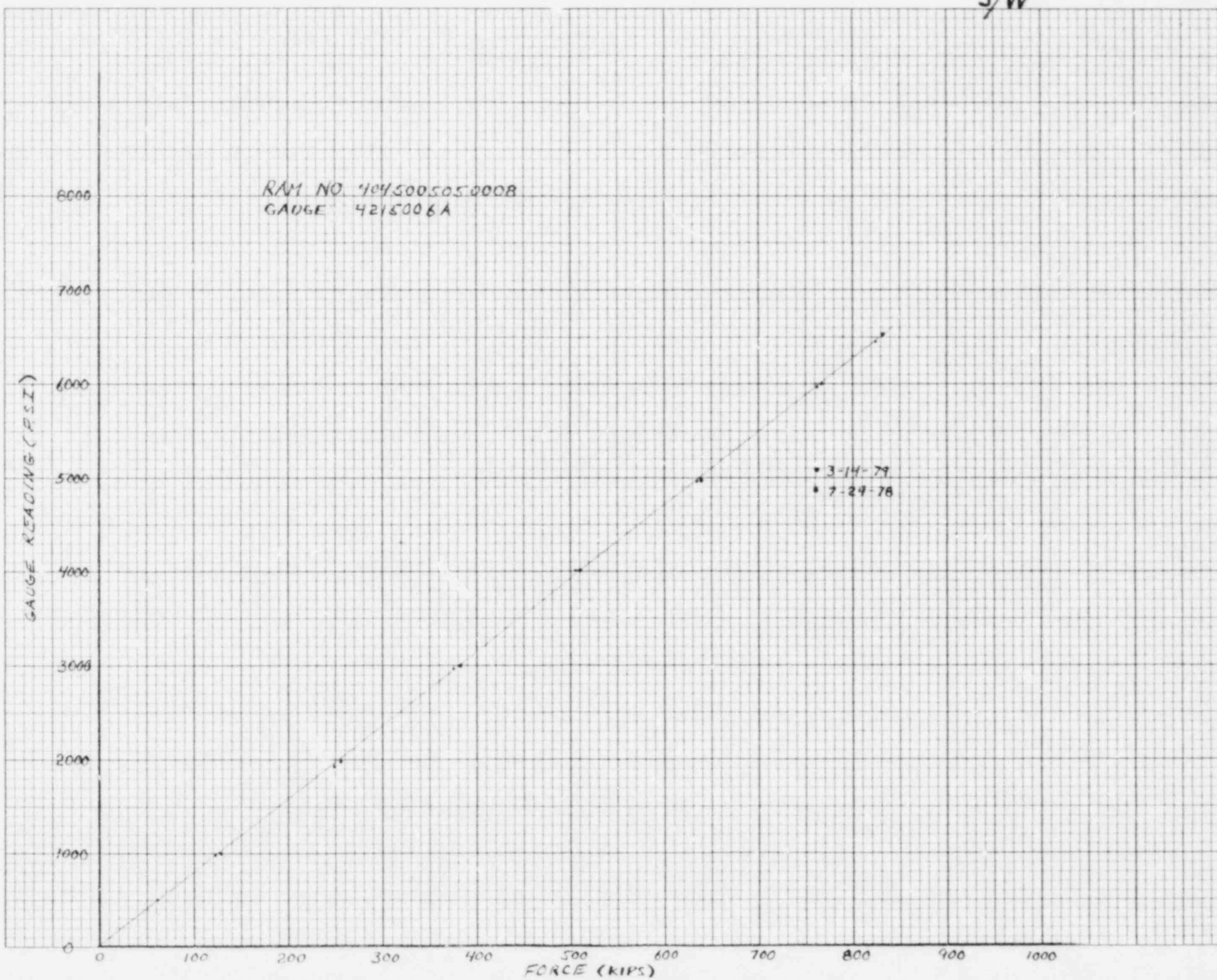
PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215009A	GAUGE No. G-224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4298	128940	1000	1000	1050	1000	1000	1000
8483	254490	2000	2000	2000	2000	1975	2000
12718	381540	3000	3025	3000	3000	3000	3050
17000	510000	4000	4050	4000	4000	4000	4050
21310	639300	5000	5050	5000	5000	4975	5050
25544	766320	6000	6050	6000	6000	6000	6050
27800	834000	6550	6600	6550	6525	6525	6525

Recorder T. CASTELLAW
Pump Operator
Witnesses

5/Q


RAM NO. 404500506008
GAUGE 4215106
7-24-78
3-14-79
GAUGE READING (P.S.I.)
8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

5/W



K+E 10 X 10 TO THE INCH • 10 X 15 INCHES KEUFFEL & ESSER CO.

47 0780

AVG LOAD	AVG READING G 239	AVG READING 421500 4A
68340	500	475
135070	1000	975
269750	2000	1958
405260	3000	2983
542580	4000	3992
678000	5000	4975
811950	6000	5925
946460	7000	6925

$$\frac{811950}{5925} = \frac{848448}{P}$$

$$P = \frac{848448(5925)}{811950} = \underline{\underline{6191}}$$ REF. 6175 from Graph

$$\frac{6191-6175}{6191} = .26\% \text{ error}$$

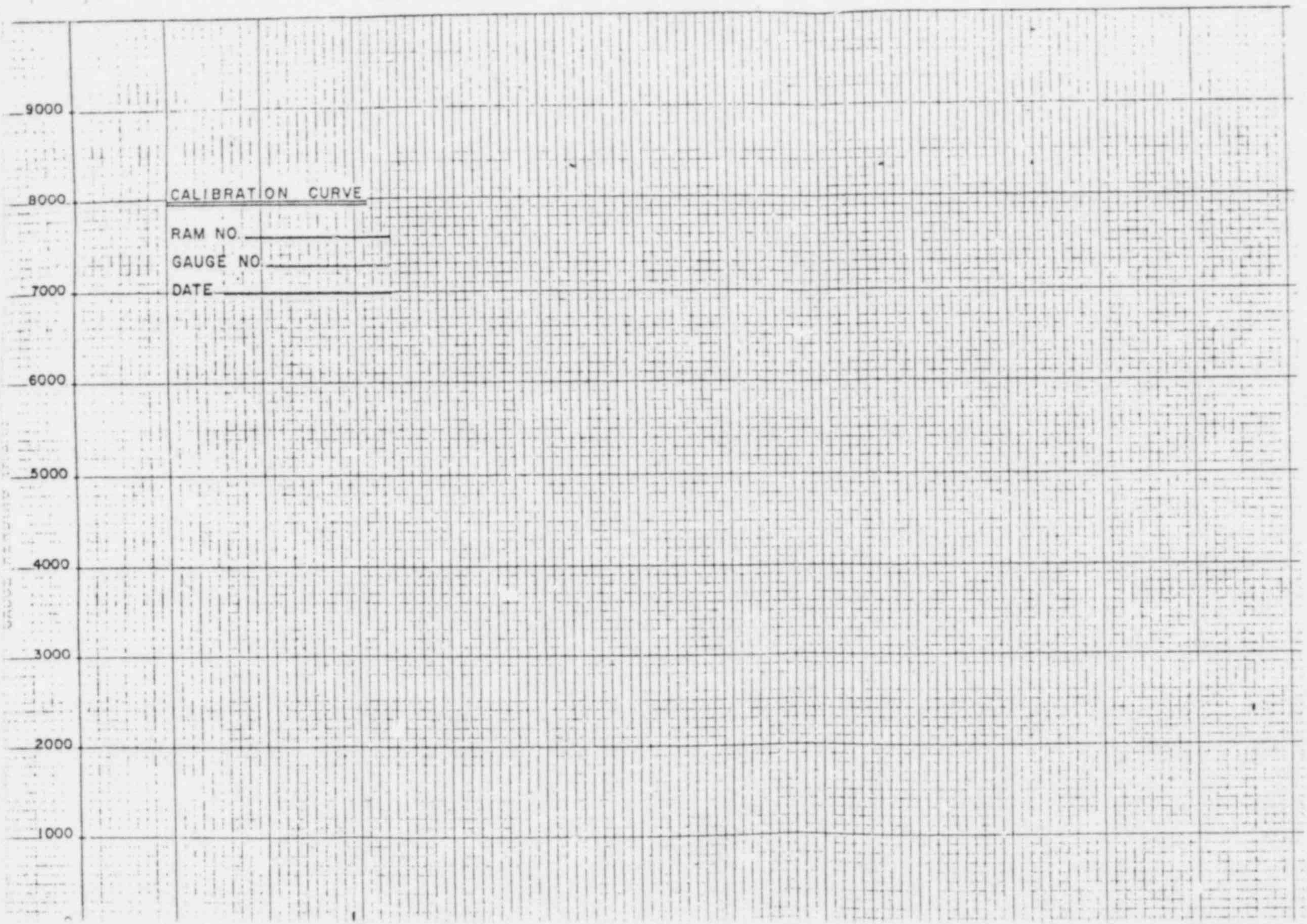
-DATA ANALYSIS-
RAM 40450200500-12
GAUGES G-239
421500 4A.

THE PRESCON CORPORATION

SUBJECT DATA AVERAGE

JOB NO.
FILE NO. CALVERT CLIFFS
DATE 7/24/78
BY T. CASTELLAW
FORM NO. 241

SHEET
OF


CALIBRATION CURVE
RAM NO.
GAUGE NO.
DATE
9000
8000
7000
6000
5000
4000
3000
2000
1000

G-239
421500 4A RAM - GAUGE CALIBRATION

RAM No. 404 50200 500 12 (129.3) in.^{2} Date 7/19/78

Piston Extension 3"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. G239	GAUGE No. 421500 4A	GAUGE No.	GAUGE No.	GAUGE No.	GAUGE No.
2155 2254	67620	500	475				
4490	134700	1000	975				
9035	271050	2000	1975				
13476	404280	3000	2975				
18110	543300	4000	4000				
22630	678900	5000	4975				
27070	812100	6000	5925				
31562	996860	7000	6925.				

Recorder

Pump Operator Alfonso Alvarado

Witnesses

G239
421500 4A RAM - GAUGE CALIBRATION

RAM No. 404 50200 50012 (129.3) in²

Date 7/19/78

Piston Extension 6"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
LOAD CELL READING	ACTUAL LOAD	1 GAUGE No. G239	2 GAUGE No. 421500 4A	3 GAUGE No.	4 GAUGE No.	5 GAUGE No.	6 GAUGE No.
2155 2250	67500	500	475				
4310 4495	134850	1000	975				
8620 8950	268500	2000	1950				
12930 13500	405000	3000	3000				
17240 18110	543300	4000	4000				
21550 22670	680100	5000	5000				
25860 27165	814950	6000	5950				
30170 31634	949020	7000	6950				

Recorder

Pump Operator Alonso Alvarado

Witnesses

G239
421500 4A RAM - GAUGE CALIBRATION

RAM No. 40450200500 12 (129.3 in²)

Date 7/19/78

Piston Extension 9"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. G239	GAUGE No. 4215004A	GAUGE No.	GAUGE No.	GAUGE No.	GAUGE No.
2155 2330	69900	500	475				
4310 4522	135660	1000	975				
8620 8990	269700	2000	1950				
12930 13550	406500	3000	2975				
17240 18038	541140	4000	3975				
21550 22500	675000	5000	4950				
25860 26960	808800	6000	5900				
30170 31450	943500	7000	6900				

Recorder

Pump Operator Alonso Alvarado

Witnesses

Information Only

AVG LOAD	AVG READING 4215004A	AVG READING G-239
134190	1050	1000
264690	2000	2008
401520	3041	3058
534700	4058	4050
669960	5058	5042
806480	6058	6050
947970	7125	7067

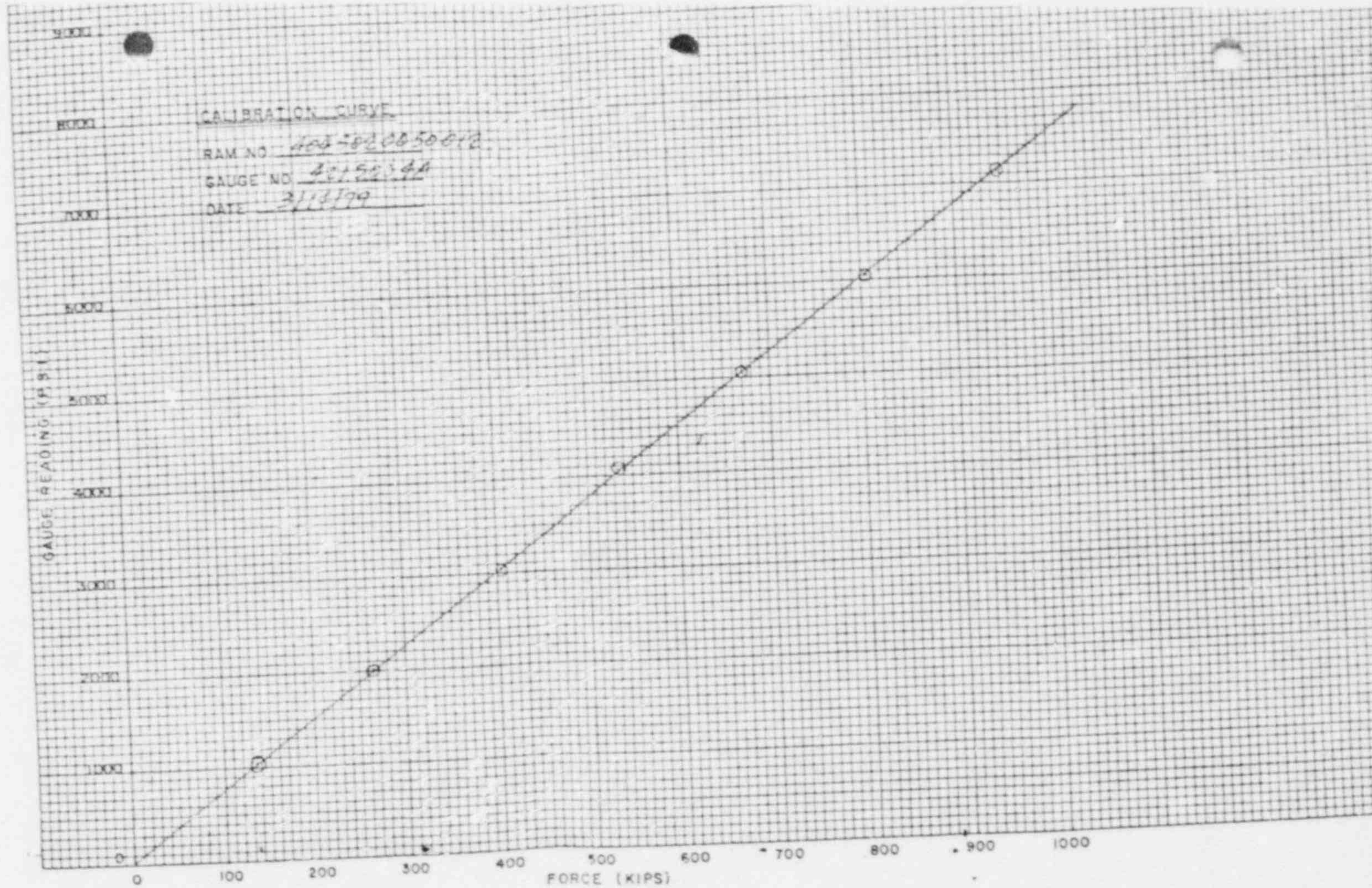
RAM# 4U45020050012
GAUGES: 4215004A
G-239

THE PRESCON CORPORATION

SUBJECT DATA AVERAGE - FOR CURVE PLOTS

JOB NO. CALVERT CLIFFS
FILE NO.
DATE 3/14/79
BY T. CASTELLAW
FORM NO. 241

SHEET NO. 2
OF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RAM NO
GAUGE NO
DATE
GAUGE READING (PSI)
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2000
3000
4000
5000
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7000
8000
9000
FORCE (KIPS)
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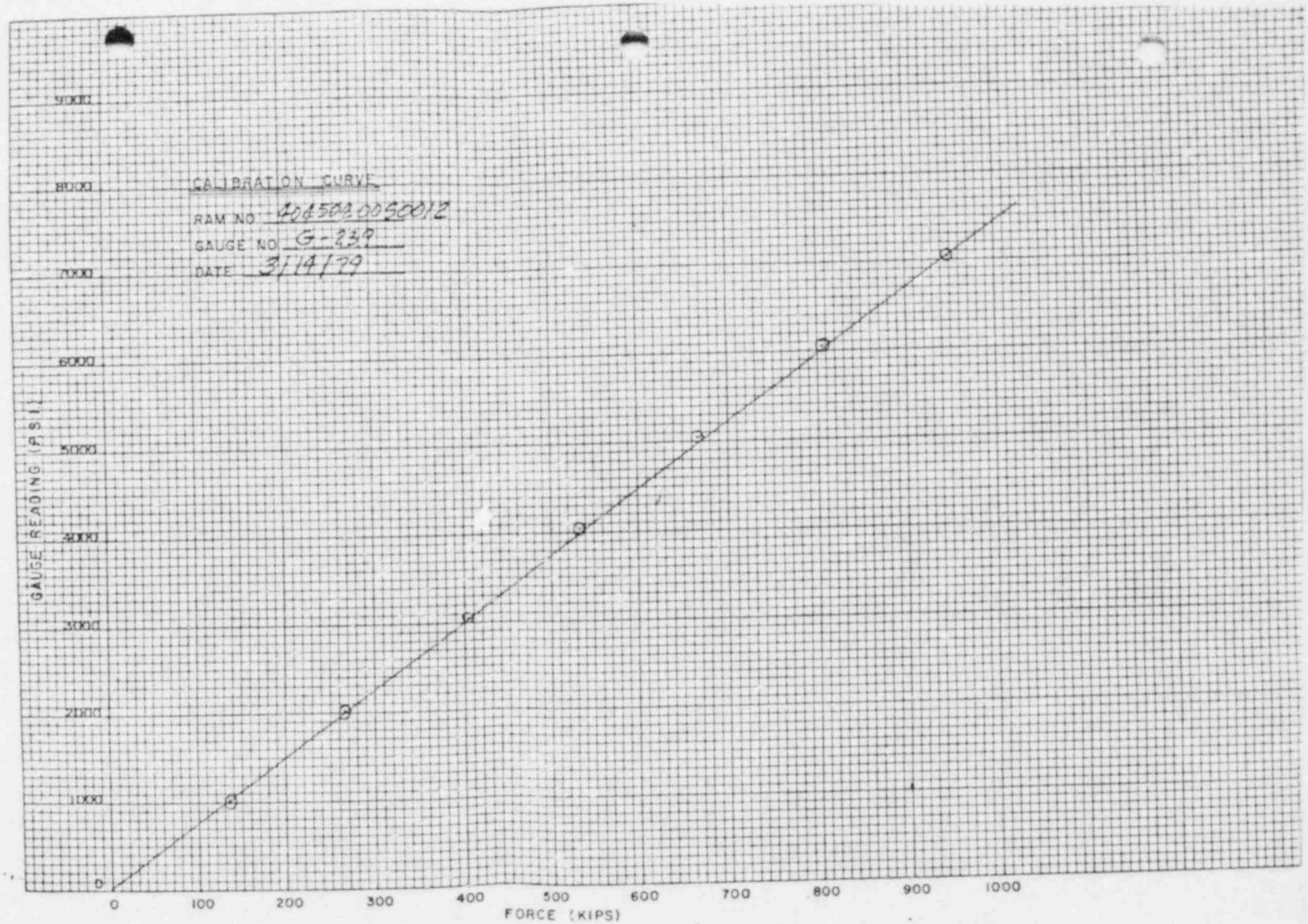
200
300
400
500
600
700
800
900
1000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GAUGE NO G-239
DATE 3/14/79
GAUGE READING (PSI)
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8000
7000
6000
5000
4000
3000
2000
1000
0
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

G-239
4215004A RAM - GAUGE CALIBRATION

RAM No. 404508005012 (129.3) in²

Date 3/14/79

Piston Extension 3"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4517	135510	1025	1050	1050	1000	1025	1000
8934	268020	2000	2000	2050	2000	2000	2025
13442	403260	3000	3050	3025	3000	3000	3100
17850	535500	4000	4050	4000	4000	4000	4050
22400	672000	5000	5075	5000	5000	4975	5050
26938	808140	6000	6050	6000	6000	6000	6050
31700	951000	7050	7125	7100	7075	7050	7075

Recorder T. CASTELLAW

G-239
4215004A RAM - GAUGE CALIBRATION

RAM No. 40450200 50012 (129.3) in²

Date 3/14/79

Piston Extension 6"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4462	133860	1025	1050	1050	1000	1000	1000
8745	262350	2000	2000	2000	2000	1950	2000
13390	401700	3000	3050	3025	3000	3000	3050
17820	534600	4000	4050	4025	4000	4000	4050
22345	670350	5000	5050	5025	5000	5000	5025
26960	808800	6025	6075	6025	6000	6000	6050
31607	948210	7075	7125	7100	7075	7050	7050

Recorder T. CASTELLAW

Pump Operator

Witnesses

G-239
4215004A RAM - GAUGE CALIBRATION

RAM No. 40450200500/2 (129.3) in²

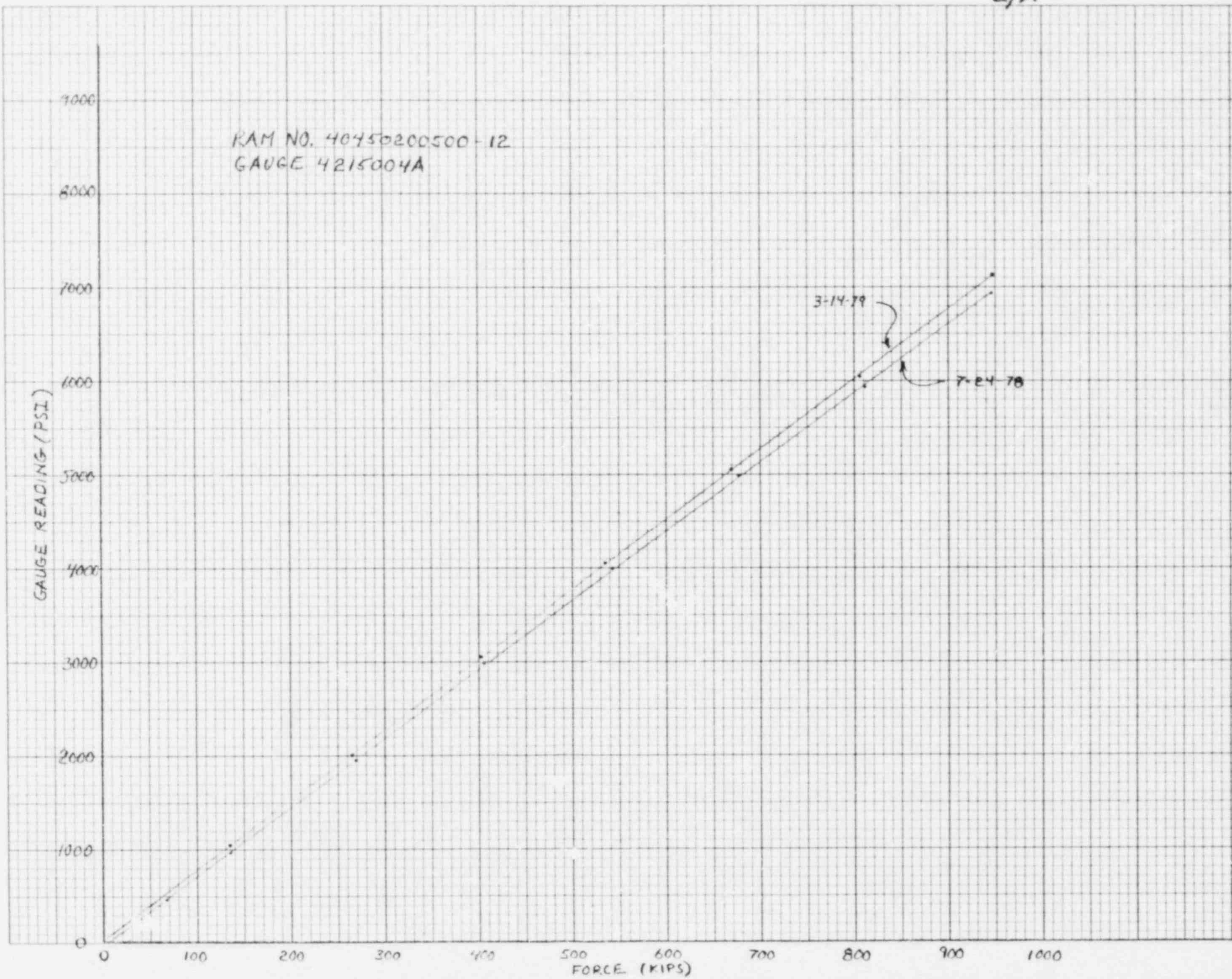
Date 3/14/79

Piston Extension 9"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4440	133200	1000	1050	1075	1000	1000	1000
8790	263700	2000	2000	2025	2000	1975	2000
13320	399600	3000	3025	3000	2975	3000	3025
17800	534000	4000	4075	4025	4000	4000	4050
22251	667530	5000	5050	5000	5000	4975	5050
26750	802500	6000	6050	6025	6000	6000	6050
31490	944700	7075	7125	7100	7100	7050	7075

Recorder T. CASTELLAW
Pump Operator
Witnesses

2/X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GAUGE 4215004A
3-14-79
7-24-78
GAUGE READING (PSI)
FORCE (KIPS)
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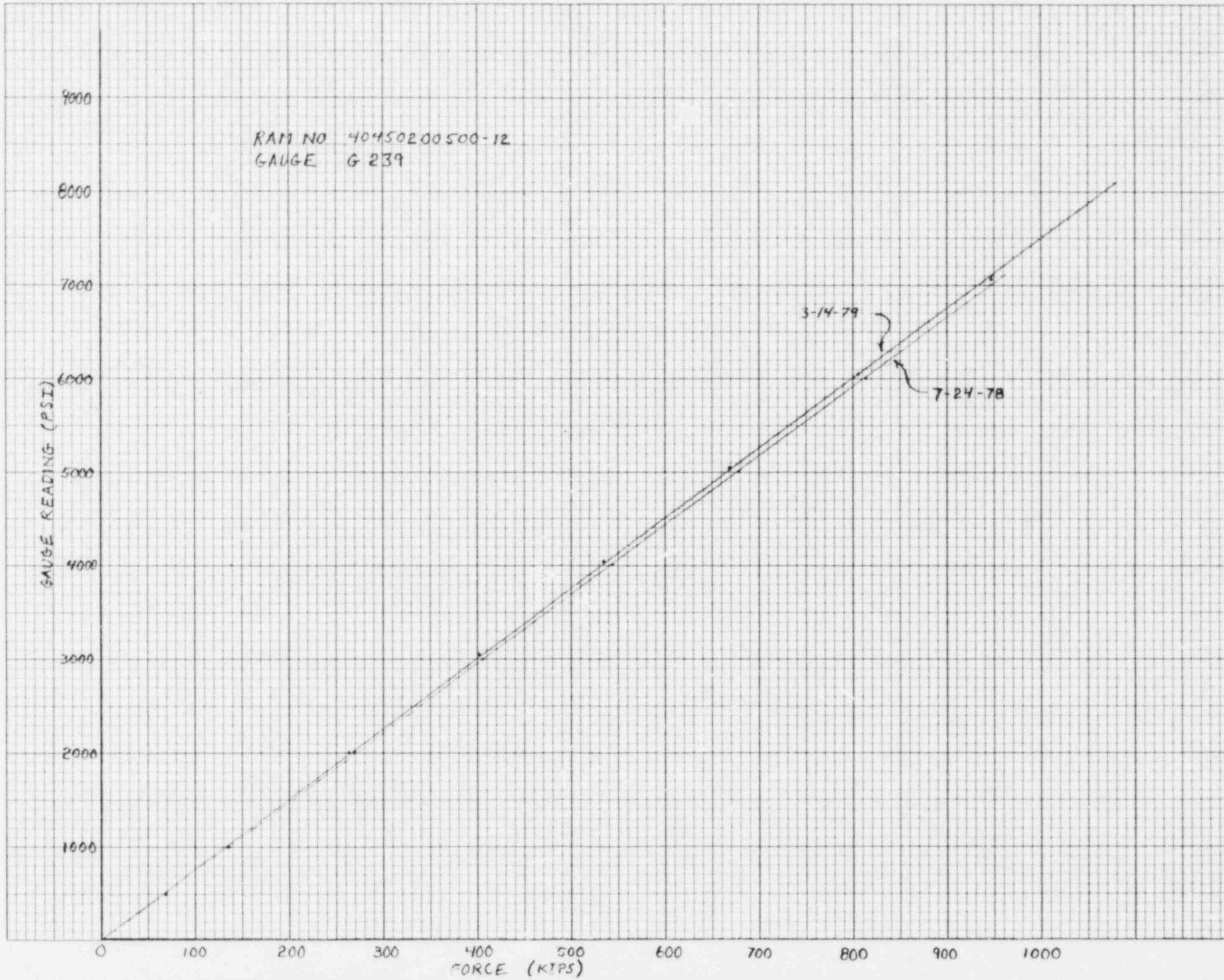
1000
2000
3000
4000
5000
6000
7000
8000
9000
100
200
300
400
500
600
700
800
900
1000



47 0780

K+E 10 X 10 TO THE INCH KEUFFEL & ESSER CO.

AVG. LOAD	AVG. 4215108	AVG. G-224
56140	500	550
118640	1000	1025
245980	2000	2008
376250	3000	3008
504600	4000	4000
634560	5000	5000
766890	6000	6000
829200	6500	6500

-DATA ANALYSIS-
RAM- 404500 405 000-8
GAUGES- 4215108
G-224

THE PRESCON CORPORATION

SUBJECT DATA AVERAGES

JOB NO.
FILE NO. CALVERT CLIFFS
DATE 7/24/78
BY T. CASTELLAW
FORM NO. 241

SHEET
OF

4215108
G-224 RAM - GAUGE CALIBRATION

RAM No. 404500405000-8 AREA · 120 in²

Date 7/20/78

Piston Extension 2"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215006A	GAUGE No. 4215108	GAUGE No. G224	GAUGE No. G239	GAUGE No. 4215004A
2000 1900	57000	500	525	500	550	525	500
4000 3880	116400	1000	1000	1000	1025	1025	975
8000 8290	248700	2000	2000	2000	2025	2025	1975
12000 12633	378990	3000	3025	3000	3025	3075	3000
16000 16820	504600	4000	4000	4000	4000	4075	4000
20,000 21224	636720	5000	5000	5000	5000	5075	5000
24,000 25550	766500	6000	6000	6000	6000	6100	6000
26,000 27620	828600 #	6500	6500	6500 780,000#	6500	6600	6500

5.

Recorder Tom Castellano
Pump Operator Alfonso Alvarado
Witnesses [illegible]

4215108
G-224 RAM - GAUGE CALIBRATION

RAM No. 404500405000-8 AREA 120 in²

Date 7/20/78

Piston Extension 4"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215006A	GAUGE No. 4215108	GAUGE No. G224	GAUGE No. G239	GAUGE No. 4215004A
2000 1880	56,400	500	525	500	550	525	475
4000 3900	117,000	1000	1000	1000	1025	1000	950
8000 8186	245,580	2000	2000	2000	2000	2000	1925
12000 12500	375,000	3000	3000	3000	3000	3000	2975
16000 16820	504,600	4000	4000	4000	4000	4000	4000
20000 21152	634,560	5000	5000	5000	5000	5025	5000
24000 25655	769,650	6000	6000	6000	6000	6100	6000
26000 27690	830,700	6500	6500	6500 780,000	6500	6600	6500

Recorder TOM CASTELLAW
Pump Operator Alfonso Alvarado
Witnesses [illegible]

4215108
G-224 RAM - GAUGE CALIBRATION

RAM No. 404500 405000-B AREA 120 in²

Date 7/20/78

Piston Extension 6"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215006A	GAUGE No. 4215108	GAUGE No. G224	GAUGE No. G239	GAUGE No. 4215004A
2000 1834	55020	500	500	500 60,000 lb	550	500	450
4000 4066	121980	1000	1000	1000 120,000	1025	1000	950
8000 8122	243660	2000	1975	2000 240,000	2000	2000	1925
12000 12492	374760	3000	3000	3000 360,000	3000	3000	2975
16000 16820	504600	4000	4000	4000 480,000	4000	4000	4000
20,000 21080	632400	4975	4975	5000 600,000	5000	5000	4975
24,000 25484	764520	6000	6000	6000 720,000	6000	6050	5975
26,000 27610	828300	6500	6500	6500 780,000	6500	6575	6475

Recorder Tom CASTELLAW

Pump Operator Alfonso Alvarado

Witnesses

Information Only

AVG. LOAD	AVG. READING G-224	AVG. READING 421510B
118220	1058	1008
242820	2017	1991
370720	3017	2992
496970	4008	3992
623730	5017	5008
749320	6025	5992
814500	6541	6508

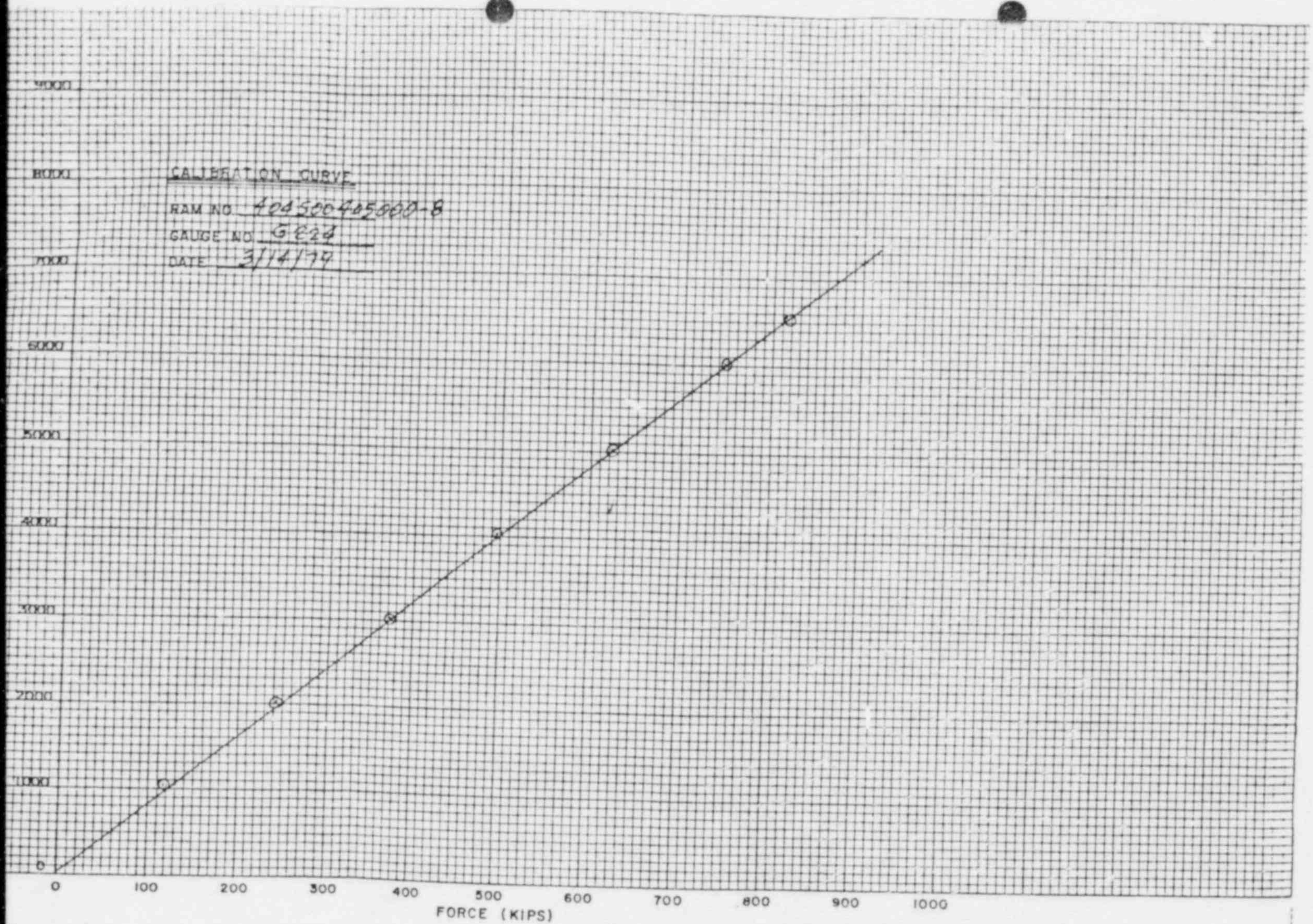
RAM # 404500405000-B
GAUGES: 421510B
G-224

THE PRESCON CORPORATION

SUBJECT DATA AVERAGE - FOR CURVE PLOT

JOB NO. CALVERT CLIFF
FILE NO.
DATE 3/14/79
BY T. CASTELLAW
FORM NO. 241

SHEET 3 OF



CALIBRATION CURVE
RAM NO 404500405800-8
GAUGE NO G824
DATE 3/14/79
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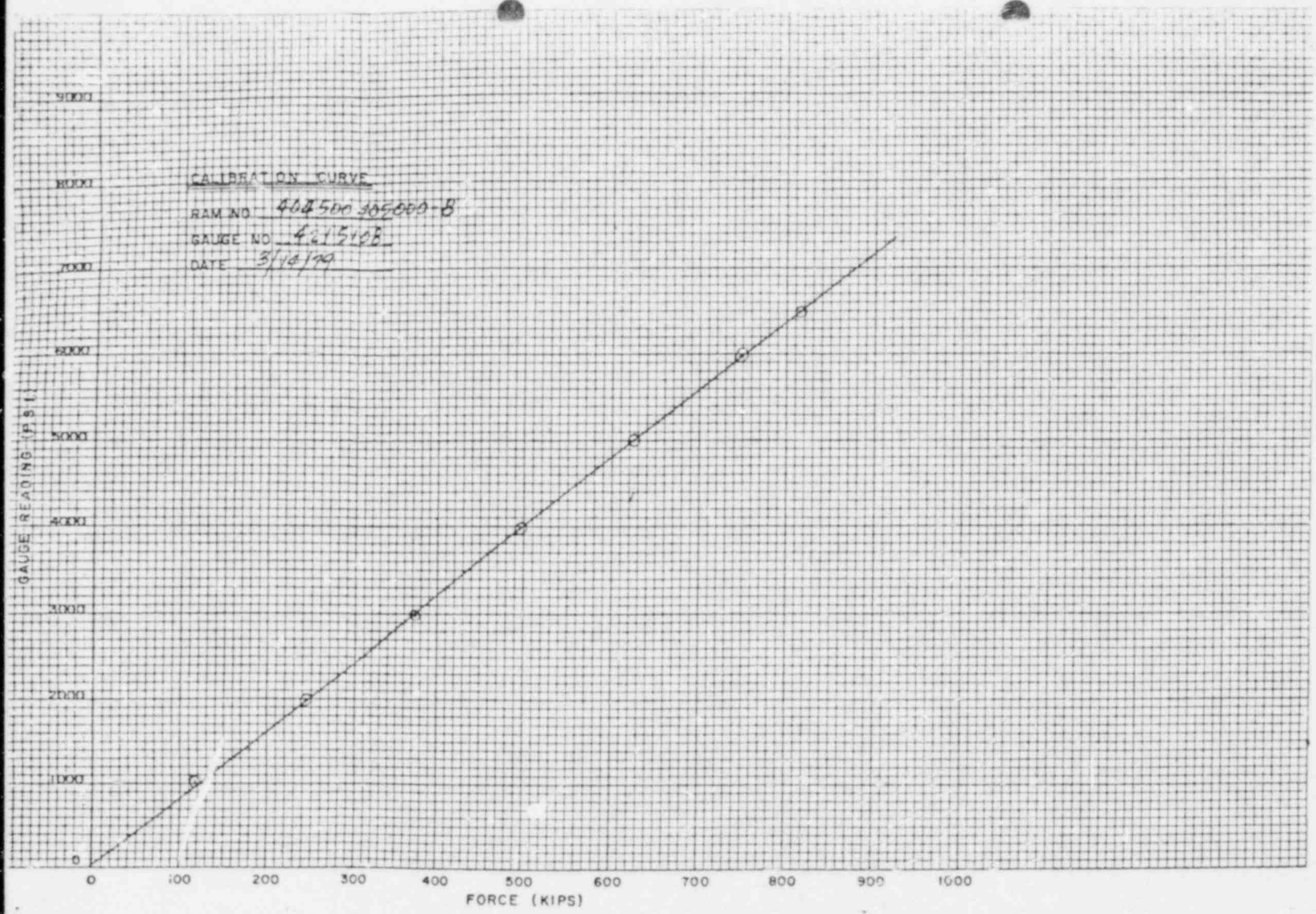
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)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GAUGE NO 421510B
DATE 3/10/79
GAUGE READING (PSI)
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2000
3000
4000
5000
6000
7000
8000
9000
0
100
200
300
400
500
600
700
800
900
1000
FORCE (KIPS)

4215108
G-224 RAM - GAUGE CALIBRATION

RAM No. 404 500 405000-8 AREA - 120 in²

Date 3/14/79

Piston Extension 2"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
4062	121860	1025	1050	1075	1025	1025	1025
8142	244260	2000	2000	2025	2000	1975	2000
12420	372600	3000	3050	3025	3000	3025	3050
16620	498600	4000	4050	4025	4000	4000	4025
20850	625500	5000	5075	5025	5025	5000	5050
24974	749220	6000	6050	6025	6000	6000	6025
27110	813300	6525	6575	6525	6500	6500	6500

Recorder T. CASTELLAW

4215108
G-224 RAM - GAUGE CALIBRATION

RAM No. 404500 405000-B AREA-120 IN²

Date 3/14/79

Piston Extension 4"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
LOAD CELL READING	ACTUAL LOAD	1 GAUGE No. 4215106	2 GAUGE No. 4215004A	3 GAUGE No. G224	4 GAUGE No. 4215108	5 GAUGE No. 4215006A	6 GAUGE No. G-239
3970	119100	1000	1000	1050	1000	1000	1000
8190	245700	2025	2000	2025	2000	1975	2025
12400	372000	3000	3025	3025	3000	3000	3050
16587	497610	4000	4050	4000	4000	4000	4025
20790	623700	5000	5050	5025	5000	4975	5025
25040	751200	6025	6050	6050	6000	6000	6050
27240	817200	6550	6600	6575	6525	6525	6525

Recorder T. CASTELLAW

4215108
G224 RAM - GAUGE CALIBRATION

RAM No. 404500 405000-B AREA = 120in2

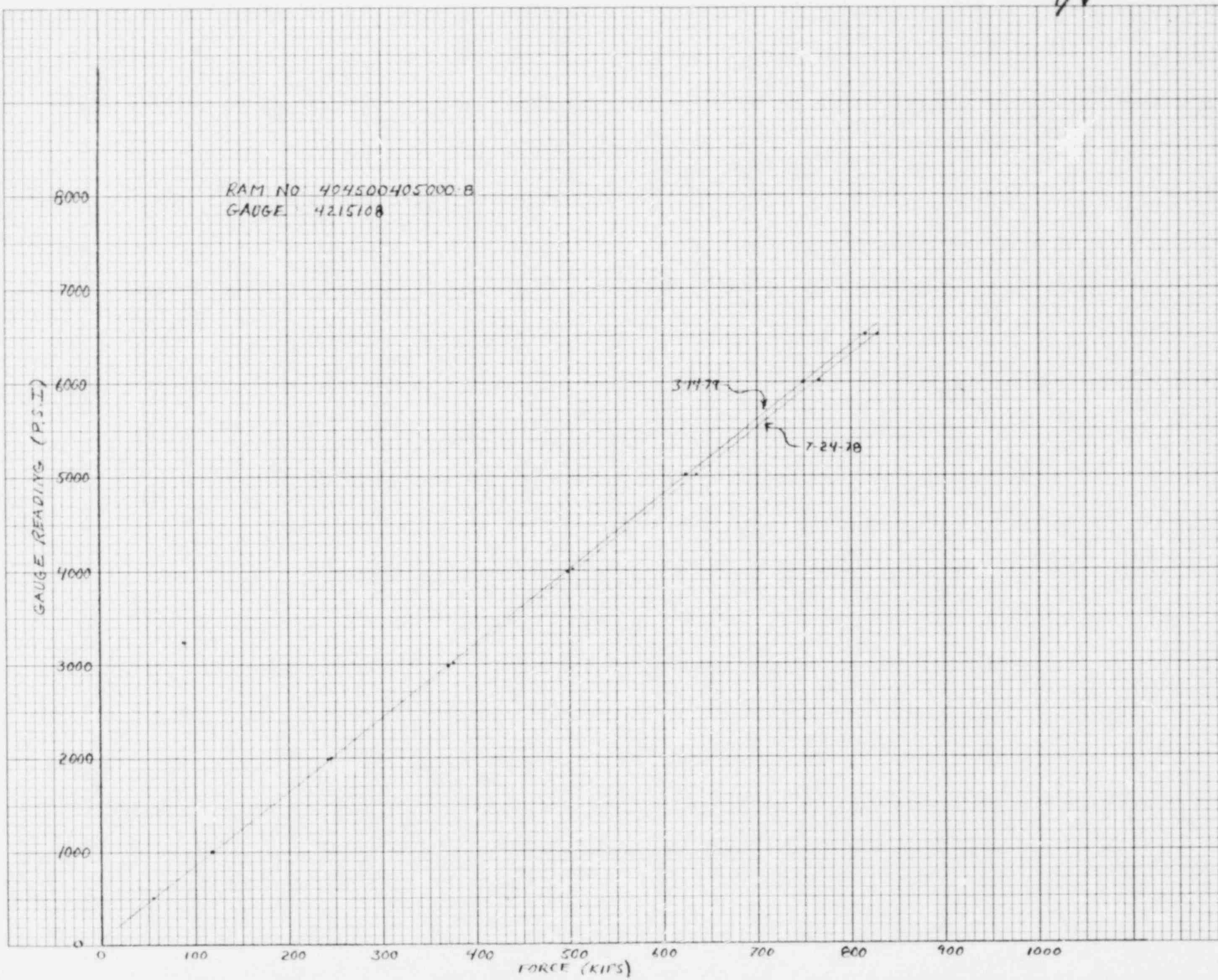
Date 3/14/79

Piston Extension 6"

PCL - 78-1.5M Loadcell BUDD P-350 Strain Indicator SN-1565		GAUGE READING P.S.I.					
		1	2	3	4	5	6
LOAD CELL READING	ACTUAL LOAD	GAUGE No. 4215106	GAUGE No. 4215004A	GAUGE No. G224	GAUGE No. 4215108	GAUGE No. 4215006A	GAUGE No. G-239
3790	113700	1000	1000	1050	1000	1000	1000
7950	238500	2000	2000	2000	1975	1950	2000
12252	367560	3000	3025	3000	2975	2975	3025
16490	494700	3975	4025	4000	3975	30975	4000
20733	621990	5000	5050	5000	5000	4975	5025
24918	747540	6000	6050	6000	5975	5975	6000
27100	813000	6525	6575	6525	6500	6500	6500

Recorder T. CASTELLAW

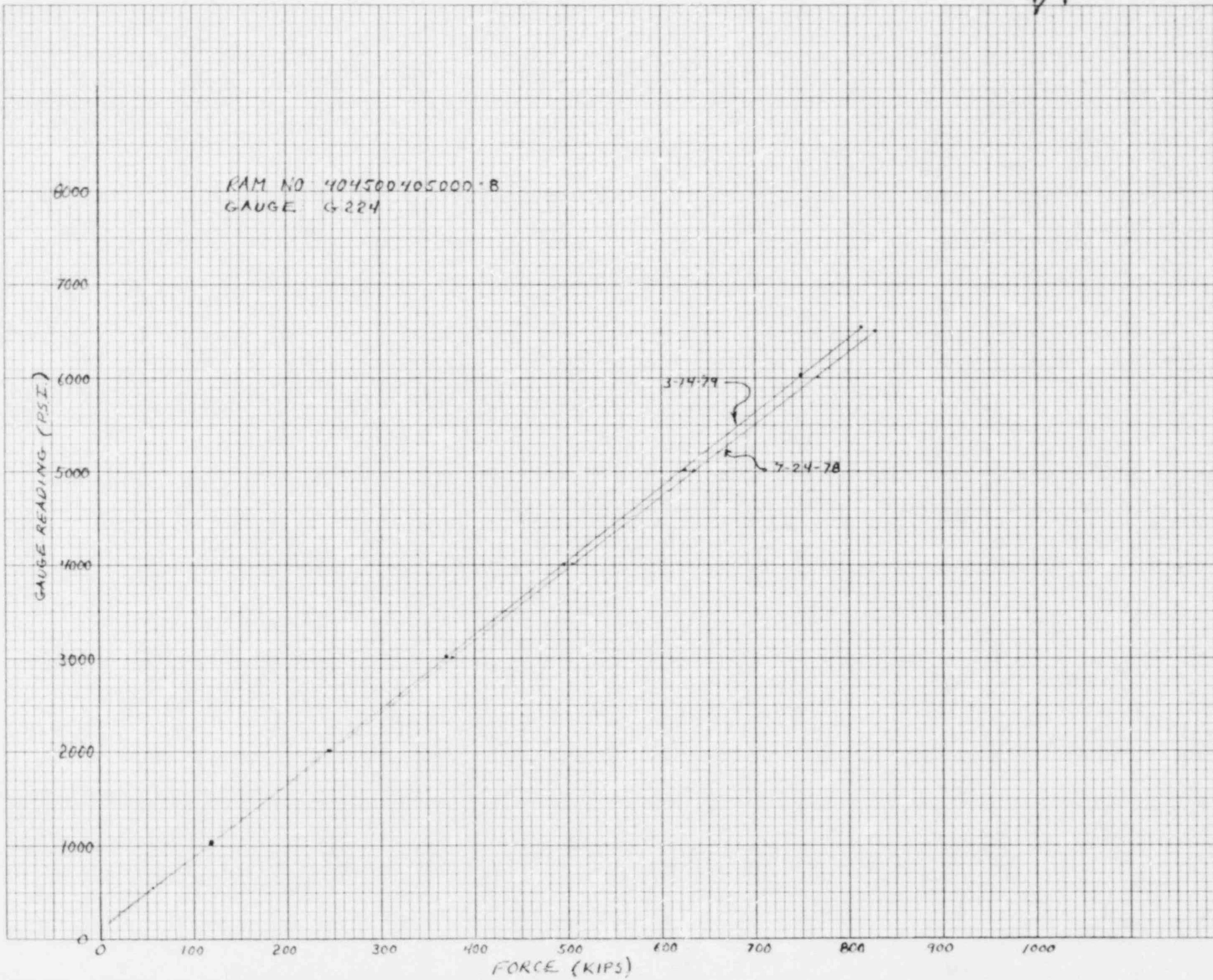
4/V



47 0780

K&E 10 X 10 TO THE INCH KEUFFEL & ESSER CO.

4/Y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GAUGE G224
3-14-79
7-24-78
GAUGE READING (PSI)
FORCE (KIPS)
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3000
4000
5000
6000
7000
8000
0
100
200
300
400
500
600
700
800
900
1000

47 0780

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 62 H 70

Closest Buttress: 2

Grease Removal: 3 gal

Date Filler CAP Removed: ~~8~~8-10-78

Date Grease Removal Started: 8-10-78

Exterior Temp.: 86°F

Interior Temp.: 118 °F

Total Volume Removed: 3 gal

Date Filler Cap Reinstalled: 8-17-78

INSPECTION OF FILLER

Color of Replacement Filler: dark brown

Color of Grease on Tendon: dark brown

Presence of Water Indicated: no

% (Approximate) Coverage of Components: 100%

Sample Taken: yes Container Identification: 62H70-2

Data Recorded By: B. C. Rudell

TENDON GREASE INSTALLATION

Date Installed: 8-17-78

Exterior Temp.: 86°F

Interior Temp.: 118°F

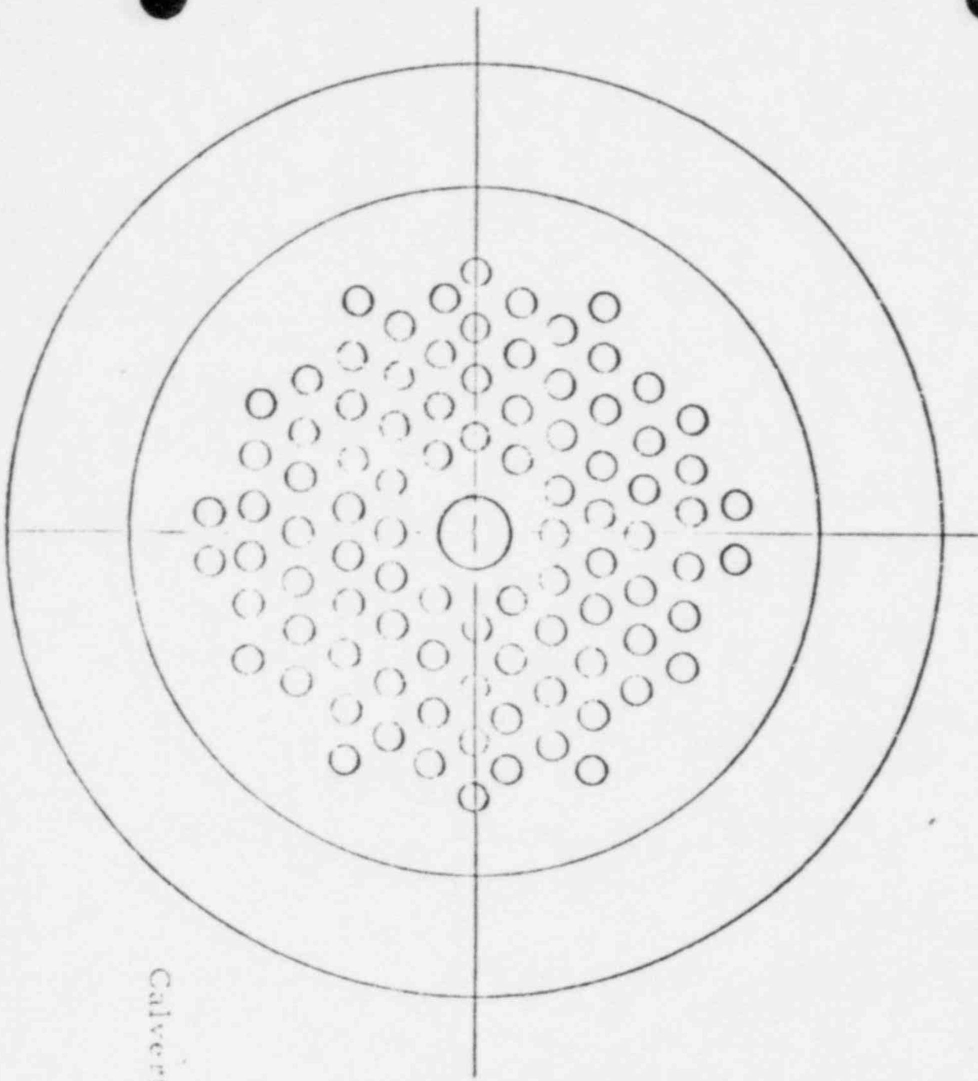
Filler Temp. @ Inlet Cap (Indicate if pumped or poured):

Filler Temp. @ Outlet Cap:

Total Volume Installed: 14 gal

Installation Pressure (if poured, N/A): N/A

Data Recorded By: H. McCall Date 8-17-78



WIRE ANCHORAGE

Closest Buttress 2

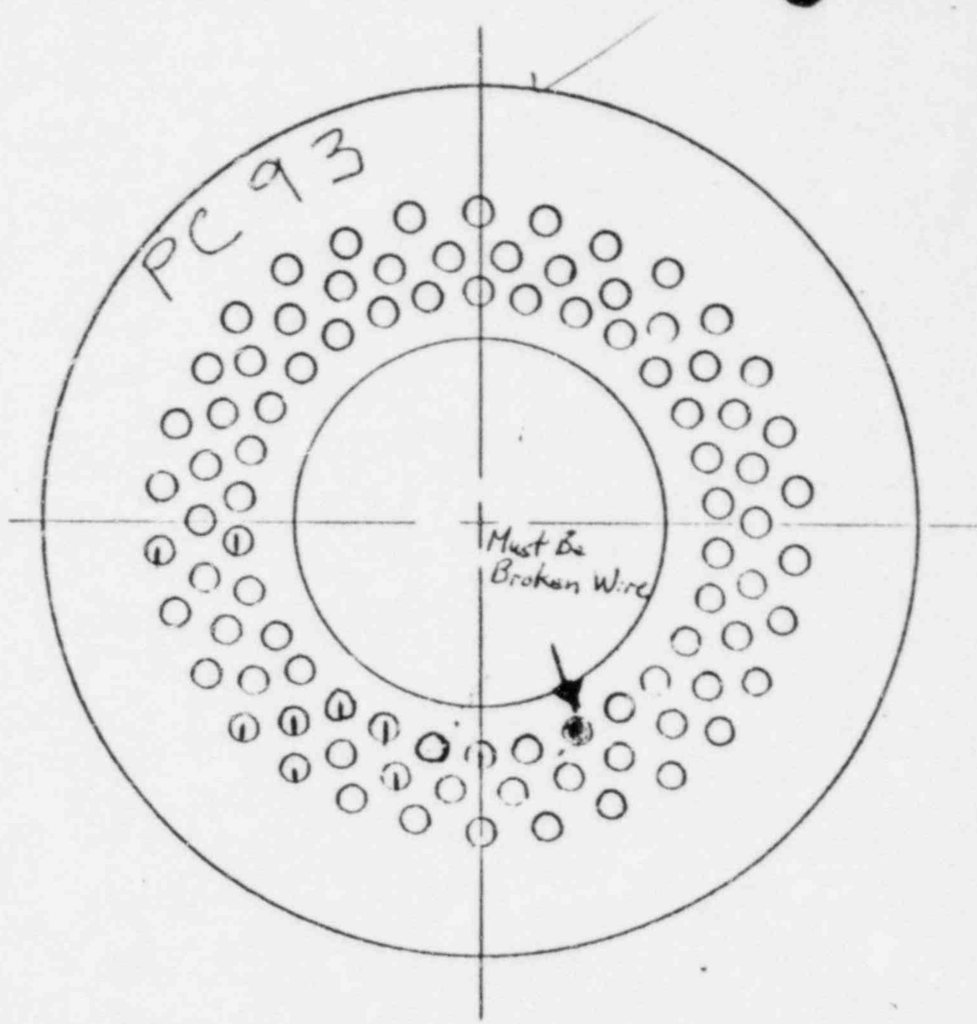
Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 2

Tendon No. 62H70

By [illegible]

Date 8-16-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
Form
Figure

Rev. 2
Page (1)

DATA SHEET VI.1

DATA RECORDED BY: B.C. Thidell

DATE 8-10-78

TENDON NUMBER 62H79 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	167.64 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.16
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.96 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	N/A Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips 50008

RAM CALIBR. CURVE	GAGE	S/N 404500050 421510-6 RAM (1)	S/N 421500 6A RAM (2)
	Hydraulic Pressure at expected Lift Off	5100 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	6690 psi	psi

Data Recorded By D. C. Kubeld

Date 8-17-78

Ram No. 404500505 0008

Gage No. 4215106 Cal Date 7-20-78

TENDON NUMBER: 62H70

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5290	5355
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	669 Kips	680 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 674.5 Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.5 Kips

Time since initial stressing of Tendon Years

7.5
90|674.5
63
44

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified 96. McCall

Date 8-17-78

	RAM (1) S/N		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e	90	Wires		
0.8f's (9.43 x N_e)	838.27	Kips		
Hydraulic Force @ 0.8f's	6590	psi	6600	psi
Original Lift-Off Hydraulic pressure, P_L	5290	psi	5355	psi
Reduction in shim pressure, P_{RE}, (N_R x 50)	0	psi	0	psi
Shim Pressure (P_L + 500 - P_{RE})	5790	psi	5855	psi

9.43
90
84.870
9.5
839.7

838.27

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 62H70

CLOSEST BUTTRESS 2

DATE: 8-17-78   DATA RECRODED BY: R.C. Kudell

RAM S/N: 404500505 0008   GAUGE S/N: 4215106

3 3 3 3.5 3 / 14.5 / 2.9 / 5/14.5 / 45

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	3				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	Avg **5290	5200	5300	5300	5350 5350	5300
VI.B.5	Pressurize to 0.8f's	**6580					
VI.B.5	Elongation @ 0.8f's	-	4 4½				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**900	900 psi				
VI.B.7	Elongation at 1 kip/wire		2½" - 3½" = -1"				
VII.	Remove Wire - This End Cut?	***	no				
VIII.3	Pressurize to 1 kip/wire	**	900				
VIII.4	Elongation at 1 kip/wire		2½" - 3½" = -1"				
VIII.5	Pressurize to 0.8f's	**6580					
VIII.5	Elongation at 0.8f's		4"				
VIII.6	Pressure for shim measure	**	5300				
VIII.7	Elongation at shim press		3¼"				
VIII.7	Shims installed		3"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5300	5300	5300	5400	5400
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		Avg 5340	yes	675+690 / 2 = 682		
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**	= 7.66 Kip/wire				
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER

DATE: DATA RECORDED BY:

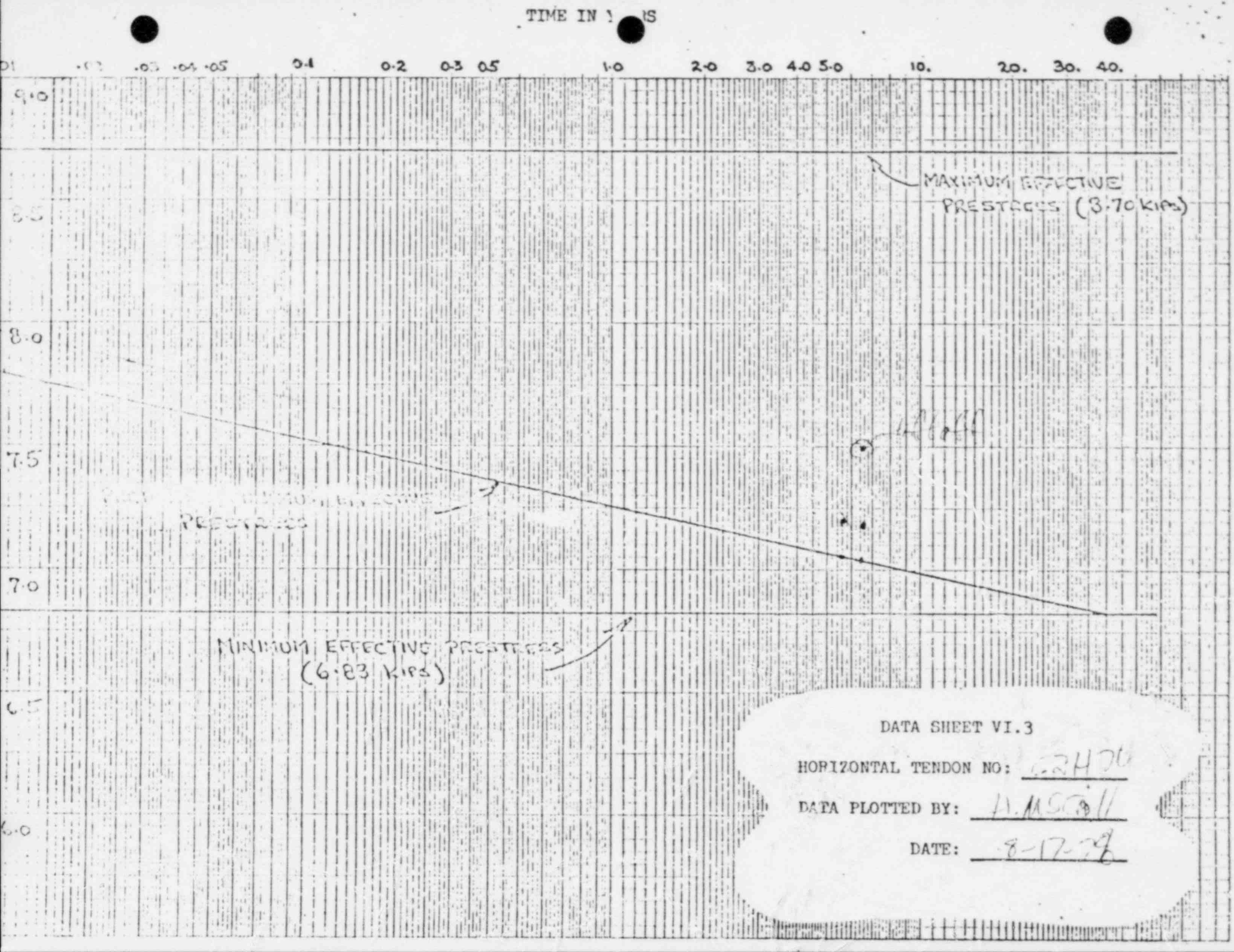
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1		4 1/4				
RESTRESS	-1		4				


TIME IN YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 KIPS)
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: 62H20
DATA PLOTTED BY:
DATE: 8-17-79

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 62 H 70.

Closest Buttress 6

Grease Removal 1 gal 2 qt

Date Filler CAP Removed 8-16-78

Date Grease Removal Started 8-16-78

Exterior Temp. 86°F

Interior Temp. 118°F

Total Volume Removed 6 qt

Date Filler Cap Reinstalled 8-17-78

2½" Shim exsist

INSPECTION OF FILLER

Color of Replacement Filler brown dark

Color of Grease on Tendon 2 tone light brown + dark brown

Presence of Water Indicated no

% (Approximate) Coverage of Components 100%

Sample Taken yes 1 qt Container Identification 62H70 - 6

Data Recorded By: B.C. Kudell

TENDON GREASE INSTALLATION

Date Installed

Exterior Temp.

Interior Temp.

Filler Temp. @ Inlet Cap } Indicate if pumped or poured

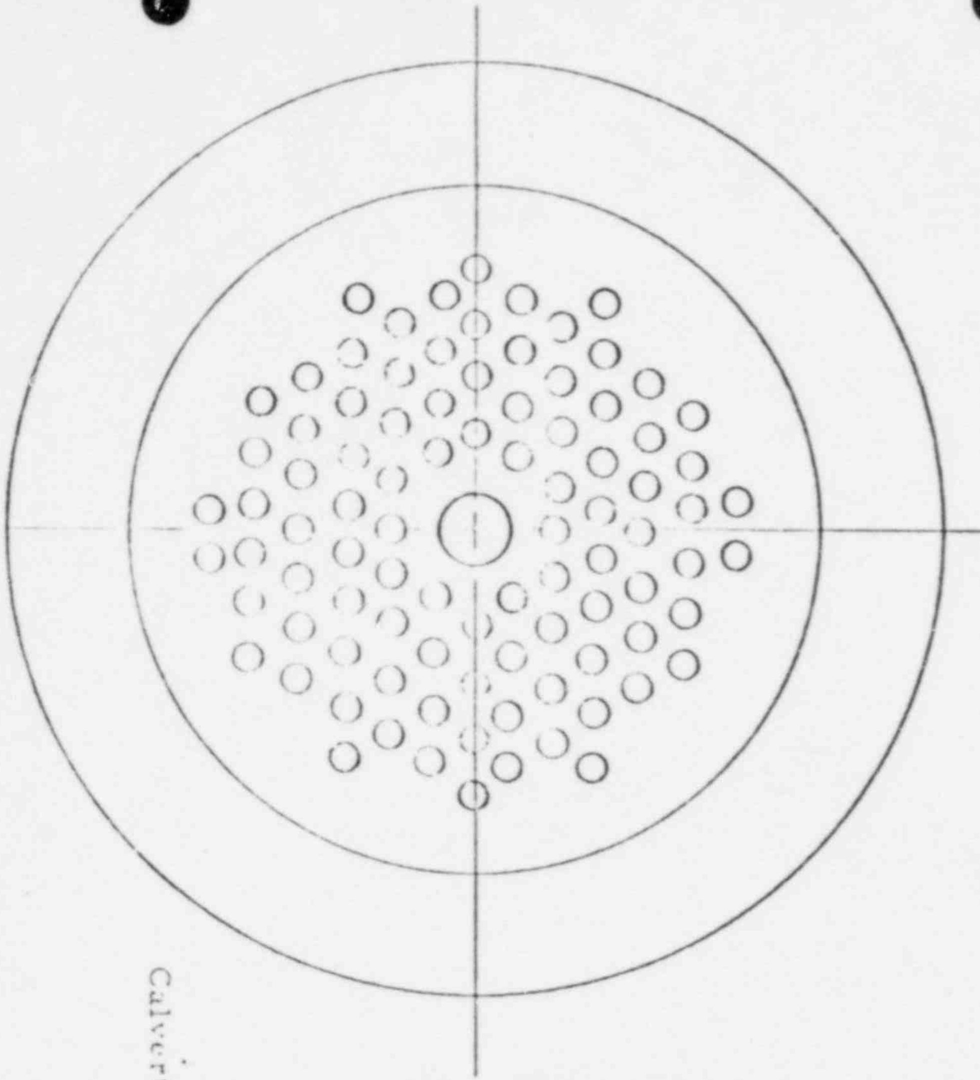
Filler Temp. @ Outlet Cap

Total Volume Installed

Installation Pressure (if poured, N/A)

Pumped From Other End

Data Recorded By: Date



WIRE ANCHORAGE

Closest Buttress 6

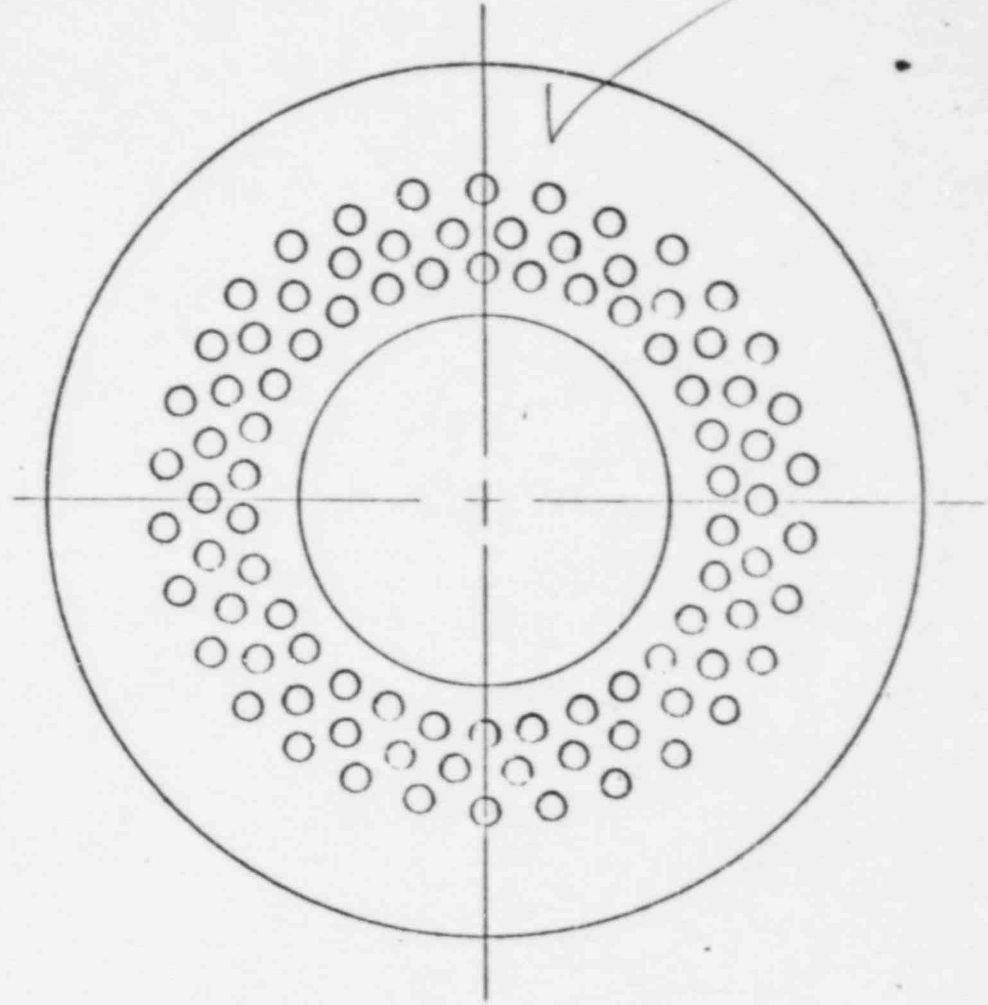
Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously No

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 6

Tendon No. 62H70

By BC. Kuskell

Date 8-16-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: B.C. Kudell

DATE 8-16-78

TENDON NUMBER 62H70 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	162.04	Ksi
	Four Day Losses: Verticals	-7.12	Ksi
	Horizontals	-5.48	Ksi
	Domes	-6.82	Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.16	
	Area of wire, A_W	.04909	in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.96	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s		Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)		Kips
	Time after initial stressing	6.6	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2	Kips
	Number of effective wires N_e	90	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648	Kips
	Maximum Effective Prestress per wire, F_{max}	8.7	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05	Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7	Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7	Kips
	Force at 1 kip per wire (1 x N_e)	90	Kips

		S/N RAM (1)	S/N 4215134 RAM (2)
RAM CALIB. CURVES	Hydraulic Pressure at expected Lift Off	psi	5100 psi
	Hydraulic Pressure at maximum effective prestress	psi	6150 psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	5006 psi
	Hydraulic pressure at absolute minimum effective prestress	psi	4850 psi
	Hydraulic Pressure at 0.8f's	psi	6650 psi

Data Recorded By BC [illegible]

Date 8-16-78

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		5355
Tendon Lift Offs Acceptable?		Yes
Lift Off Force, F_L	Kips	680 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips 675

Force Per Wire ($F_{LAV} \div N_e$) Kips 7.5

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [illegible]

Date ________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R		Wires 0
Number of effective wires N_e		Wires 89
0.8f's (9.43 x N_e)		Kips 839.27
Hydraulic Force @ 0.8f's	psi	6600 psi
Original Lift-Off Hydraulic pressure, P_L	psi	5355 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	psi	5855 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 62H20

CLOSEST BUTTRESS 6

DATE: 8-16-79 DATA RECRODED BY: H. McCall

RAM S/N: 40450040500008 GAUGE S/N: 4215109

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	2 1/2"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	5250	5400	5350	5400	5375
VI.B.5	Pressurize to 0.8f's	** 6600					
VI.B.5	Elongation @ 0.8f's	-	3 1/4				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	** 700					
VI.B.7	Elongation at 1 kip/wire		2 3/4 - 3/4				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	-					
VIII.4	Elongation at 1 kip/wire		-3/4				
VIII.5	Pressurize to 0.8f's	** 6600					
VIII.5	Elongation at 0.8f's		3 1/2				
VIII.6	Pressure for shim measure	**	5355				
VIII.7	Elongation at shim press						
VIII.7	Shims installed		Removed one 1/2" shim and replaced a 1" shim total 3"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5450	5450	5400	5400	5450
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5430	640 kip			
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

OUT = 1 3/4 1/2 3/4

*** If required by Data Sheet II.1

TENDON NUMBER 62H70

DATE: DATA RECORDED BY: D.C. Hudel

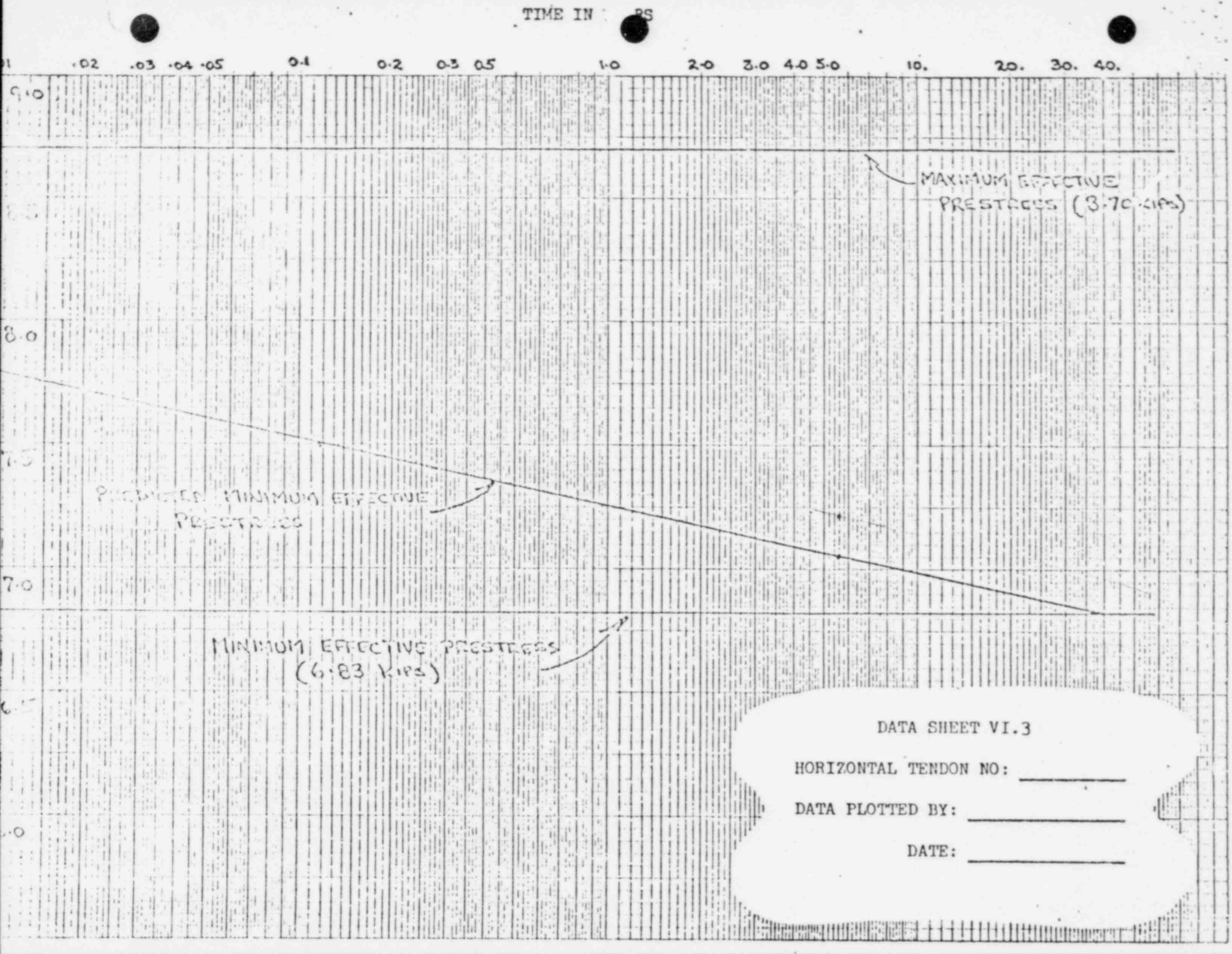
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1	-3/4	4 1/4	3 1/4	5 1/4	4	9 1/4
RESTRESS	-1	-3/4	4	3 1/2	5	4 1/4	9 1/4



DATA SHEET VI.3

HORIZONTAL TENDON NO: ____________

DATA PLOTTED BY: ____________

DATE: ____________

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 24 H55

Closest Buttress	4
Grease Removal	3 gal
Date Filler CAP Removed	8-18-78
Date Grease Removal Started	8-18-78
Exterior Temp.	79°F
Interior Temp.	119°F
Total Volume Removed	3 gal
Date Filler Cap Reinstalled	8-18-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 24H55-4

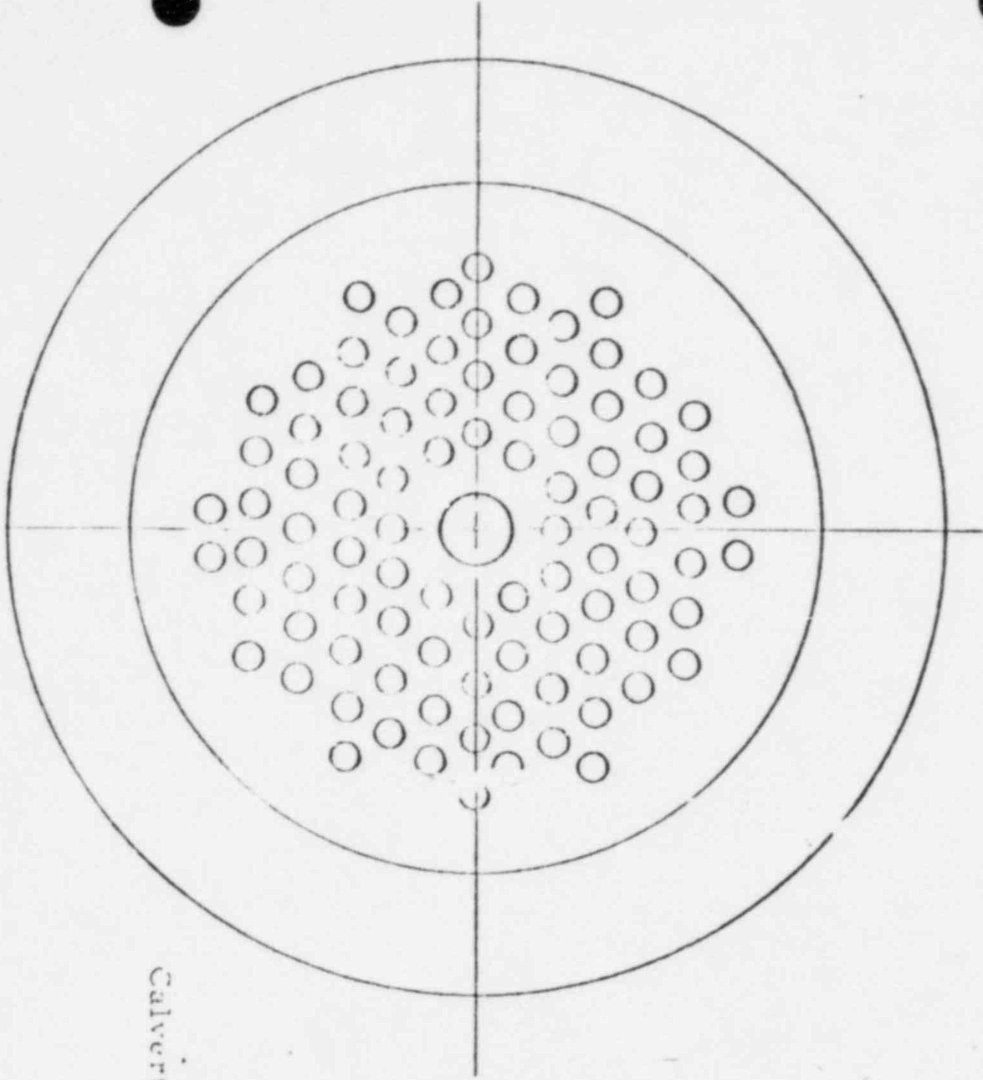
Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	Pumped From Other End
Filler Temp. @ Outlet Cap	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ________ Date ______

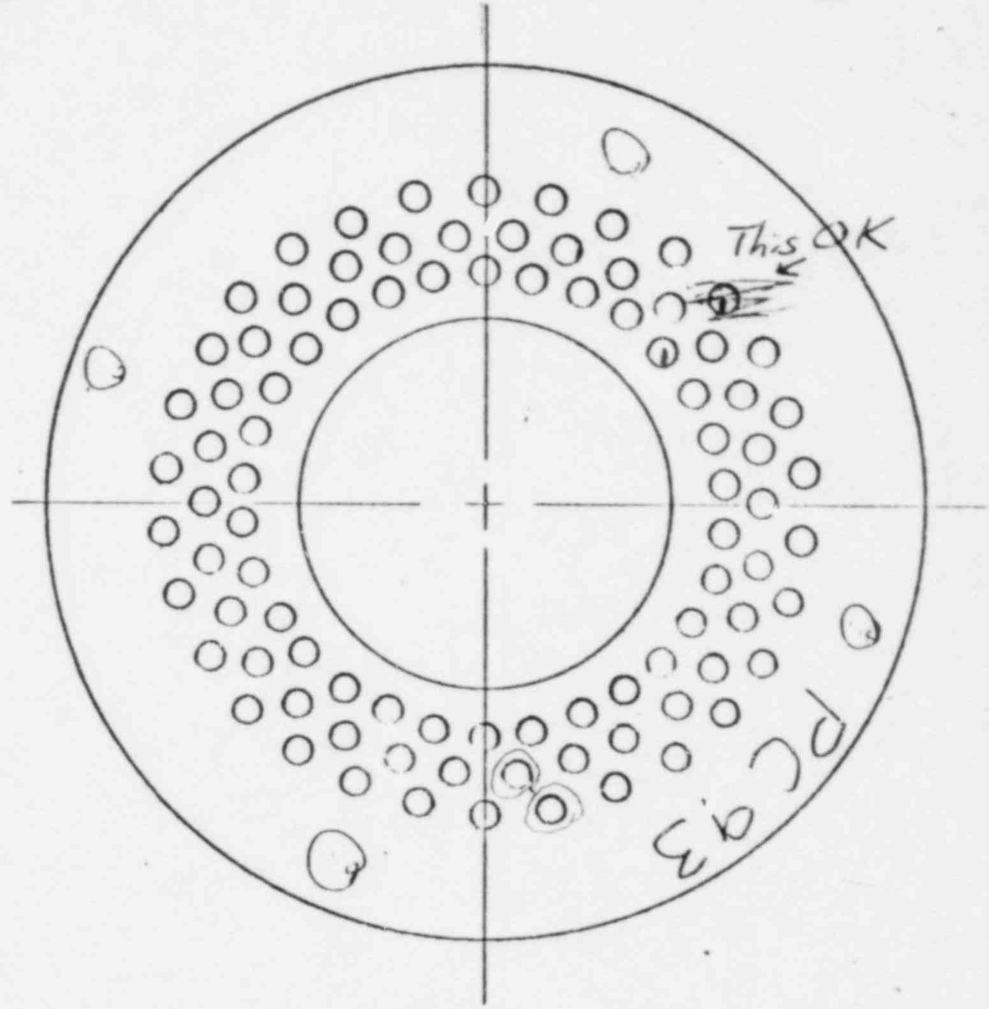
Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure



WIRE ANCHORAGE

Closest Buttress 4

- Off-Size Buttonhead
- Buttonhead with Split
- Wire Removed Previously
- Discontinuous Wire Removed this surveillance
- Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 24H55

By B.C. Rudell

Date 8-18-78

DATA SHEET VI.1

DATA RECORDED BY: BCRudell

DATE 8-18-78

TENDON NUMBER 24 H 55 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	168.29 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.81
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	7.992 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-26-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.14 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	642. Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

Ram (1) 404500403000B
Gage 4215108
Cal Curve Date 7-20-78

RAM CALIBR. ION CURVES	S/N RAM (1)	S/N RAM (2)
Hydraulic Pressure at expected Lift Off	5050 psi	psi
Hydraulic Pressure at maximum effective prestress	6100 psi	psi
Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
Hydraulic pressure at absolute minimum effective prestress	4800 psi	psi
Hydraulic Pressure at 0.8f's	6600 psi	psi

Data Recorded By BC Rudell

Date 8-18-78

TENDON NUMBER: 24H55

Ram 1 Ram No 404500405000 8
Gage No 4215108.
Date Cal. 7-20-78

	RAM (1) S/N 404500405000 8	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5040	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 685. Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.56 Kips

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified BC Rudell

Date 8-18-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6600 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5040 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5540 psi	psi

DATA SHEET VI.2

Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 24H55

CLOSEST BUTTRESS 4

DATE: 8-18-78 DATA RECRODED BY: B.C. Kendall

RAM S/N: 4045004050008 GAUGE S/N: 4215108 Date Cal. 7-20-78

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 7.56 kip/wire avg 5040 psi	5050 **	5100	5000	5000	5000	5100
VI.B.5	Pressurize to 0.8f's	6600 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	3 5/16"				
VI.B.6	Depressurize to zero	-	✓ 1 13/16" Stressing				
VI.B.7	Pressurize to 1 kip/wire	**	2" ✓				
V	Elongation at 1 kip/wire	3 1/2 + 2"	-1 1/2"				
VII.	Remove Wire - This End Cut? NA	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's		3"				
VIII.6	Pressure for shim measure	**	5540				
VIII.7	Elongation at shim press		2 3/4				
VIII.7	Shims installed 1/4 inch shim added		2 1/2"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure avg 5530 psi		5600	5550	5500	5500	5500
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	705 ≥ 685 kip	705 Kips ~~[illegible]~~				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

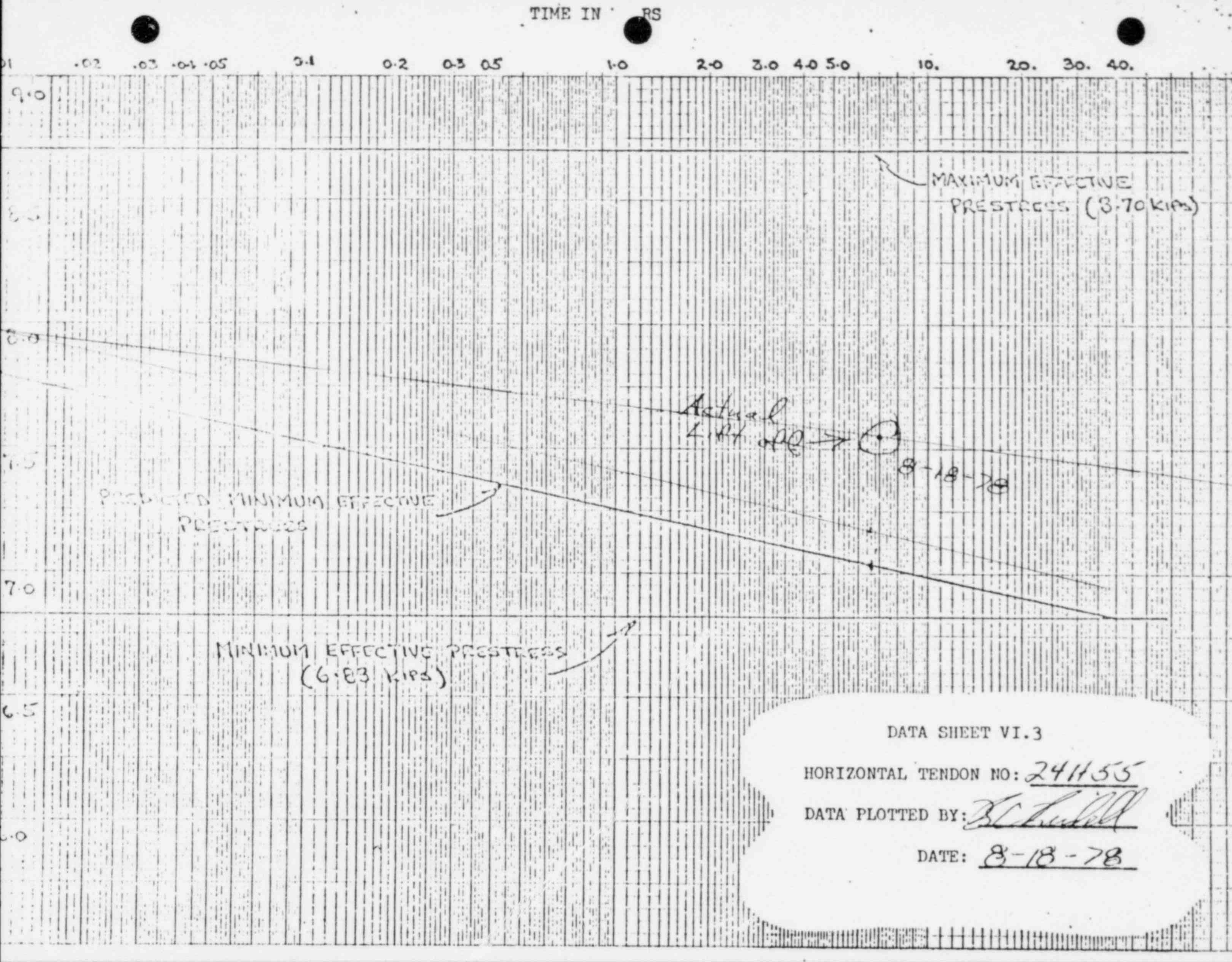
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 24H55

DATA PLOTTED BY: [signature]

DATE: 8-18-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 24 H 55

Closest Buttress	2
Grease Removal	N/A
Date Filler CAP Removed	8-18-78
Date Grease Removal Started	8-18-78
Exterior Temp.	79°F
Interior Temp.	119°F
Total Volume Removed	10 Qt
Date Filler Cap Reinstalled	8-18-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100%

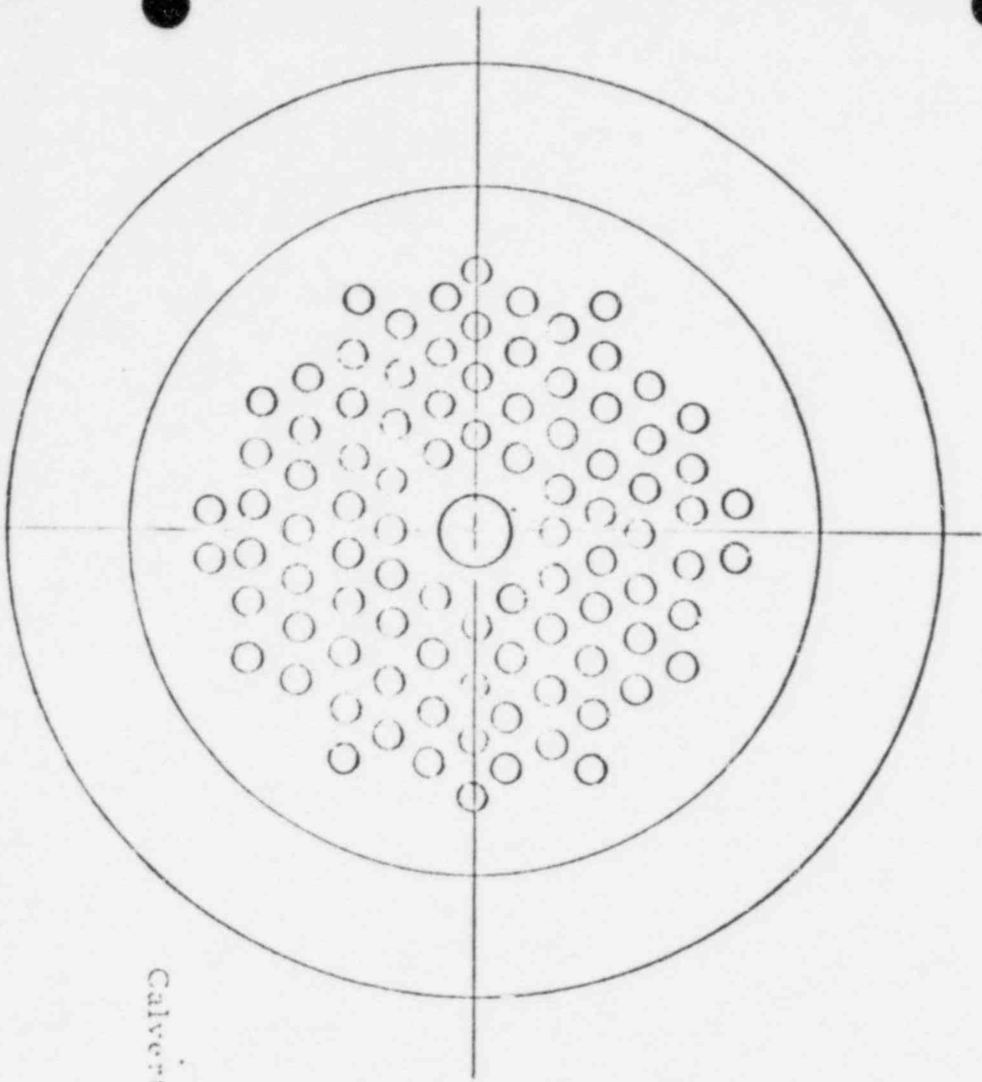
Sample Taken 1 Qt Container Identification 24 H55

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	8-18-78
Exterior Temp.	79°F
Interior Temp.	119°F
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	7 gal
Installation Pressure (if poured, N/A)	N/A

Data Recorded By: H. McCall Date 8-18-78



WIRE ANCHORAGE

Closest Buttress ________

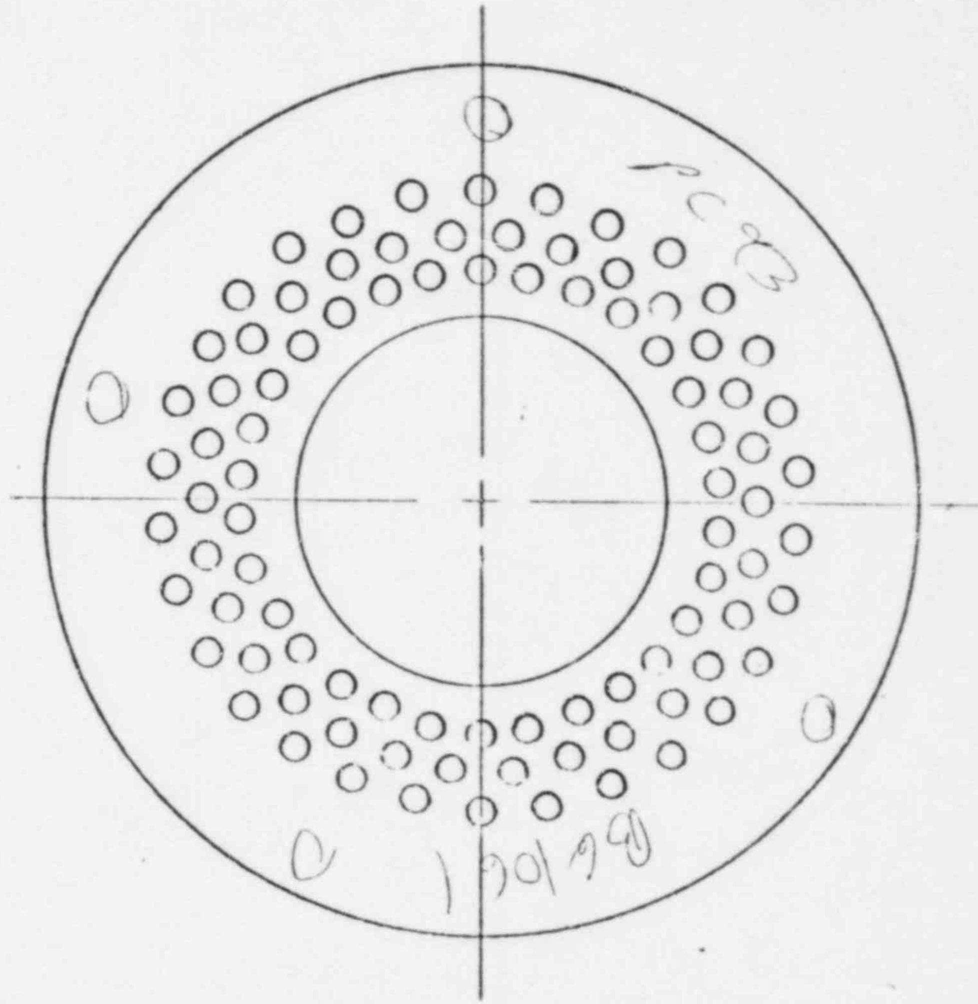
Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 2

Tendon No. 24455

By L McCall

Date 8-16-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
[illegible] Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: HMcCall

DATE 9-19-78

TENDON NUMBER 24 H55 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.29 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.81
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	7.992 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-26-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.14 Kips
	Number of effective wires Ne	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	642 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

	9215006A #2	S/N 5 RAM (1)	S/N RAM (2)
RAM CALIB. CURVE	Hydraulic Pressure at expected Lift Off	5000 psi	psi
	Hydraulic Pressure at maximum effective prestress	6100 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4950 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4800 psi	psi
	Hydraulic Pressure at 0.8f's	6600 psi	psi

Data Recorded By V. McCall

Date 8-18-79

TENDON NUMBER: 24455

	RAM (1) 5 S/N 6215006G	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5250	5040
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	675 Kips	685 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 680 Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.56 Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified V. McCall

Date 8-18-79

	RAM (1) S/N 5	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6600 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5250 psi	5040 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	5250 psi	5540 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 24455

CLOSEST BUTTRESS 2

DATE: 8-18-78 DATA RECRODED BY: H McColl

RAM S/N: 4045005050003 GAUGE S/N: 421500-6A

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	2¼"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	5250 avg (5000) **	5200	5250	5300	5200	5300
VI.B.5	Pressurize to 0.8f's	6600 **	5250 avg				
VI.B.5	Elongation @ 0.8f's	-	3½"				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	700 **	~~2¼~~				
V[illegible]	Elongation at 1 kip/wire		2¼" - 3½" = -1¼"				
VII.	Remove Wire - This End Cut?	***	No				
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire		2¼" - 3½" = - 1¼"				
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's	6600	4⅛"				
VIII.6	Pressure for shim measure	**	5750				
VIII.7	Elongation at shim press		~~3¼~~ 3"				
VIII.7	Shims installed		2 15/16"	installed 1 pair 1" removed 1 pair ½" ½"			
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5500	5100	5050		
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		No				
VIII.9	If "NO" above Pressurize to 1000 psi above Initial avg. Lift-off	**	6350				
	Shims installed		3 7/16"	installed 1 pair ½"			
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure		5600	5600	5600	5600	5600

5600" = 720 kips

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 24H55

DATE:

DATA RECORDED BY: [illegible]

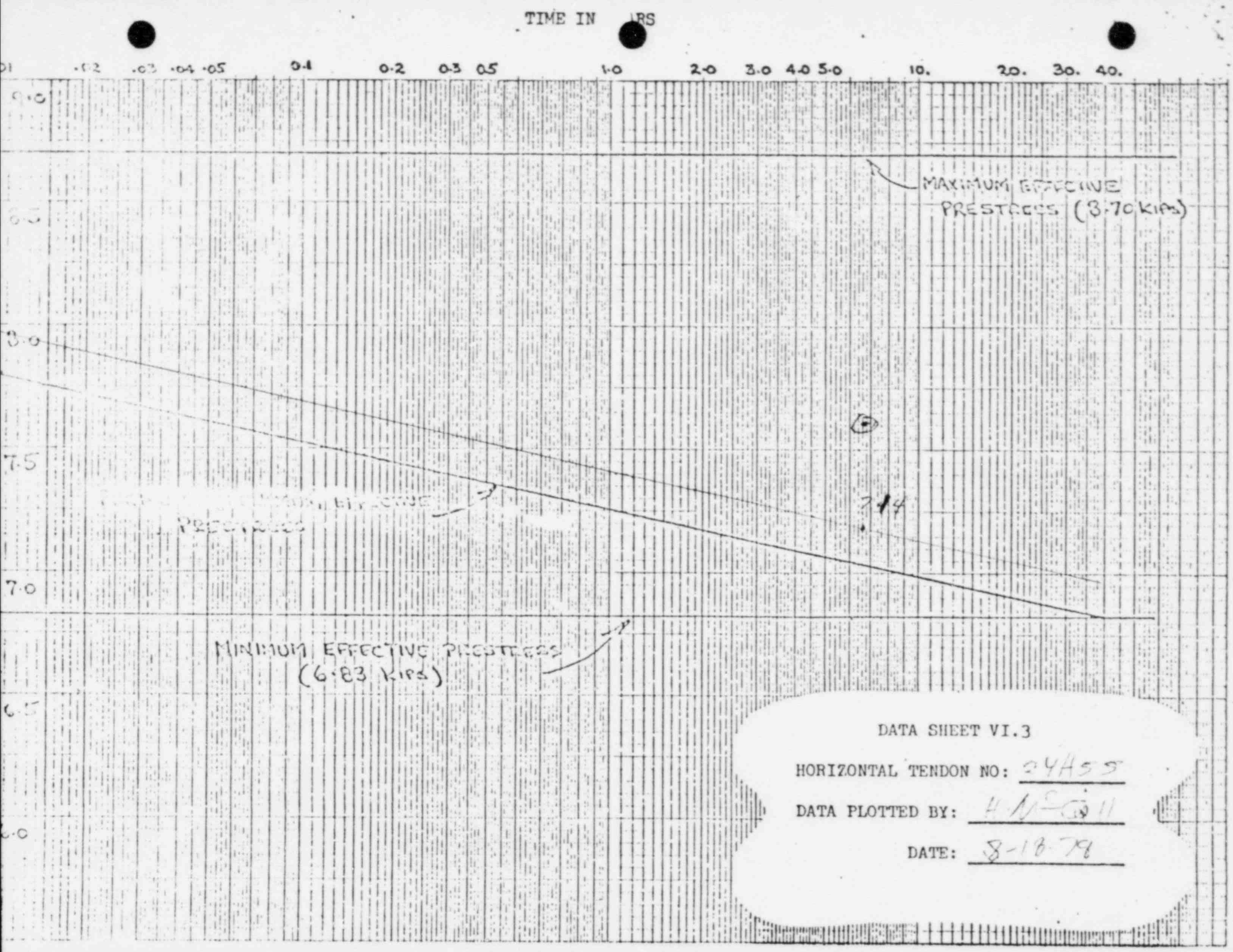
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 1/2	-1 1/4	3 5/16	3 1/2	4 13/16	4 3/4	9 9/16
RESTRESS	-1 1/2	-1 1/4	3	4 1/8	4 1/2	5 3/8	9 7/8



DATA SHEET VI.3

HORIZONTAL TENDON NO: 24H55

DATA PLOTTED BY: H. McGill

DATE: 8-18-79

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 31 H 50

Closest Buttress	1
Grease Removal	8-19-78
Date Filler CAP Removed	8-19-78
Date Grease Removal Started	8-19-78
Exterior Temp.	85°F
Interior Temp.	118°F
Total Volume Removed	6 Qt
Date Filler Cap Reinstalled	8-19-78

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100%

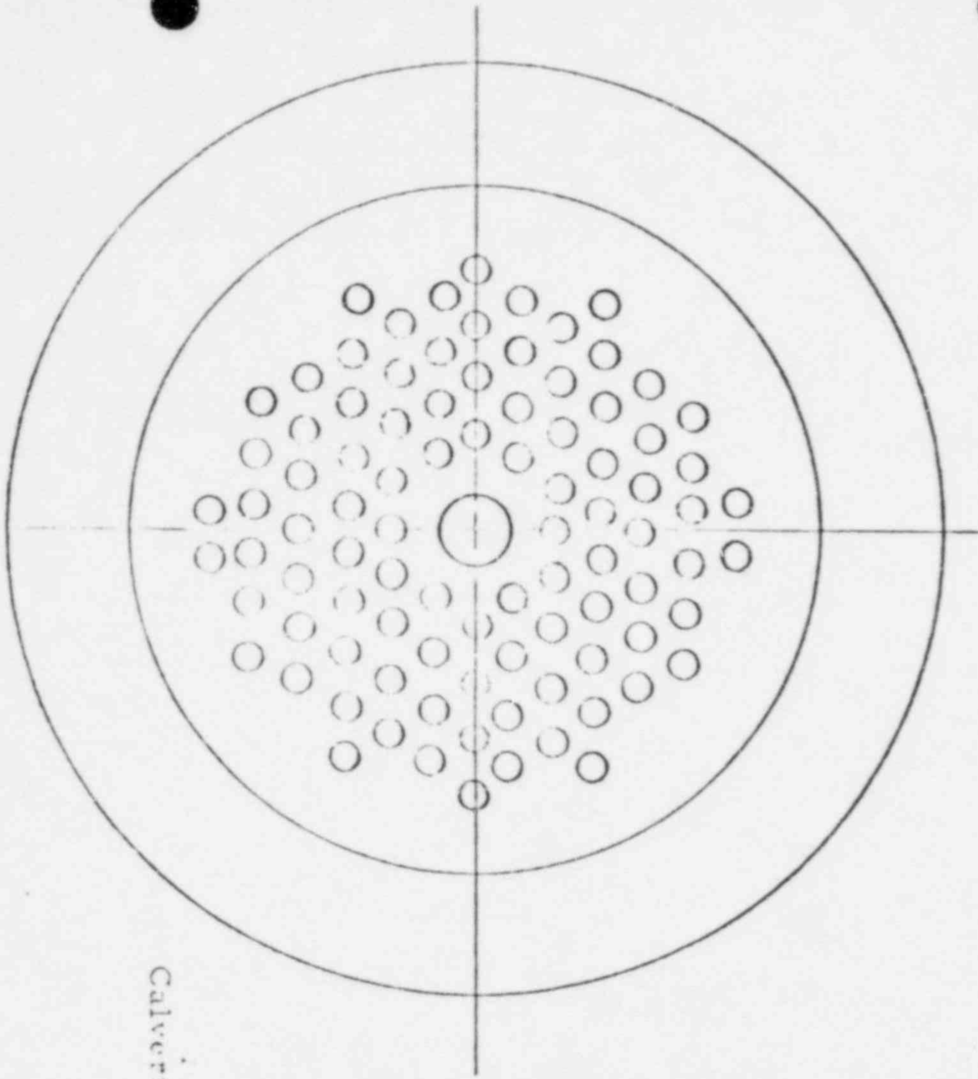
Sample Taken 1Qt Container Identification 31-50

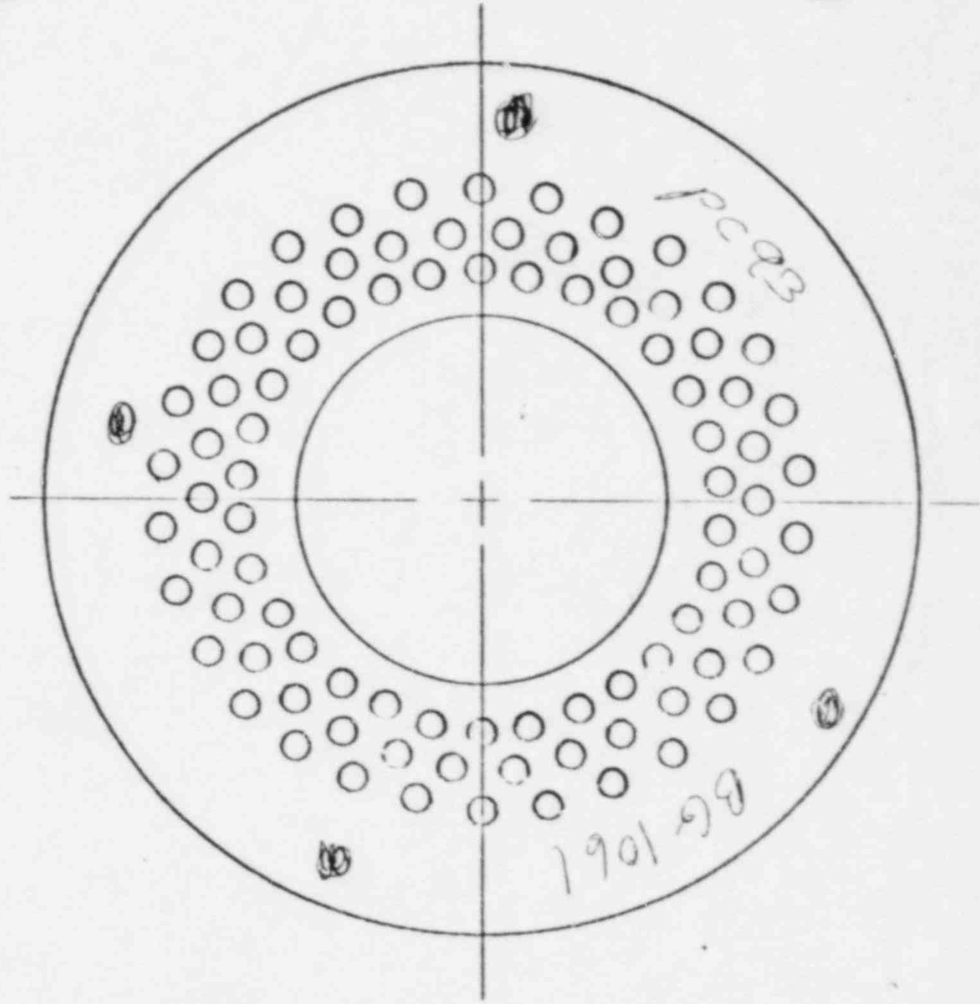
Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	8-19-78
Exterior Temp.	85°
Interior Temp.	118°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	8 gal
Installation Pressure (if poured, N/A)	N/A

Data Recorded By: H. McCall Date 8-19-78





WIRE ANCHORAGE

Closest Buttress ______

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 1

Tendon No. 31H50

By H McCall

Date 8-19-76

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: H. McCall

DATE 8-19-78

TENDON NUMBER 31 H 50 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	167.40 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.92
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	7.95 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-7-72 - 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.16 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	644. Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	785 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVES		S/N 5 4315064 RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5000 psi	psi
	Hydraulic Pressure at maximum effective prestress	6100 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4900 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4800 psi	psi
	Hydraulic Pressure at 0.8f's	6600 psi	psi

Data Recorded By H McCall

Date 8-19-78

TENDON NUMBER: 31450

	RAM (1) S/N 5	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5270	5370
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	675 Kips	685 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ 675 Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.5 Kips

Time since initial stressing of Tendon Years

75
90/675
63
45

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified V. McCall

Date 8-19-78

	RAM (1) S/N 5		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e		Wires		
0.8f's (9.43 x N_e)	848.7 ~~[illegible]~~	Kips		
Hydraulic Force @ 0.8f's	6600	psi	6600	psi
Original Lift-Off Hydraulic pressure, P_L	5270	psi	5370	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0	psi	0	psi
Shim Pressure (P_L + 500 - P_{RH})	5770	psi	5870	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H50

CLOSEST BUTTRESS 1

DATE: 8-19-78 DATA RECRODED BY: K. McColl

RAM S/N: 40450050500 GAUGE S/N: 4215006A

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	3"			350	
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	(5000 ...) **	5300	5300	5200	5350	5200
VI.B.5	Pressurize to 0.8f's	(6500) **	5270 avg 675kips				
VI.B.5	Elongation @ 0.8f's	-	3½"				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	(1000) **					
V[...]	Elongation at 1 kip/wire		2 5/8" - 3½ = -7/8				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	-					
VIII.4	Elongation at 1 kip/wire		2 5/8" = -7/8				
VIII.5	Pressurize to 0.8f's	(6500) **	6400				
VIII.5	Elongation at 0.8f's		4¼"				
VIII.6	Pressure for shim measure	**	5270				
VIII.7	Elongation at shim press		3"				
VIII.7	Shims installed		3"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5500	5600	5500	5500	5500
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5520 yes 710kips				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

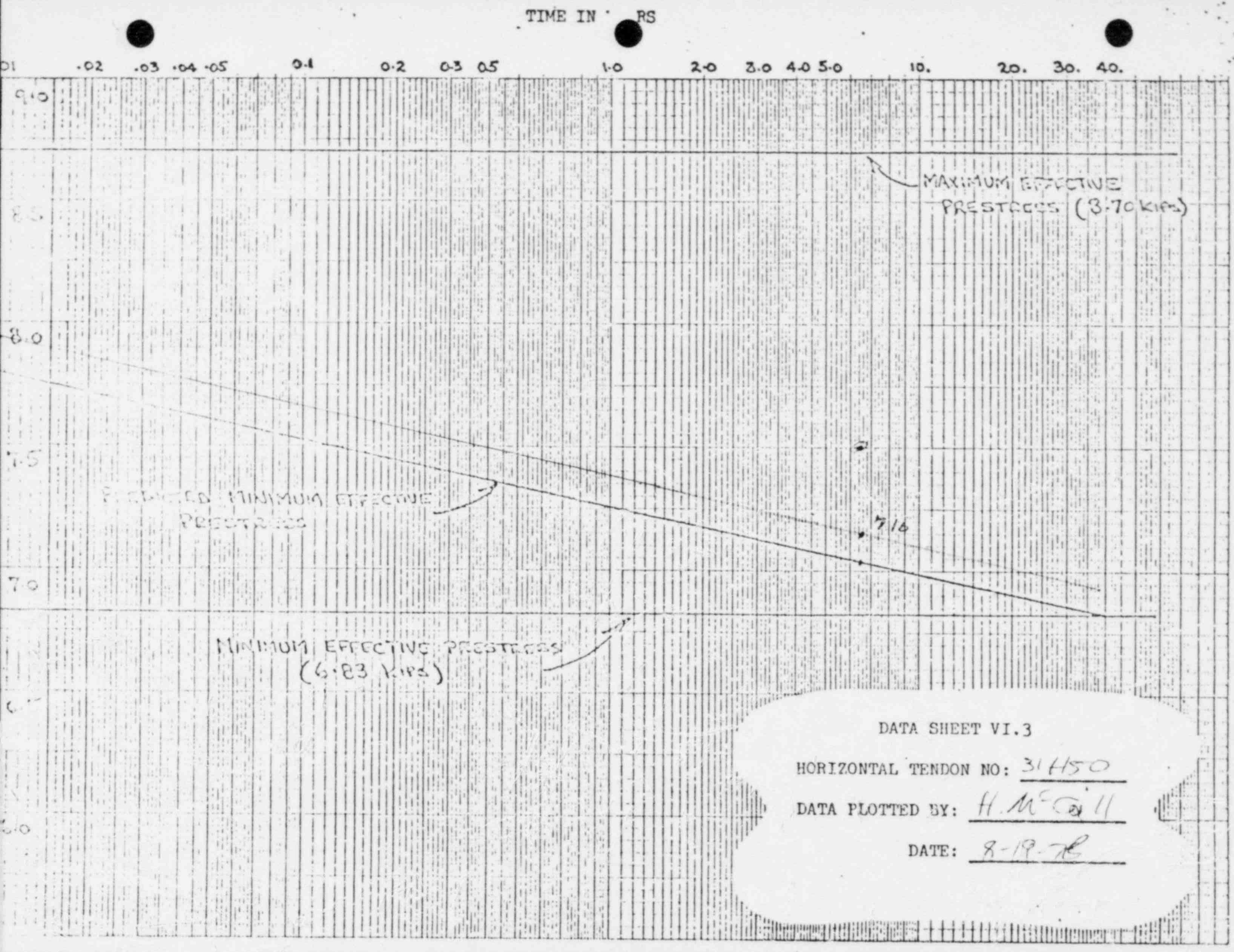
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							


TIME IN RS
.01 .02 .03 .04 .05 0.1 0.2 0.3 0.5 1.0 2.0 3.0 4.0 5.0 10. 20. 30. 40.
9.0
8.5
8.0
7.5
7.0
6.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 KIPS)
MINIMUM EFFECTIVE PRESTRESS
7/6
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: 31H50
DATA PLOTTED BY: H. McCall
DATE: 8-19-76

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 31 H 50

Closest Buttress 3

Grease Removal 8-19-78 2 gal

Date Filler CAP Removed 8-19-78

Date Grease Removal Started 8-19-78

Exterior Temp. 85°F

Interior Temp. 118°F

Total Volume Removed 2 gal

Date Filler Cap Reinstalled

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes / 8-19-78 Container Identification 31 H 50-3

Data Recorded By: B.C. Kimbell

TENDON GREASE INSTALLATION

Date Installed 8-19-78

Exterior Temp.

Interior Temp.

Filler Temp. @ Inlet Cap } Indicate if pumped or poured

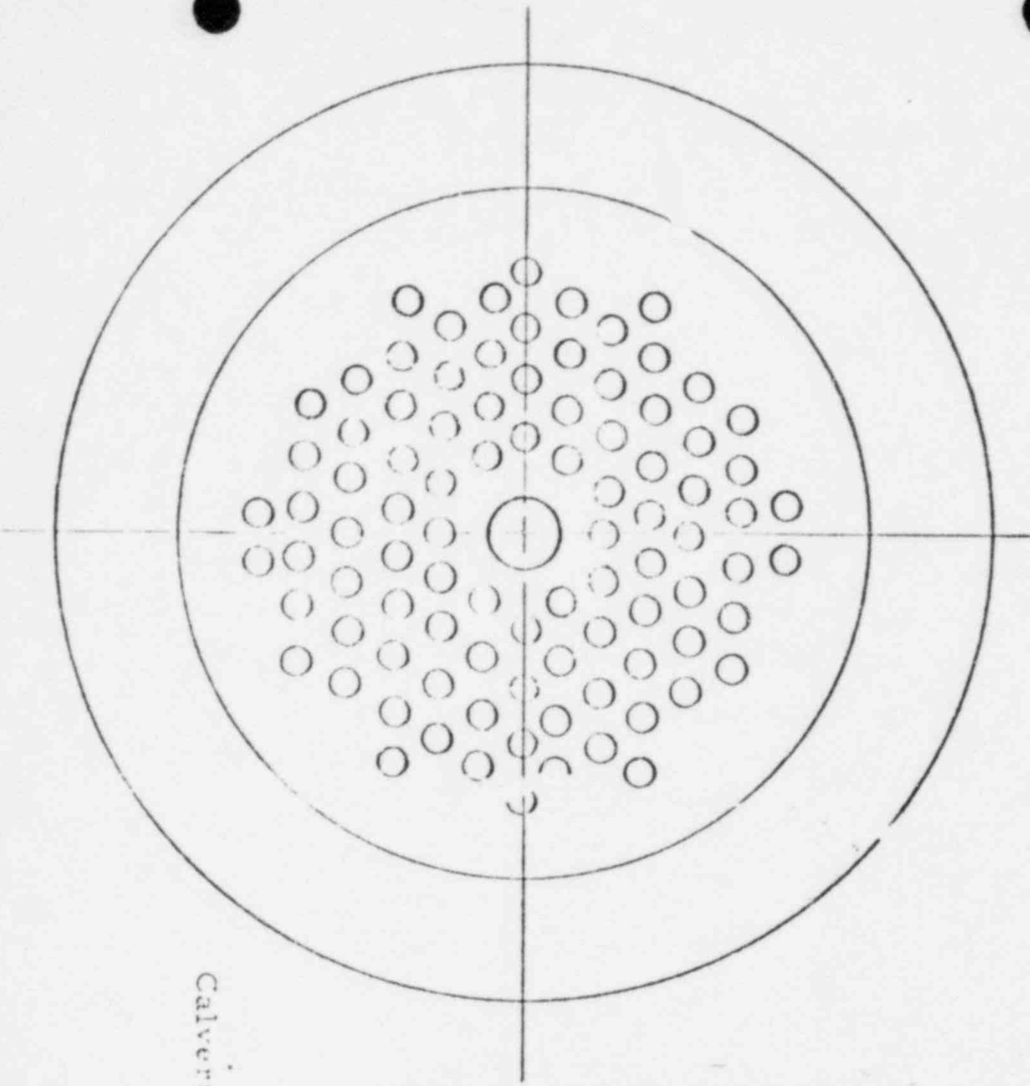
Filler Temp. @ Outlet Cap

Total Volume Installed

Pumped from Other End

Installation Pressure (if poured, N/A)

Data Recorded By: Date



WIRE ANCHORAGE

Closest Buttress 3

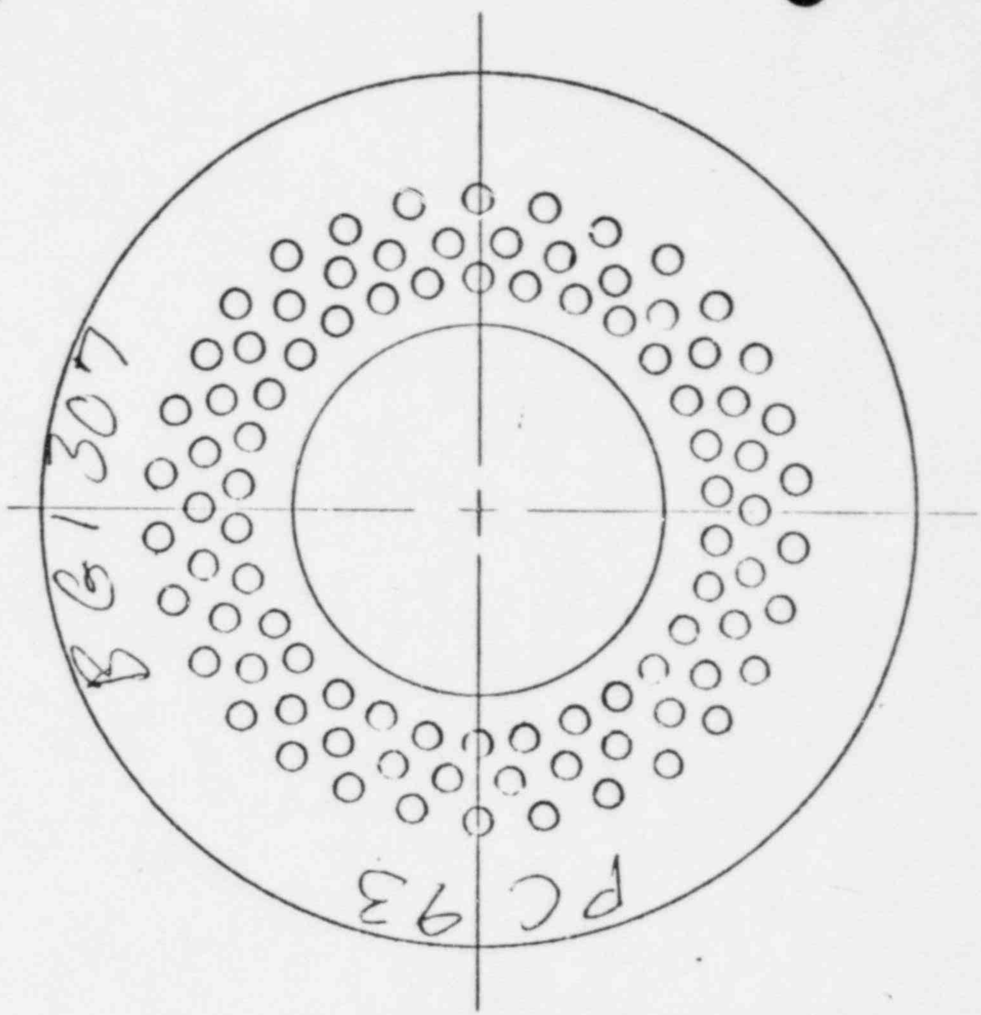
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 3

Tendon No. 31H50

By B.C. Rudell

Date 8-19-78

All Buttonheads Good

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: E C Ludell

DATE 8-19-78

TENDON NUMBER 31 H 50 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	167.40 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.92
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.95 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-7-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.16 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	644. Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips 7.05
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

	(1) Ram 4045004050008 Gage 4215108 Date Cal. 7-20-78	S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Hydraulic Pressure at expected Lift Off	5060 psi	psi
	Hydraulic Pressure at maximum effective prestress	6140 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4830 psi	
	Hydraulic Pressure at 0.8f's	6600 psi	

Data Recorded By B C Rudell

Date 8-19-78

TENDON NUMBER: 31 H 50

Ram S/N 40450840500008
Gage S/N 4215108
Date Cal. 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5370	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	675 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 675 Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.5 Kips

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B C Rudell

Date 8-19-78

Date Cal 7-20-78
Gage 4215108

	RAM (1) S/N 40450040500008	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6600 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5370 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5870 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H50

CLOSEST BUTTRESS 3

DATE: 8-19-78 DATA RECRODED BY: B.C. Kudell

RAM S/N: 40450C405008 GAUGE S/N: 4215108

Date Cal 7-20-78

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2"				
	(expect 5060)		Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 5370	**	5400	5350	5400	5400	5300
VI.B.5	(6600 psi) Pressurize to 0.8f's	**	6600 psi ✓				
VI.B.5	Elongation @ 0.8f's	-	~~2 9/16"~~ ? Ram extended : New Reading → 3 7/8" ✓				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	(750 psi) Pressurize to 1 kip/wire	**	✓ 750 psi				
V	Elongation at 1 kip/wire		2 1/4" - 3 1/2" = -1 1/4" ✓				
VII.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**	✓				
VIII.4	Elongation at 1 kip/wire		2 1/4" - 3 1/2" = -1 1/4" ✓				
VIII.5	(6600psi) Pressurize to 0.8f's	**	6600psi ✓				
VIII.5	Elongation at 0.8f's		3 3/16" ✓				
VIII.6	Pressure for shim measure	5870 **	5870 psi ✓				
VIII.7	Elongation at shim press		3"				
VIII.7	2" exsisted. Added 1 pair 1/2" Shims ← From 62H70 Shims installed + 1 pair 3/8" Shims		2 7/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure Avg. 5330		5400	5400	5250	5400	5200
VIII.8	5330 ≥ 5370 AVG Lift Off ≥ Initial AVG Lift Off?	$\frac{710+675}{2}$ =	692 kip avg. ≥ 675 ✓				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

Smallest 3/16

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER 31 H50

DATE: DATA RECORDED BY: [signature]

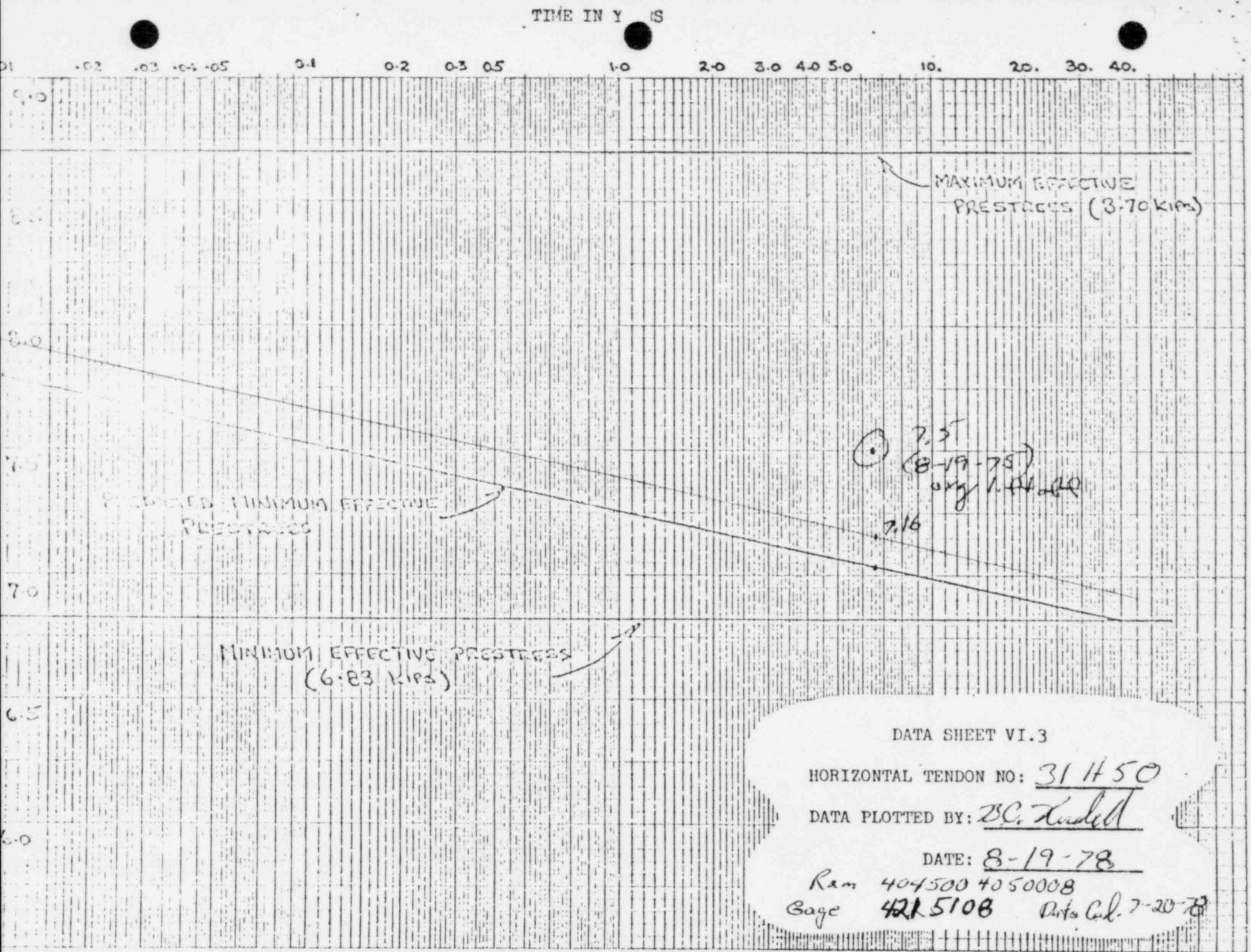
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-7/8	-1 1/4	3 1/2	3 7/8	4 3/8	5 1/8	9 1/2
RESTRESS	-7/8	-1 1/4	4 1/4	3 3/16	5 1/8	4 7/16	9 9/16



DATA SHEET VI.3

HORIZONTAL TENDON NO: 31 H 50

DATA PLOTTED BY: B.C. Haskell

DATE: 8-19-78

Ram 404500 4050008

Gage 421 5108 Date Cal. 7-20-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 51 H 45

Closest Buttress 5

Grease Removal 3 gal

Date Filler CAP Removed 8-21-78

Date Grease Removal Started 8-21-78

Exterior Temp. 75 °F

Interior Temp. 119 °F

Total Volume Removed 3 gal

Date Filler Cap Reinstalled 8-21-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon 25% Light Brown 75% Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 51H45-5

Data Recorded By: B.C. Kudell

TENDON GREASE INSTALLATION

Date Installed 8-21-78

Exterior Temp.

Interior Temp.

Filler Temp. @ Inlet Cap } Indicate if pumped or poured

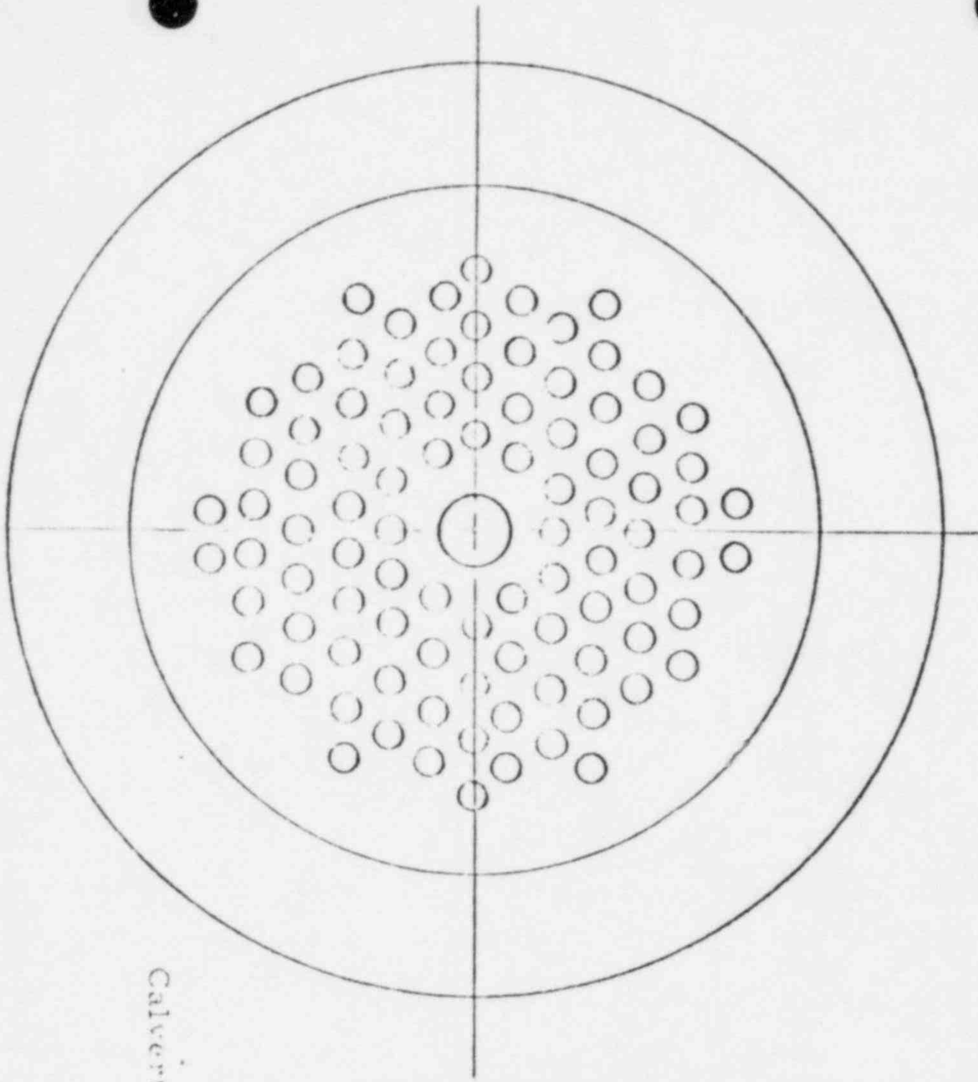
Filler Temp. @ Outlet Cap

Total Volume Installed

Installation Pressure (if poured, N/A)

Pumped From Other End

Data Recorded By: B.C. Kudell Date 8-22-78



WIRE ANCHORAGE

Closest Buttress 5

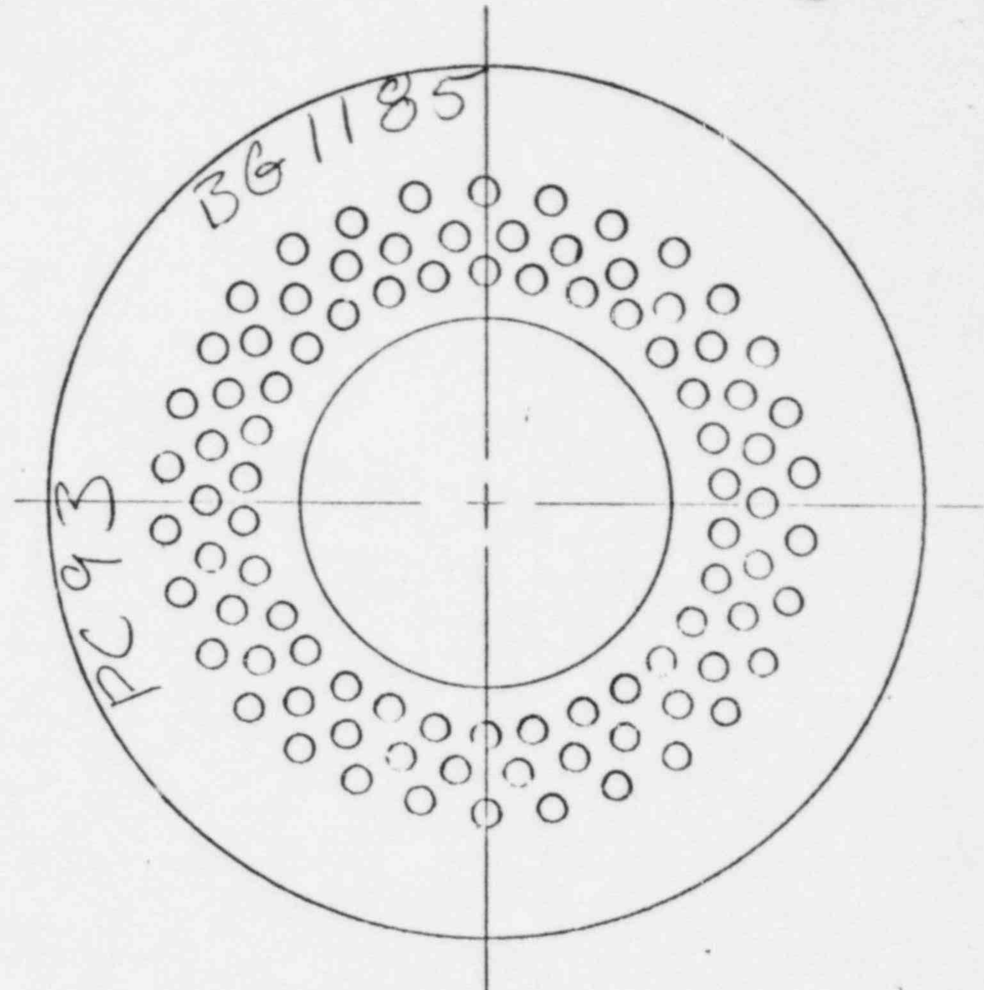
Off Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



51H45

WIRE ANCHORAGE

Closest Buttress 5

Tendon No. 51H45

By [illegible]

Date 8-21-78

90 Wires

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

Rev. 2
Page (1)

DATA SHEET VI.1

DATA RECORDED BY: BC. Hindell

DATE 8-21-78

TENDON NUMBER 51 H 45 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	165.82 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	160.34
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	7.87 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-8-72 – 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.1 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	639 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

(1) Ram S/N 40450040500008
Gage S/N 4215108
Date Cal 7-20-78

RAM CALIBRATION CURVE	S/N RAM (1)	S/N RAM (2)
Hydraulic Pressure at expected Lift Off	5050 psi	psi
Hydraulic Pressure at maximum effective prestress	6100 psi	psi
Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
Hydraulic Pressure at 0.8f's	6600 psi	psi

Data Recorded By B.C. Rudell

Date 8-21-78

TENDON NUMBER: 51H45

Ram No. 4045004050008
Gage No. 4215108
Date Cal 7-20-78

	RAM (1) S/N 4045004050008	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	4810	
Tendon Lift Offs Acceptable?	Yes	
Lift Off Force, F_L	617 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 617 Kips

Force Per Wire ($F_{LAV} \div N_e$) 6.86 Kips

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Rudell

Date 8-21-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	None Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6600 psi	psi
Original Lift-Off Hydraulic pressure, P_L	4810 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5310 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 51H45

CLOSEST BUTTRESS 5

DATE: 8-21-78 DATA RECRODED BY: B C. Rudell

RAM S/N: 404500405 0008 GAUGE S/N: 4215108 Date Cal - 7-20-78

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	1 3/4" exsist				
		expect 5050 psi	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 4810	**	4850	4800	4850	4800	4750
VI.B.5	Pressurize to 0.8f's	6600 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	2 7/8"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	750 psi **	✓				
V[illegible]	Elongation at 1 kip/wire		2 3/8 - 3 1/2 = -1 1/8				
VII.	Remove Wire - This End Cut?	***	-0- NA				
VIII.3	Pressurize to 1 kip/wire	750 psi **					
VIII.4	Elongation at 1 kip/wire		2 3/8 - 3 1/2 = -1 1/8				
VIII.5	Pressurize to 0.8f's	6600 psi **	✓				
VIII.5	Elongation at 0.8f's		3 1/2				
VIII.6	Pressure for shim measure	5310 psi **	✓ 5400 psi				
VIII.7	Elongation at shim press		2 7/8				
VIII.7	Shims installed 1 pair 1 3/4" Shim Exsisted 1 pair 1" Shim Added New Shim Came from other end of Tendon.		2 3/4		2 15/16 *		
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		4400	4350	4500	4900	
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		No				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	5800 psi **	Add 1 pair of 3/16" shims *				
	Shims installed	~~4800~~	2 15/16" shims				
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure		5300	5300	5300	5250	5300

avg 5290 = 670 kip

avg kips = 692

✓

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

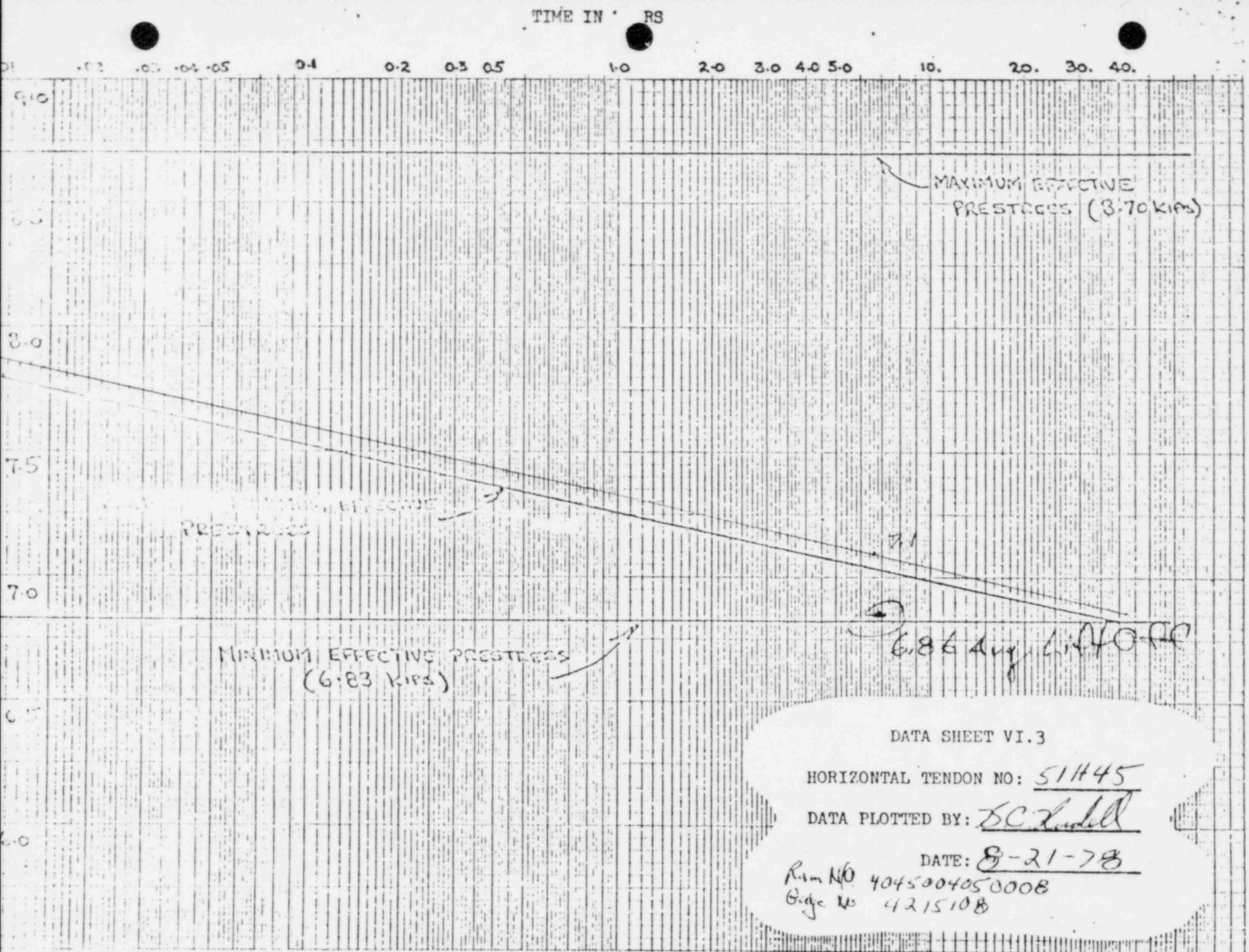
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 51H45

DATA PLOTTED BY: DC Kuchel

DATE: 8-21-78

Ram NO 40450040500008
Gage No 4215108

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 51 H 45

Closest Buttress	1
Grease Removal	8-21-78
Date Filler CAP Removed	8-21-78
Date Grease Removal Started	8-21-78
Exterior Temp.	75 °F
Interior Temp.	119 °F
Total Volume Removed	6 Qt
Date Filler Cap Reinstalled	8-21-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100%

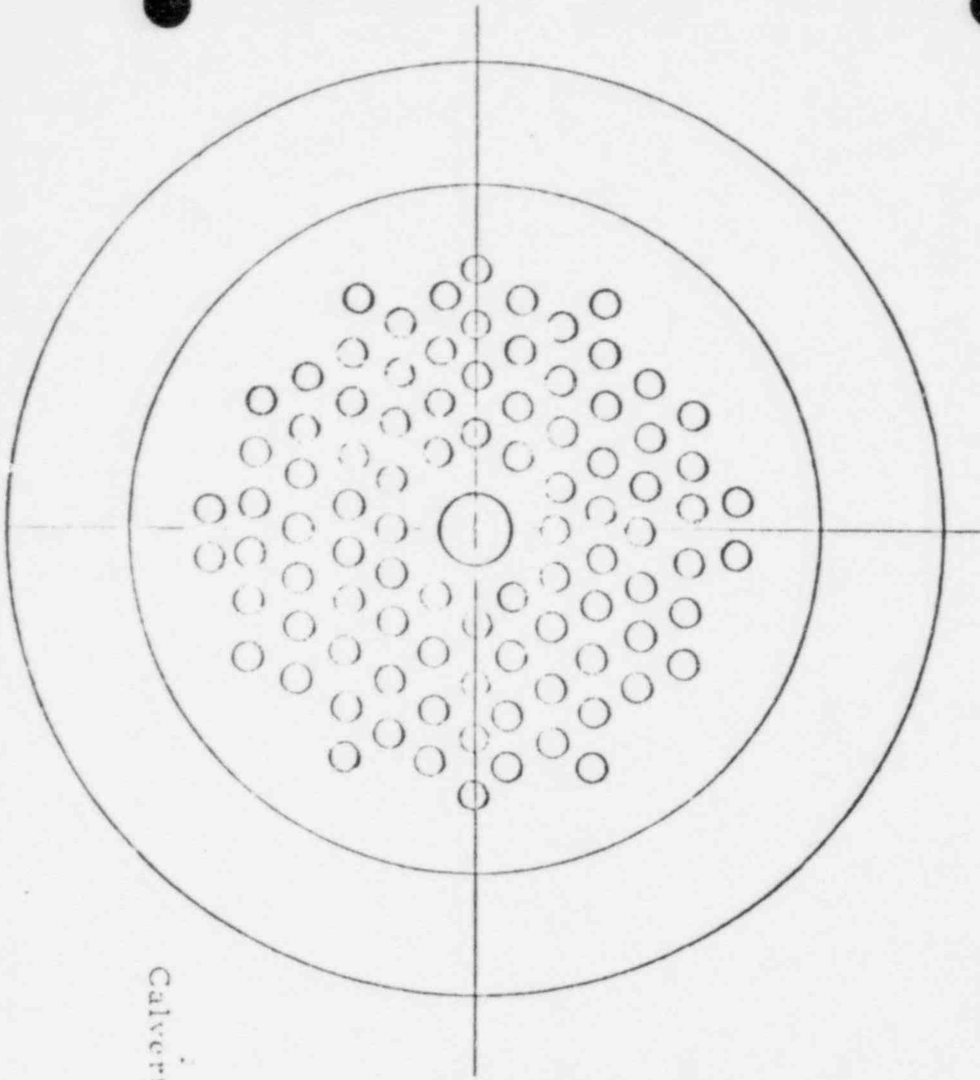
Sample Taken 1 Qt Container Identification 51 H 45

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	8-21-78
Exterior Temp.	75°
Interior Temp.	119°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	7 gal
Installation Pressure (if poured, N/A)	N/A

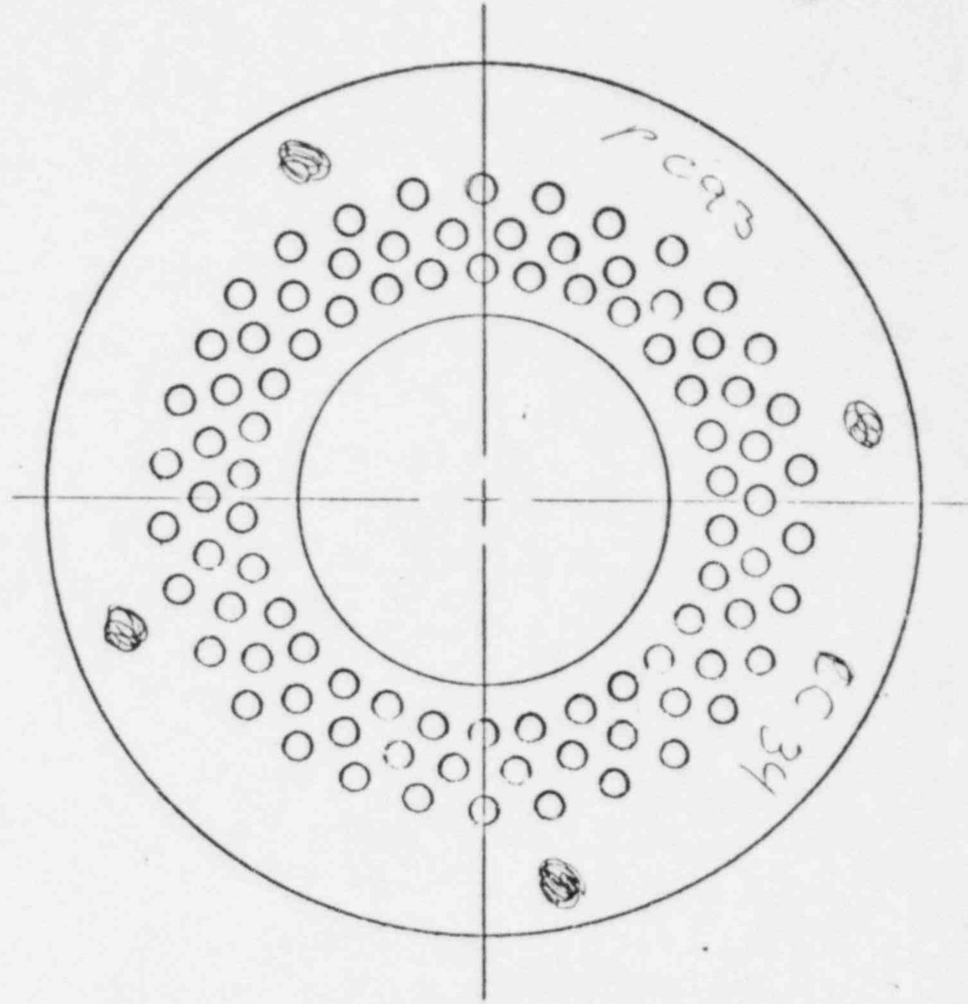
Data Recorded By: H. McCall Date 8-21-78



WIRE ANCHORAGE

Closest Buttress ________

- Off-Size Buttonhead
- Buttonhead with Split
- Wire Removed Previously
- Discontinuous Wire Removed this surveillance
- Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 1

Tendon No. 51H45

By H. McCall

Date 8-21-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: L. McCall

DATE: 8-21-78

TENDON NUMBER 51 H 45 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	165.82 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	160.34
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	7.87 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-8-72 – 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.1 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	639 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

RAM CALIBRATION CURVE		S/N 5 42 1500 6A RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5000 psi	psi
	Hydraulic Pressure at maximum effective prestress	6100 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4750 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4500 psi	psi
	Hydraulic Pressure at 0.8f's	6600 psi	psi

Data Recorded By H McCall

Date 8-21-78

TENDON NUMBER: 51445

	RAM (1) S/N 5	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	4820	4810
Tendon Lift Offs Acceptable?	yes	yes
Lift Off Force, F_L	620 Kips	614 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 617 Kips

Force Per Wire ($F_{LAV} \div N_e$) 6.86 Kips

Time since initial stressing of Tendon Years

685
6.70
54
77
3.3

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified H McCall

Date 8-21-78

	RAM (1) S/N 5		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e	90	Wires		
0.8f's (9.43 x N_e)	848	Kips		
Hydraulic Force @ 0.8f's	6600	psi		psi
Original Lift-Off Hydraulic pressure, P_L	4820	psi	4810	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0	psi	0	psi
Shim Pressure (P_L + 500 - P_{RH})	5320	psi	5310	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 51H45

CLOSEST BUTTRESS 1

DATE: 8-21-78 DATA RECRODED BY: H. McCall

RAM S/N: 404 5005 0003 GAUGE S/N: 4215006A

STEP	DESCRIPTION	OBJECTIVE	
VI.B.2	Check Gauges	Zero	
VI.B.1	Measure Shims	-	2 3/4"
VI.B.3	Lift Off	max 5000 **	Run 1: 4800; Run 2: 4400; Run 3: 4800; Run 4: 4900; Run 5: 4900
VI.B.5	Pressurize to 0.8f's	5600 **	4820 6201(psi)
VI.B.5	Elongation @ 0.8f's	-	4"
VI.B.6	Depressurize to zero	-	
VI.B.7	Pressurize to 1 kip/wire	700 **	
V[illegible]	Elongation at 1 kip/wire		2 3/16" - 3 1/2" = -1 5/16
VII.	Remove Wire - This End Cut?	***	
VIII.3	Pressurize to 1 kip/wire	-	
VIII.4	Elongation at 1 kip/wire		2 3/16" - 3 1/2" = -1 5/16
VIII.5	Pressurize to 0.8f's	**	
VIII.5	Elongation at 0.8f's		3 1/2"
VIII.6	Pressure for shim measure	5320 **	
VIII.7	Elongation at shim press ½" Shims added from 24H55 Tendon		2 1/4" removed 1" shims added 1/2" shims
VIII.7	Shims installed		NO
VIII.8	Lift Off pressure		Run 1: 4800; Run 2: 4800; Run 3: ; Run 4: ; Run 5:
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		No
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**	added 1/2" 1/4"
	Shims installed		3"
	New Lift-Off pressure		Run 1: 5600; Run 2: 5500; Run 3: 5600; Run 4: 5600; Run 5: 5600

5580 = 715 Kips

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 51H45

DATE:

DATA RECORDED BY: B.C. Tindall

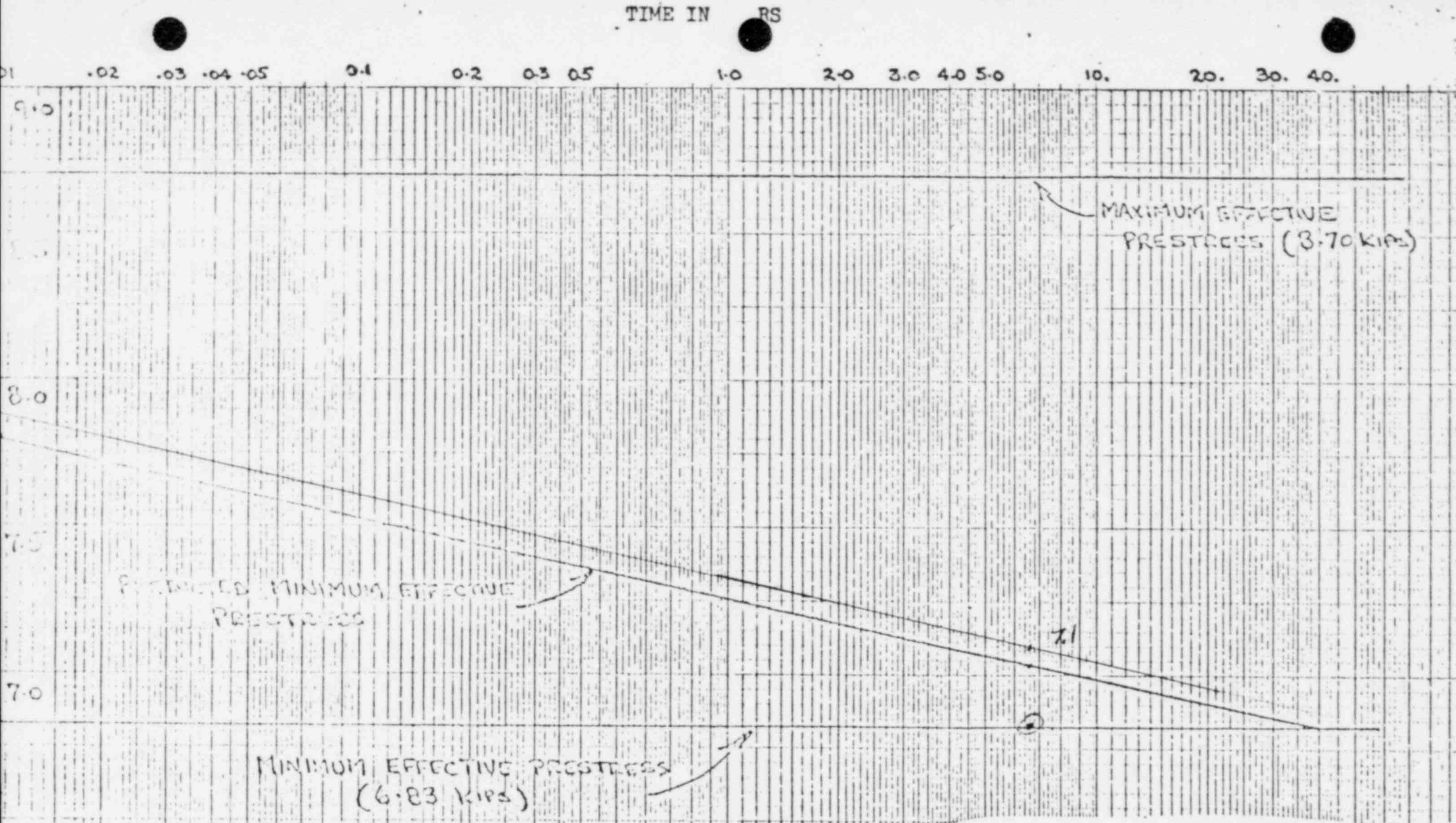
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 1/8	-1 5/16	2 7/8	4"	4	5 5/16"	9 5/16
RESTRESS	-1 1/8	-1 5/16	3 1/2	3 1/2"	4 5/8	4 13/16	9 7/16



DATA SHEET VI.3

HORIZONTAL TENDON NO: 51H45

DATA PLOTTED BY: H. McGill

DATE: 8-21-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 35 H 65

Closest Buttress	5
Grease Removal	6 Qt
Date Filler CAP Removed	8-22-78
Date Grease Removal Started	8-22-78
Exterior Temp.	76°F
Interior Temp.	119°F
Total Volume Removed	5 gal
Date Filler Cap Reinstalled	8-22-78

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon Dark Brown, yellow

Presence of Water Indicated yes

% (Approximate) Coverage of Components 90%

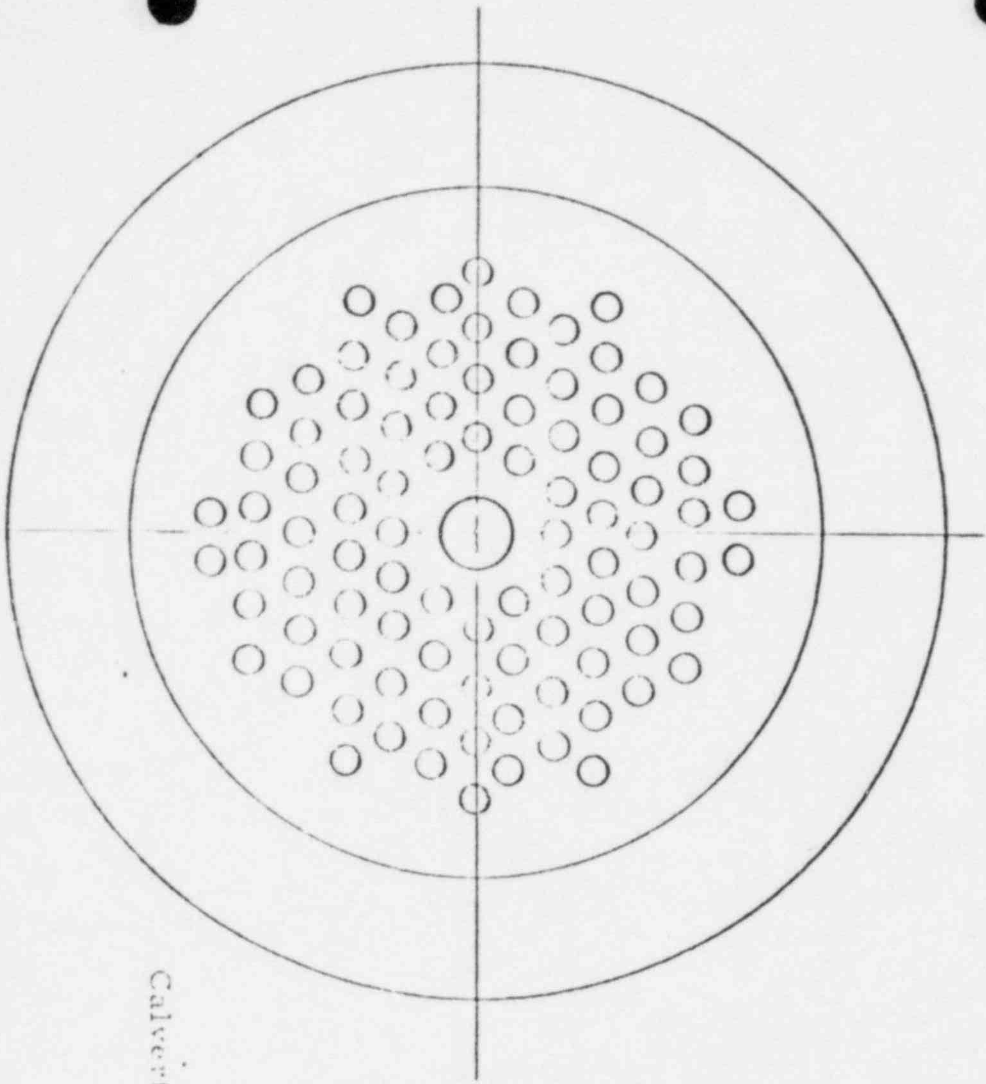
Sample Taken 1 Qt Container Identification 53 H65

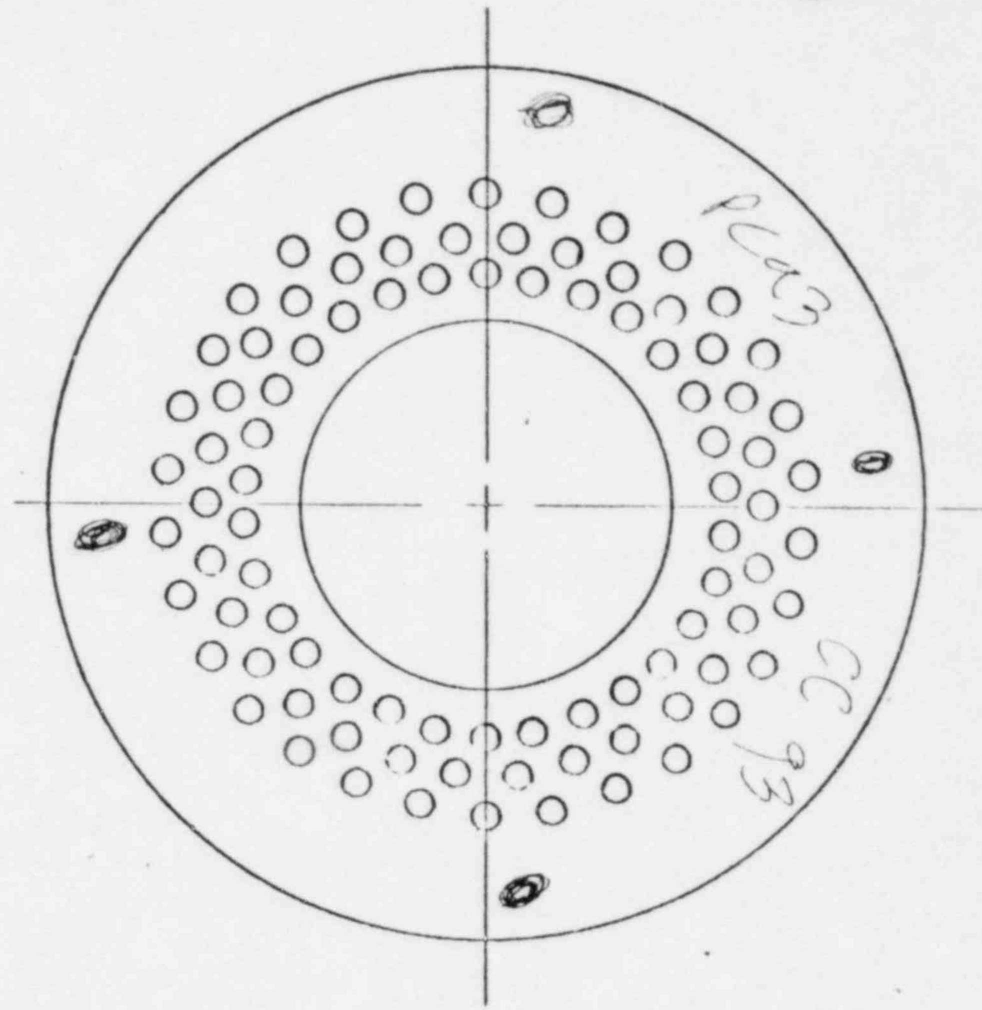
Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	8-22-78
Exterior Temp.	76°
Interior Temp.	119°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	8 gal
Installation Pressure (if poured, N/A)	N/A

Data Recorded By: H. McCall Date 8-22-78





WIRE ANCHORAGE

Closest Buttress ______

Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress's 5

Tendon No. 53H65

By H. McCall

Date 8-22-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor S[illegible] Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: H McCall

DATE 8-22-78

TENDON NUMBER 35-H65 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.89 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.4
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.92 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-31-71 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.15 Kips
	Number of effective wires N_e	86 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	614.9 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	748.2 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	606.3 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	587.4 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	810.9 Kips
	Force at 1 kip per wire (1 x N_e)	86 Kips

		S/N 5 RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Hydraulic Pressure at expected Lift Off	4800 psi	psi
	Hydraulic Pressure at maximum effective prestress	5800 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4700 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4600 psi	psi
	Hydraulic Pressure at 0.8f's	6300 psi	psi

Data Recorded By H. McCall

Date 8-22-78

TENDON NUMBER: 53H65

	RAM (1) S/N 5	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5050	5190
Tendon Lift Offs Acceptable?		655
Lift Off Force, F_L	650 Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	652.5	Kips
Force Per Wire ($F_{LAV} \div N_e$)	7.58	Kips
Time since initial stressing of Tendon		Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified yes H. McCall

Date 8-22-78

	RAM (1) S/N 5		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e	86	Wires		
0.8f's (9.43 x N_e)	810.9	Kips		
Hydraulic Force @ 0.8f's	6300	psi		psi
Original Lift-Off Hydraulic pressure, P_L	5050	psi	5190	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0	psi	0	psi
Shim Pressure (P_L + 500 - P_{RH})	5550	psi	5700	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 53465

CLOSEST BUTTRESS 5

DATE: 8-22-78 DATA RECRODED BY: [illegible]

RAM S/N: 404500505000 GAUGE S/N: 42150064

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	2¼"				
		4400	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	5000	5000	5100	5150	5000
VI.B.5	Pressurize to 0.8f's	~~8600~~ 6300 **	5050				
VI.B.5	Elongation @ 0.8f's	5 -	3¼"				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	600 **	2				
V[illegible]	Elongation at 1 kip/wire		2¼ - 3½ = -1¼				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire		2¼ - 3½ = -1¼				
VIII.5	Pressurize to 0.8f's	6300 **	3½"				
VIII.5	Elongation at 0.8f's		3½"				
VIII.6	Pressure for shim measure	**	3550				
VIII.7	Elongation at shim press		3"				
VIII.7	Shims installed ¼" Shim came from other end		added 1 pair ¼" 1 pair ½"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5200	5100	5200	5100	5200
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5160	660			
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER

DATE: LATA RECORDED BY:

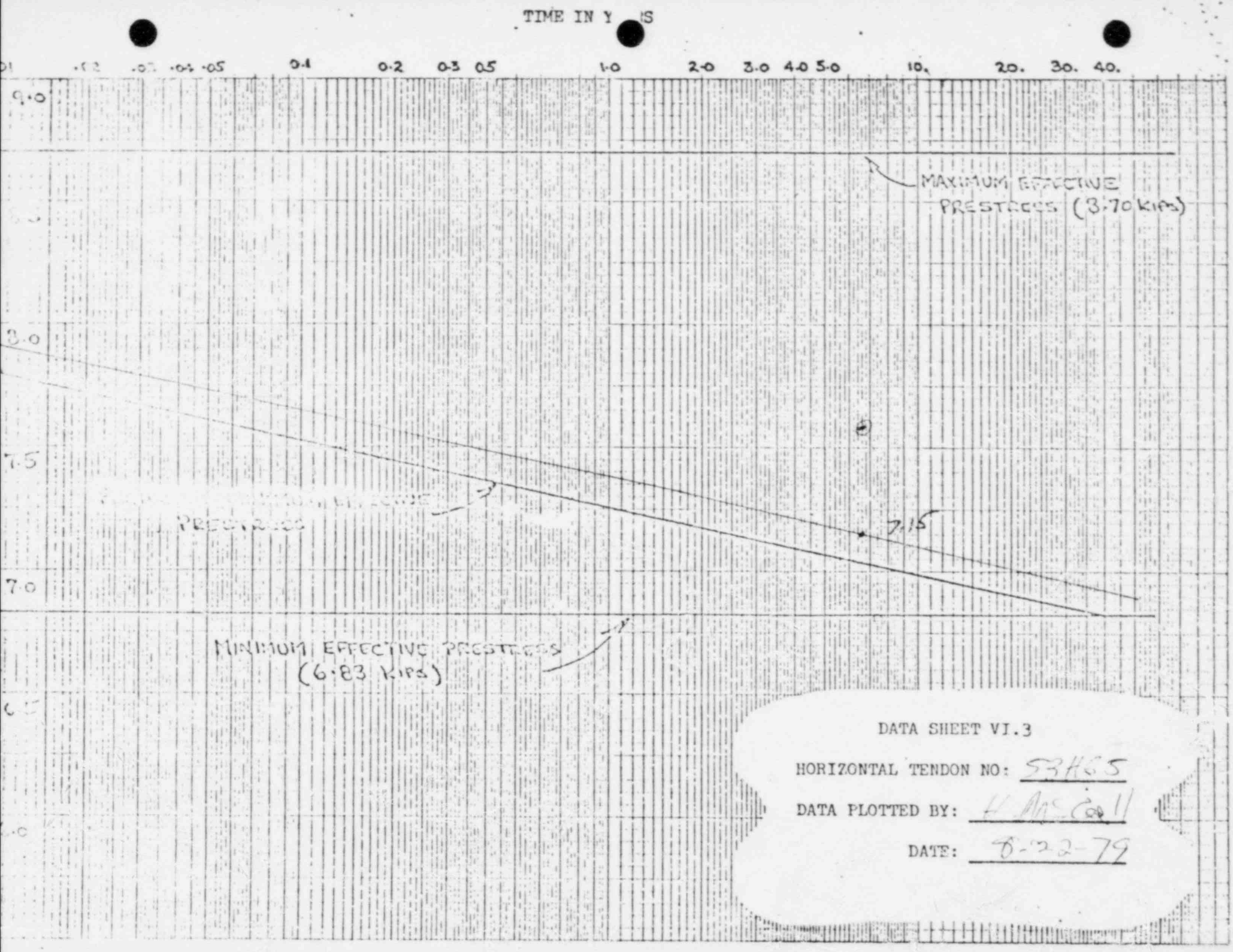
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 53H65

DATA PLOTTED BY: H McCall

DATE: 8-22-79

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 35 H 65

Closest Buttress	3
Grease Removal	5 gal
Date Filler CAP Removed	8-22-78
Date Grease Removal Started	8-22-78
Exterior Temp.	76°F
Interior Temp.	119°F
Total Volume Removed	~~4 gal~~ 5 gal BCR
Date Filler Cap Reinstalled	8-22-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Liquid Dark Brown (Sun is on Buttress)

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

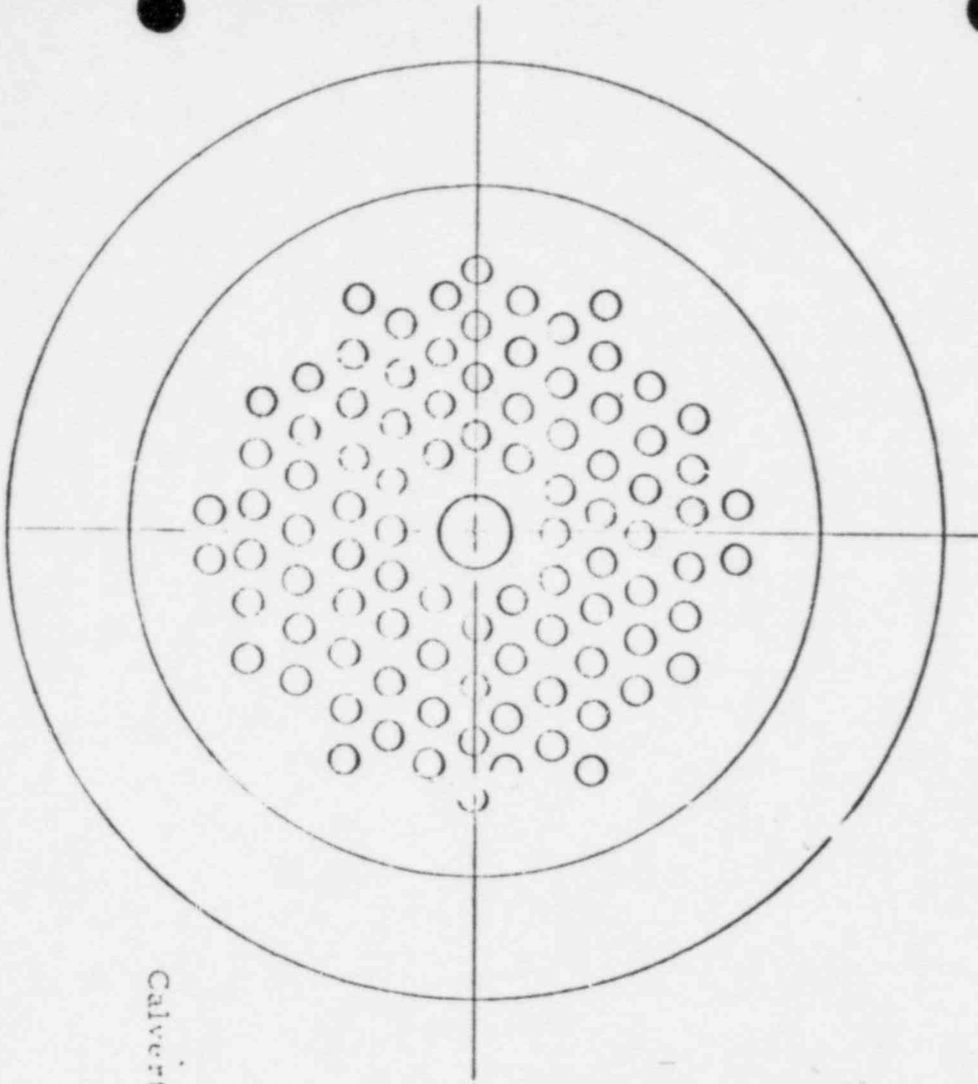
Sample Taken yes Container Identification 35H65-3

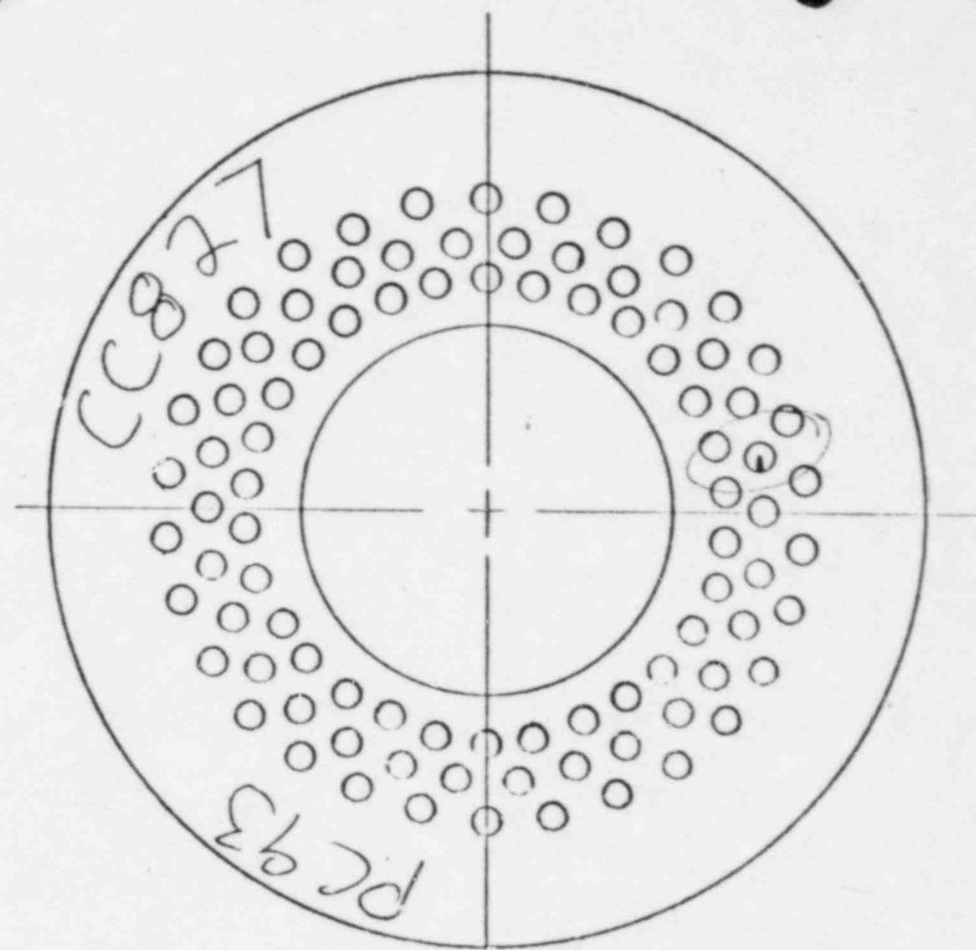
Data Recorded By: R C Hudill

TENDON GREASE INSTALLATION

Date Installed	8-22-78
Exterior Temp.	
Interior Temp.	Pumped From
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	Other End
Filler Temp. @ Outlet Cap	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ________ Date ______





90 Buttonheads on this side

WIRE ANCHORAGE

Closest Buttress 3

Off Size Buttonhead /

Buttonhead with Split none

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 3

Tendon No. 35H65

By BC Russell

Date 8-22-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: B.C. Kidd

DATE 8-22-78

TENDON NUMBER 35-H65 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.89 Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	~~Horizontals~~	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.4	
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.92 Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips	
	Time after initial stressing 12-21-71 — 8-1-78	6.6 Years	
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.15 Kips	
	Number of effective wires N_e	86 Wires	
	Expected lift off force, F_L ($F_{LE} \times N_e$)	614.9 Kips	
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips	
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips	
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips	
	Maximum effective prestress ($F_{max} \times N_e$)	748.2 Kips	
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	606.3 Kips	
	Absolute min. effective prestress ($F_{min} \times N_e$)	587.4 Kips	
	80% min. ultimate strength (.8f's) (9.43 x N_e)	810.9 Kips	
	Force at 1 kip per wire (1 x N_e)	86 Kips	
RAM CALIBRATION CURVES	Ram No 4045004050008 Gage No 4215108 Date Cal 7-20-78	S/N ~~RAM (1)~~	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	4850 psi	psi
	Hydraulic Pressure at maximum effective prestress	5850 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4770 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4620 psi	psi
	Hydraulic Pressure at 0.8f's	6350 psi	psi

Data Recorded By BC Rudell

Date 8-22-78

TENDON NUMBER: 35H65

Ram No 404500405000 8
Gauge No 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5190 psi	
Tendon Lift Offs Acceptable?	Yes	
Lift Off Force, F_L	655 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 652.5 Kips

Force Per Wire ($F_{LAV} \div N_e$) (86 wires) 7.58 Kips
(90 wires) 7.24

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Coudition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified BC Rudell

Date 8-22-78

Ram No 404500405000 8
Gauge No 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	86 Wires	
0.8f's (9.43 x N_e)	810.9 Kips	
Hydraulic Force @ 0.8f's	6350 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5190 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5690 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 35H65

CLOSEST BUTTRESS 3

DATE: 8-22-78 DATA RECRODED BY: R.C. Kudell

RAM S/N: 4045004050008 GAUGE S/N: 4215108 Date Cal 7-20-78

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	3"				
		ave 5190	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off expect 4850 psi	**	~~4800~~ 5200	~~4950~~ 5200	~~4900~~ 5100	5250	5200
VI.B.5	Pressurize to 0.8f's 6350 psi	**					
VI.B.5	Elongation @ 0.8f's	-	✓ 3 9/16				
VI.B.6	Depressurize to zero	-	✓ (2 13/16 - 3 1/2) =				
VI.B.7	Pressurize to 1 kip/wire 710 psi	**	✓				
V[illegible]	Elongation at 1 kip/wire		(2 5/8 - 3 1/2) = -7/8"				
VII.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**	✓				
VIII.4	Elongation at 1 kip/wire		(2 5/8 - 3 1/2) = -7/8"				
VIII.5	Pressurize to 0.8f's 6350 psi	**	✓				
VIII.5	Elongation at 0.8f's		3 5/16				
VIII.6	Pressure for shim measure 5690	**	✓				
VIII.7	Elongation at shim press		~~[illegible]~~ 2 3/4"				
VIII.7	Shims installed used exsisting shims removed 1/4" shim pair		2 3/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5150	5050	5150	5250	5250
VIII.8	AVG Lift Off 5170 ~~657~~ ≥ Initial 5190 ~~655~~ AVG Lift Off?		(new avg.) 657 ≥ 655 (old avg.)				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**	Yes				
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 35H65

DATE: DATA RECORDED BY: [signature]

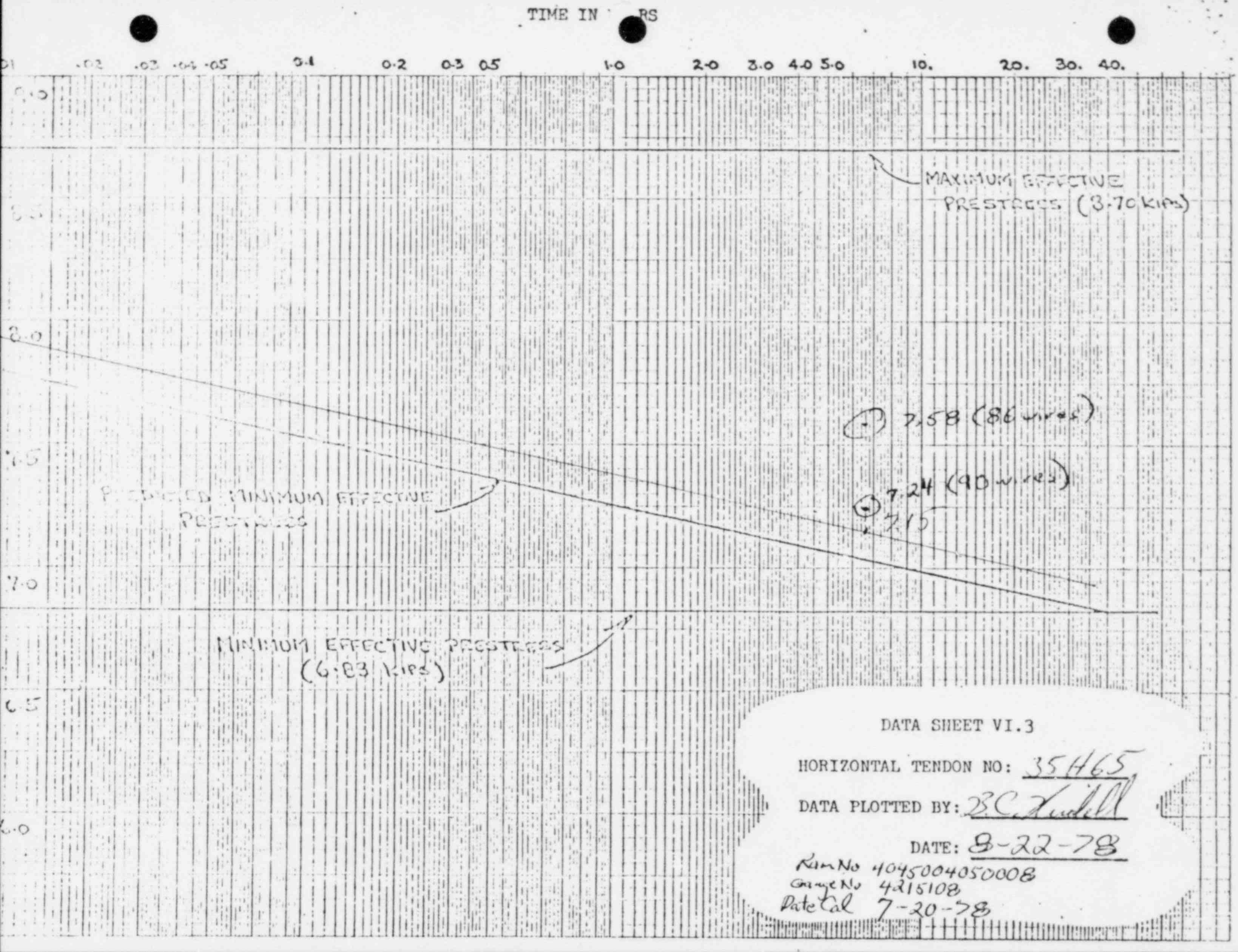
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 1/4	-7/8	3 1/4	3 9/16	4 1/2	4 7/16	8 15/16
RESTRESS	-1 1/4	-7/8	3 1/2	3 5/16	4 3/4	4 3/16	8 15/16


TIME IN RS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 kips)
7.58 (86 wires)
7.24 (90 wires)
7.15
MINIMUM EFFECTIVE
MINIMUM EFFECTIVE PRESTRESS (6.83 kips)
DATA SHEET VI.3
HORIZONTAL TENDON NO: 35H65
DATA PLOTTED BY:
DATE: 8-22-78
Ram No 4045004050008
Gauge No 4215108
Date Cal 7-20-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 31 H 2

Closest Buttress	1
Grease Removal	2 gal
Date Filler CAP Removed	11-14-78
Date Grease Removal Started	11-14-78
Exterior Temp.	64°
Interior Temp.	105°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	11-17-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown + Light Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 31H2-1

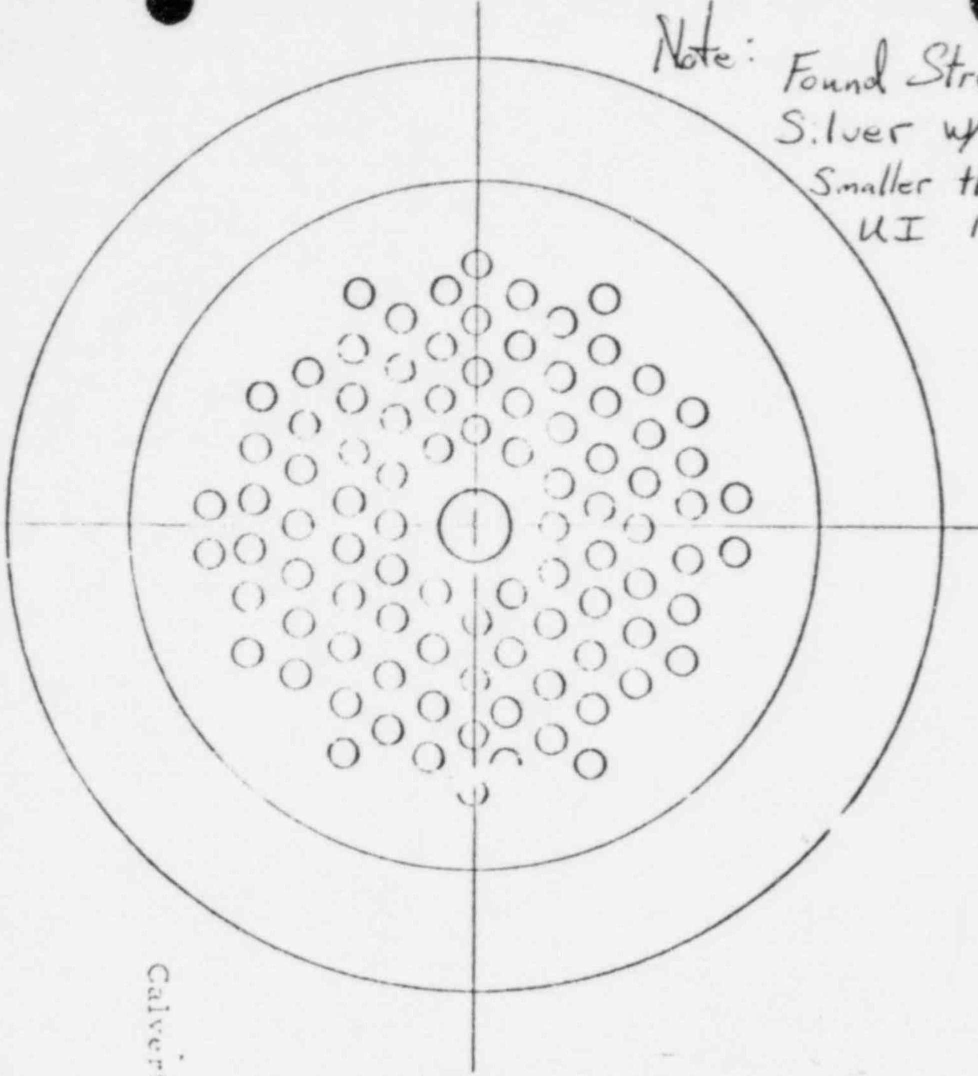
Data Recorded By: B.C. Kendell

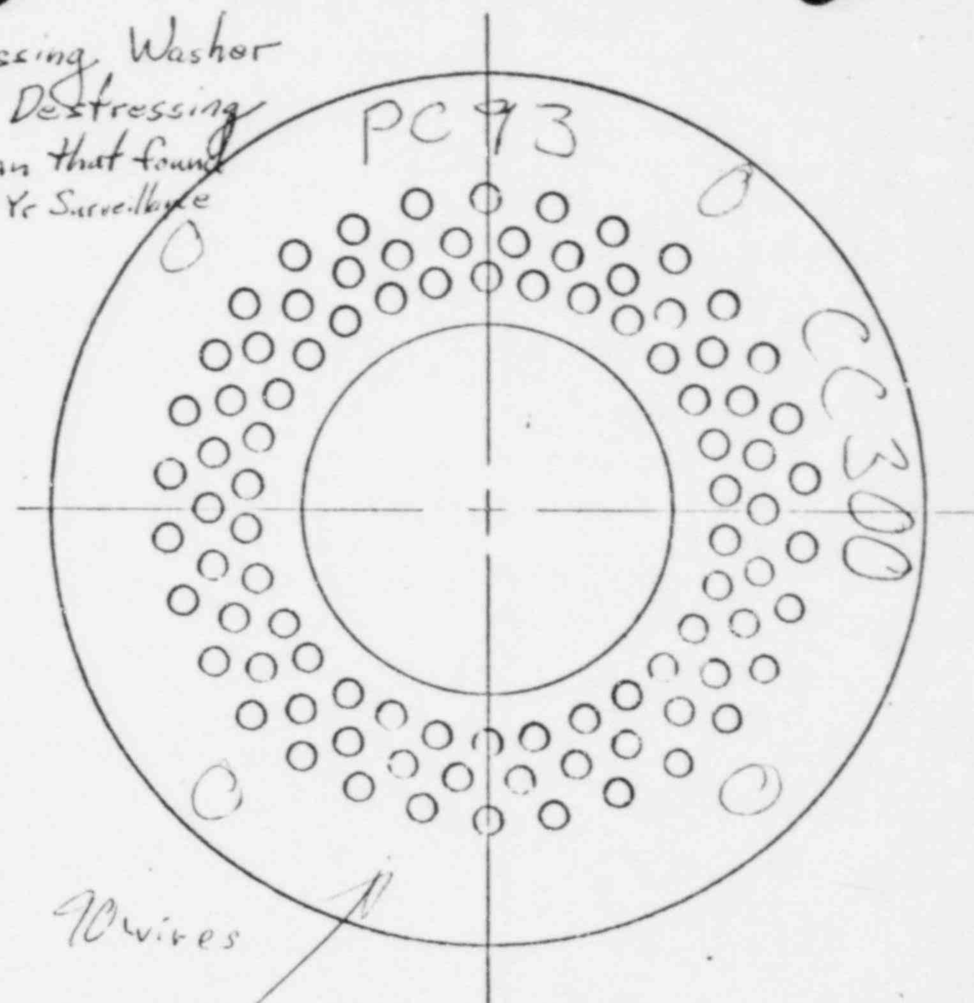
TENDON GREASE INSTALLATION

Date Installed	11-18-78
Exterior Temp.	64°
Interior Temp.	105°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	10 gal
Installation Pressure (if poured, N/A)	

Data Recorded By: B.C. Kendell Date 11-20-78

Note: Found Stressing Washer Silver w/ Destressing Smaller than that found UI 1 Yr Surveillance





WIRE ANCHORAGE

Closest Buttress 1 Level 1

Off-Size Buttonhead None No Rust

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 1

Tendon No. 31H2

By BC Ruddell

Date 11-15-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY [illegible signature]

DATE 11-16-78

TENDON NUMBER 31 H 2 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	164.70 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	159.2
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.81 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.07 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	636.3 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Hydraulic Pressure at expected Lift Off	psi	4650 psi
	Hydraulic Pressure at maximum effective prestress	psi	5700 psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	4620 psi
	Hydraulic pressure at absolute minimum effective prestress	psi	4480 psi
	Hydraulic Pressure at 0.8f's	psi	6160 psi

Data Recorded By [signature]

Date 11-16-78

TENDON NUMBER: 31H2

	RAM (1) S/N	RAM (2) S/N 90450200500-12
Average Hydraulic pressure at Lift-Off		5440
Tendon Lift Offs Acceptable?		Yes
Lift Off Force, F_L	Kips	~~745~~ 722 Kips
Average Lift Off Force F_{LAV} $\frac{F_L(1) + F_L(2)}{2}$		Kips 739.5
Force Per Wire ($F_{LAV} \div N_e$)		Kips ~~8.215~~ 8.09
Time since initial stressing of Tendon		Years 6.8

Change Due To Re-Cal 3-14-79

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 11-16-78

	RAM (1) S/N	RAM(2) S/N 90450200500-12
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H2

CLOSEST BUTTRESS 1

DATE: 11-16-78 DATA RECRODED BY: A. Barth

RAM S/N: 90450200 500-12 GAUGE S/N: 4215004A Cal 3-14-79

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 7/8				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	≥ 4650 **	5500	5500	5350	5450	5400
VI.B.5	Pressurize to 0.8f's	6180 **	✓				
VI.B.5	Elongation @ 0.8f's	-	3 1/8				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 **	✓				
V[illegible]7	Elongation at 1 kip/wire		+2 3/8 - 3 1/2 = -1 1/8				
VII.	Remove Wire - This End Cut?	***	X				
VIII.3	Pressurize to 1 kip/wire	650 **	X				
VIII.4	Elongation at 1 kip/wire		X				
VIII.5	Pressurize to 0.8f's	6180 **	✓				
VIII.5	Elongation at 0.8f's		3 1/2				
VIII.6	Pressure for shim measure	5940 **	✓				
VIII.7	Elongation at shim press		2 7/8				
VIII.7	Shims installed		2 7/8				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure	5940	5700	5700	5700	5720	5720
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		AVG 783 Kips (AVG 5708) > initial avg by 58				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**	X				
	Shims installed		X				
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure		X				

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

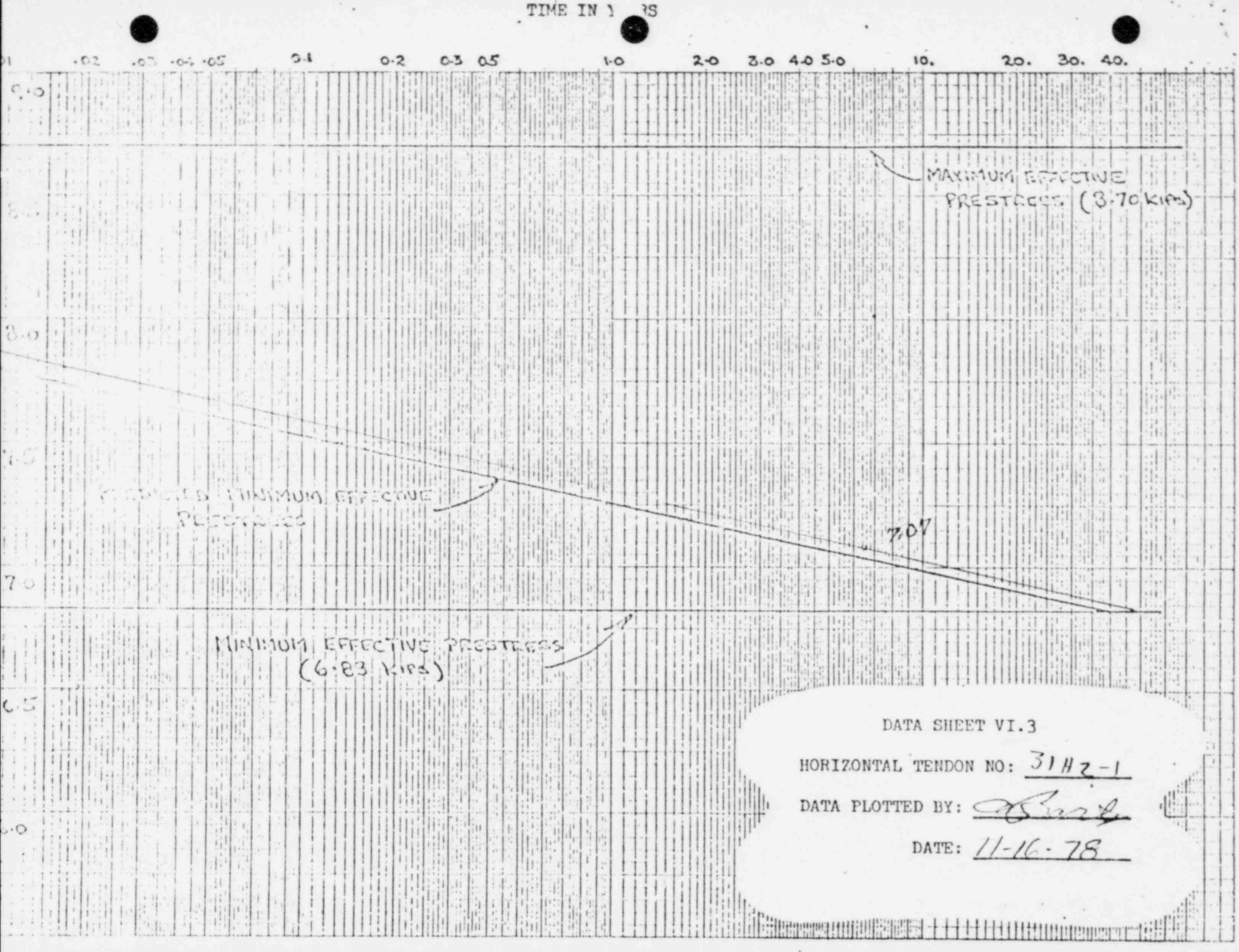
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 31H2-1

DATA PLOTTED BY: [signature]

DATE: 11-16-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 31 H 2

Closest Buttress	3
Grease Removal	2 gal
Date Filler CAP Removed	11-13-78
Date Grease Removal Started	11-13-78
Exterior Temp.	52°
Interior Temp.	105°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	11-16-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Two Tone - Dark Brown Light Brown + White

Presence of Water Indicated Yes - Some Water Present

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 31H2-3

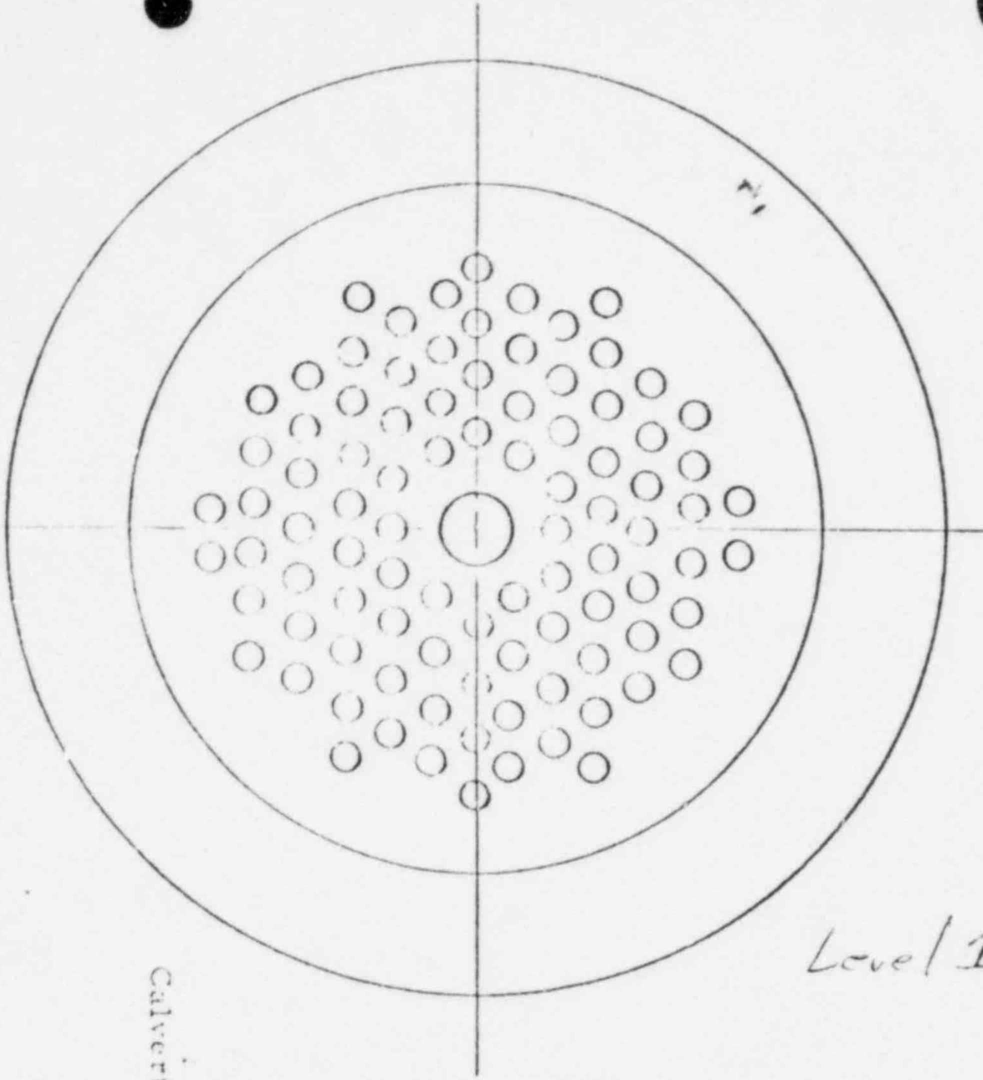
Sample is taken of ~~[illegible]~~ grease that is the lightest.

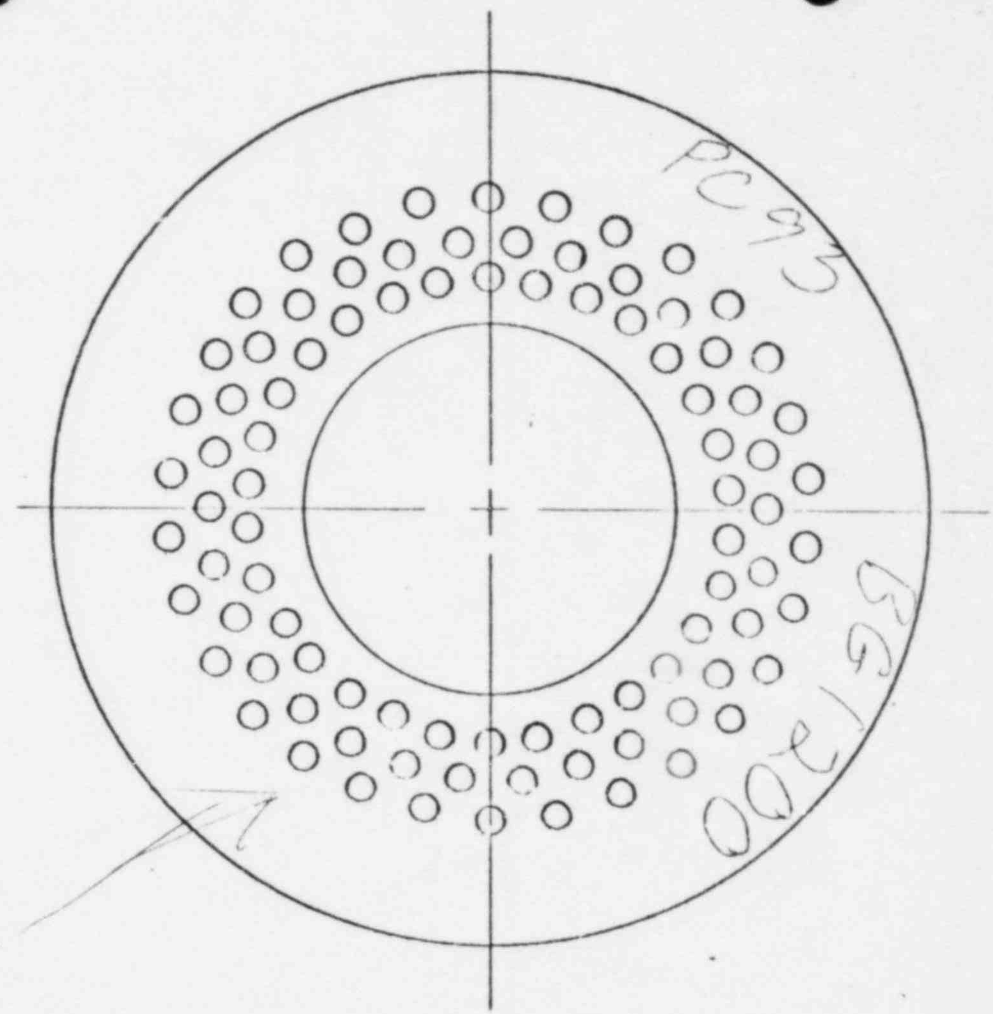
Data Recorded By: K.C. Kudell

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	NA Pumped
Interior Temp.	
Filler Temp. @ Inlet Cap (Indicate if pumped or poured)	From Other
Filler Temp. @ Outlet Cap (Indicate if pumped or poured)	
Total Volume Installed	Buttress
Installation Pressure (if poured, N/A)	

Data Recorded By: K.C. Kudell Date 11-16-78





WIRE ANCHORAGE

Closest Buttress 3

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

No Rust

WIRE ANCHORAGE

Closest Buttress 3

Tendon No. 31H2

By BC Kudell

Date 11-14-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: TSC [illegible signature]

DATE 11-16-78

TENDON NUMBER 31 H 2 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	164.70 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ -4 day loss)	159.2
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.81 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.07 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	636.3 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

Ram # 404500 4050008

Gauge # 4215108 Date Cal 7-20-78

RAM CALIBRATION CURVES		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5000 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi

Data Recorded By [signature]

Date 11-16-78

TENDON NUMBER:

Ram No 40450040500008
Gauge No. 4215108
Date Cal. 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5780 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	734 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ $\frac{734 + 745}{2}$ ~~739.~~ Kips 728.5

Force Per Wire ($F_{LAV} \div N_e$) 8.09 ~~8.216~~ Kips

Time since initial stressing of Tendon Due to Re Cal 12" Ram 6.8 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 11-16-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	None Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5780 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 − P_{RH})	6280 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H2

CLOSEST BUTTRESS 3

DATE: 11-16-78 DATA RECRODED BY: D.C. [illegible]

RAM S/N: 404500405-0008

GAUGE S/N: 4215108 Data Cal 7-20-78

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	1 3/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 5780	expect 5000 psi **	5900	5700	5900	5700	5700
VI.B.5	Pressurize to 0.8f's	**	6650 psi				
VI.B.5	Elongation @ 0.8f's	6650 psi -	~~[illegible]~~ 1 7/8"				
VI.B.6	Depressurize to zero	-	~~[illegible]~~ = ✓				
VI.B.7	Pressurize to 1 kip/wire	700 psi **	✓				
V[illegible]	Elongation at 1 kip/wire		3/8" - 3 1/2" = -2 1/8				
VII.	Remove Wire - This End Cut?	No ***					
VIII.3	Pressurize to 1 kip/wire	700 psi	✓				
VIII.4	Elongation at 1 kip/wire		3/8" - 3 1/2 = -2 1/8				
VIII.5	Pressurize to 0.8f's	6650 psi **	✓				
VIII.5	Elongation at 0.8f's		1 7/16" + [illegible]"				
VIII.6	Pressure for shim measure	6280 **	✓				
VIII.7	Elongation at shim press		1 3/4"				
VIII.7	Installed Original Shims Shims installed		1 3/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure avg 5940		5900	5950	5950	5950	5950
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	avg 756 kip + 783 / 2	~~768~~ = 739 751 = 728 New ✓OK				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

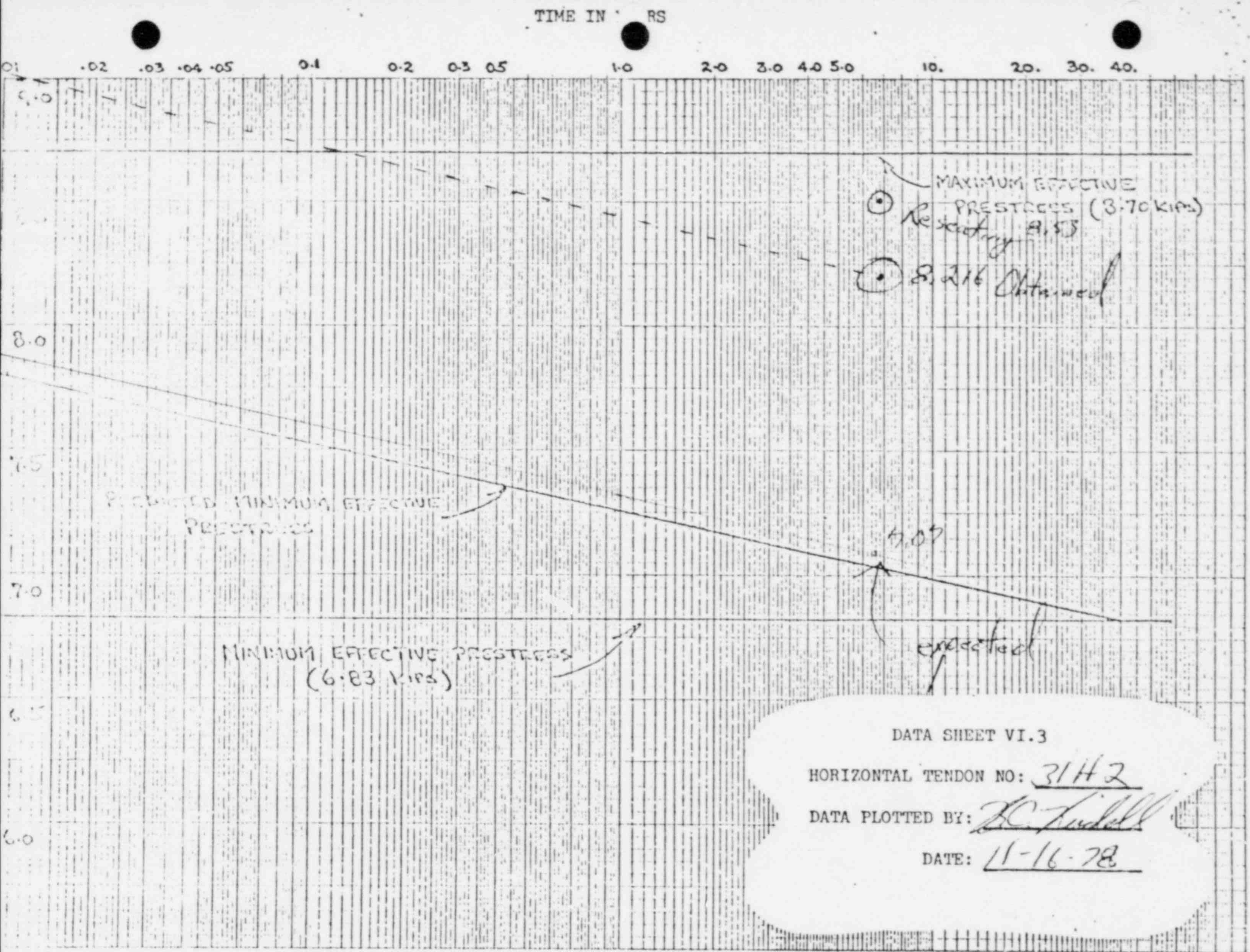
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 1/8	-2 1/8	3 1/8	1 7/8	4 1/4	4	8 1/4
RESTRESS	-1 1/8	-2 1/8	3 1/2	1 7/16	4 5/8	3 9/16	8 3/16



DATA SHEET VI.3

HORIZONTAL TENDON NO: 31H2

DATA PLOTTED BY: [signature]

DATE: 11-16-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 24 H 28

Closest Buttress ____________

Grease Removal ____________

Date Filler CAP Removed ____________

Date Grease Removal Started ____________

Exterior Temp. ____________

Interior Temp. ____________

Total Volume Removed ____________

Date Filler Cap Reinstalled ____________

Can Not Be Done @ this time due to test equipment on Sub. Blowdown Tank 3/7/91

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon

Presence of Water Indicated

% (Approximate) Coverage of Components

Sample Taken ____________ Container Identification ____________

Data Recorded By: ____________

TENDON GREASE INSTALLATION

Date Installed ____________

Exterior Temp. ____________

Interior Temp. ____________

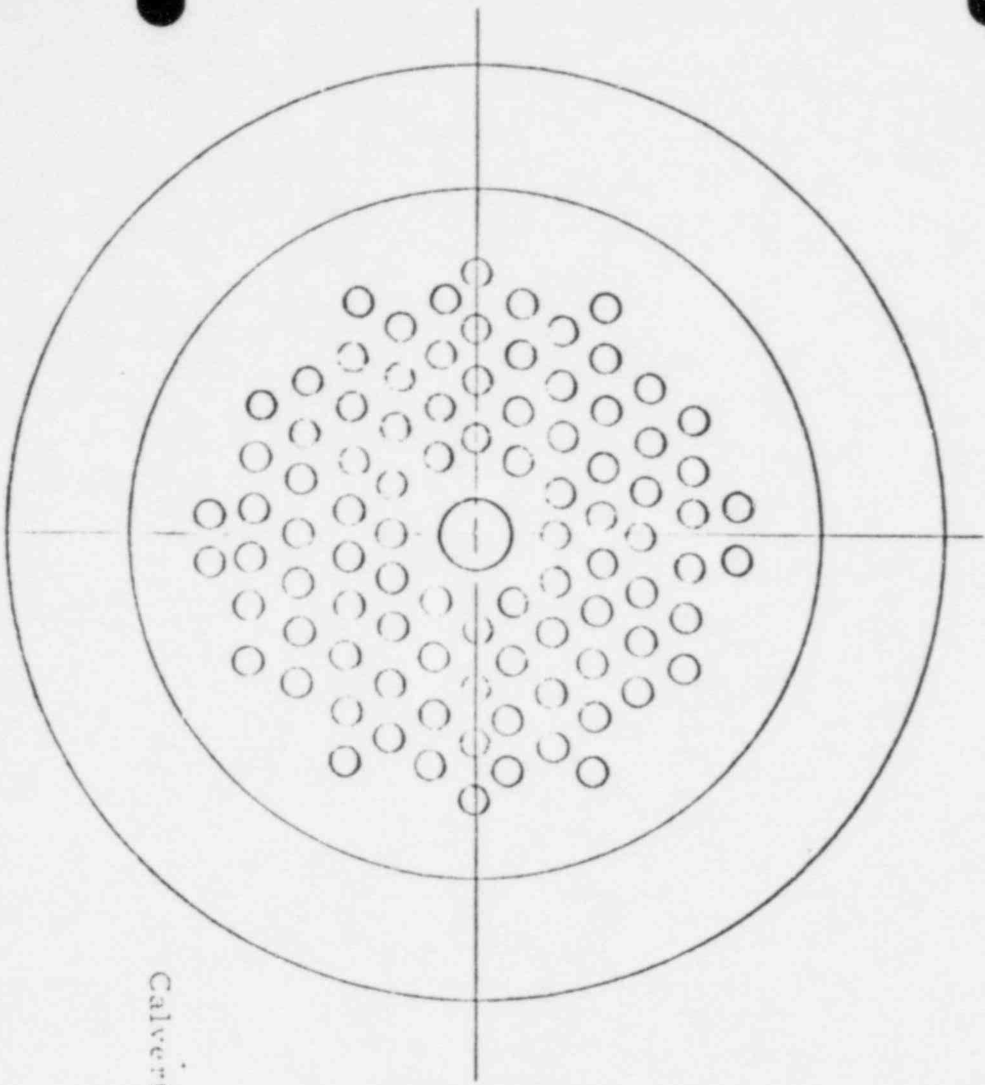
Filler Temp. @ Inlet Cap } Indicate if pumped or poured ____________

Filler Temp. @ Outlet Cap ____________

Total Volume Installed ____________

Installation Pressure (if poured, N/A) ____________

Data Recorded By: ____________ Date ____________



WIRE ANCHORAGE

Closest Buttress ________

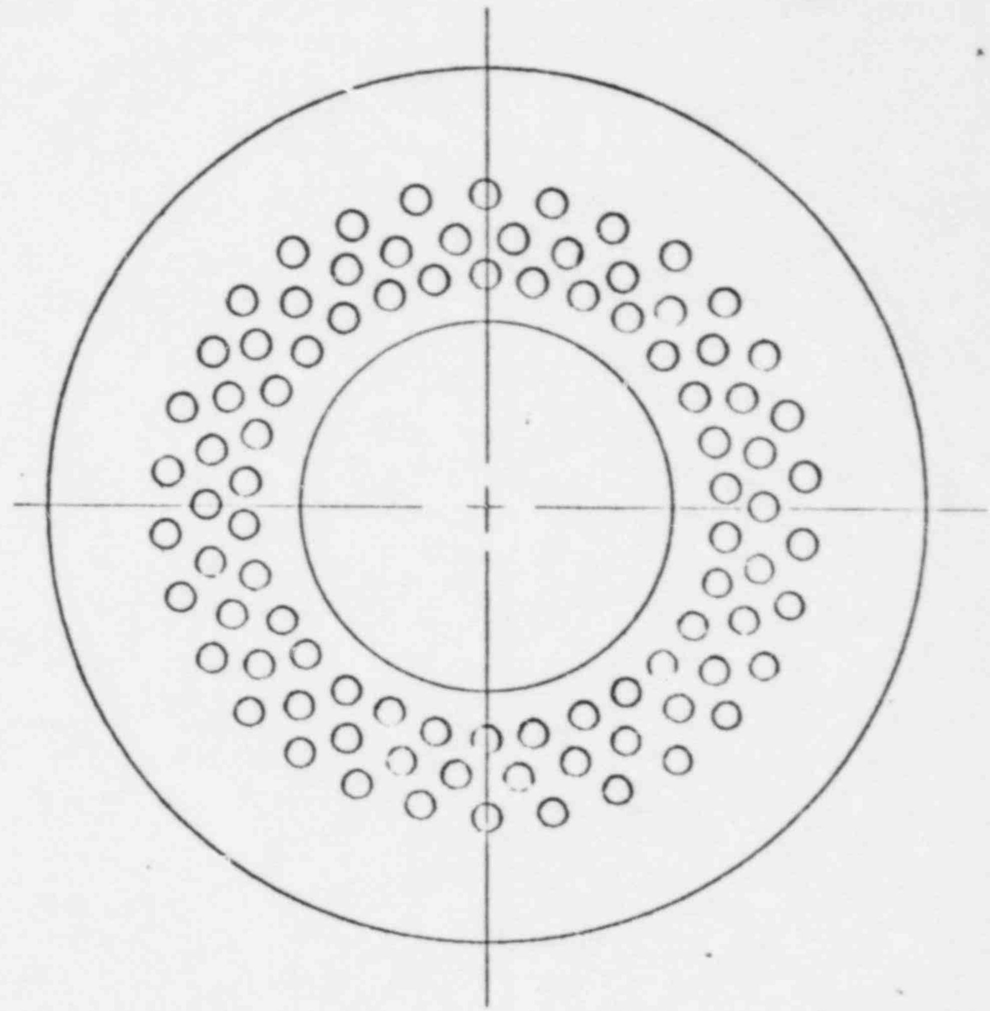
Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: ______________

DATE ______________

TENDON NUMBER 24 H 28 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	169.45 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	163.9
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.05 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-21-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.23 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	650.7 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVES		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By ____________

Date ____________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________

Date ____________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure,, P_L	psi	psi
Reduction in shim pressure, P_{RH},(N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ________________ DATA RECRODED BY: ____________________________

RAM S/N: GAUGE S/N:

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
V [illegible] 7	Elongation at 1 kip/wire						
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

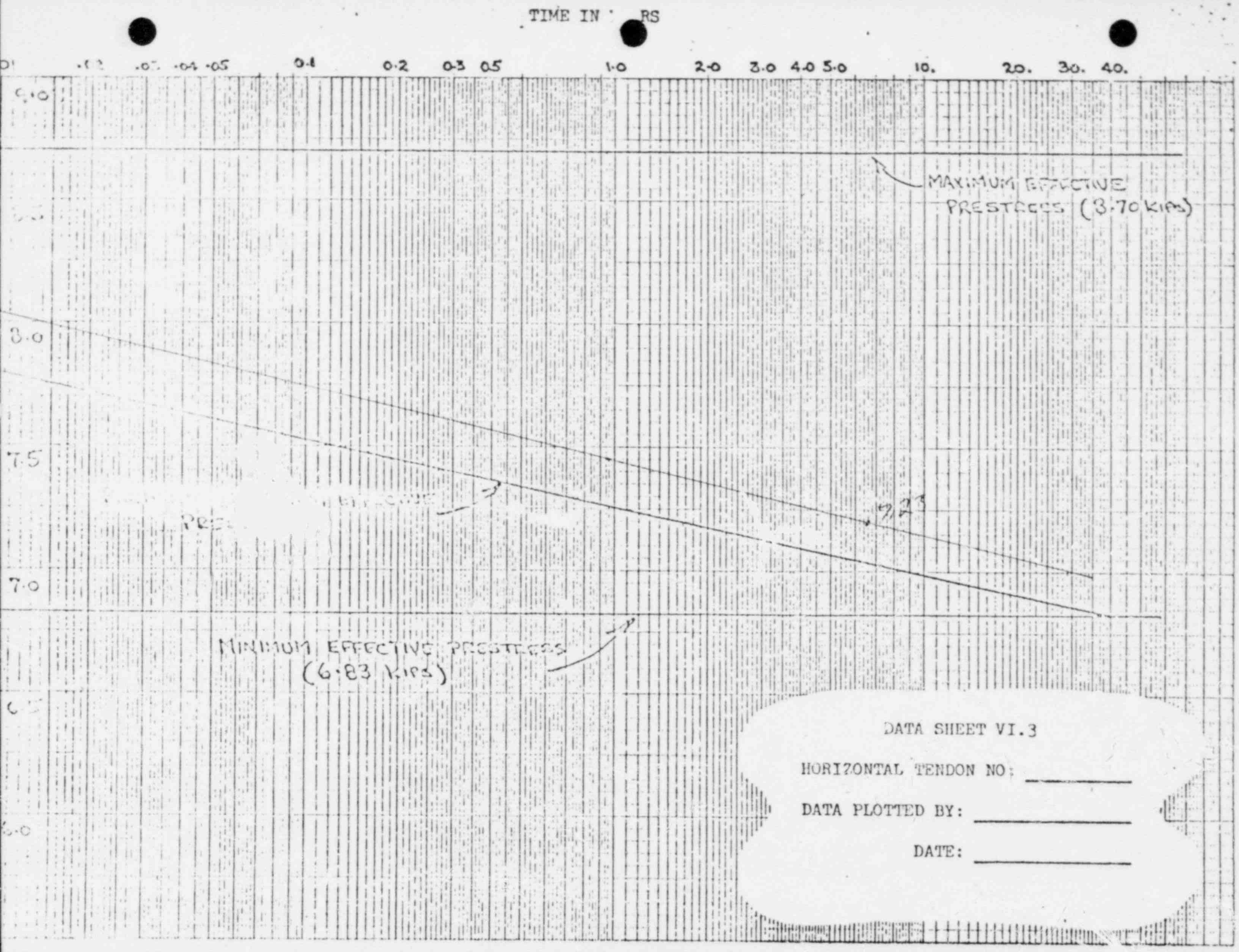
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: ________

DATA PLOTTED BY: ________

DATE: ________

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 24 H 28

Closest Buttress ______________

Grease Removal ______________

Date Filler CAP Removed ______________

Date Grease Removal Started ______________

Exterior Temp. ______________

Interior Temp. ______________

Total Volume Removed ______________

Date Filler Cap Reinstalled ______________

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon

Presence of Water Indicated

% (Approximate) Coverage of Components

Sample Taken ________ Container Identification ______________

Data Recorded By: ______________

TENDON GREASE INSTALLATION

Date Installed ______________

Exterior Temp. ______________

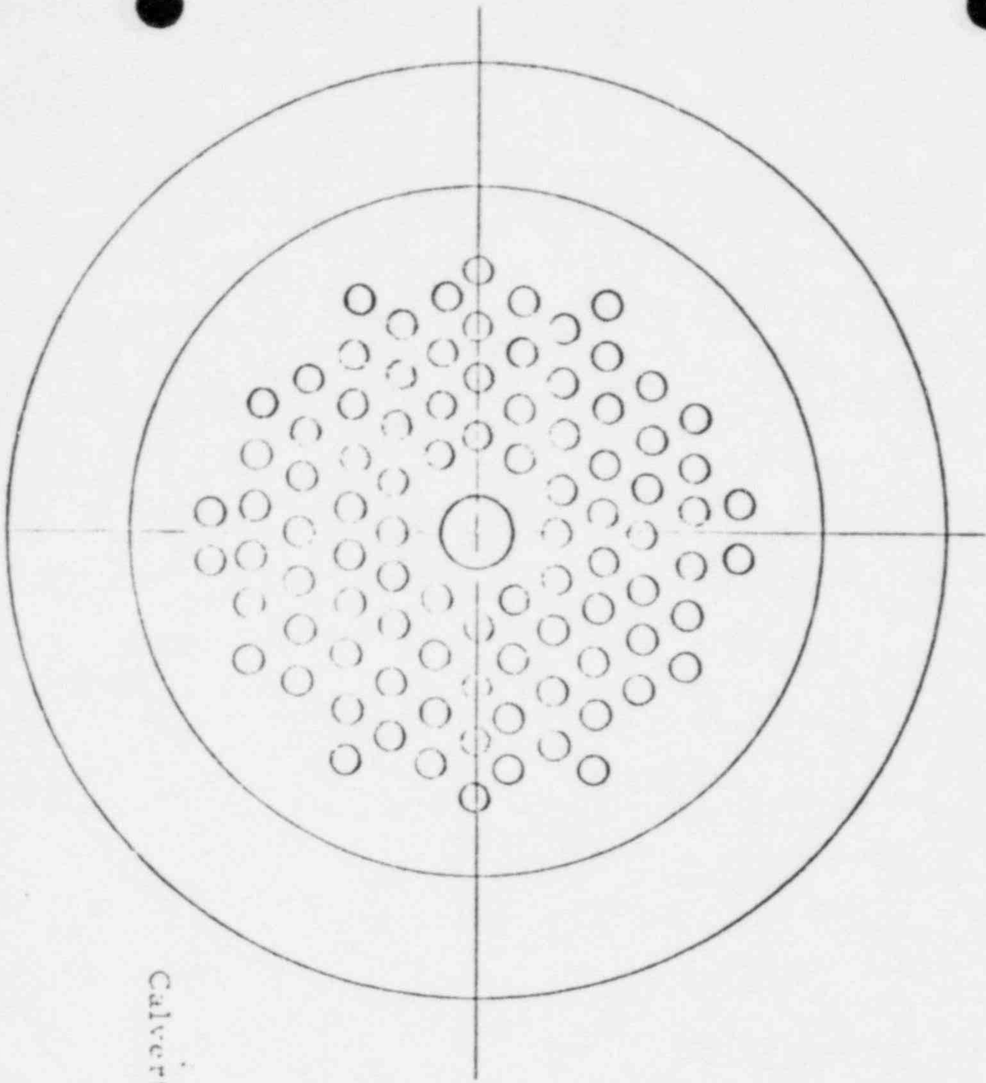
Interior Temp. ______________

Filler Temp. @ Inlet Cap ⎫ Indicate ______________
⎬ if pumped
Filler Temp. @ Outlet Cap ⎭ or poured ______________

Total Volume Installed ______________

Installation Pressure
(if poured, N/A) ______________

Data Recorded By: ______________ Date ________



WIRE ANCHORAGE

Closest Buttress ________

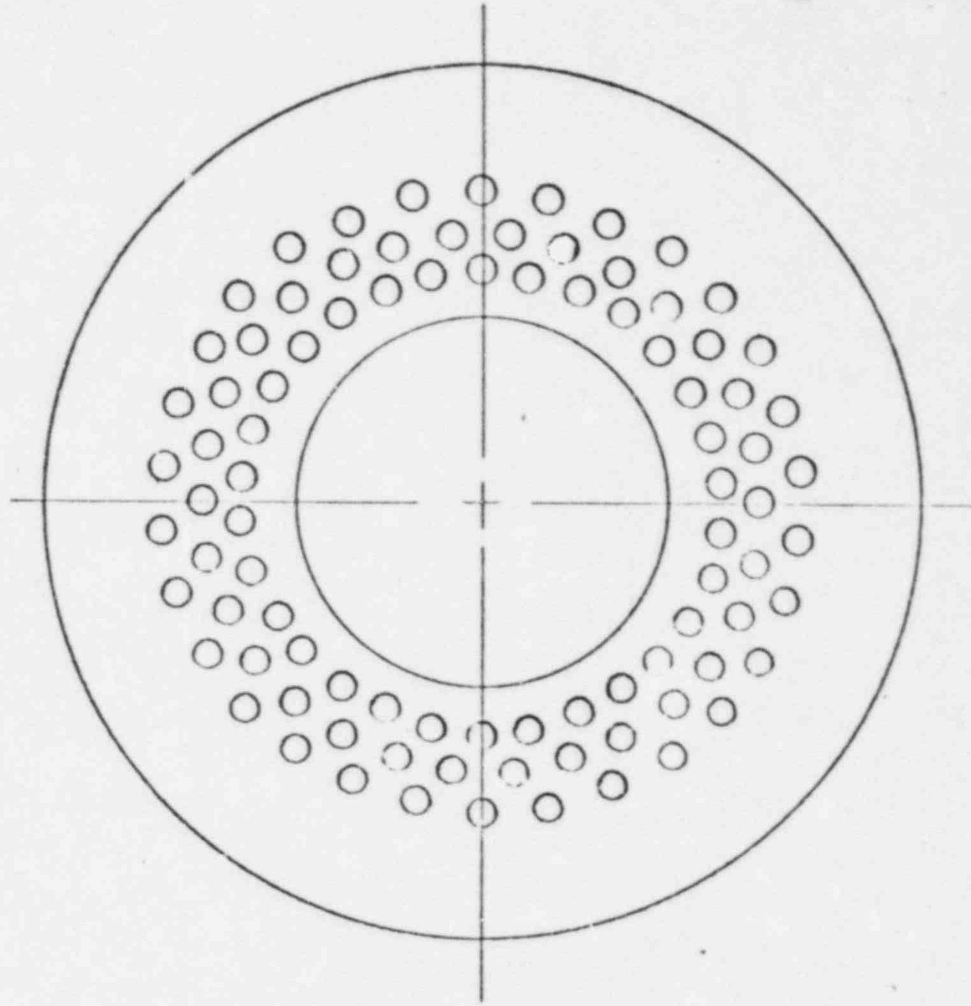
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: ______________________

DATE ______________________

TENDON NUMBER 24 H 28 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	169.45 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.9
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.05 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-21-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.23 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	650.7 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$	Kips	
Force Per Wire ($F_{LAV} \div N_e$)	Kips	
Time since initial stressing of Tendon	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure,, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ______________ DATA RECRODED BY: ______________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
V[illegible]	Elongation at 1 kip/wire						
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	-					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

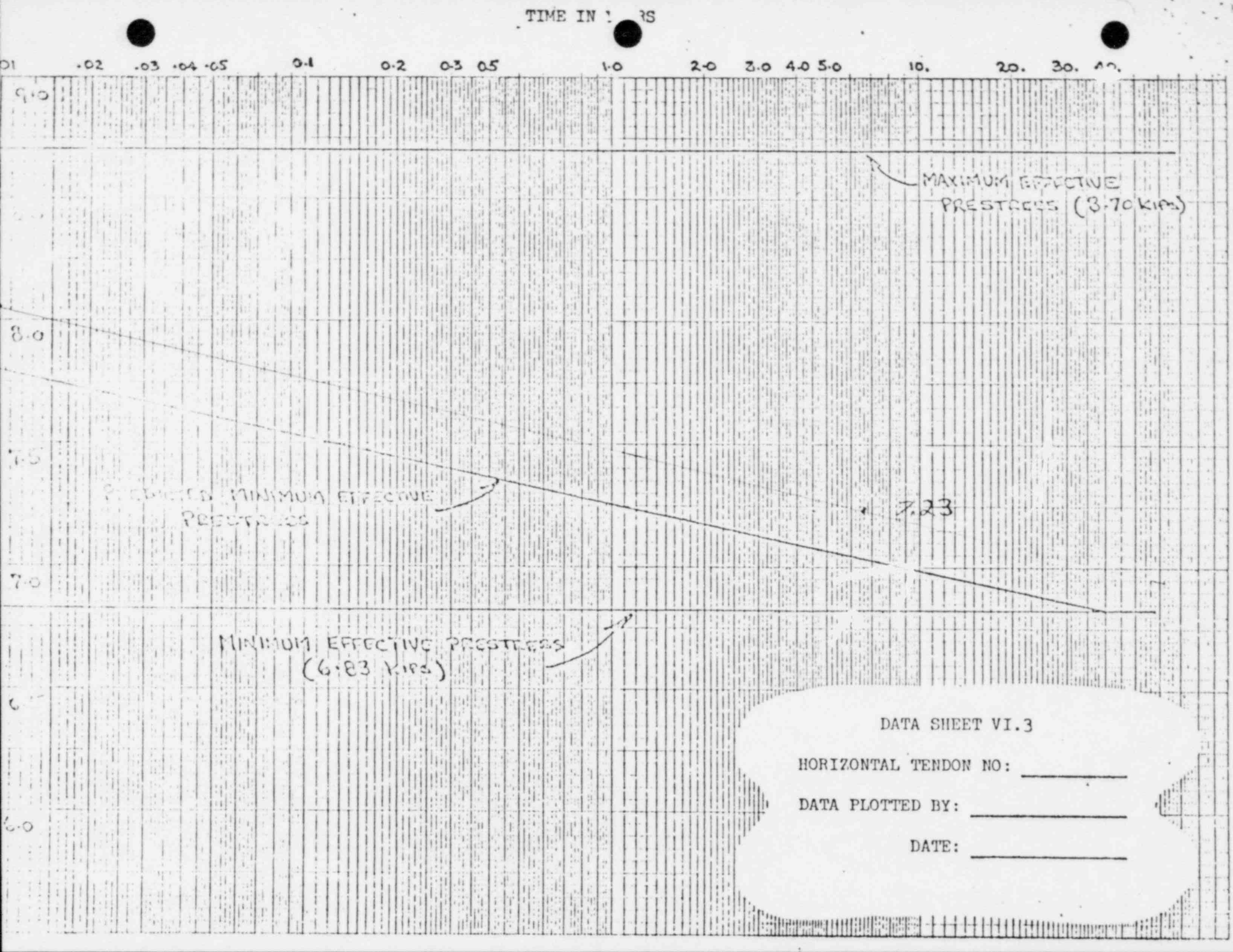
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							


TIME IN ·RS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
9.0
8.0
7.5
7.0
6.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 KIPS)
MINIMUM EFFECTIVE PRESTRESS
7.23
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO:
DATA PLOTTED BY:
DATE:

DATA SHEET IV.1

TENDON DISCHARGE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 24H37

Closest Buttress	2 Outside
Grease Removal	1 gal
Date Filler CAP Removed	1-18-79
Date Grease Removal Started	1-18-79
Exterior Temp.	30°
Interior Temp.	75°
Total Volume Removed	1 gal
Date Filler Cap Reinstalled	1-22-79

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

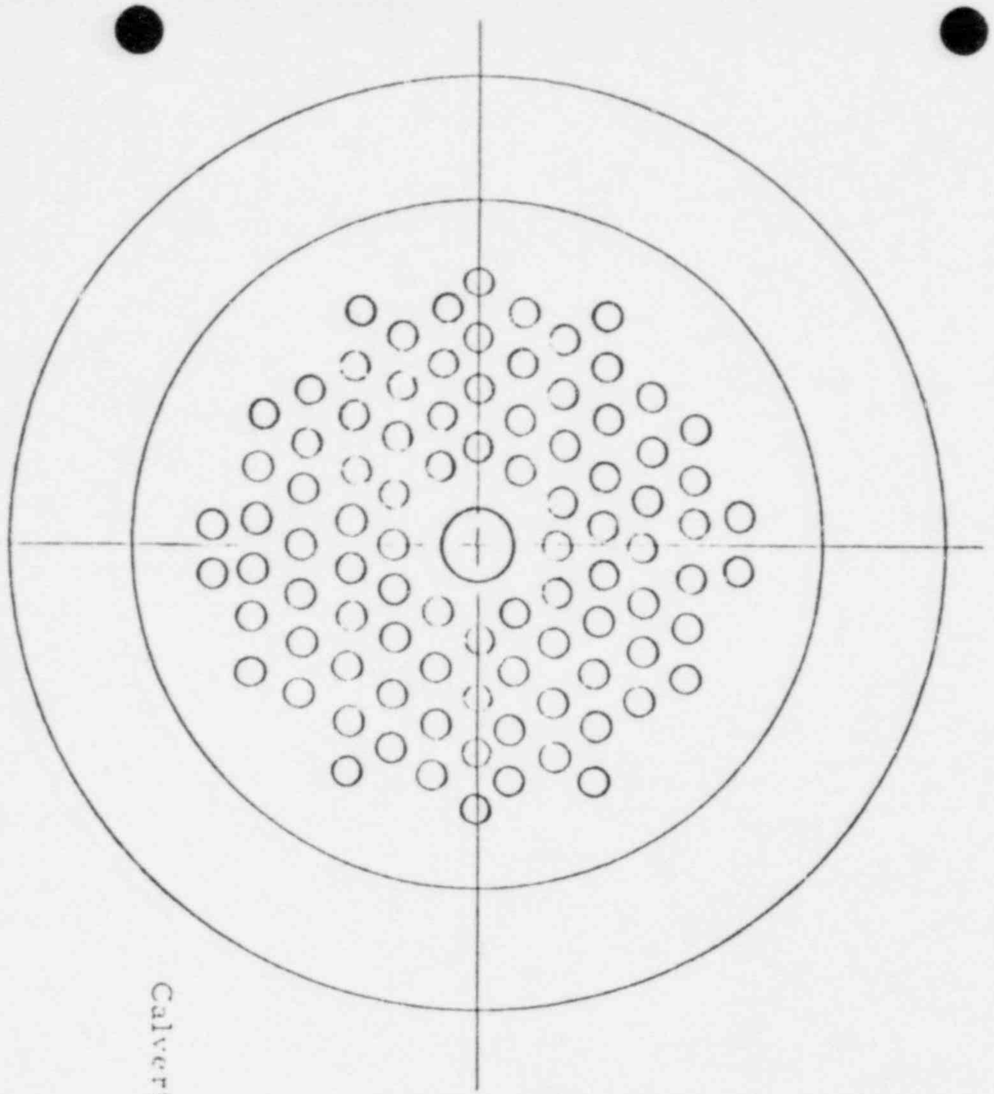
Sample Taken yes Container Identification 24H37 Buttress 2

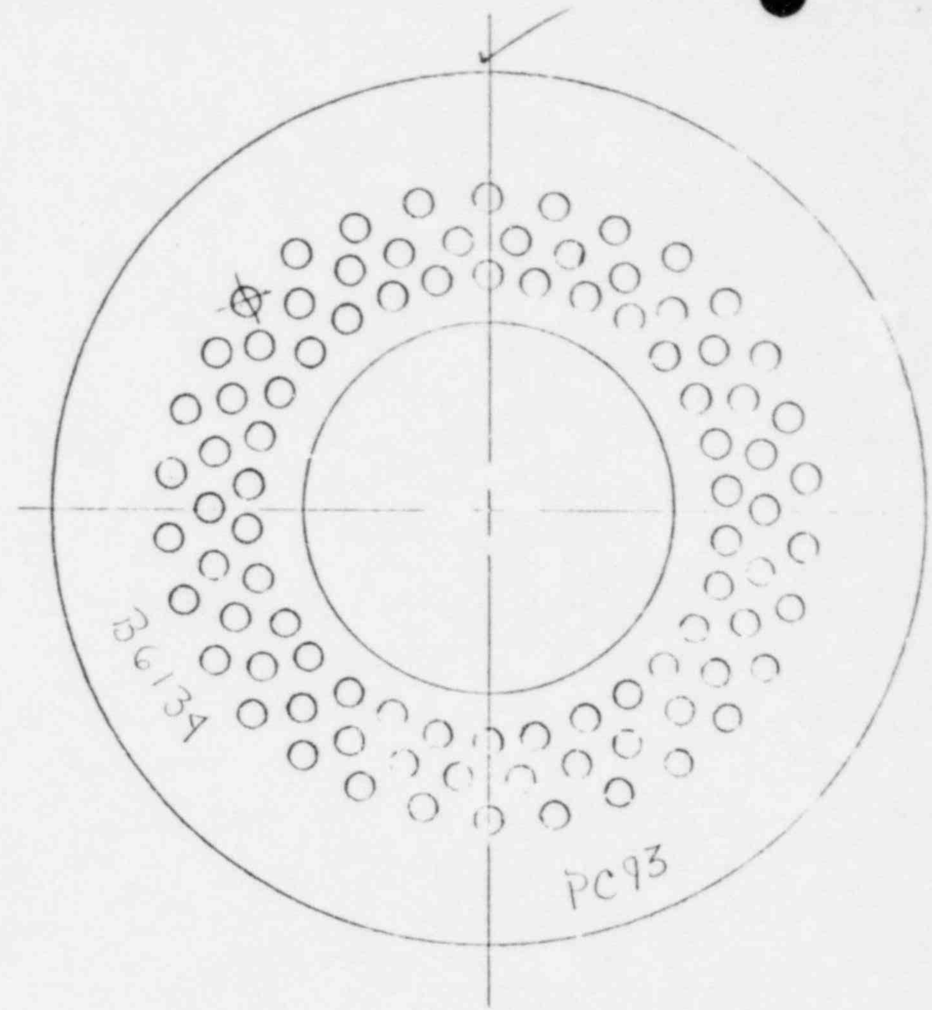
Data Recorded By: [illegible]

TENDON GREASE INSTALLATION

Date Installed	1-23-79
Exterior Temp.	30°
Interior Temp.	75°
Filler Temp. @ Inlet Cap } Indicate if pumped	
Filler Temp. @ Outlet Cap } or poured	
Total Volume Installed	9 gal
Installation Pressure (if poured, N/A)	

Data Recorded By: [illegible] Date 1-30-79





WIRE ANCHORAGE

Closest Buttress 2

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None 90 wires

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 2

Tendon No. 24H37

By B.C. Tindell

Date 1-18-79

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY B.C. Kudell

DATE 1-19-79

TENDON NUMBER 24H37 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.72 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	163.24
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	8.01 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	2.0 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.25 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	652.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.03 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	632.7 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram 4345005050008 Gauge # 4215106		
	Hydraulic Pressure at expected Lift Off	5700 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4550 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______

Date ______

Tendon Number 24H37

Ram # 404520505C008
Gauge # 4215106

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5050	4820
Tendon Lift Offs Acceptable?	Yes	
Lift Off Force, F_L	640 Kips	615 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 627.5 Kips

Force Per Wire ($F_{LAV} \div N_e$) 6.97 Kips

Time since initial stressing of Tendon 7 Years

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 1-19-79

Ram # 404505050003
Gauge # 4215106

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	1 Wires	
Number of effective wires N_e	89 Wires	
0.8f's (9.43 x N_e)	839 Kips	
Hydraulic Force @ 0.8f's	6550 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5050 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	50 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5500 psi	psi

STRESSING - DESTRESSING

TENDON NUMBER 24H37

CLOSEST BUTTRESS 2

DATE: 1-19-79 DATA RECORDED BY: [illegible]

RAM S/N: 404 5005C5.008 GAUGE S/N: 4215164

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off Ave, 5050	5100 **	5100	5100	5000	5000	5050
VI.B.5	Pressurize to 0.8f's	6650 **	✓				
VI.B.5	Elongation @ 0.8f's	-	3 1/4"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	750 **	✓				
VI.B.7	Elongation at 1 kip/wire		3 1/2 - 3 1/2 = 0				
VII.	Remove Wire - This End Cut?	***	YES				
VIII.3	Pressurize to 1 kip/wire	750psi **					
VIII.4	Elongation at 1 kip/wire		3 3/8" (- 1/8")				
VIII.5	Pressurize to 0.8f's	6550 **					
VIII.5	Elongation at 0.8f's		3 1/4"				
VIII.6	Pressure for shim measure	~5500psi **					
VIII.7	Elongation at shim press		2 3/4"				
VIII.7	Shims installed Recycl Extra Shims Installed		2 5/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5150	5200	5150	5100	5100
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	5140 PSI 655 Kips	≥ 645 kips				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 24H37

DATE: DATA RECORDED BY:

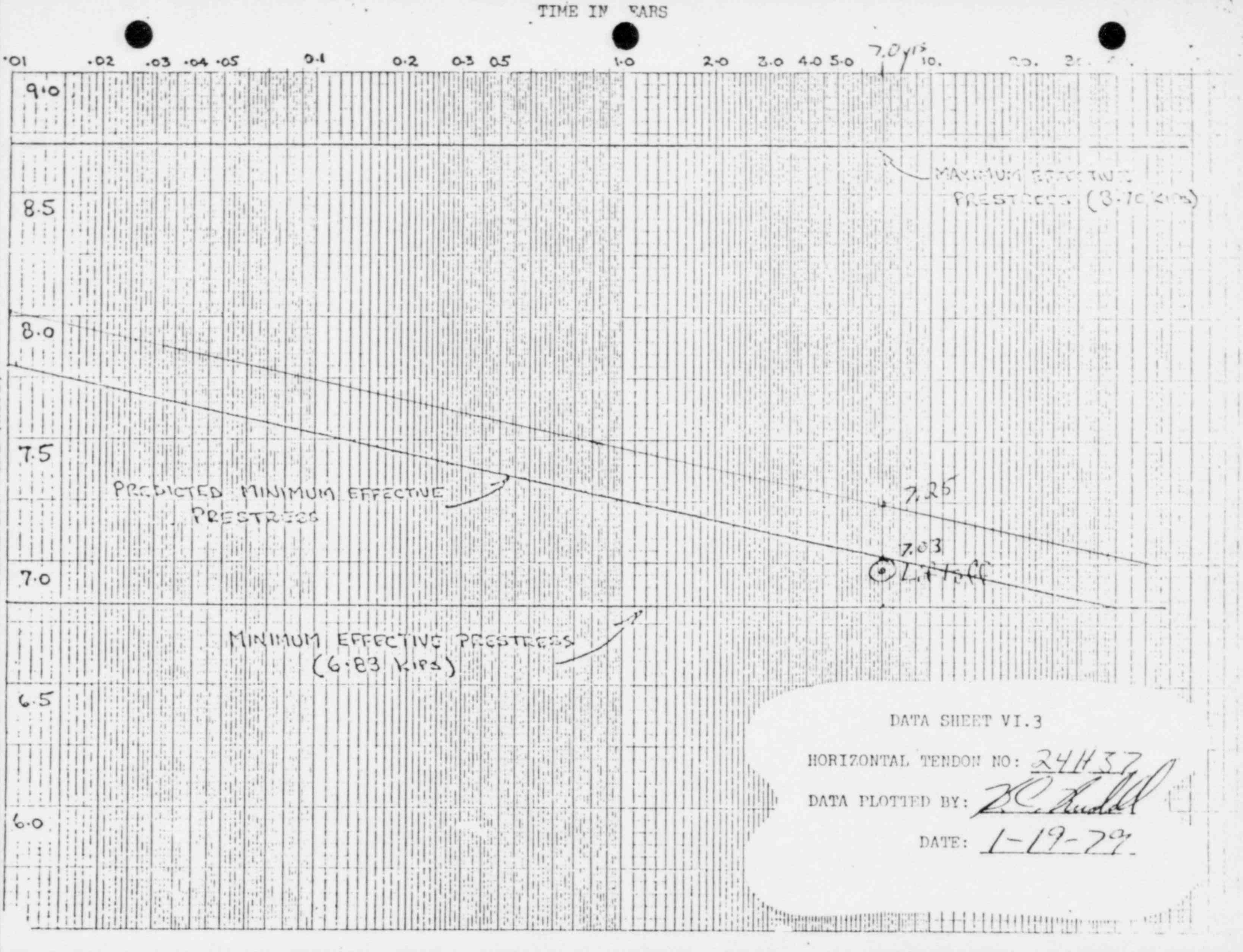
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



TIME IN YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
7.0 yrs
10.
20.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 KIPS)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
7.25
7.03
Lift off
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: 24H37
DATA PLOTTED BY:
DATE: 1-19-79

DATA SHEET IV.1

TENDON DEGREASING/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 24H37

Closest Buttress 4 Inside

Grease Removal 2gal

Date Filler CAP Removed 1-4-79

Date Grease Removal Started 1-4-79

Exterior Temp. 24°

Interior Temp. 57°

Total Volume Removed 2gal

Date Filler Cap Reinstalled 1-22-79

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken ________ Container Identification ________

Data Recorded By: B.C. Rudell

TENDON GREASE INSTALLATION

Date Installed 1-23-79

Exterior Temp.

Interior Temp.

Filler Temp. @ Inlet Cap } Indicate if pumped or poured

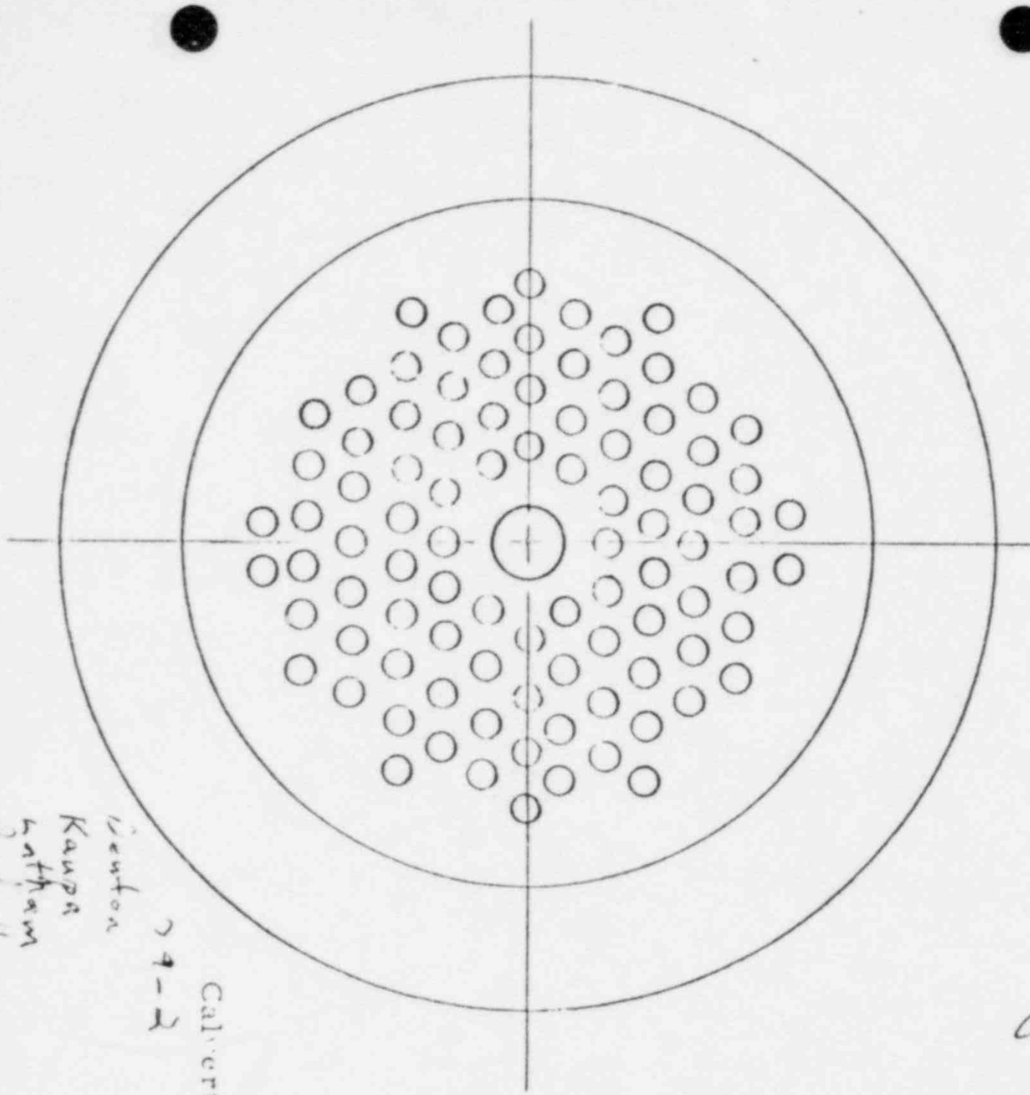
Filler Temp. @ Outlet Cap

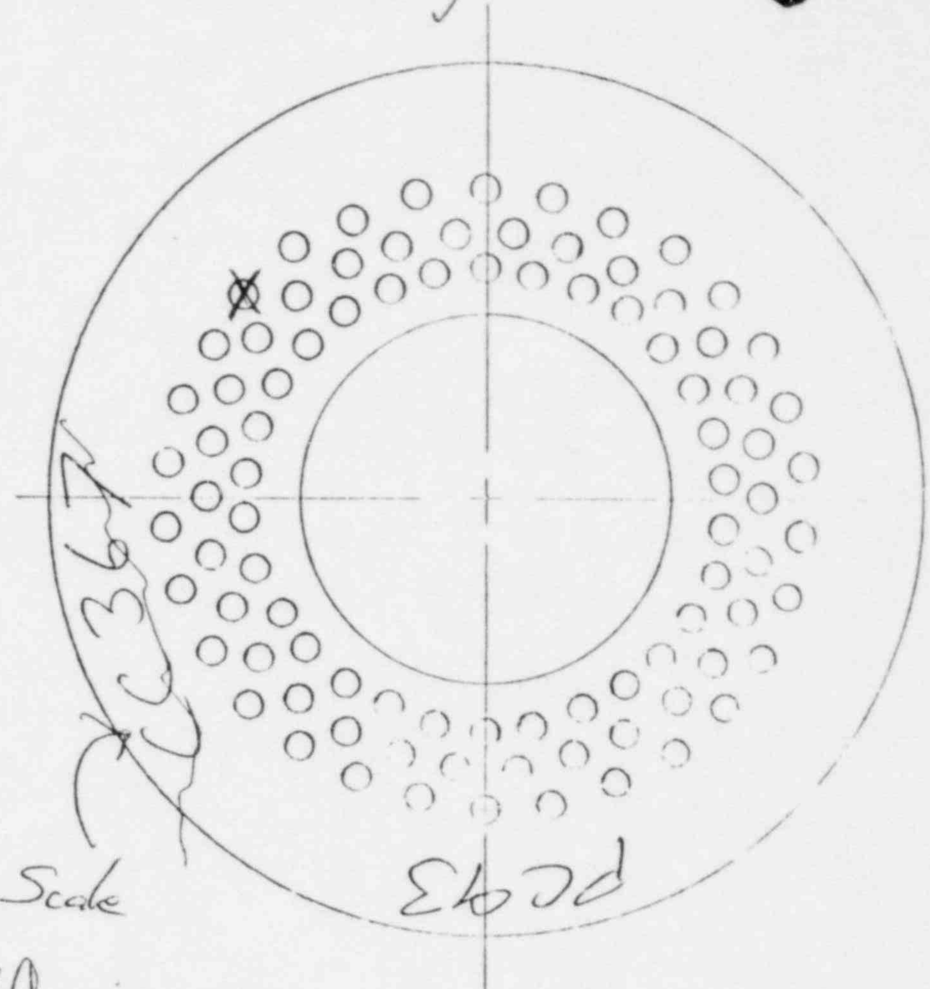
Total Volume Installed

Installation Pressure (if poured, N/A)

Pumped From Other End

Data Recorded By: B.C. Rudell Date 1-30-79





Scale

90 wires

WIRE ANCHORAGE

Closest Buttress 4

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance None

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 24H37

By ZBC Koch [illegible]

Date 1-4-79

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

79-2

Denton
Kaupa
Latham
Rudell

DATA RECORDED BY J.C. [illegible]

DATE 1-19-79

TENDON NUMBER 24H37 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.72 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	163.24
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.01 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	7.0 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.25 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	652.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.03 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	632.7 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram# 404500405000-8 Gauge# G-224 Date Cal 7-20-78		
	Hydraulic Pressure at expected Lift Off	5100 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi

Data Recorded By

Date 1-19-79

24H37

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		4320 psi
Tendon Lift Offs Acceptable?		Yes
Lift Off Force, F_L	Kips	615 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 627.5 Kips

Force Per Wire ($F_{LAV} \div N_e$) 6.97 Kips

Time since initial stressing of Tendon 7 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [illegible signature]

Date 1-19-79

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	1 Wires	
Number of effective wires N_e	89 Wires	
0.8f's (9.43 x N_e)	839 Kips	839
Hydraulic Force @ 0.8f's	psi	6550 psi
Original Lift-Off Hydraulic pressure, P_L	psi	4820 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	50 psi
Shim Pressure (P_L + 500 - P_{RH})	psi	5270 psi

STRESSING - DESTRESSING

TENDON NUMBER 24H37

CLOSEST BUTTRESS 4

DATE 1-23-79 DATA RECORDED BY: A. Barth

RAM S/N: 404 500 405 000-8 GAUGE S/N: G-224

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off 4320	expect 5100 **	4300	4350	4300	4300	4300
VI.B.5	Pressurize to 0.8f's	6650 psi **					
VI.B.5	Elongation @ 0.8f's	-	3 7/8"				
VI.B.6	Depressurize to zero	0 -					
VI.B.7	Pressurize to 1 kip/wire	750 psi **					
VI.B.7	Elongation at 1 kip/wire		1 3/16 - 3 1/2 = -2 5/16				
VII.	Remove Wire - This End Cut?	***	✓				
VIII.3	Pressurize to 1 kip/wire	750 psi **	✓				
VIII.4	Elongation at 1 kip/wire		1 1/4 (-2 1/4)				
VIII.5	Pressurize to 0.8f's	6550 psi **	✓				
VIII.5	Elongation at 0.8f's		3 7/8				
VIII.6	Pressure for shim measure	~5500 psi **	✓				
VIII.7	Elongation at shim press		2 15/16				
VIII.7	Shims installed Record Extra Shims Installed		2 7/8				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure (AVG 5160)		5100	5100	5200	5200	5200
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off? Ram 2 (655 kips)	(Avg 655)	✓ ≥ 645 kips				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	NA				
	Shims installed		NA				
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure		NA				

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 24H37

DATE: DATA RECORDED BY:

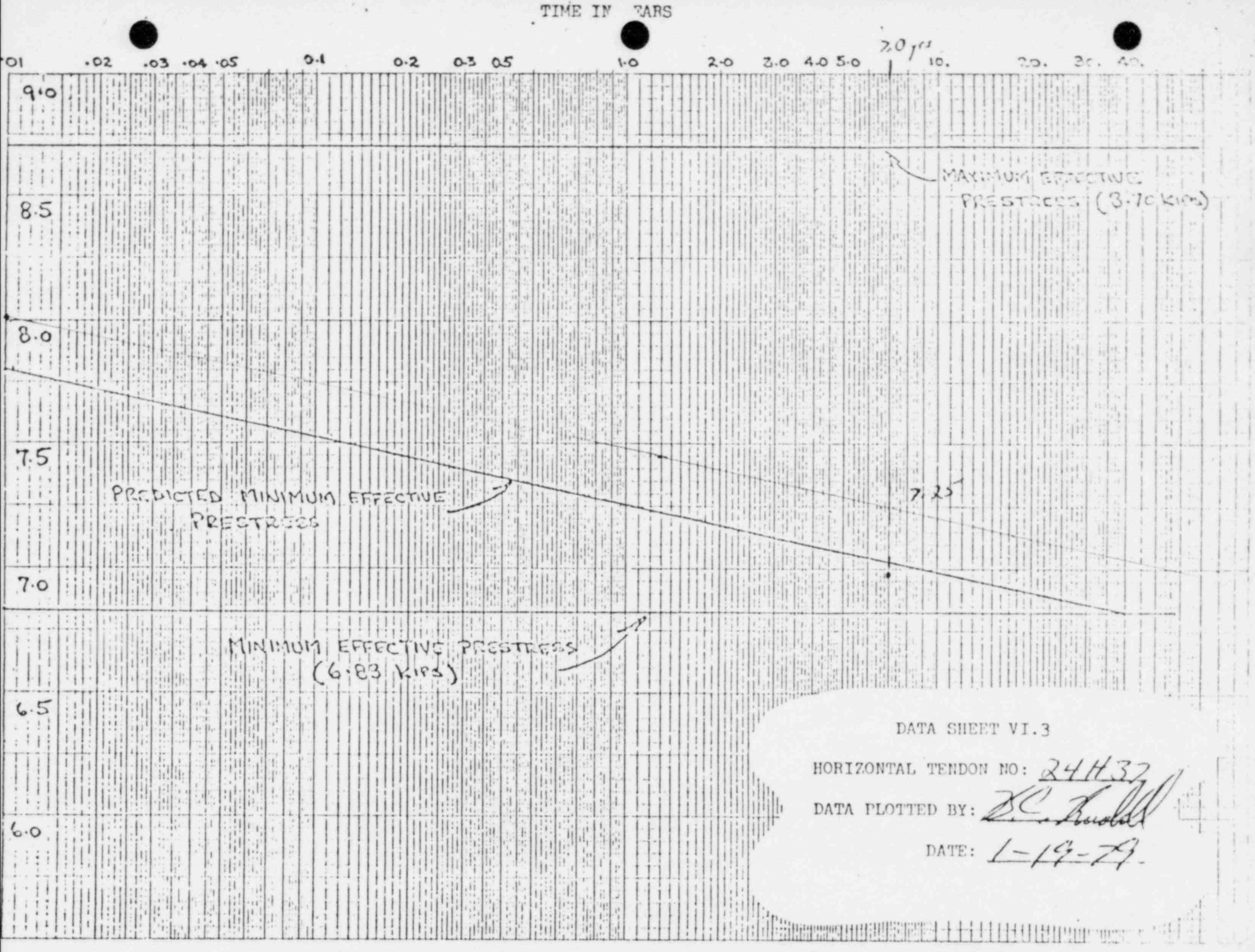
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	0	-2 5/16	3 1/4	3 7/8	3 1/4	6 3/16	9 7/16
RESTRESS	-1/8	-2 1/4	3 1/4	3 7/8	3 3/8	6 1/8	9 1/2



DATA SHEET VI.3

HORIZONTAL TENDON NO: 24H37

DATA PLOTTED BY: [signature]

DATE: 1-19-79

DATA SHEET VII.1

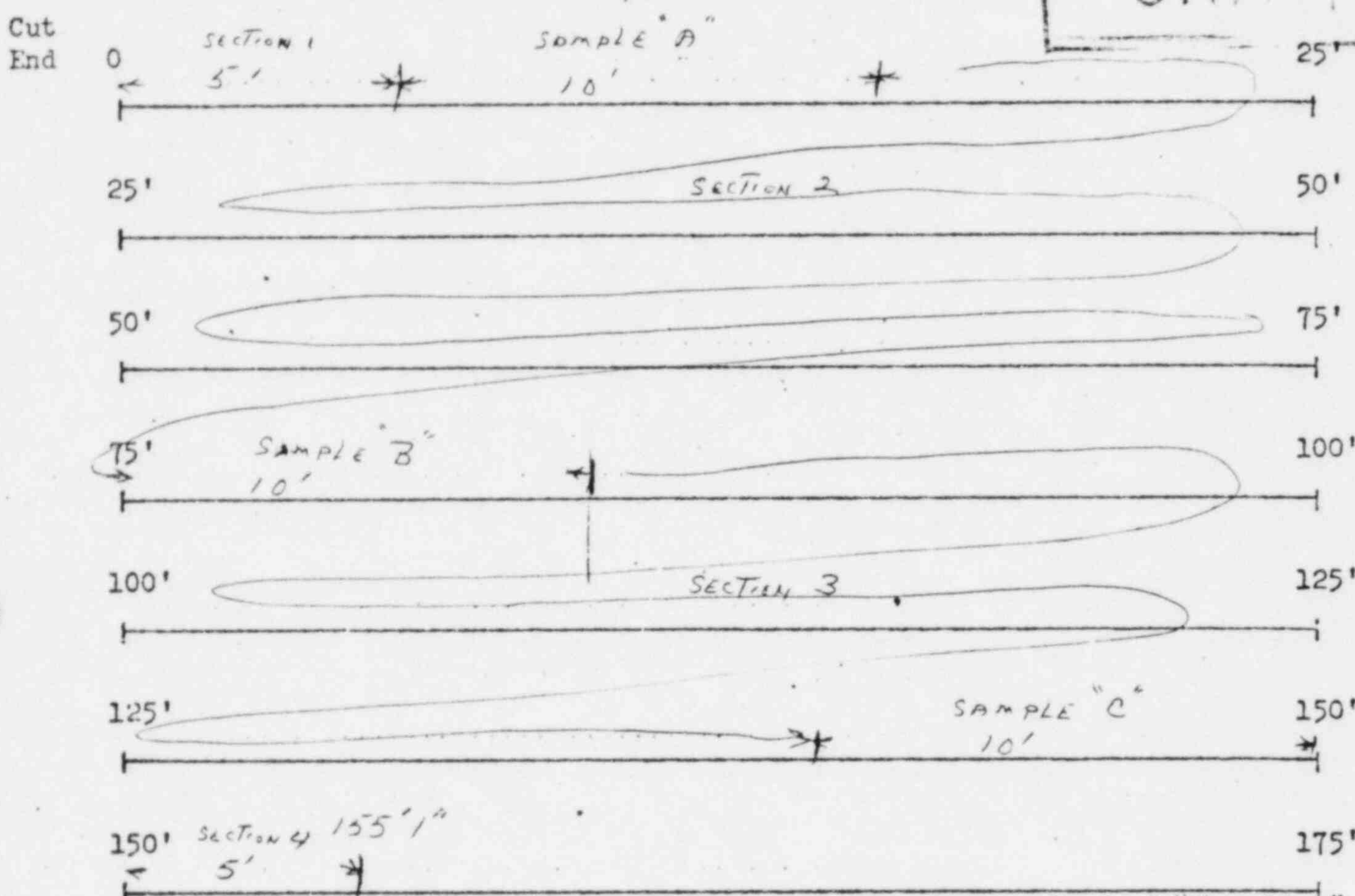
TENDON WIRE INSPECTION SHEET

TENDON NUMBER: 24H37 CLOSEST BUTTRESS: Cut At Buttress 2 Pulled At Buttress 4

INSPECTION PERFORMED BY: C. L. McKenzie DATE: 1-24-79

LENGTH: BUTTON HEAD TO SCRIBE 155'-1"

UNIT 1



Scale 1/4' = 1'-0"

Corrosion Level 1

Indicate above:
- a. All Corrosion levels
- b. Any scratches resulting from removal
- c. Sample locations
- d. Button head
- e. Any pertinent information indicating wire condition

CORROSION LEVELS

1. No visible oxidation
2. Visible oxidation, no pitting
3. 0 $<$ pitting $\leq$ 0.003"
4. 0.003" $<$ pitting $\leq$ 0.006"
5. 0.006" $<$ pitting $\leq$ 0.010"

☆ Damage resulting from removal

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 53 H5

53H4

Closest Buttress ______

Grease Removal ______

Date Filler CAP Removed ______

Date Grease Removal Started ______

Exterior Temp. ______

Interior Temp. ______

Total Volume Removed ______

Date Filler Cap Reinstalled ______

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon

Presence of Water Indicated

% (Approximate) Coverage of Components

Can Not Rig To 53H5

Sample Taken ______ Container Identification ______

Data Recorded By: ______

TENDON GREASE INSTALLATION

Date Installed ______

Exterior Temp. ______

Interior Temp. ______

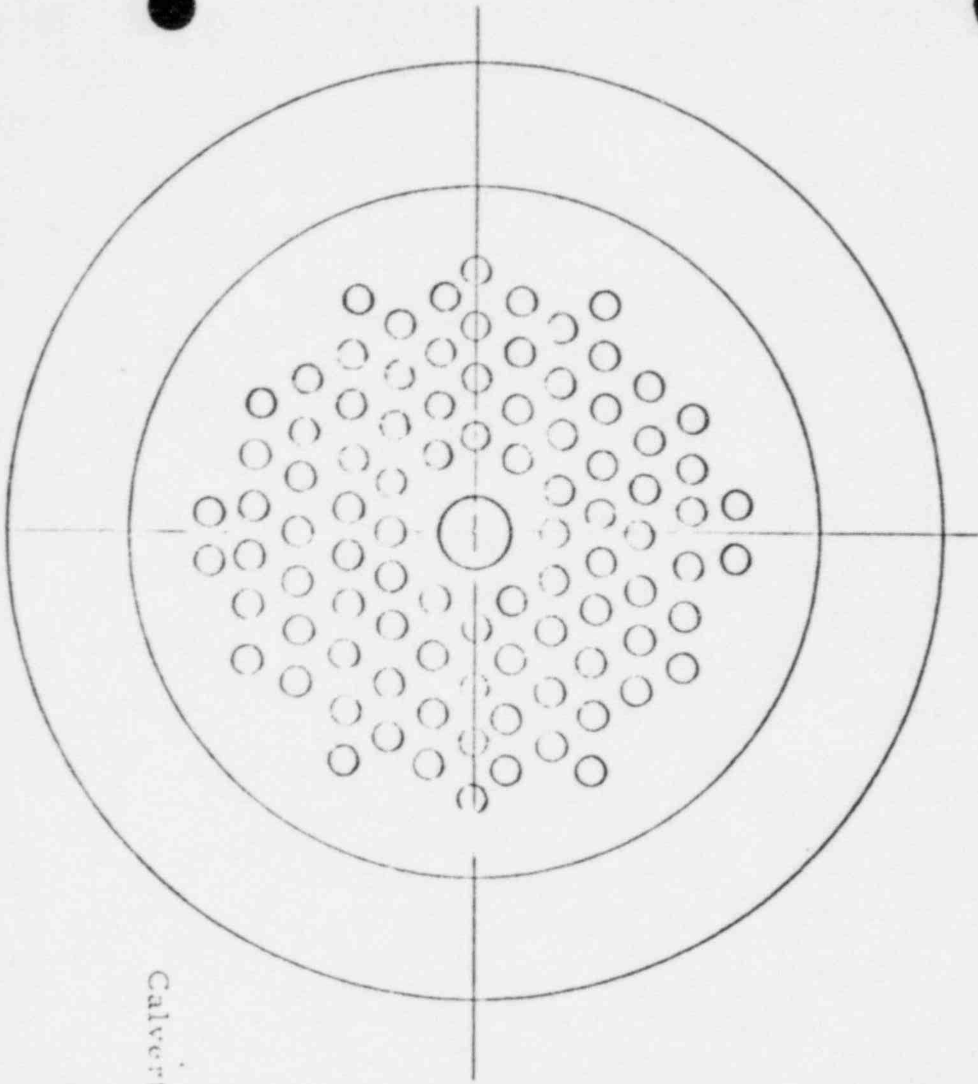
Filler Temp. @ Inlet Cap } Indicate if pumped or poured ______

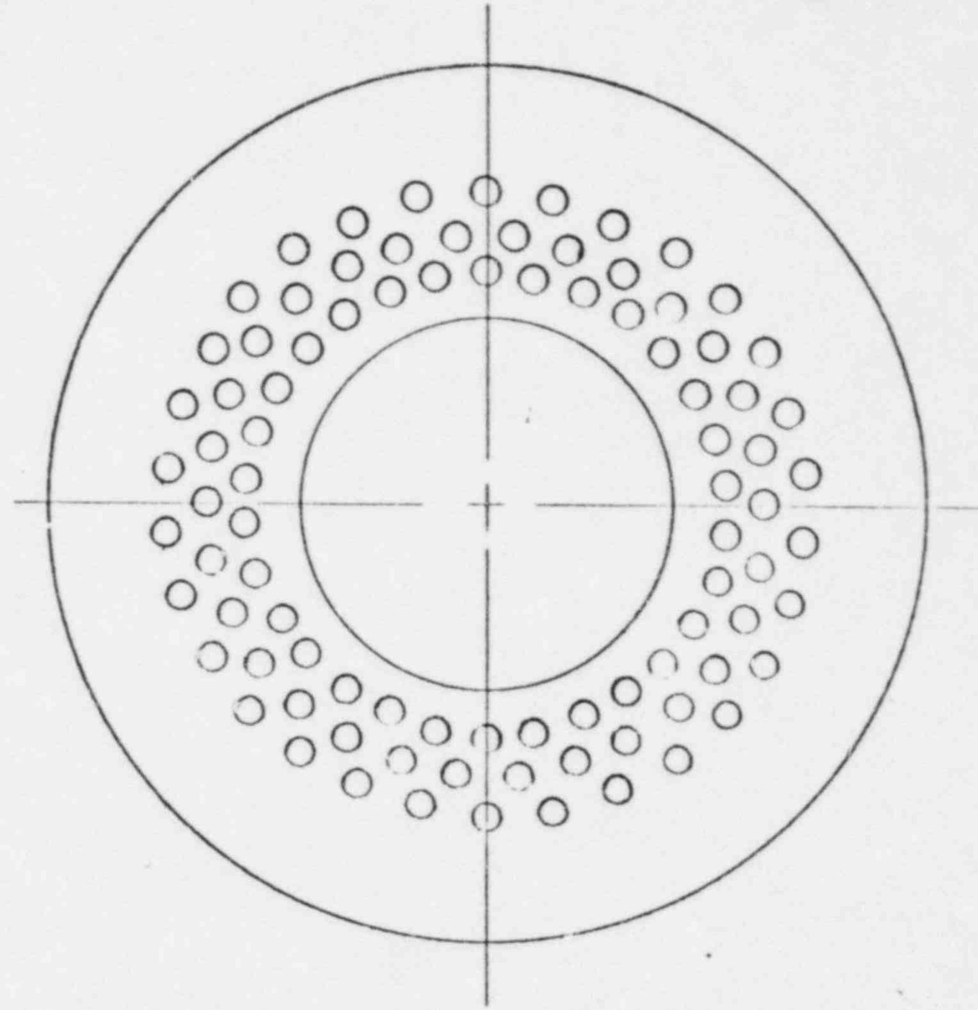
Filler Temp. @ Outlet Cap ______

Total Volume Installed ______

Installation Pressure (if poured, N/A) ______

Data Recorded By: ______ Date ______





WIRE ANCHORAGE

Closest Buttress ________

Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ____________

DATE ____________

TENDON NUMBER 53 H 5 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.95 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.5
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.93 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.14 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	642.6 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, , P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER __________

CLOSEST BUTTRESS __________

DATE: __________ DATA RECRODED BY: __________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
V	Elongation at 1 kip/wire						
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER

DATE: DATA RECORDED BY:

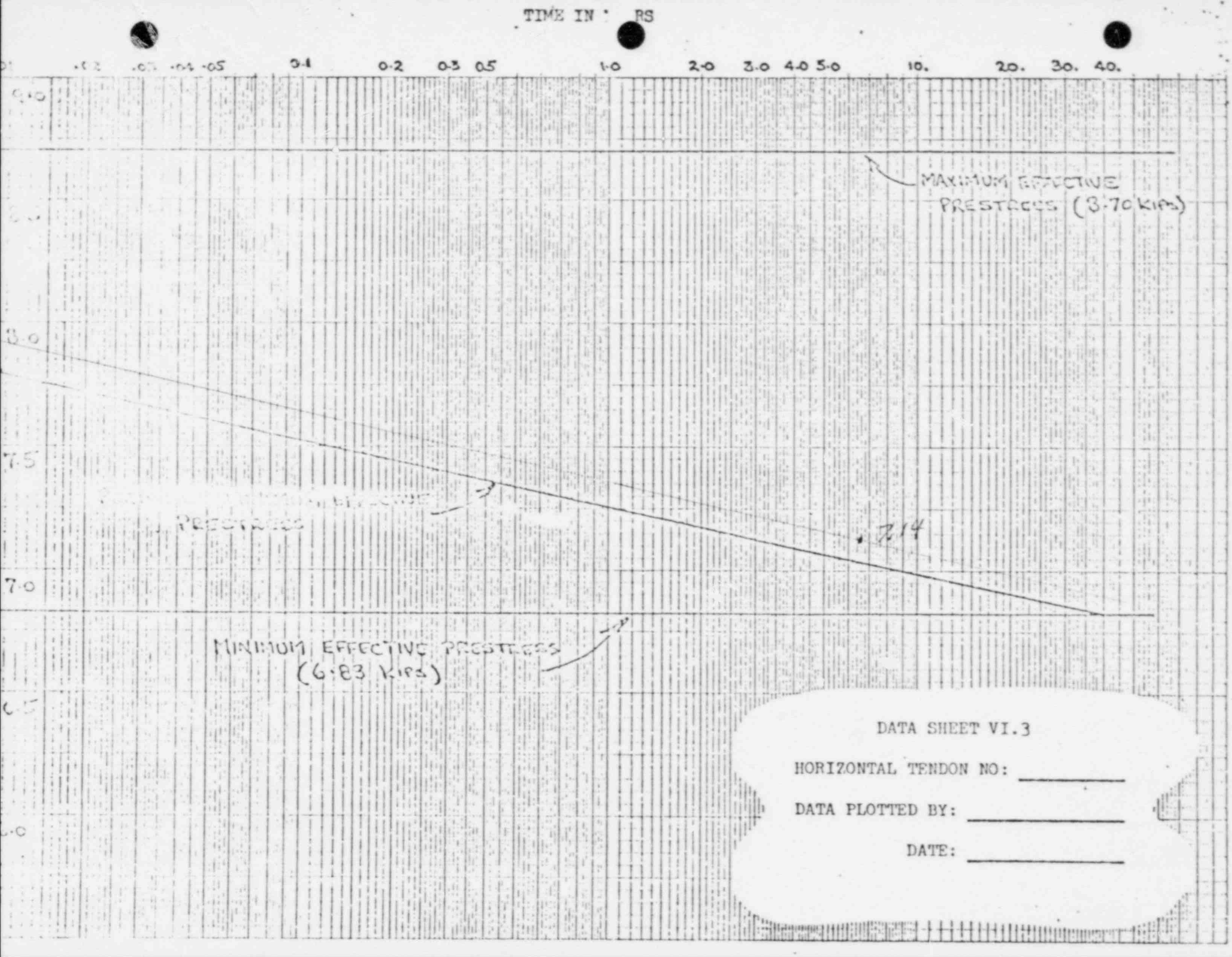
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							


TIME IN RS
0.1
0.2
0.3 0.5
1.0
2.0 3.0 4.0 5.0
10.
20. 30. 40.
9.0
8.0
7.5
7.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 KIPS)
PRESTRESS
7.14
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: ______
DATA PLOTTED BY: ______
DATE: ______

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 53 H 5

Closest Buttress

Grease Removal

Date Filler CAP Removed

Date Grease Removal Started

Exterior Temp.

Interior Temp.

Total Volume Removed

Date Filler Cap Reinstalled

53H4

Can No. 4 R to 53H5

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon

Presence of Water Indicated

% (Approximate) Coverage of Components

Sample Taken ______ Container Identification ______

Data Recorded By:

TENDON GREASE INSTALLATION

Date Installed

Exterior Temp.

Interior Temp.

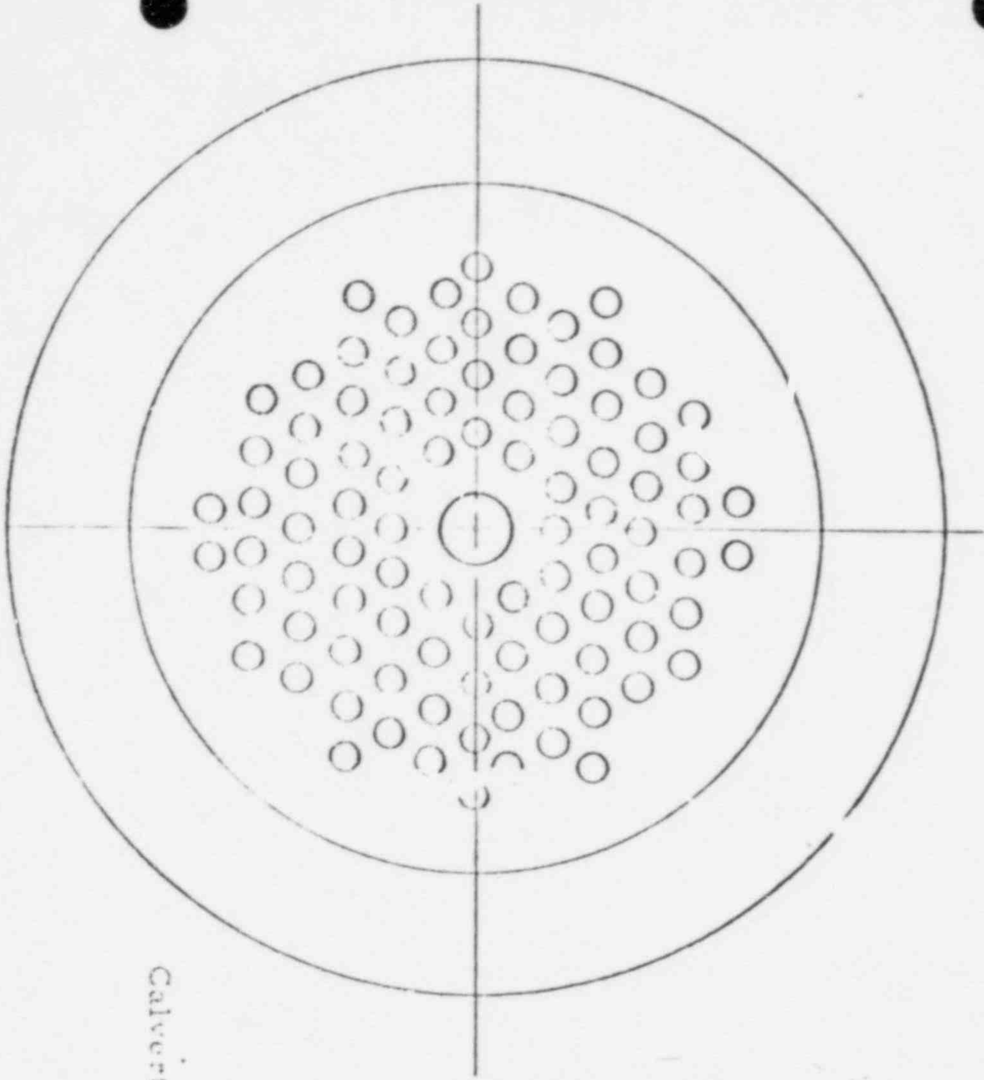
Filler Temp. @ Inlet Cap } Indicate if pumped or poured

Filler Temp. @ Outlet Cap

Total Volume Installed

Installation Pressure
(if poured, N/A)

Data Recorded By: ______ Date ______



WIRE ANCHORAGE

Closest Buttress ________

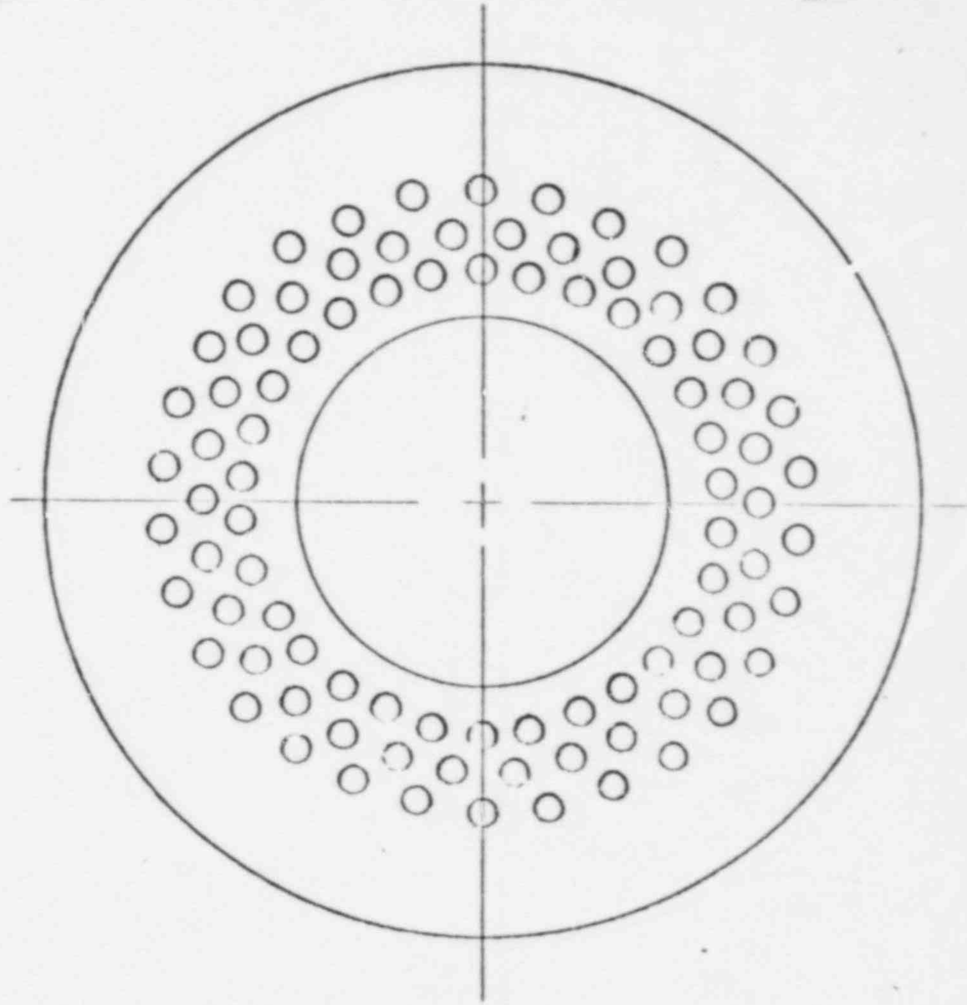
Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor S[illegible] Form
Figure

DATA SHEET VI.1

DATA RECORDED BY' ____________________

DATE ____________________

TENDON NUMBER DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.95 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	~~Horizontals~~	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.5
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.93 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.14 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	642.6 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips 63
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By ______________________

Date ______________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$		Kips
Force Per Wire ($F_{LAV} \div N_e$)		Kips
Time since initial stressing of Tendon		Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________________

Date _ ______

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's ($9.43 \times N_e$)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, ($N_R \times 50$)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ______________ DATA RECRODED BY: ______________________

RAM S/N: GAUGE S/N:

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
V[illegible]7	Elongation at 1 kip/wire						
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off $\geq$ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. Lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

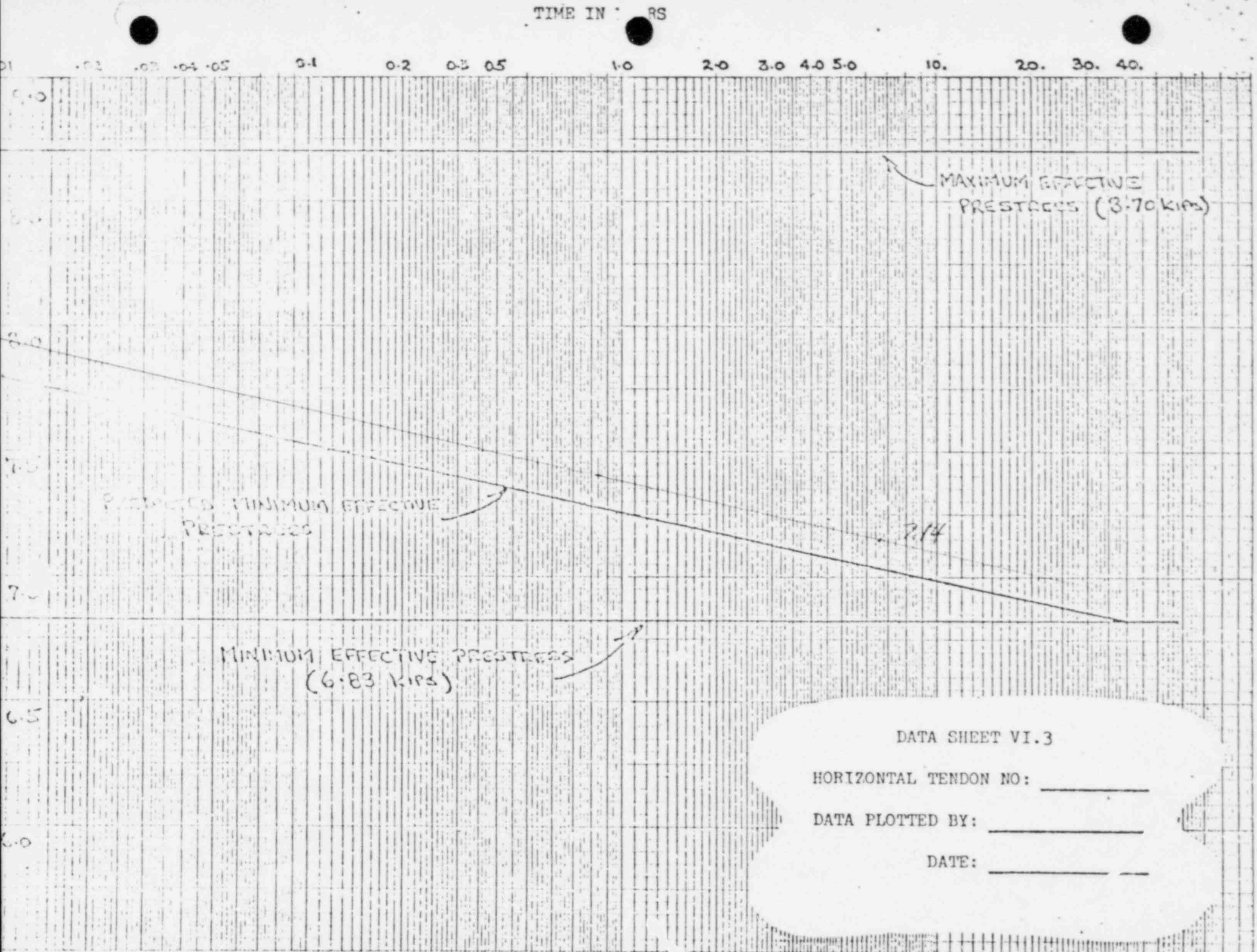
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: ____________

DATA PLOTTED BY: ____________

DATE: ____________

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 53H4

Substituted for 53H5

Closest Buttress: 5

Grease Removal: 1gal Bext

Date Filler CAP Removed: 11-8-78

Date Grease Removal Started: 11-8-78

Exterior Temp.: 50°

Interior Temp.: 106°

Total Volume Removed: 1 gal

Date Filler Cap Reinstalled: 11-9-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown + Light Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 53H4 - But 5

Data Recorded By: R.C. Rudell

TENDON GREASE INSTALLATION

Date Installed: 11-13-78

Exterior Temp.: 50°

Interior Temp.: 106°

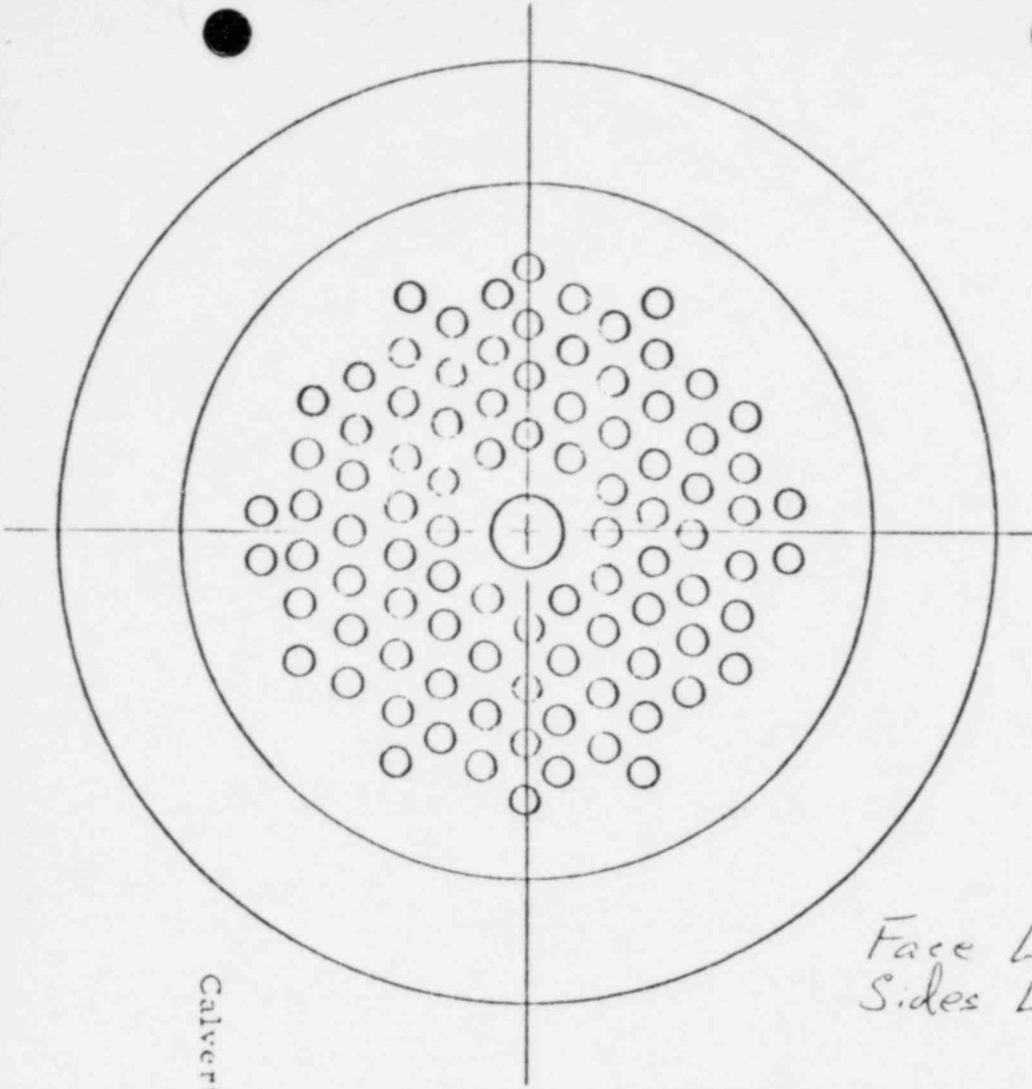
Filler Temp. @ Inlet Cap } Indicate if pumped or poured: ~150°F

Filler Temp. @ Outlet Cap: ~85°F

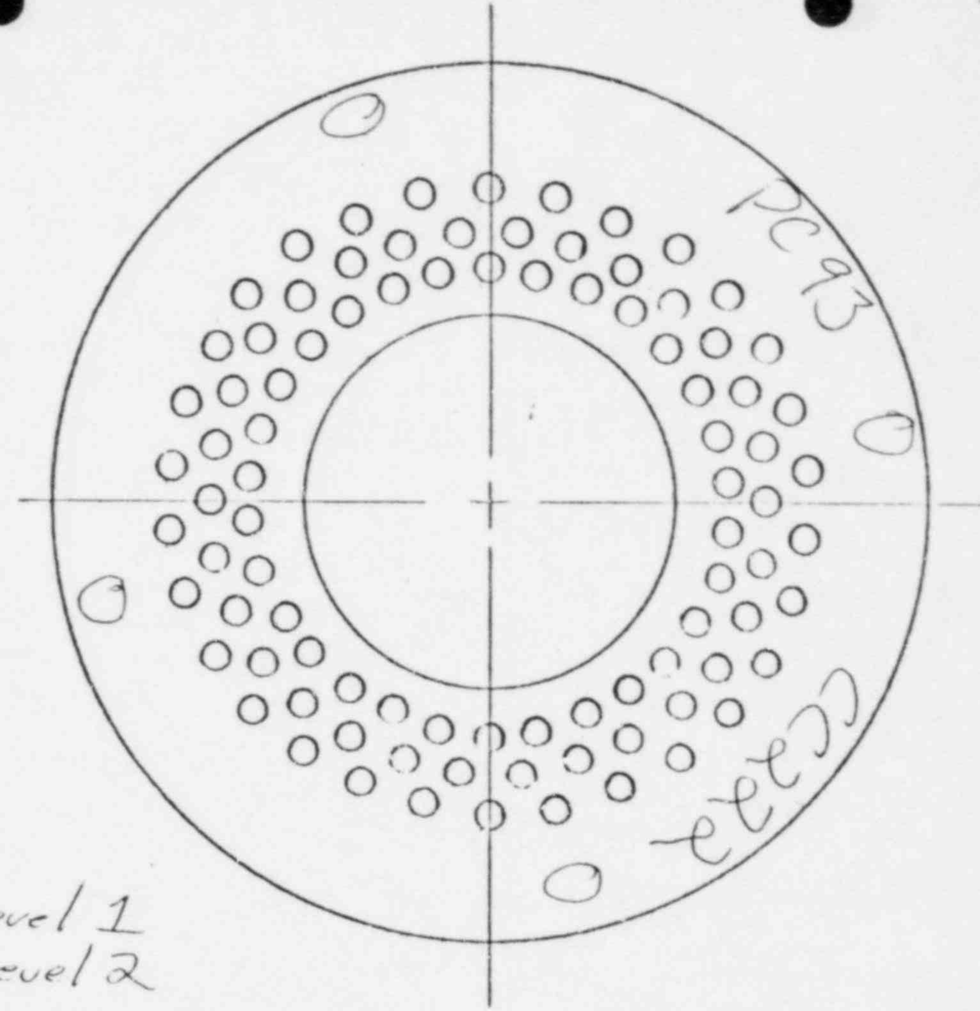
Total Volume Installed: 11 gal

Installation Pressure (if poured, N/A): 0~25 psi

Data Recorded By: R.C. Rudell Date 11-13-78



Face Level 1
Sides Level 2



WIRE ANCHORAGE

Closest Buttress 5

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance NA

Wire removed this surveillance for inspection NA

WIRE ANCHORAGE

Closest Buttress 5

Tendon No. 53H4

By [illegible]

Date 11-8-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

Rev. 2
Page (1)

DATA SHEET VI.1

DATA RECORDED BY ____________

DATE ____________

TENDON NUMBER 53-H4 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	167.66 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.18
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	7.96 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648 Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	~~643.~~ Kips 634. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

RAM CALIBRATION CURVES		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	5100 psi
	Hydraulic Pressure at maximum effective prestress	psi	6150 psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	5000 psi
	Hydraulic pressure at absolute minimum effective prestress	psi	4[illegible]5 psi

DATA SHEET 1 VI.1

Data Recorded By A. Barth

Date 11-9-78

TENDON NUMBER: 53H4

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		770
Tendon Lift Offs Acceptable?		Yes
Lift Off Force, F_L	Kips	770 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ Kips 757.5

Force Per Wire ($F_{LAV} \div N_e$) Kips 8.4

Time since initial stressing of Tendon Years 6.9

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified C. Bath

Date 11-9-78

Ram 2# 4045005050008
Gauge# 421506 Date Cal. 7-20-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires None	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 53H4

CLOSEST BUTTRESS 5

DATE: 11-9-78 DATA RECRODED BY: [illegible]

RAM S/N: [illegible] GAUGE S/N: 421506
7/20/78 [illegible]

EP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero	✓				
I.B.1	Measure Shims	-	2 3/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
I.B.3	Lift Off 6060	**	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
I.B.5	Pressurize to 0.8f's	**	✓				
I.B.5	Elongation @ 0.8f's	-	3				
I.B.6	Depressurize to zero	-	✓				
I.B.7	Pressurize to 1 kip/wire	**	[illegible] ✓				
I.	Elongation at 1 kip/wire		2 - 3 1/2 = -1 1/2				
II.	Remove Wire - This End Cut?	***	✗				
III.3	Pressurize to 1 kip/wire	**	✗ 700psi				
III.4	Elongation at 1 kip/wire		/ 2" - 3 1/2 = -1/2				
III.5	Pressurize to 0.8f's	**	✓				
III.5	Elongation at 0.8f's		2 1/2				
III.6	Pressure for shim measure	**	✓				
III.7	Elongation at shim press		2 1/2				
III.7	Shims installed 1/2" Shim set removed.		2 1/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
III.8	Lift Off pressure 720 kips		5700	5700	5700	5700	5700
III.8	AVG Lift Off ≥ Initial AVG Lift Off?		≤ 722.5 Avg [illegible]				
III.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	-1 1/2 -*				
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

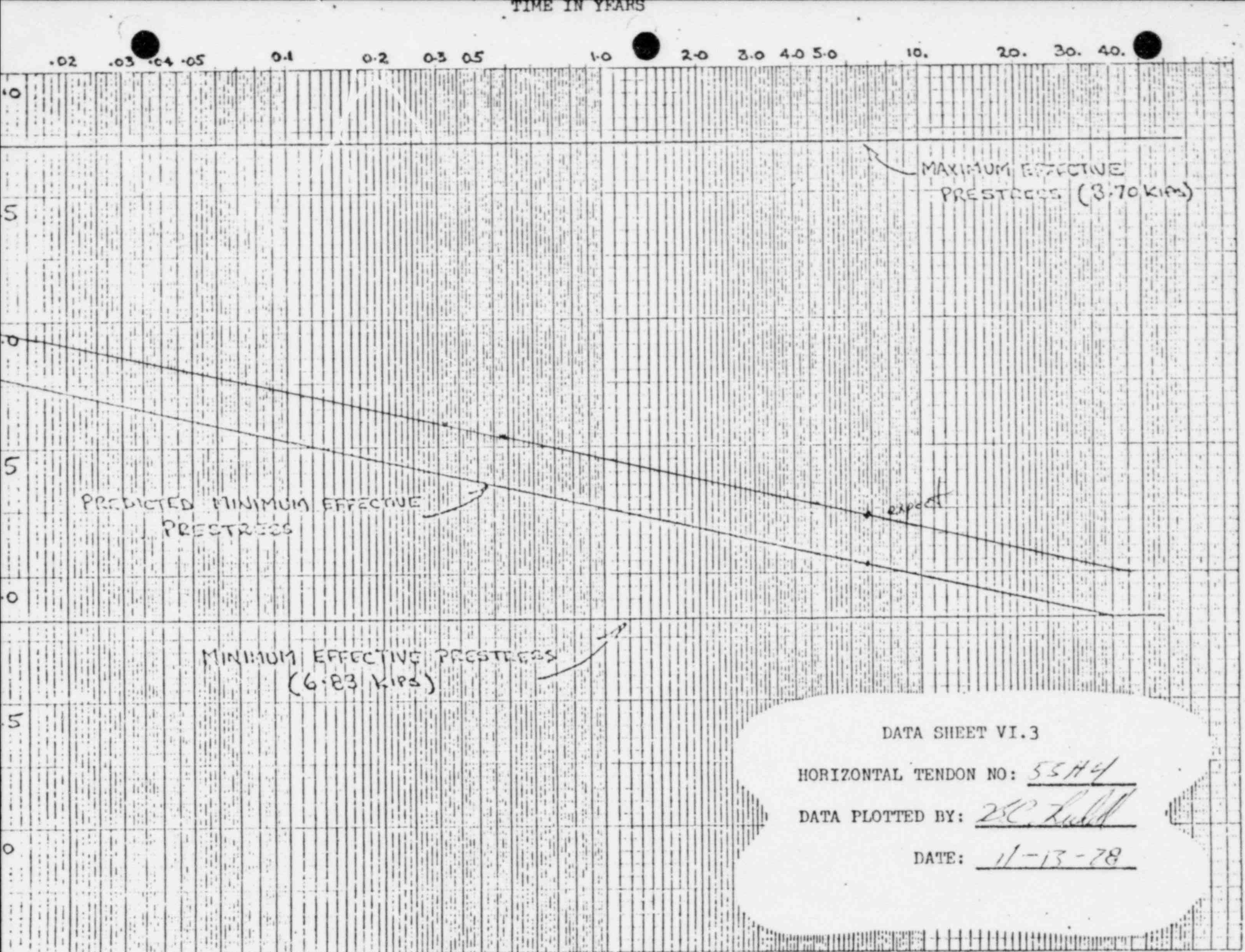
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 55H4

DATA PLOTTED BY: BC Kidd

DATE: 11-13-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 53H4

Closest Buttress	3
Grease Removal	2 gal
Date Filler CAP Removed	11-8-78
Date Grease Removal Started	11-8-78
Exterior Temp.	50°
Interior Temp.	106°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	11-9-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 53H4-Out. 3

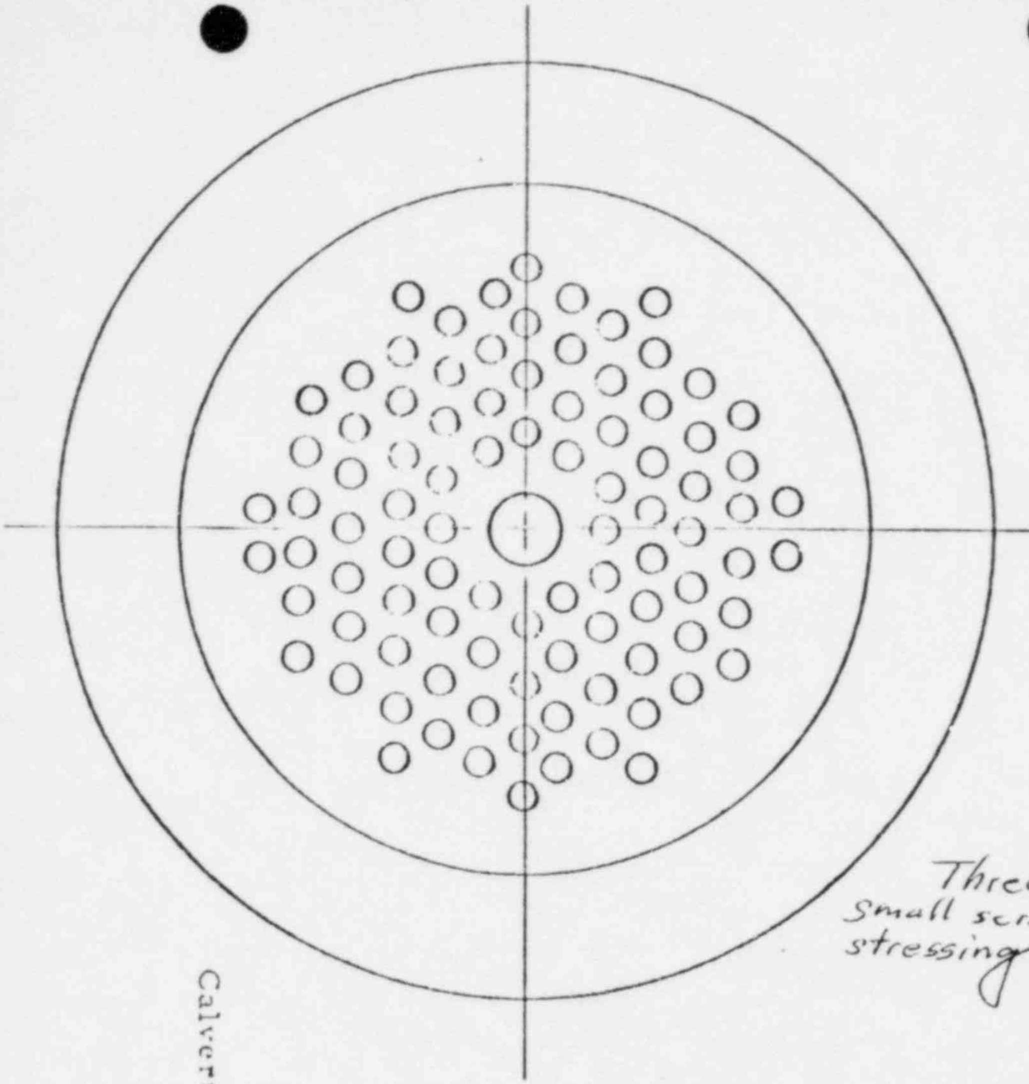
Data Recorded By: [signature]

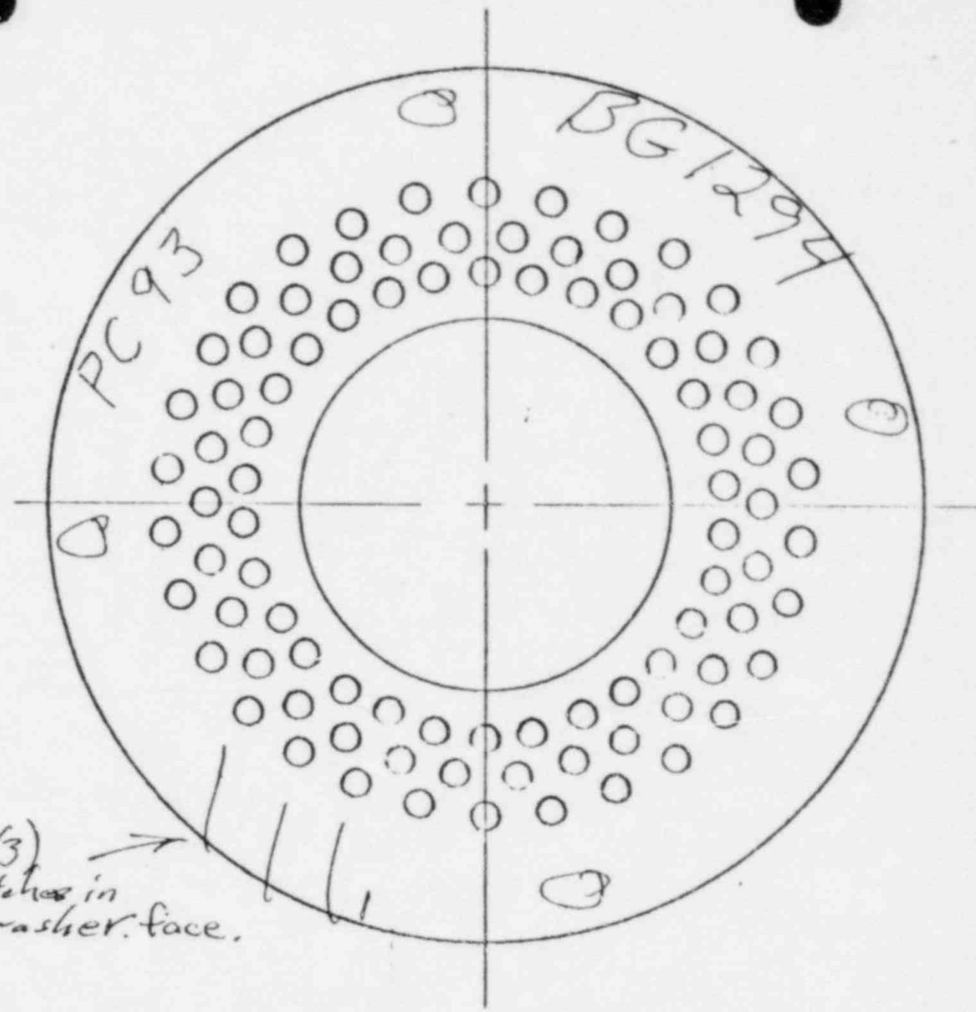
TENDON GREASE INSTALLATION

Pumped from other end

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap (Indicate if pumped or poured)	
Filler Temp. @ Outlet Cap (Indicate if pumped or poured)	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: [signature] Date 11-10-78





Three(3) small scratches in stressing washer face.

WIRE ANCHORAGE

Closest Buttress 3

Off-Size Buttonhead none

Buttonhead with Split none

Wire Removed Previously none

Discontinuous Wire Removed this surveillance NA

Wire removed this surveillance for inspection no

WIRE ANCHORAGE

Closest Buttress 5

Tendon No. 53H4

By [signature]

Date 11-8-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY H.C. Rudell

DATE 11-9-78

TENDON NUMBER 53H4 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	167.66 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	162.18
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.96 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648 Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	~~633.~~ Kips 634.
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Ram # 404500405008 Gauge # 4215108 Date Cal 7-20-78		
	Hydraulic Pressure at expected Lift Off	5100 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	[illegible] psi	psi

DATA SHEET 1 VI.1

Data Recorded By B.C. Kudell

Date 11-9-78

TENDON NUMBER: 53H4

Ram No. 404500 4050008
Gauge No. 4215108
Date Cal. 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5860 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	745 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ $\frac{745+770}{2} = 757.5$ Kips

Force Per Wire ($F_{LAV} \div N_e$) 8.42 Kips

Time since initial stressing of Tendon 6.8 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Kudell

Date 11-9-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5860 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	6360 psi	psi

Note: Above Maximum effective Prestress, Will install original shims.

DATA SHEET VI.2

Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 53H4 (alternate to 53H5) (could not rig to 53H5)

CLOSEST BUTTRESS 3

DATE: 11-9-78 DATA RECRODED BY: [signature]

RAM S/N: 404500 4050008 GAUGE S/N: 4215108

Date Cal 7-20-78

EP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero	✓				
I.B.1	Measure Shims	-	1 3/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
I.B.3	Lift Off avg lift off 5860psi	expect 5100psi **					
I.B.5	Pressurize to 0.8f's	6650psi **	6650psi ✓				
I.B.5	Elongation @ 0.8f's	-	2 1/16				
I.B.6	Depressurize to zero	-	✓ 3/16" - 3 1/2 =				
I.B.7	Pressurize to 1 kip/wire	700psi **	✓ 700 psi				
I	Elongation at 1 kip/wire		7/8" - 3 1/2" = -2 5/8				
II.	Remove Wire - This End Cut?	***	NA				
III.3	Pressurize to 1 kip/wire	**	700psi				
III.4	Elongation at 1 kip/wire		7/8" - 3 1/2 = -2 5/8				
III.5	Pressurize to 0.8f's	6650psi **	6650 ✓				
III.5	Elongation at 0.8f's		~~3/16"~~ 2 1/2				
III.6	Pressure for shim measure	6360 **	✓				
III.7	Elongation at shim press		2 1/4"				
III.7	Shims installed Oringinal + 1/2" set from other side		2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
III.8	Lift Off pressure avg 5920		5900	5900	5950	5950	5900
III.8	AVG Lift Off ≥ Initial AVG Lift Off? (755 + 720) ÷ 2 = 737.5	avg 737.5 kips / 90 wires	= 8.194 ≥ 8.42 No!				
III.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off NA	**	More shims would bring seating stress above maximum effective prestress!				
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

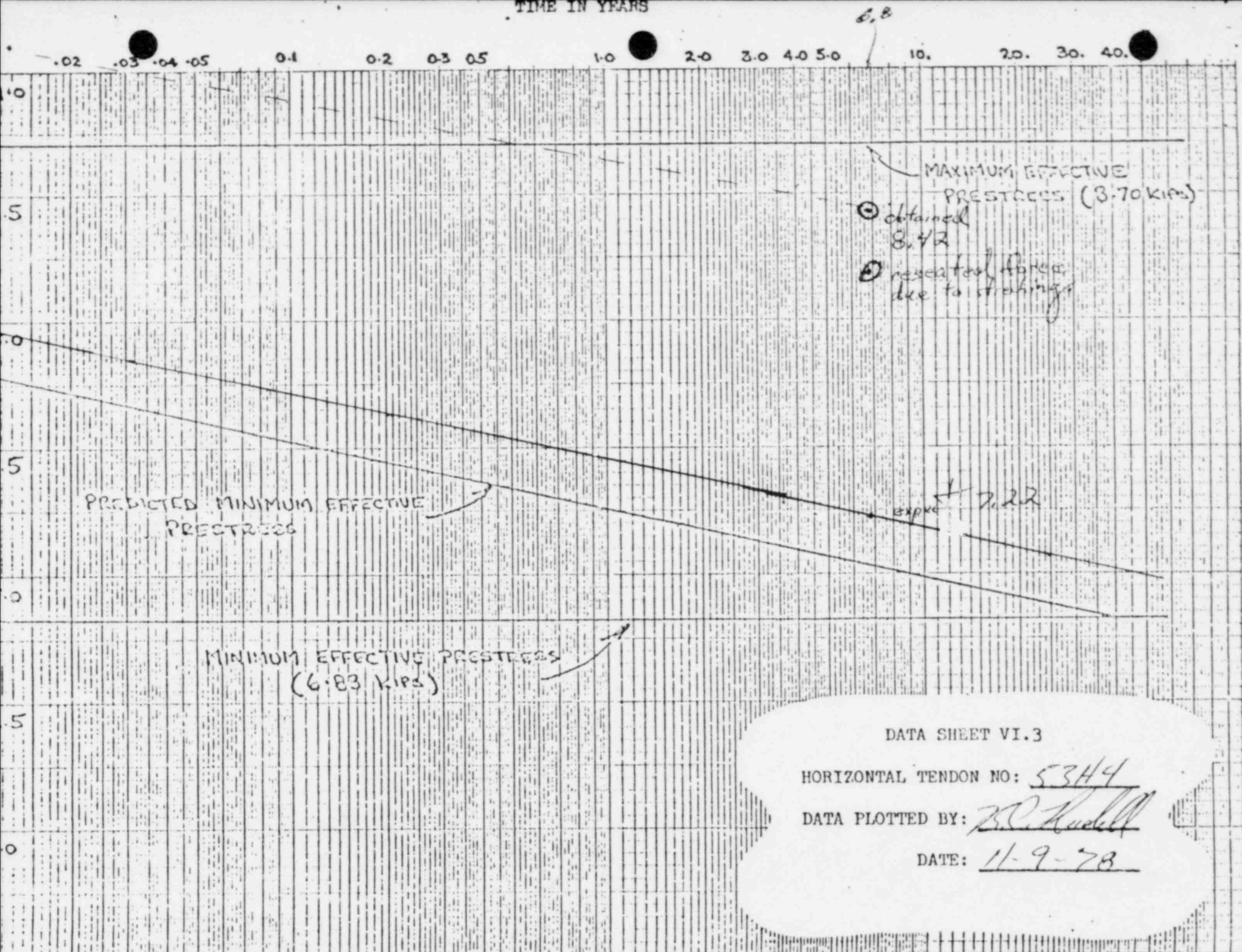
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 1/2	-2 5/8	3	2 1/16	4 1/2	4 11/16	9 3/16
RESTRESS	-1 1/2	-2 5/8	2 1/2	2 7/8	4	5 1/2	9 1/2



DATA SHEET VI.3

HORIZONTAL TENDON NO: 53H4

DATA PLOTTED BY: B.C. Kuckell

DATE: 11-9-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 26 H 4 This side on Aux. Bld.

Closest Buttress 2

Grease Removal 1 gal

Date Filler CAP Removed 11-1-78

Date Grease Removal Started 11-1-78

Exterior Temp. 54°

Interior Temp. 106°

Total Volume Removed 2 gal

Date Filler Cap Reinstalled 11-4-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken Yes Container Identification 26H4-2

Data Recorded By: B.C. Kudell

TENDON GREASE INSTALLATION

Date Installed 11-4-78

Exterior Temp. pumped from

Interior Temp. other end

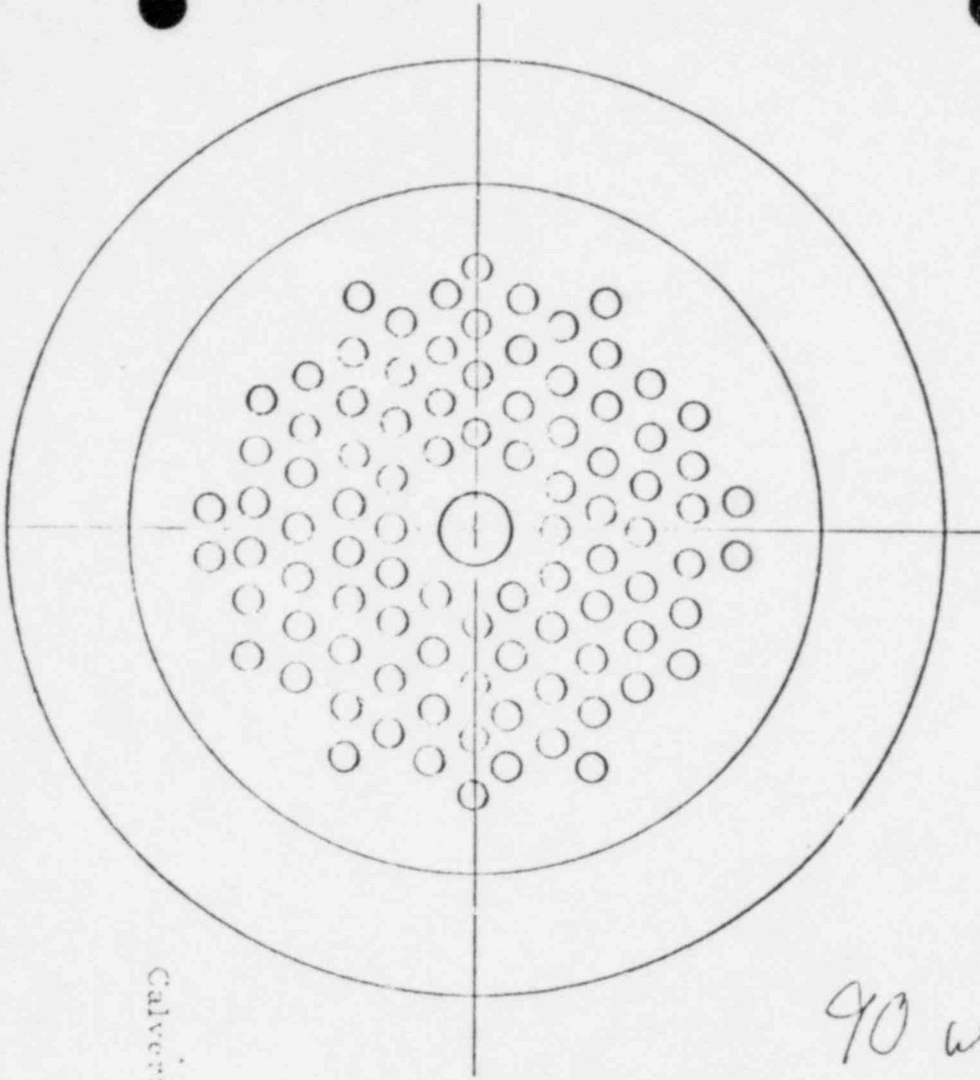
Filler Temp. @ Inlet Cap } Indicate if pumped or poured

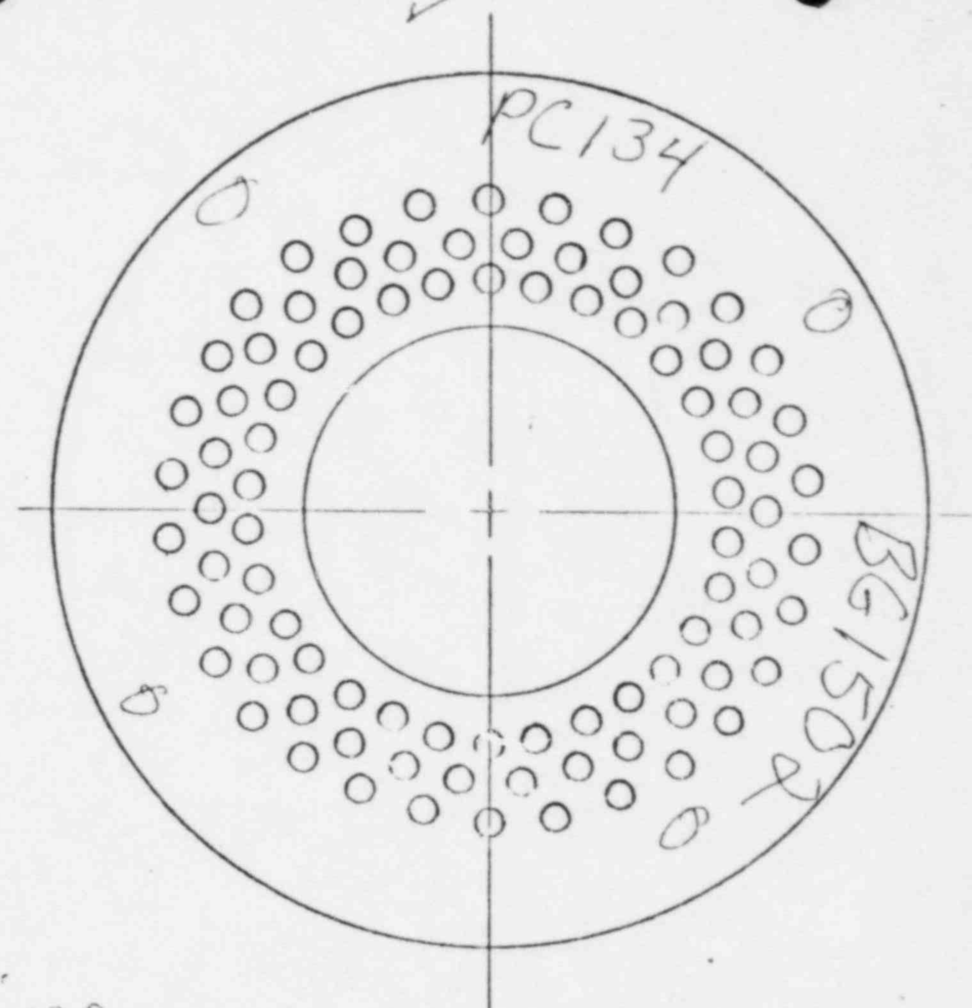
Filler Temp. @ Outlet Cap

Total Volume Installed

Installation Pressure (if poured, N/A)

Data Recorded By: B.C. Kudell Date 11-6-78





90 wires.

WIRE ANCHORAGE

Closest Buttress 2 No Rust Level 1

Off Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 2

Tendon No. 62H4

By [signature]

Date 11-2-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY: S.C. [illegible]

DATE 11-2-78

TENDON NUMBER 26 H 4 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	169.11 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.63
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	8.03 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648. Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

Ram No. 40450040500 8
Gauge No 4215108 Date Cal 7-20-78

RAM CALIBRATION CURVE		~~S/N~~ RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5100 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4980 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi

Data Recorded By [signature]

Date 11-3-78

TENDON NUMBER: 62-H4

Ram No. 40450C4050008
Gauge No. 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5270 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	668 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{F_L(1) + F_L(2)}{2}$ $666.5 = \frac{665+668}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.4 Kips

Time since initial stressing of Tendon 6.8 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 11-3-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's ($9.43 \times N_e$)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5270 psi	psi
Reduction in shim pressure, P_{RH}, ($N_R \times 50$)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5770 psi	psi

DATA SHEET VI.2

Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 62H4[illegible]

CLOSEST BUTTRESS #2

DATE: 11-3-78 DATA RECRODED BY: D.C. Kudell

RAM S/N: GAUGE S/N:

404500405000-8 Gauge No. 4215108

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gaures	Zero	✓				
VI.B.1	Measure Shims (1) 1/2" + (1) 1 3/4"	-	2 1/4"				
		avg 5270	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off expected 5100 psi	**	5200	5300	5250	5300	5300
VI.B.5	Pressurize to 0.8f's	6650 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	3 1/8"				
VI.B.6	Depressurize to zero	-	✓ 1 1/4 - 3 3/4 =				
VI.B.7	Pressurize to 1 kip/wire	700 psi **	✓				
V[illegible]	Elongation at 1 kip/wire		2 1/8 - 3 1/2 = -1 3/8				
VII.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**	✓				
VIII.4	Elongation at 1 kip/wire		2 1/8 - 3 1/2 = -1 3/8				
VIII.5	Pressurize to 0.8f's	6650 psi **	✓				
VIII.5	Elongation at 0.8f's		3 1/4"				
VIII.6	Pressure for shim measure	5770 psi **	✓				
VIII.7	Elongation at shim press		2 3/8"				
VIII.7	Shims installed 2 1/4" original shims		2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure	avg 5410	5400	5350	5500	5400	5400
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	Ram 1 685 Ram 2 670	677.5 ≥ 666. ksi ✓				
VIII.9	If "NO" above Pressurize to 1000 psig above	**					
	Initial avg. [illegible] Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER

DATE: DATA RECORDED BY:

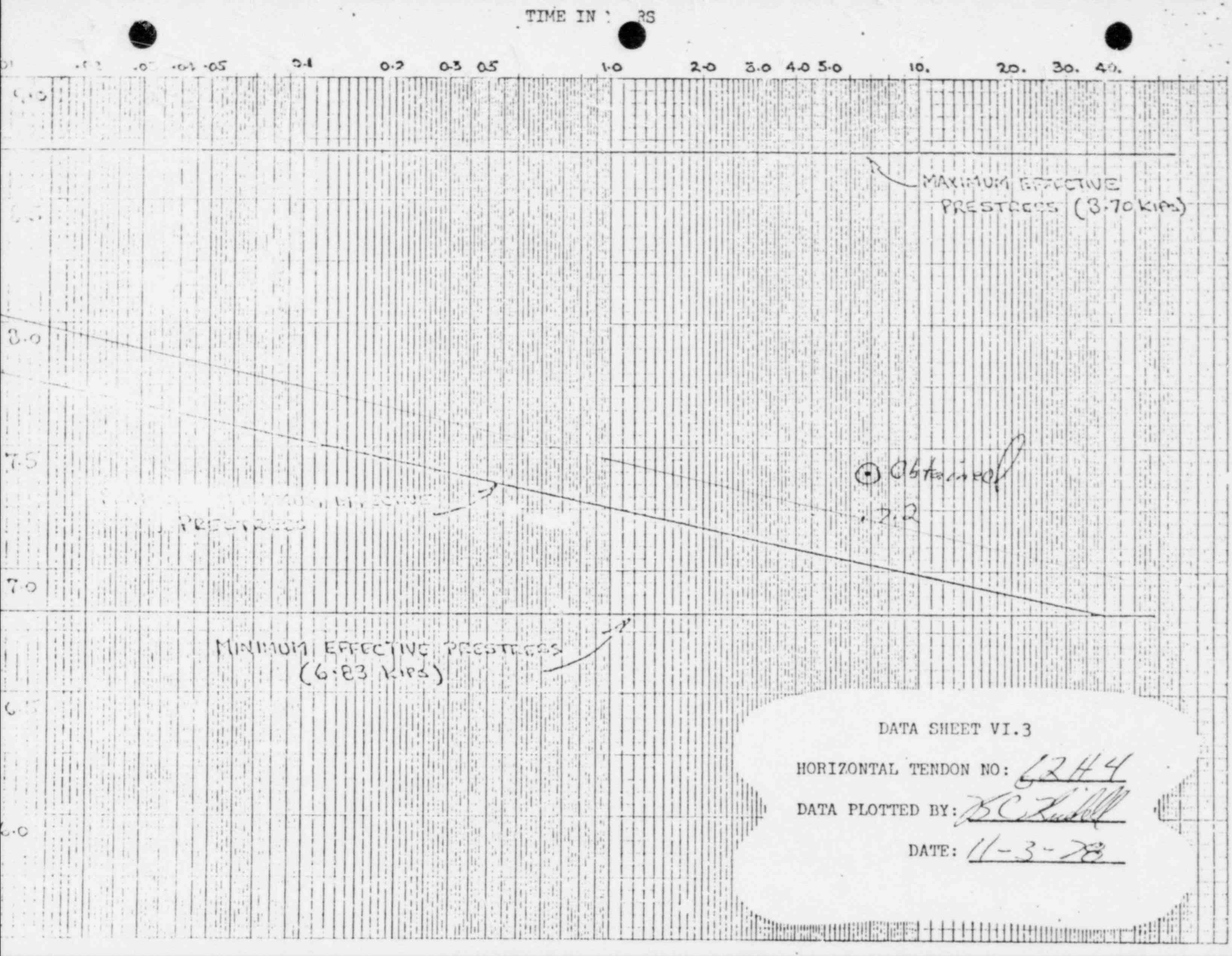
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 62H4

DATA PLOTTED BY: B C Kudell

DATE: 11-3-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 26 H 4

Closest Buttress 6

Grease Removal 1 Gal.

Date Filler CAP Removed 11-1-78

Date Grease Removal Started 11-1-78

Exterior Temp. 54°

Interior Temp. 106°

Total Volume Removed 2 gal

Date Filler Cap Reinstalled 11-4-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Two Tone Light Brown + Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken Yes Container Identification Bat #6 Pot #4 26H4-6

Data Recorded By: B.C. Rudell 11-1-78

TENDON GREASE INSTALLATION

Date Installed 11-4-78

Exterior Temp. 54°

Interior Temp. 106°

Filler Temp. @ Inlet Cap ~120°F

Filler Temp. @ Outlet Cap

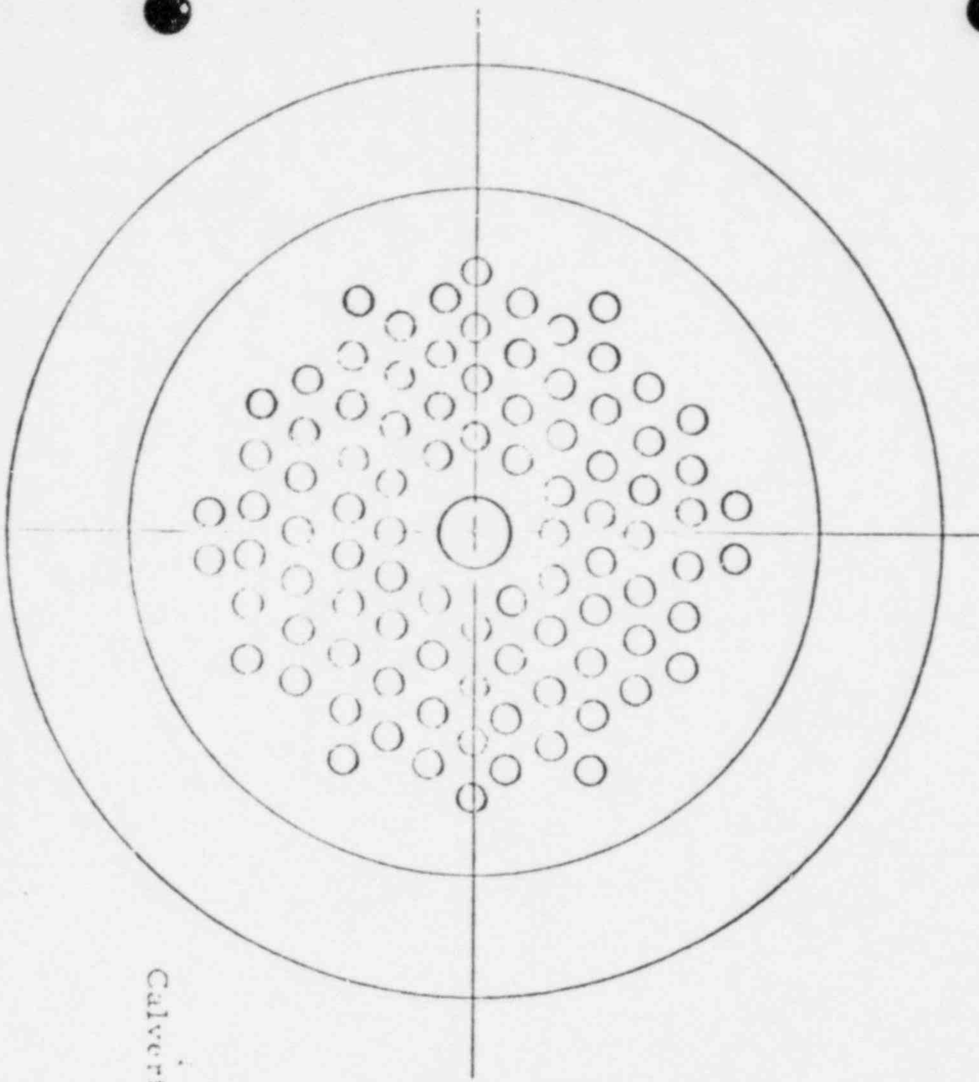
(Indicate if pumped or poured)

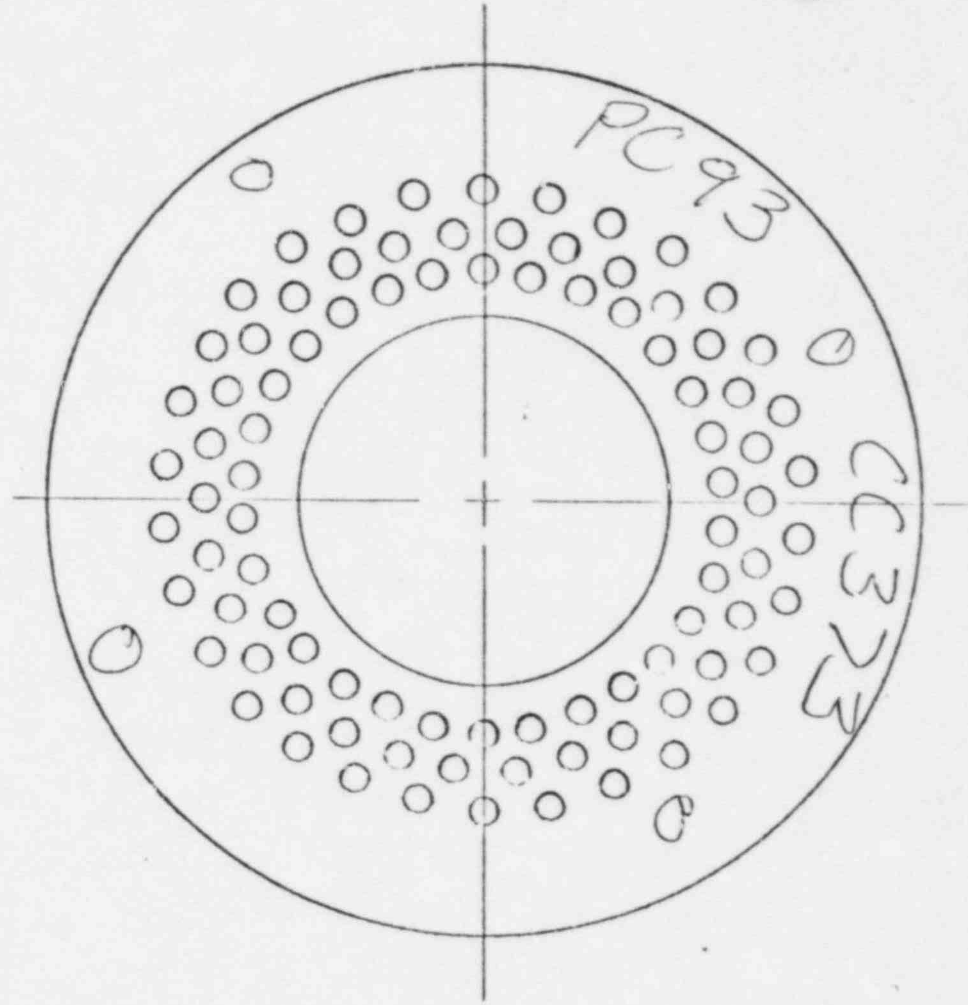
Total Volume Installed 4 gal

Installation Pressure (if poured, N/A) 20 psi

6

Data Recorded By: ______ Date ______





WIRE ANCHORAGE

Closest Buttress 6 | No rust Shims Good

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 6

Tendon No. 62H4

By B.C. Kidell

Date 11-1-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY [illegible]

DATE 11-3-[illegible]

TENDON NUMBER 26 H4 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	169.11 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.63
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.03 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.2 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	648. Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVES		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By [illegible]

Date [illegible]

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		5220
Tendon Lift Offs Acceptable?		yes
Lift Off Force, F_L	Kips	665 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips 666.5

Force Per Wire ($F_{LAV} \div N_e$) Kips 7.4

Time since initial stressing of Tendon Years 6.8

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 11-3-79

	RAM (1) S/N	RAM(2) S/N [illegible]
Number of wires removed this surveillance N_R		Wires NONE
Number of effective wires N_e		Wires 90
0.8f's (9.43 x N_e)		Kips 848.7
Hydraulic Force @ 0.8f's	psi	6650 psi
Original Lift-Off Hydraulic pressure, P_L	psi	5220 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	psi	5720 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 26-H-9

CLOSEST BUTTRESS 6

DATE: 11-3-78 DATA RECRODED BY: [illegible]

RAM S/N: 404500 505000-8 GAUGE S/N: 421510b

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 1/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	5200	5200	5250	5250	5200
VI.B.5	Pressurize to 0.8f's	**	✓				
VI.B.5	Elongation @ 0.8f's	-	3 3/16				
VI.B.6	Depressurize to zero	-	1 11/16				
VI.B.7	Pressurize to 1 kip/wire	**	700				
V[illegible]	Elongation at 1 kip/wire		1 7/8 - 3 1/2 = -1 5/8				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	-					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	6650 **	✓				
VIII.5	Elongation at 0.8f's		3 1/4				
VIII.6	Pressure for shim measure	5720 **	✓				
VIII.7	Elongation at shim press		2 13/16				
VIII.7	Shims installed		2 1/2 Add 1/4 in shim				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5300	5350	5250	5300	5300
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		677.5 > 666.6 ✓				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER

DATE: DATA RECORDED BY:

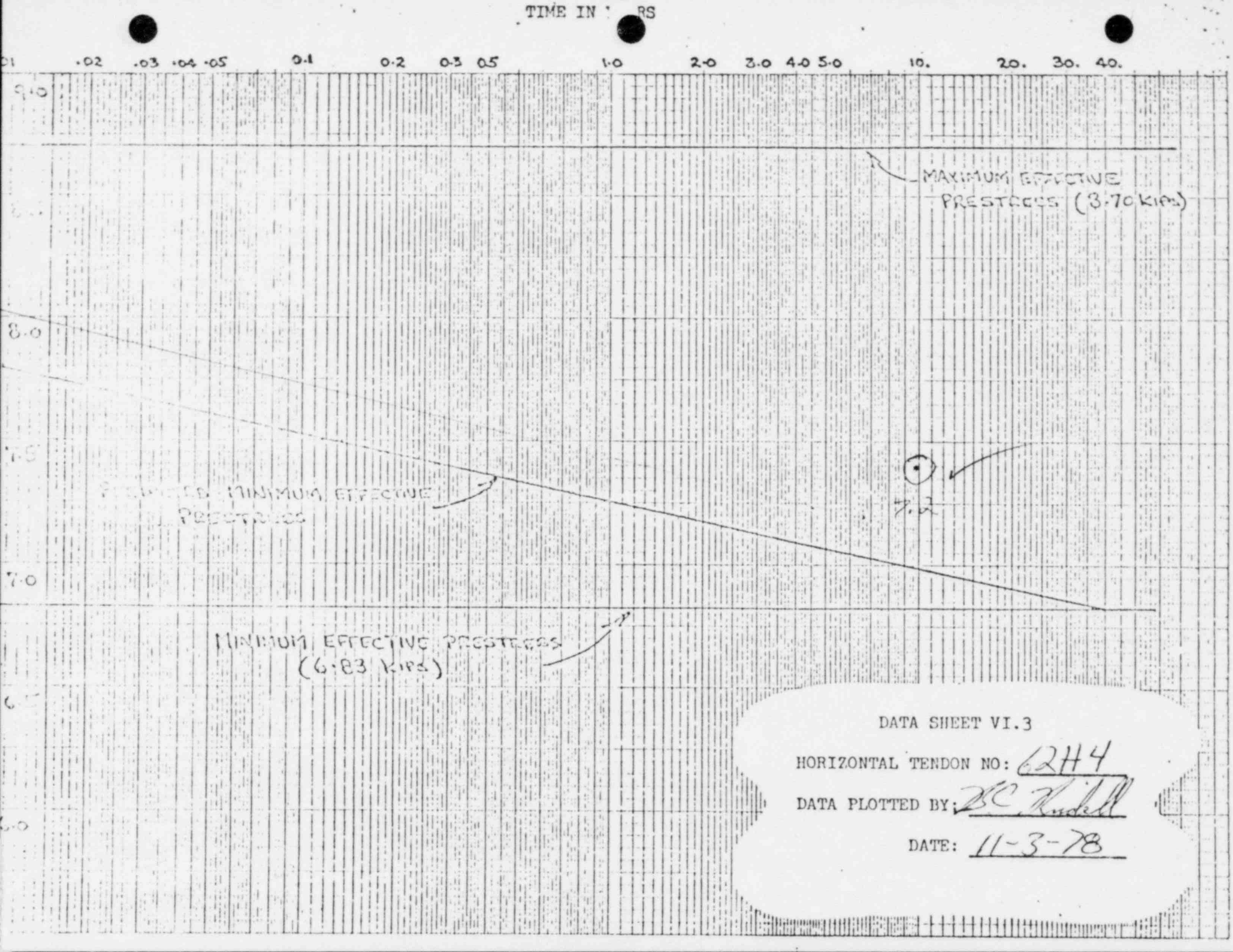
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 3/8	-1 5/8	3 1/8	3 3/16	4 1/2	4 13/16	9 5/16
RESTRESS	-1 3/8	-1 5/8	3 1/4	3 1/4	4 5/8	4 7/8	9 1/2



DATA SHEET VI.3

HORIZONTAL TENDON NO: 62H4

DATA PLOTTED BY: BC Kudell

DATE: 11-3-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 64 H 40

Closest Buttress 6

Grease Removal 10-26-78

Date Filler CAP Removed 10-26-78

Date Grease Removal Started 10-26-78

Exterior Temp. 70°

Interior Temp. 108°

Total Volume Removed 2 gal

Date Filler Cap Reinstalled 10-30-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Two Tone (Brown + Dark Brown)

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 64 H 40 Buttress 6

Data Recorded By: D. C. Kudell

TENDON GREASE INSTALLATION

Date Installed 10-30-78

Exterior Temp. 70°

Interior Temp. 108°

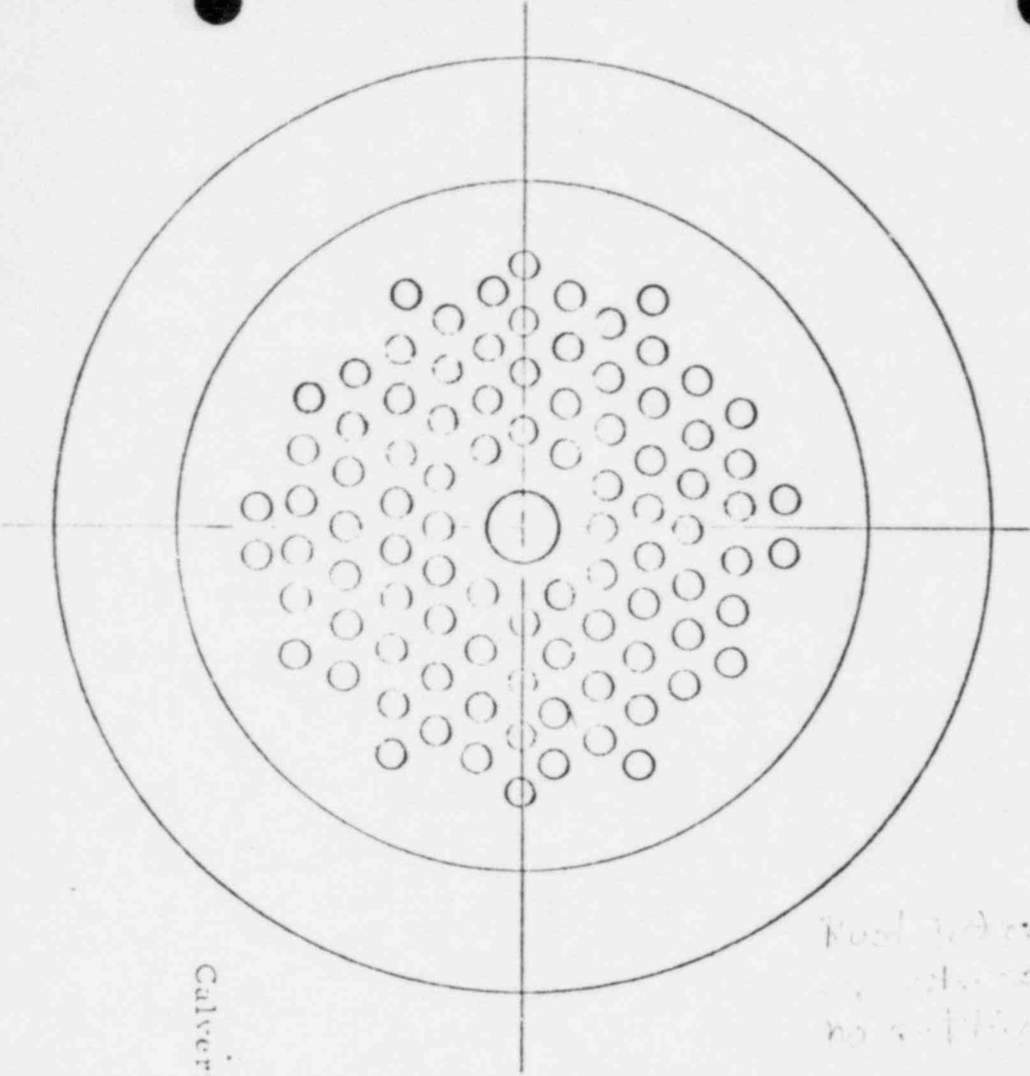
Filler Temp. @ Inlet Cap } Indicate if pumped or poured pumped 120°F

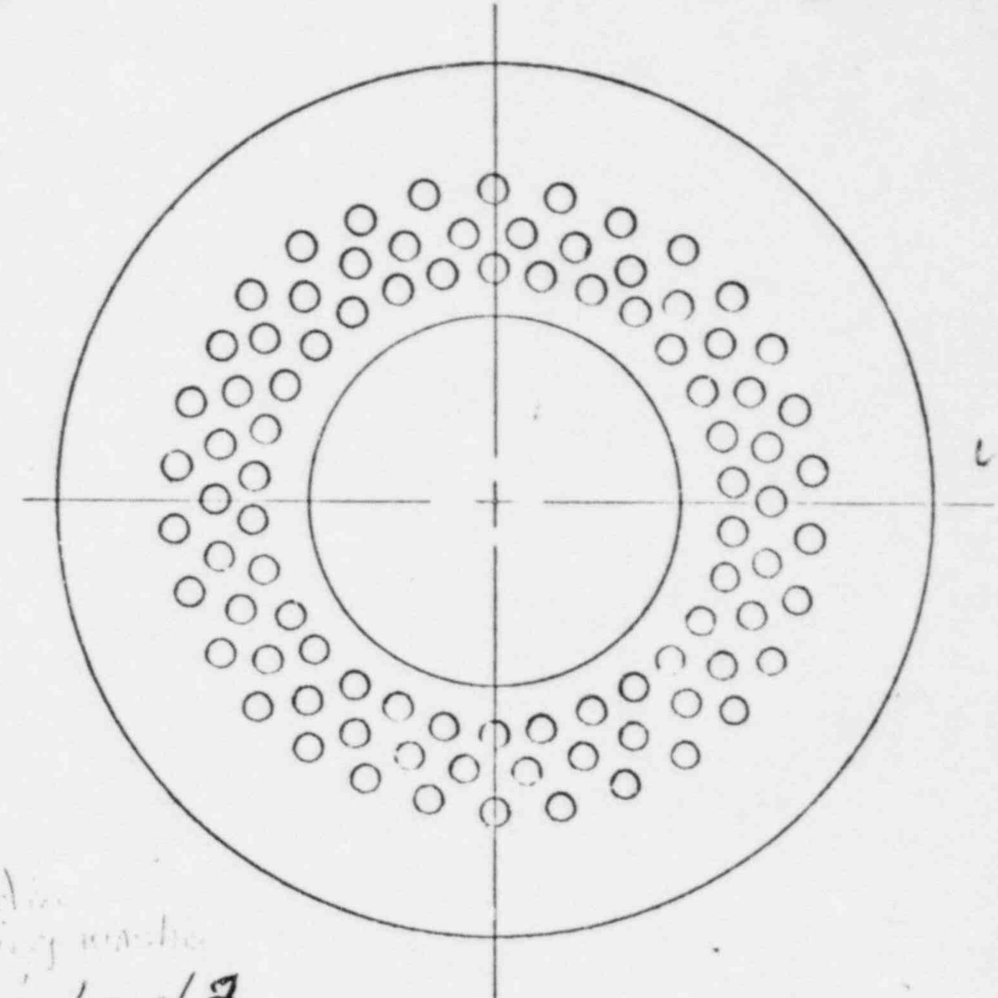
Filler Temp. @ Outlet Cap

Total Volume Installed 8 gal

Installation Pressure (if poured, N/A)

Data Recorded By: D. C. Kudell Date 10-30-78





Level 2

WIRE ANCHORAGE

Closest Buttress ________

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 6

Tendon No. 64H40

By [illegible signature]

Date 10-30-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY [illegible signature]

DATE 10-28-78

TENDON NUMBER 64 H 40 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.84 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.36
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.92 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-19-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.12 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	640.8 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVES		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	4680 psi
	Hydraulic Pressure at maximum effective prestress	psi	5700 psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	4600 psi
	Hydraulic pressure at absolute minimum effective prestress	psi	45[illegible] psi
	Hydraulic Pressure at 0.8f's	psi	6175 psi

Data Recorded By [illegible]

Date 10-28-78

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		615 kips
Tendon Lift Offs Acceptable?		within 4% [illegible]
Lift Off Force, F_L	Kips	~~[illegible]~~ 597 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 610.5 Kips ~~622~~

Force Per Wire ($F_{LAV} \div N_e$) 6.78 ~~Kips~~ ~~[illegible]~~

Time since initial stressing of Tendon Years 6.6

Note: New Cal Ram Date On 12" Ram

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______

Date 10·28·78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires 0	
Number of effective wires N_e	Wires 90	
0.8f's (9.43 x N_e)	Kips 848.7	
Hydraulic Force @ 0.8f's	psi	6175 psi
Original Lift-Off Hydraulic pressure, P_L	psi	4500 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	psi	5000 psi

DATA SHEET VI.2

Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 40

CLOSEST BUTTRESS 6

DATE: 10-28-78 DATA RECRODED BY: [illegible]

RAM S/N: 10450 200 500-12 GAUGE S/N: 4215004A

CAL DATE 3-14-79

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	2 1/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	45[illegible]	4500	4500	4500	4500
VI.B.5	Pressurize to 0.8f's	**	63[illegible]				
VI.B.5	Elongation @ 0.8f's	-	3 1/4				
VI.B.6	Depressurize to zero	-	1 1/4-3 3/4 - 2				
VI.B.7	Pressurize to 1 kip/wire	**					
V[illegible]7	Elongation at 1 kip/wire		2 5/16 - 3 1/2 = -1 3/16				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	-	~~[illegible]~~				
VIII.4	Elongation at 1 kip/wire		[illegible] 3 1/2 = -1 3/16				
VIII.5	Pressurize to 0.8f's	**	✓				
VIII.5	Elongation at 0.8f's		4				
VIII.6	Pressure for shim measure	**	5000				
VIII.7	Elongation at shim press		2 1/2				
VIII.7	Shims installed Added 1 Set 1/4" Shim		2 1/2				
	Average 4[illegible]		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		4400	4450	4[illegible]	[illegible]	[illegible]
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		✓ Yes				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. lift-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER

DATE: DATA RECORDED BY:

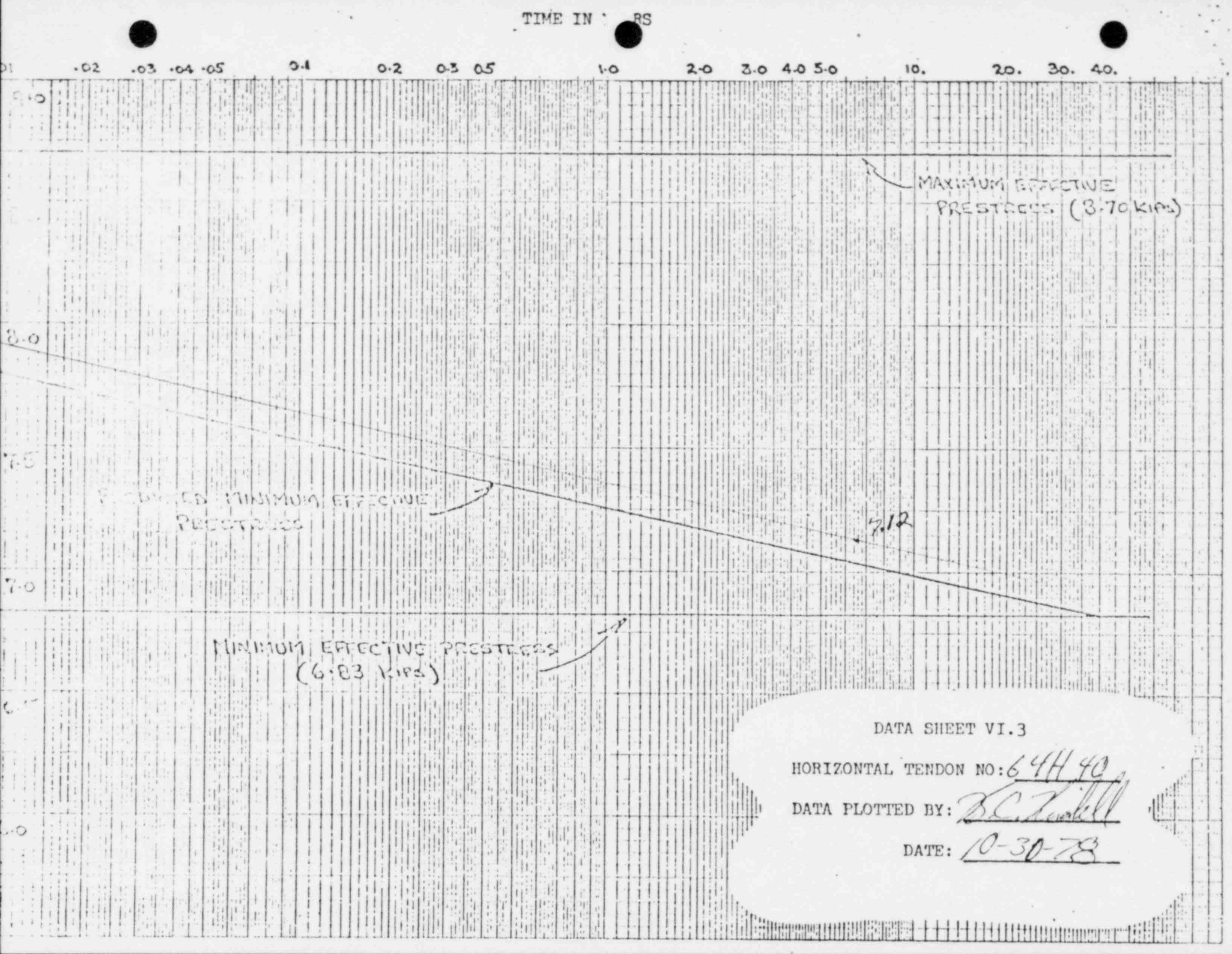
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 64H40

DATA PLOTTED BY: B.C. [illegible]

DATE: 10-30-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 64 H 40

Closest Buttress 4 (In Aux Bldg.)

Grease Removal 10-27-78 ← 5 gal

Date Filler CAP Removed 10-27-78

Date Grease Removal Started 10-27-78

Exterior Temp. 70°

Interior Temp. 108°

Total Volume Removed 6 gal

Date Filler Cap Reinstalled 10-30-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 64 H 40 Buttress 4

Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed 10-30-78

Exterior Temp. Pumped

Interior Temp.

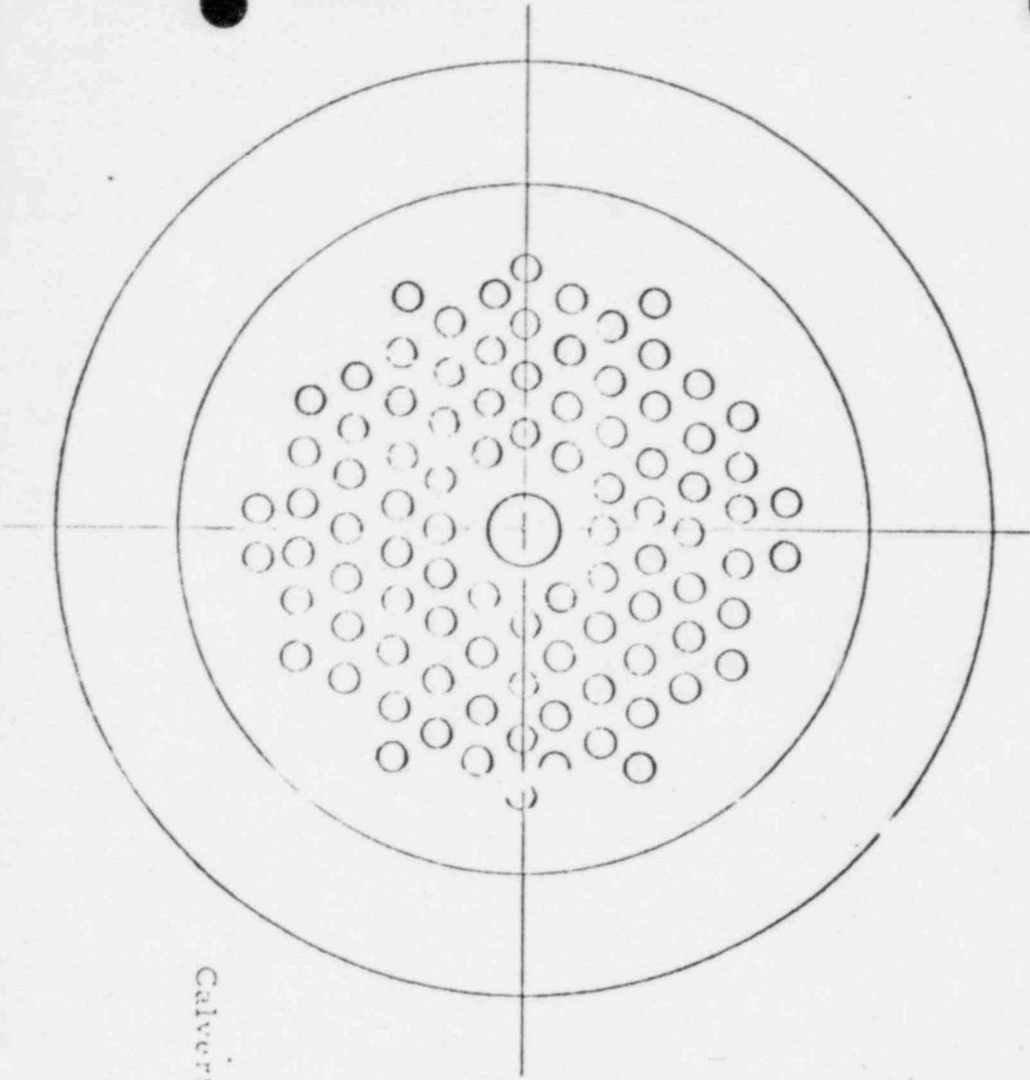
Filler Temp. @ Inlet Cap } Indicate if pumped or poured Grease from

Filler Temp. @ Outlet Cap Other End

Total Volume Installed

Installation Pressure (if poured, N/A)

Data Recorded By: [signature] Date 10-30-78



WIRE ANCHORAGE

Closest Buttress 4

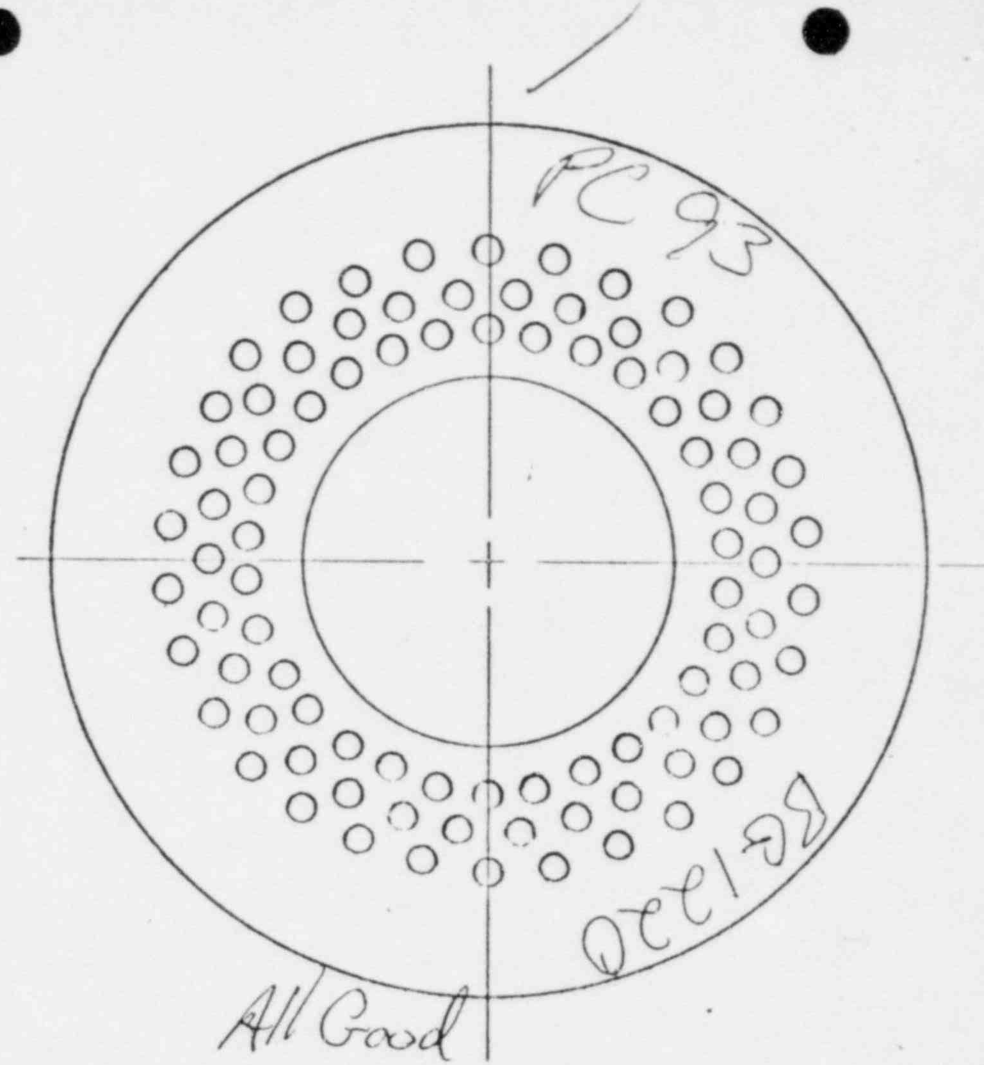
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 64H40

By B.C. Lukell

Date 10-30-78

Small Amount of Level 1
Rust.

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

Rev. 2
Page (1)

DATA SHEET VI.1

DATA RECORDED BY: B.C. Kidell

DATE 10-29-78

TENDON NUMBER 64 H 40 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	166.84 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.36
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.92 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 1-19-72 — 8-1-78	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.12 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	640.8 Kips ✓
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.05 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips ✓
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	634.5 Kips ✓
	Absolute min. effective prestress ($F_{min} \times N_e$)	614.7 Kips ✓
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips ✓
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Ram # 404500405000-8 Gauge # 4215108 Date Cal. 7-20-78		
	Hydraulic Pressure at expected Lift Off	5050 psi	psi
	Hydraulic Pressure at maximum effective prestress	6130 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4970 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4840 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi

Data Recorded By B. C. Kudell

Date 10-29-78

TENDON NUMBER: 64H40

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	4940 psi	
Tendon Lift Offs Acceptable?	within 4% of expected	
Lift Off Force, F_L	629 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ $\frac{615 + 629}{2}$ = ~~622.~~ Kips > 610.5

Force Per Wire ($F_{LAV} \div N_e$) Note: New Cal On 12" Ram ~~6.91~~ Kips > 6.78

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B. C. Kudell

Date 10-29-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, , P_L	4940 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5440 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 64H40

3 3/4

CLOSEST BUTTRESS 4

DATE: 10-29-78 DATA RECRODED BY: D.C. Hudell

RAM S/N: 404500405 038 GAUGE S/N: 4215108

Date Cal. 7-20-78

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	~~2 ...~~ DCH 2 1/2"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg. 4940	~~...~~ 5050 psi **	5100	4900	4900	4900	4900
VI.B.5	Pressurize to 0.8f's	6650 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	3 5/16"				
VI.B.6	Depressurize to zero	-	~~1 3/2 - 3 1/4~~ =				
VI.B.7	Pressurize to 1 kip/wire	700 psi **	~~2 1/8 - 3 1/2~~ =				
VI.B.7	Elongation at 1 kip/wire		2 1/8 - 3 1/2 = -1 3/8				
VII.	Remove Wire - This End Cut?	***	N/A				
VIII.3	Pressurize to 1 kip/wire	700 psi **	✓				
VIII.4	Elongation at 1 kip/wire		✓ 2 1/8 - 3 1/2 = -1 3/8				
VIII.5	Pressurize to 0.8f's	6650 psi **	✓				
VIII.5	Elongation at 0.8f's		3 3/16"				
VIII.6	Pressure for shim measure	5440 **	5500 psi				
VIII.7	Elongation at shim press		1 11/16" 1 15/16" 2 11/16"				
VIII.7	Shims installed		Added 1/4" Shim 2 3/4" total				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure avg 5690 psi		5700	5700	5750	5600	5700
VIII.8	avg 5690 ≥ 4940 AVG Lift Off ≥ Initial AVG Lift Off?	✓	$\frac{720+660}{2}$ = 690 ≥ 622 ✓				
VIII.9	If "NO" above Pressurize to 1000 psig above	**					
	Initial avg. lift-off Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 64H40

DATE: DATA RECORDED BY:

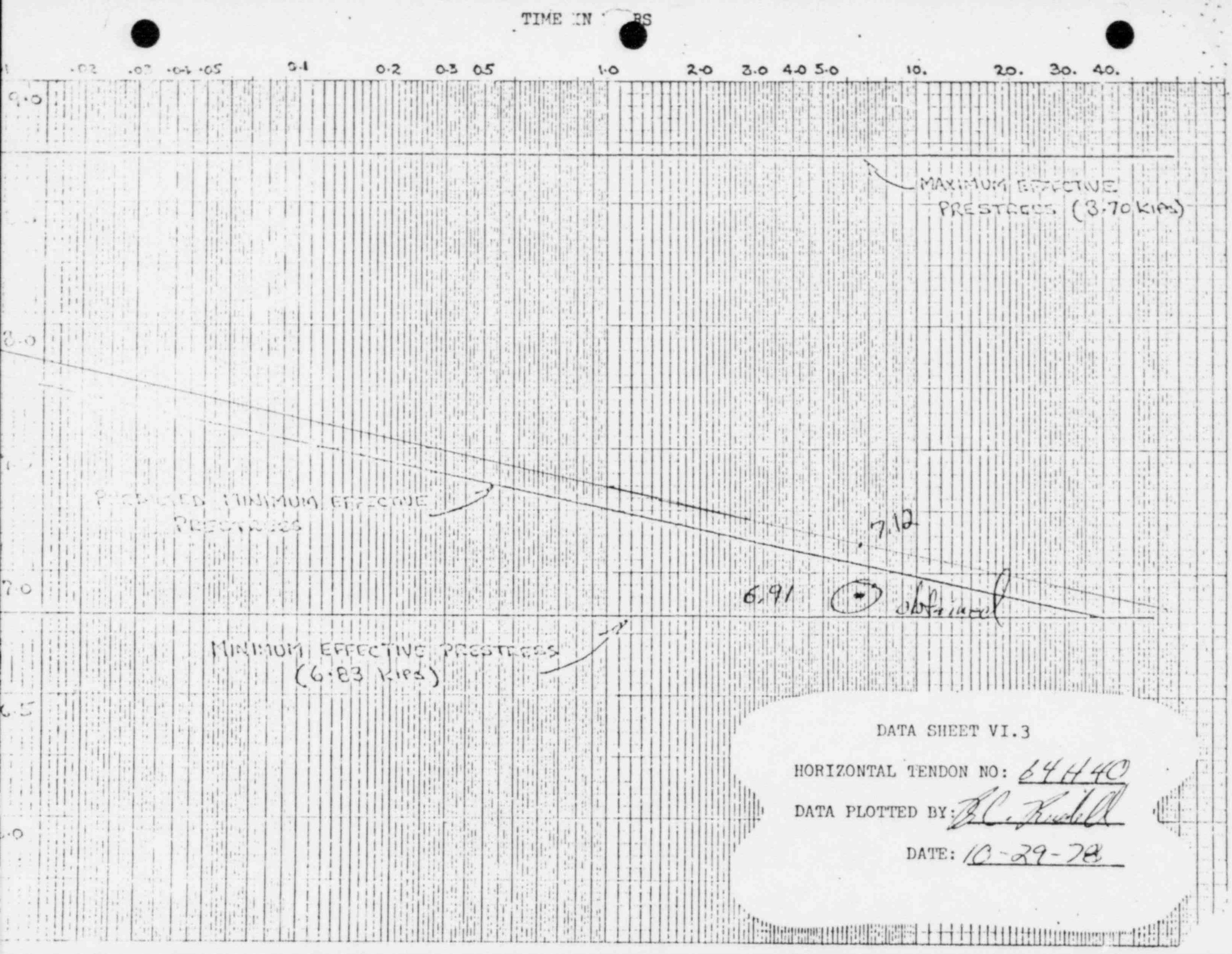
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-1 3/16	-1 3/8	3 1/4	3 5/16	4 7/16	4 11/16	9 1/8
RESTRESS	-1 3/16	-1 3/8	4	3 3/16	5 3/16	4 9/16	9 3/4



DATA SHEET VI.3

HORIZONTAL TENDON NO: 64H40

DATA PLOTTED BY: B.C. Kuhl

DATE: 10-29-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 3D43-S

Closest Buttress	4
Grease Removal	9 gal
Date Filler CAP Removed	8-26-78
Date Grease Removal Started	8-26-78
Exterior Temp.	77°F
Interior Temp.	119°F
Total Volume Removed	9 gal
Date Filler Cap Reinstalled	8/28/78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Liquid Dark Brown

Presence of Water Indicated none

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 3D43-S

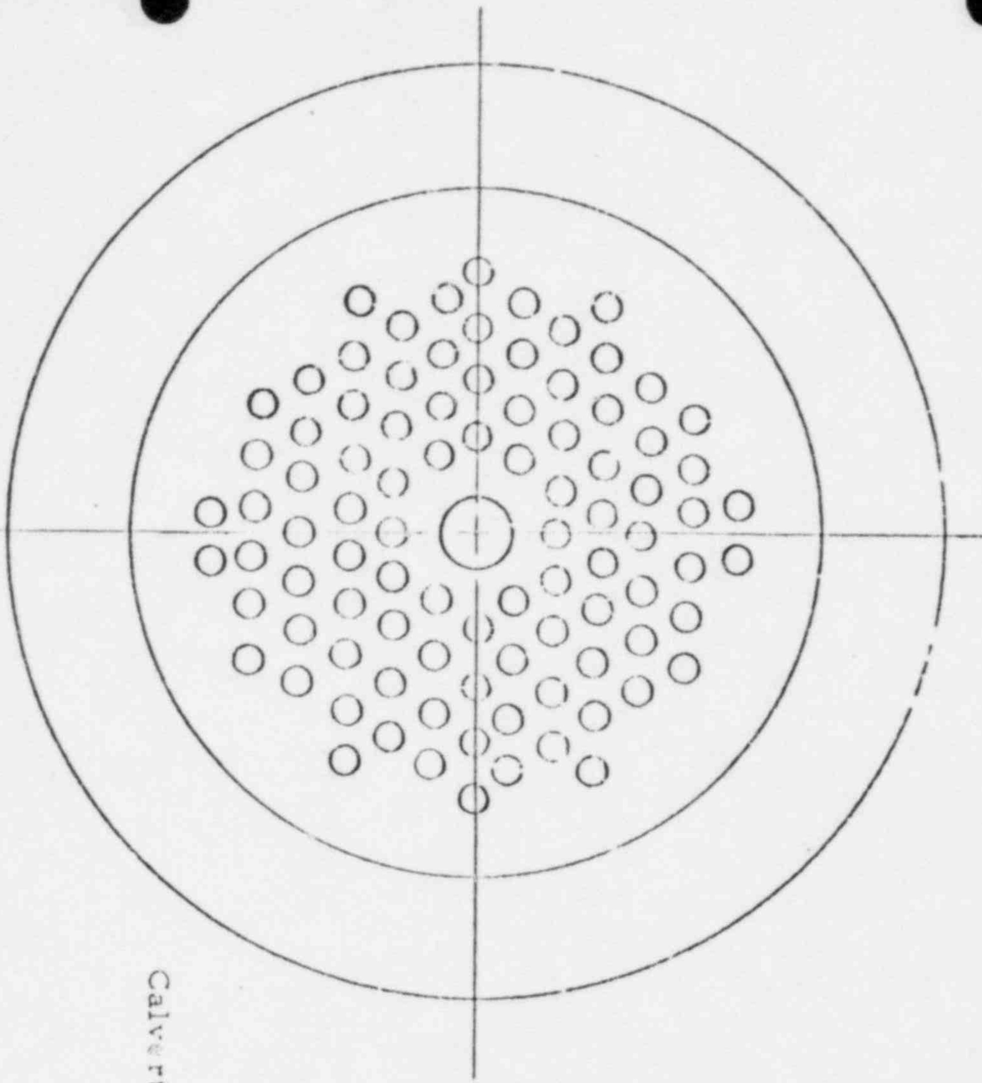
Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed	NA
Exterior Temp.	NA
Interior Temp.	NA
Filler Temp. @ Inlet Cap (Indicate if pumped or poured)	NA
Filler Temp. @ Outlet Cap (Indicate if pumped or poured)	NA
Total Volume Installed	NA
Installation Pressure (if poured, N/A)	NA

pumped from other side

Data Recorded By: [signature] Date 8-25-78



WIRE ANCHORAGE

Closest Buttress 4

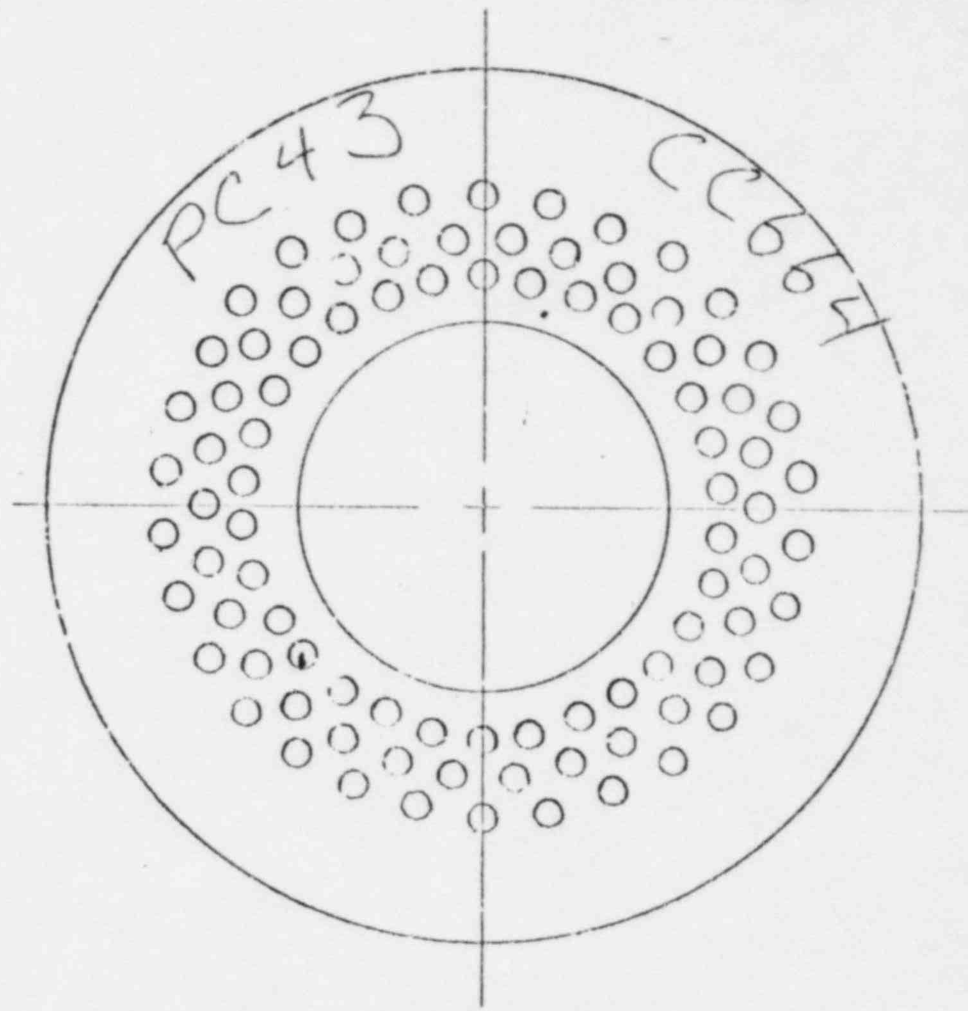
Off-Size Buttonhead 1 too large

Buttonhead with Split none

Wire Removed Previously none

Discontinuous Wire Removed this surveillance none

Wire removed this surveillance for inspection none



WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 3D43

By B. C. Hubbell

Date 8-26-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY D.C. Liddell

DATE 8-26-78

TENDON NUMBER 3D43 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	170.52 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.70
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	8.036 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.4 Kips
	Number of effective wires Ne	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	666 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	643. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram No. 404500405 0008 Gauge No. 4215108 Date Cal 7-20-78		
	Hydraulic Pressure at expected Lift Off	5250 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5070 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4920 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

DATA SHEET 1 VI.1

Data Recorded By R.C. Rudill

Date 8-26-78

TENDON NUMBER: 3D43

Ram No 40450040500008
Gauge No 4215108
Date Cal 7-20-78

	~~RAM (1)~~ S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5325	
Tendon Lift Offs Acceptable?	YES	
Lift Off Force, F_L	678 ~~680~~ Kips	680 Kips

Note: New Cal. On 12" Ram RH

Average Lift Off Force F_{LAV} $\frac{F_L(1) + F_L(2)}{2}$	679 ~~7.55~~	Kips	764
Force Per Wire ($F_{LAV} \div N_e$)	7.55	Kips	7.38
Time since initial stressing of Tendon	6.6	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 8/28/78

Ram No 40405004050008
Gauge No 4215108
Date Cal 7-20-78

	~~RAM (1)~~ S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5325 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5825 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 3043

CLOSEST BUTTRESS 4

DATE: 8-26-78 DATA RECRODED BY: [illegible signature]

RAM S/N: 4045004050008 GAUGE S/N: 4215108 Date Cal. 7-20-78

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	5" (4 shim)				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off expected 5250	*	~~5250~~ 5300	5400	5350	5250	5300
			5320 AVG				
VI.B.5	Pressurize to 0.8f's	6650 psi **					
VI.B.5	Elongation @ 0.8f's	-	5.25"				
VI.B.6	Depressurize to zero	-	—				
VI.B.7	Pressurize to 1 kip/wire	740 psi **	~~[illegible]~~				
VI.B.7	Elongation at 1 kip/wire		~~[illegible]~~ 2 1/8" [illegible]				
VII.	Remove Wire - This End Cut?	***	NO				
VIII.3	Pressurize to 1 kip/wire	740 psi **	—				
VIII.4	Elongation at 1 kip/wire		2 1/8"				
VIII.5	Pressurize to 0.8f's	6650 psi **					
VIII.5	Elongation at 0.8f's		6 3/4"				
VIII.6	Pressure for shim measure	**	5825				
VIII.7	Elongation at shim press		6 1/2"	shim ADDED ~~installed~~			
VIII.7	Shims installed	6 3/8	6 1/4"	1 PAIR 1" shim, 1 PAIR 3/4" shim			
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5300	5500	5550	5600	5300
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	5460 (1690 KIPS)	5600	5700	5500	5400	5400
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 3D43

DATE:

DATA RECORDED BY:

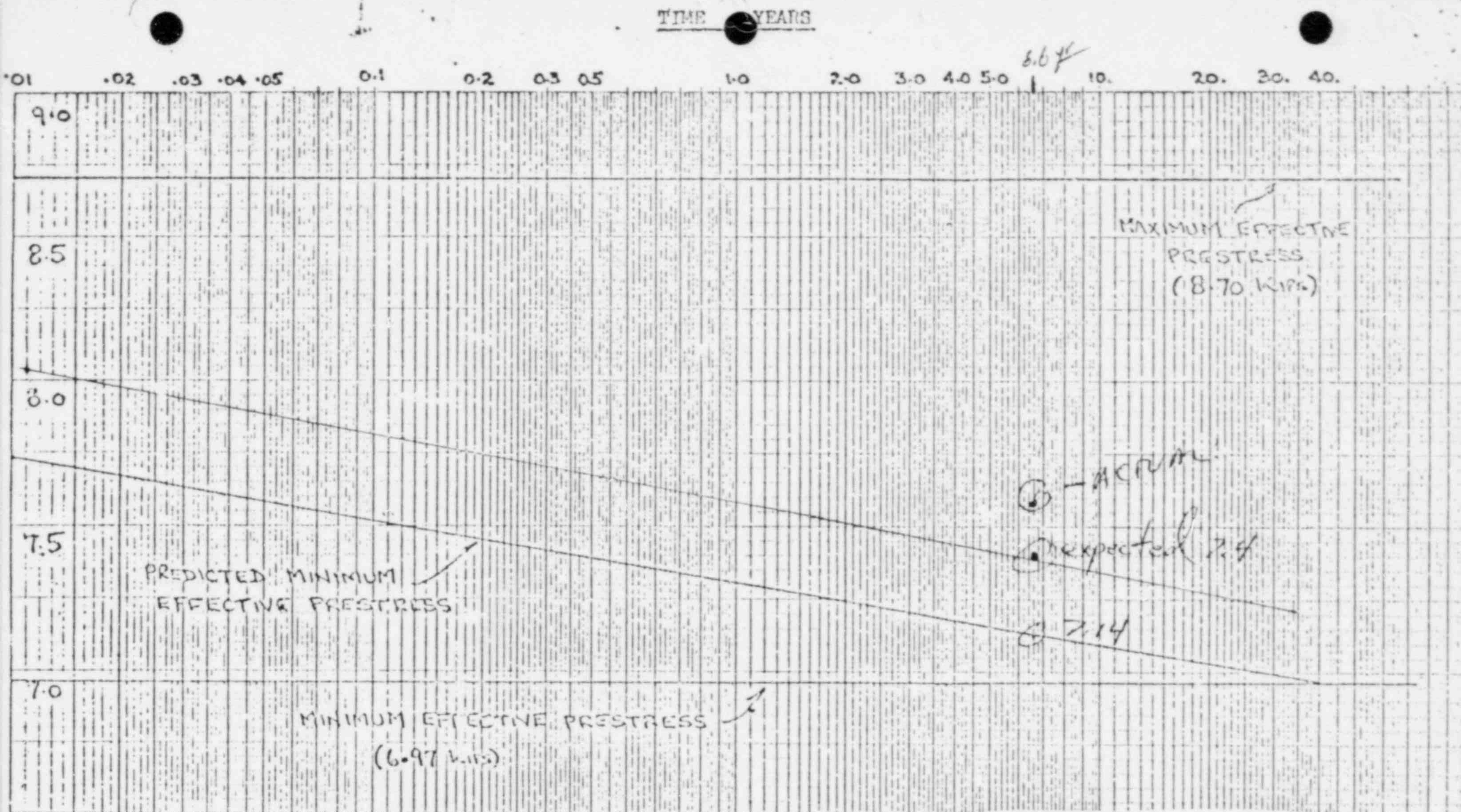
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

DOME TENDON NO: 3D43

DATA PLOTTED BY: K C Riddell

DATE: 8-26-78

Ram No 4045004050008

Gauge No 4215108

Date Cal 7-20-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 3D43

Closest Buttress	5
Grease Removal	9-26-78
Date Filler CAP Removed	9-26-78
Date Grease Removal Started	9-26-78
Exterior Temp.	77°F
Interior Temp.	119°F
Total Volume Removed	20 gal
Date Filler Cap Reinstalled	9-28-78

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon — Dark Brown

Presence of Water Indicated — No

% (Approximate) Coverage of Components — 100%

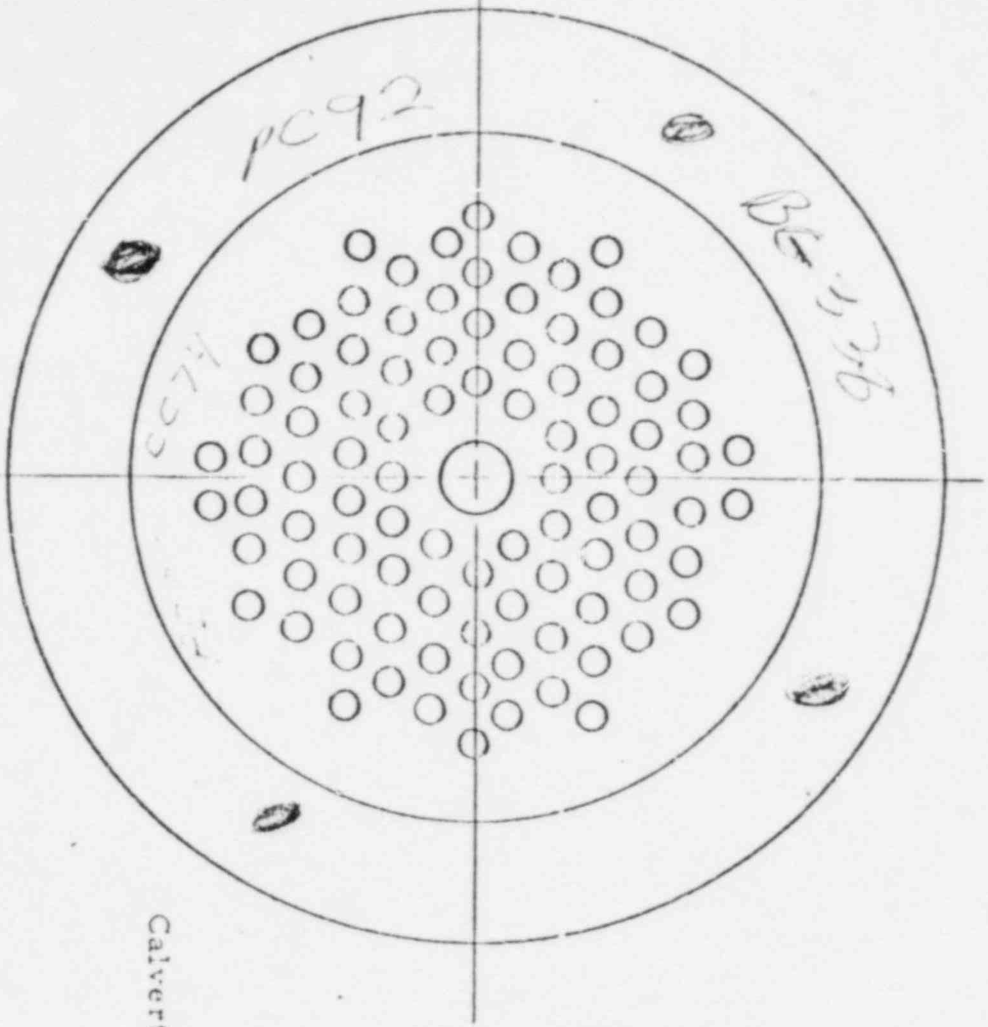
Sample Taken 1 qt Container Identification 3D43

Data Recorded By: [illegible]

TENDON GREASE INSTALLATION

Date Installed	9-28-78
Exterior Temp.	77°
Interior Temp.	119°
Filler Temp. @ Inlet Cap } Indicate if ~~pumped~~ or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	22 gal
Installation Pressure (if poured, N/A)	N/A

Data Recorded By: [illegible] Date [illegible]



WIRE ANCHORAGE

Closest Buttress ______

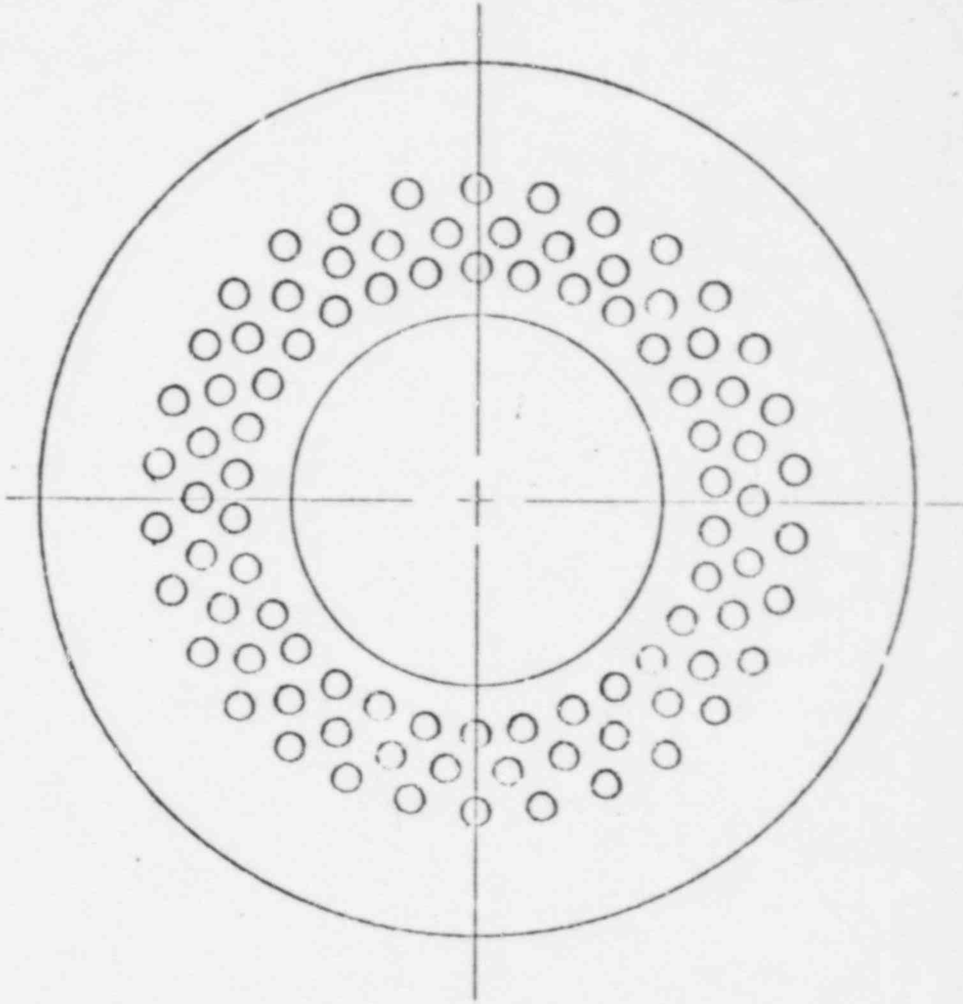
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 5

Tendon No. 3D43

By [illegible]

Date [illegible]

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY L / ...

DATE

TENDON NUMBER 3D43 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	170.52 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.70
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.036 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.4 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	666. Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	643. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	4550 psi	psi
	Hydraulic Pressure at maximum effective prestress	57 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	5 psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______________

Date ______________

TENDON NUMBER: 3043

Note: New Cal. On 12" Ram DCK

	RAM (1) S/N 20	RAM (2) S/N 4
Average Hydraulic pressure at Lift-Off	4940	5325
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	670 Kips	680 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ ~~570~~ 664 Kips

Force Per Wire ($F_{LAV} \div N_e$) ~~255~~ 7.38 Kips

Time since initial stressing of Tendon 6.6 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________

Date 5-29-74

	RAM (1) S/N 20	RAM (2) S/N 4
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	849.7 6200 Kips	
Hydraulic Force @ 0.8f's	6200 psi	6050 psi
Original Lift-Off Hydraulic pressure, P_L	4940 psi	5325 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	5440 psi	5825 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 3D43

CLOSEST BUTTRESS 5

DATE: [illegible] DATA RECRODED BY: ____________

RAM S/N: [illegible] GAUGE S/N: [illegible]

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	7 1/4				
		1850	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	[illegible]	[illegible]	5000	5000	[illegible]
VI.B.5	Pressurize to 0.8f's	62[illegible] **		4940			
VI.B.5	Elongation @ 0.8f's	-	9 1/2				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**	650				
VI.B.7	Elongation at 1 kip/wire		3 1/8				
VII.	Remove Wire - This End Cut?	***	No				
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire		3 1/8				
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's		8 1/2				
VIII.6	Pressure for shim measure	**	5400				
VIII.7	Elongation at shim press		7 1/4				
VIII.7	Shims installed		7 1/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5300	5300	5300	5400	5200
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5280 4940	720			
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 3D43

DATE: DATA RECORDED BY:

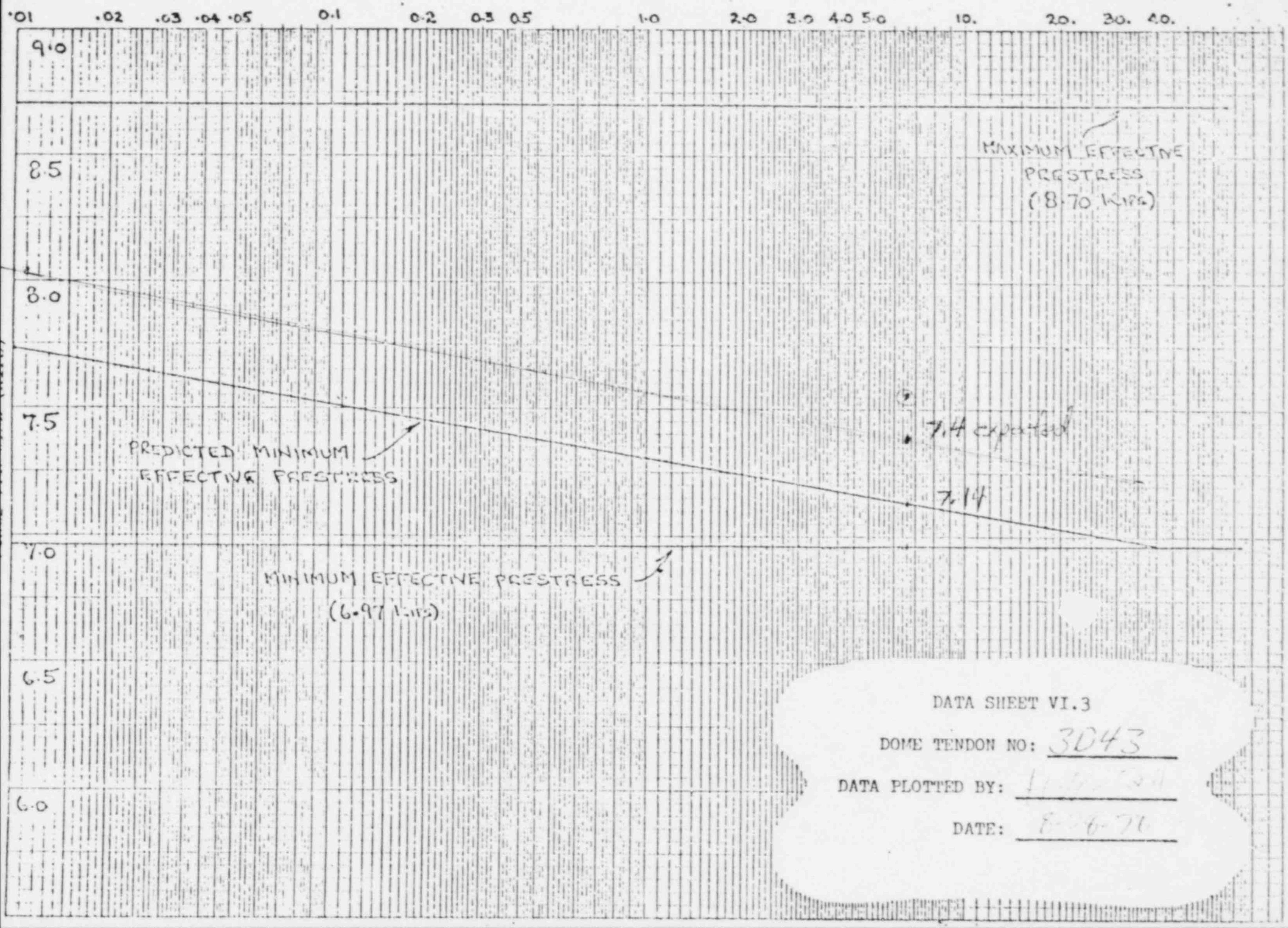
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	2 1/8	3 1/8	5 1/4	9 1/2	3 1/8	6 3/8	9 1/2
RESTRESS	2 1/8	3 1/8	6 3/4	8 1/4	4 5/8	5 1/8	9 3/4


TIME YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 kips)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.97 kips)
7.4 expected
7.14
DATA SHEET VI.3
DOME TENDON NO: 3D43
DATA PLOTTED BY:
DATE:

DATA SHEET IV.1

TENDO[illegible] GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 1040

Closest Buttress 1

Grease Removal 8-30-78

Date Filler CAP Removed 8-30-78

Date Grease Removal Started 8-30-78

Exterior Temp. 82°F

Interior Temp. 119°F

Total Volume Removed 15 gal

Date Filler Cap Reinstalled 8-31-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100

Sample Taken 1 Qt Container Identification 1040 L

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed 8-31-78

Exterior Temp. 82°

Interior Temp. 119°

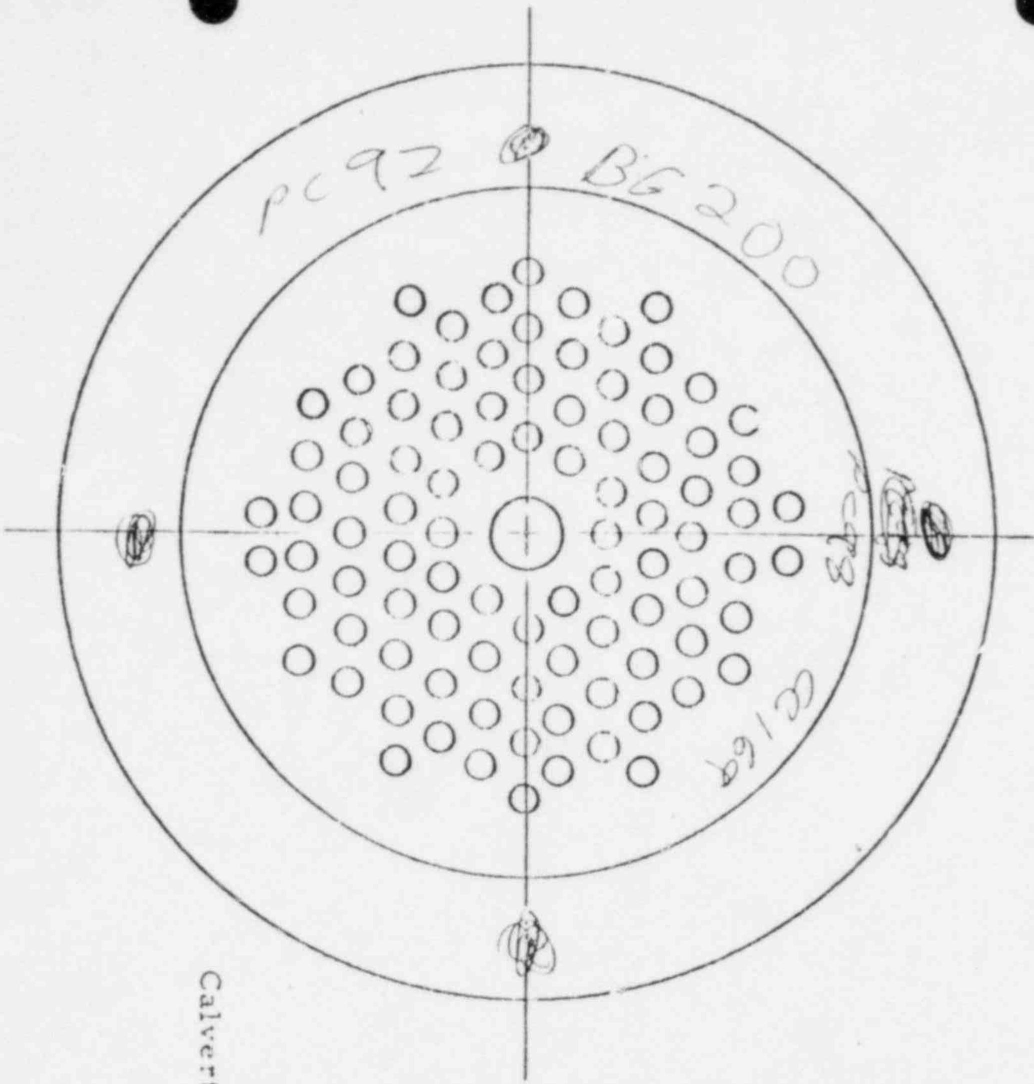
Filler Temp. @ Inlet Cap } Indicate if pumped or poured

Filler Temp. @ Outlet Cap

Total Volume Installed 30 gal

Installation Pressure (if poured, N/A) N/A

Data Recorded By: H. McCall Date 8-31-78



WIRE ANCHORAGE

Closest Buttress ______

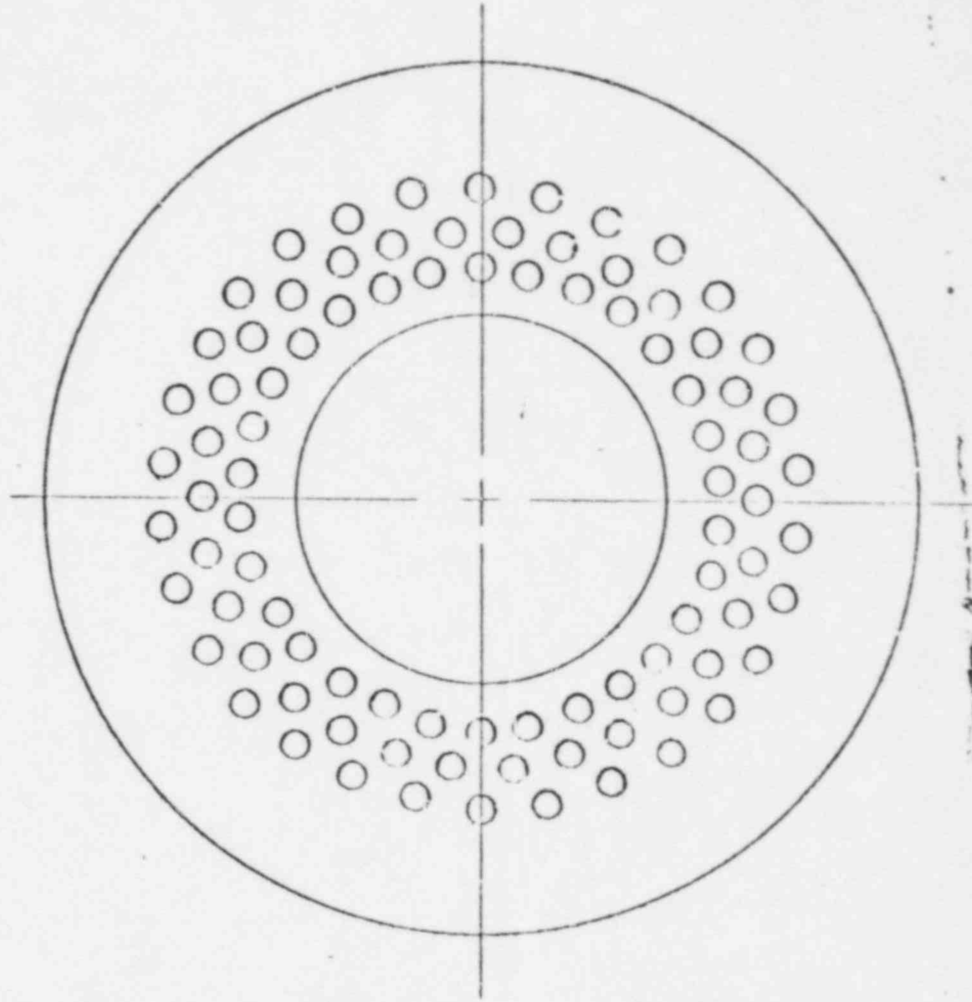
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 1

Tendon No. 1040

By H. McCall

Date 8-30-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY L. McCall

DATE 8-30-78

TENDON NUMBER 1040 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.75	Ksi
	Four Day Losses: Verticals	-7.12	Ksi
	Horizontals	-5.48	Ksi
	Domes	161.93 -6.82	Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)		
	Area of wire, A_W	.04909	in^2
	Force per wire after 4 days, F4 (σ4 x A_W)	7.95	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s		Ksi
	Force per wire at restressing F_s (σ_s x A_W)		Kips
	Time after initial stressing	6.8	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.34	Kips
	Number of effective wires N_e	90	Wires
	Expected lift off force, F_L (F_{LE} x N_e)	660	Kips
	Maximum Effective Prestress per wire, F_{max}	8.7	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13	Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97	Kips
	Maximum effective prestress (F_{max} x N_e)	783	Kips
	Predicted min. effective prestress (F_{pmin} x N_e)	642	Kips
	Absolute min. effective prestress (F_{min} x N_e)	627	Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	8487	Kips
	Force at 1 kip per wire (1 x N_e)	90	Kips

		S/N 20 RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	4800 psi	psi
	Hydraulic Pressure at maximum effective prestress	5700 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4700 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4600 psi	psi
	Hydraulic Pressure at 0.8f's	6200 psi	psi

Data Recorded By K. McColl

Date 9-30-79

TENDON NUMBER:

Note: New Cal. On 12" Ram

	RAM (1) S/N 20	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5040	5080
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	667 ~~695~~ Kips	650 Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	~~673~~ 655 Kips	
Force Per Wire ($F_{LAV} \div N_e$)	~~7.47~~ 7.28 Kips	
Time since initial stressing of Tendon	6.8 Years	

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified K. McColl

Date 8-30-79

	RAM (1) S/N 20	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6200 psi	~~6500~~ 6650 psi
Original Lift-Off Hydraulic pressure, P_L	5040 psi	5080 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	5540 psi	5580 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 1040

CLOSEST BUTTRESS 1

DATE: 9-30-78 DATA RECRODED BY: H. McCall

RAM S/N: 4045020050012 GAUGE S/N: 42150004A

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	6 1/4				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	5000	5000	5050	5100	5050
VI.B.5	Pressurize to 0.8f's	6200 **	5040				
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	650 **					
VI.B.7	Elongation at 1 kip/wire		2 1/8				
VII.	Remove Wire - This End Cut?	***	No				
VIII.3	Pressurize to 1 kip/wire	650 **	2 1/8				
VIII.4	Elongation at 1 kip/wire		2 1/8				
VIII.5	Pressurize to 0.8f's	6200 **					
VIII.5	Elongation at 0.8f's		9 7/8"				
VIII.6	Pressure for shim measure	**	5550				
VIII.7	Elongation at shim press		6 3/4				
VIII.7	Shims installed		6 3/4	added pair 1/2"			
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5200	5200	5250	5200	5250
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5220 yes 710 Kips				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

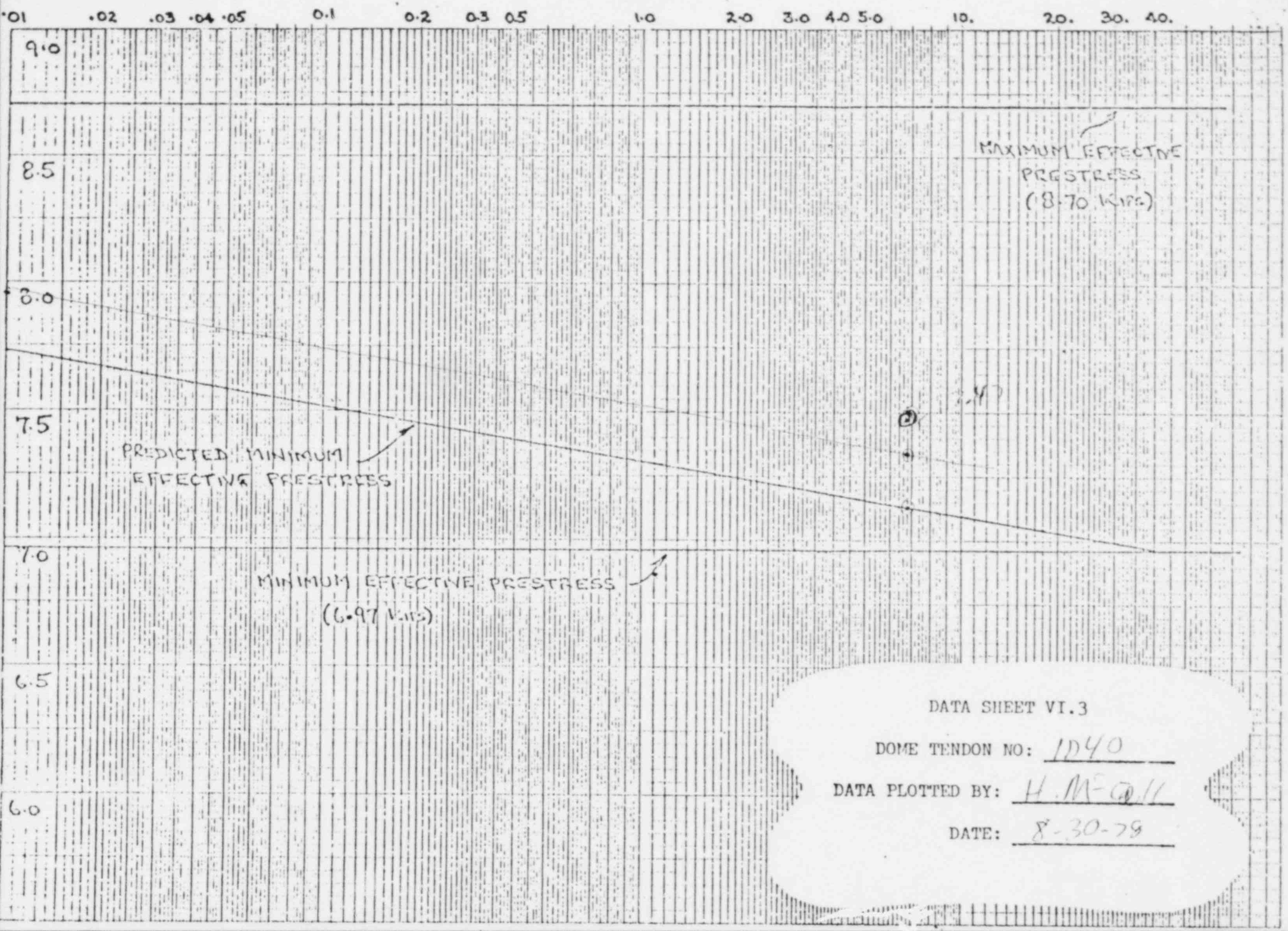
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

DOME TENDON NO: 1D40

DATA PLOTTED BY: H. McCall

DATE: 8-30-79

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 1D40

Closest Buttress	[illegible]
Grease Removal	
Date Filler CAP Removed	[illegible]
Date Grease Removal Started	[illegible]
Exterior Temp.	82°F
Interior Temp.	119°F
Total Volume Removed	10 gal
Date Filler Cap Reinstalled	[illegible]

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon Br[illegible]

Presence of Water Indicated [illegible]

% (Approximate) Coverage of Components

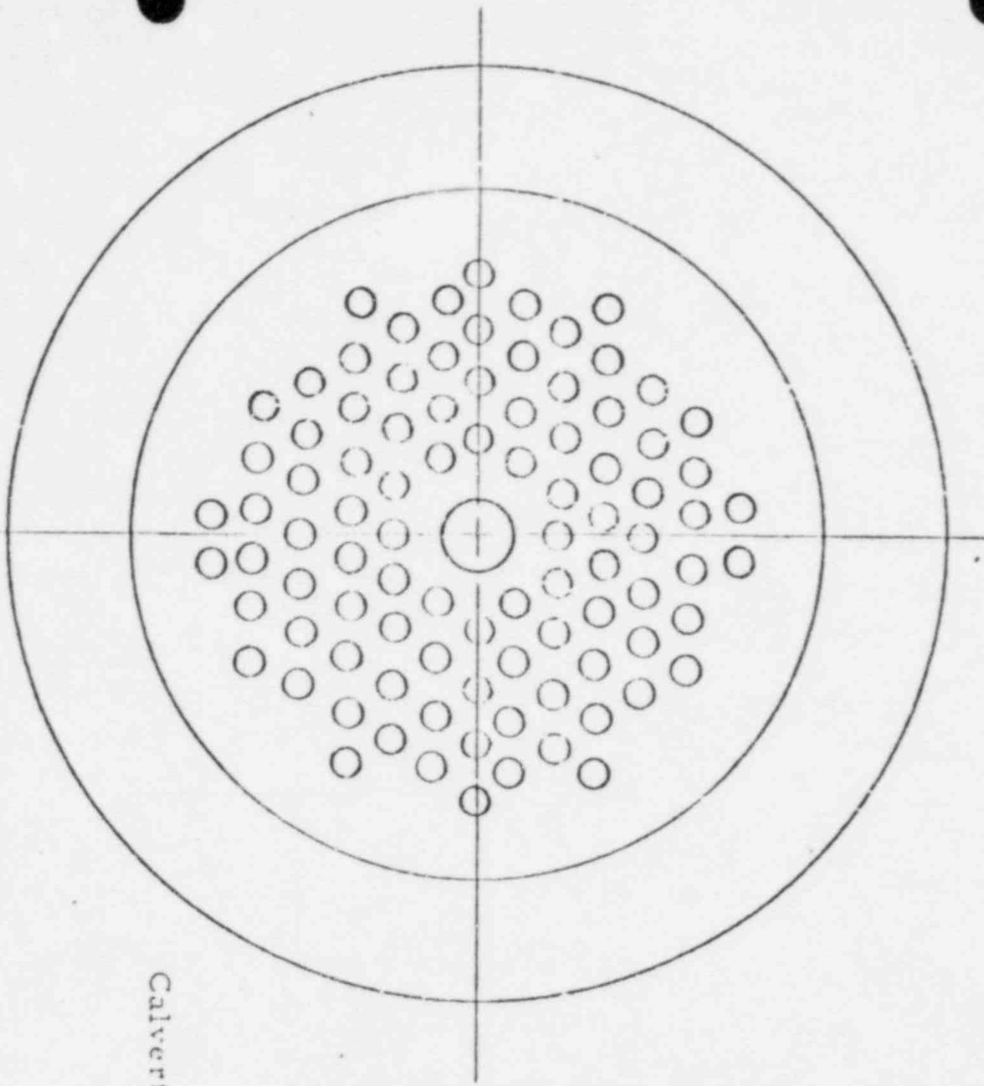
Sample Taken [illegible] Container Identification [illegible]

Data Recorded By: ____________________

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	Pumped from Other End
Filler Temp. @ Outlet Cap }	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ____________________ Date ________



WIRE ANCHORAGE

Closest Buttress ________

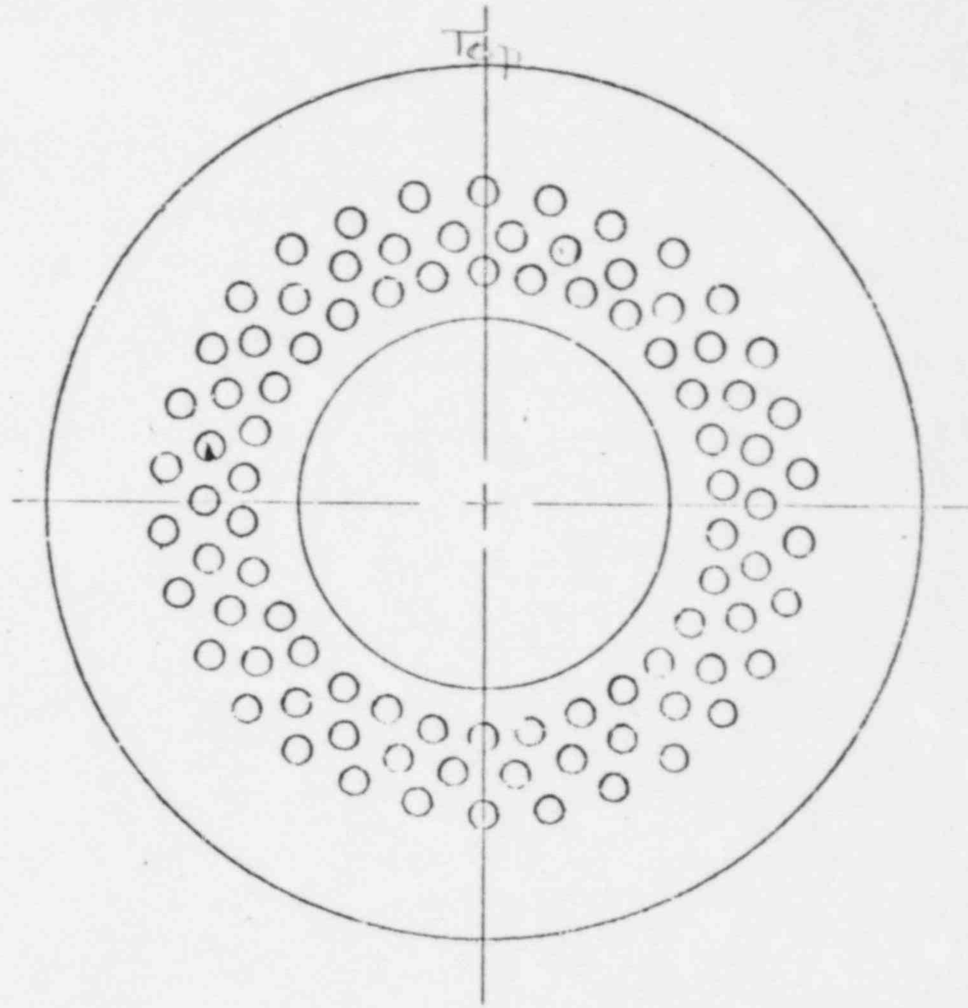
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress ________

Tendon No. ________

By ________

Date ________

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ____________

DATE ____________

TENDON NUMBER 1040 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.75 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.93
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	7.95 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.34 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	660 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	642 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	6650 psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi

Data Recorded By ______________________

Date ______________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5030	
Tendon Lift Offs Acceptable?	✓	
Lift Off Force, F_L	Kips	Kips

Note: New Cal On 12" Ram BCK

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ 655.5 Kips ~~[illegible]~~

Force Per Wire ($F_{LAV} \div N_e$) 7.28 Kips ~~[illegible]~~

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________________

Date [illegible]

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	— Wires	
Number of effective wires N_e	— Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 1D40

CLOSEST BUTTRESS 3

DATE: 8-30-78 DATA RECRODED BY: A. Barth

RAM S/N: 9 GAUGE S/N: 4215108

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	5.5				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**	5100	[illegible]	[illegible]	[illegible]	[illegible]
VI.B.5	Pressurize to 0.8f's	**	6500				
VI.B.5	Elongation @ 0.8f's	-	6 3/8				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**	7[illegible]				
VI.B.7	Elongation at 1 kip/wire		[illegible]				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**	[illegible]				
VIII.7	Elongation at shim press		6 [illegible]				
VIII.7	Shims installed + 1/2 Shim Set + 1/4 Shim Set		5				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5250	[illegible]	5250	[illegible]	[illegible]
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5250 > 5[illegible]				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

1. Find Elongation:

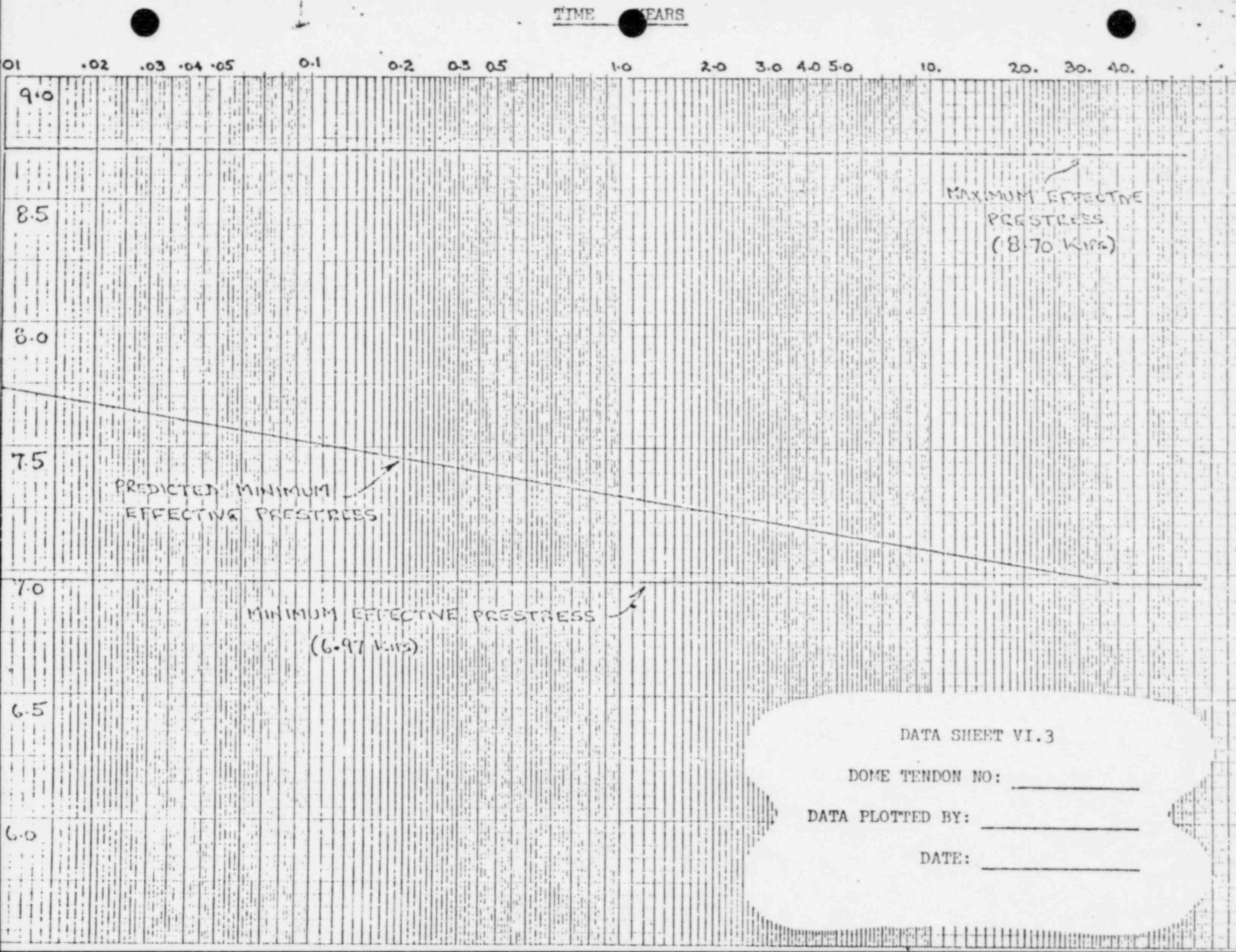
Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	2 1/8	5 3/4	NOT TAKEN	6 3/8			
RESTRESS	2 1/8	5 3/4	6 3/4	NOT TAKEN			

Ram #4
Gage 4215108

add 1 pair 1/2
1/4



DATA SHEET VI.3

DOME TENDON NO: __________

DATA PLOTTED BY: __________

DATE: __________

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 1D24

Closest Buttress	4
Grease Removal	3 gal.
Date Filler CAP Removed	9-1-78
Date Grease Removal Started	9-1-78
Exterior Temp.	71°F
Interior Temp.	119°F
Total Volume Removed	3 gal
Date Filler Cap Reinstalled	9-1-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

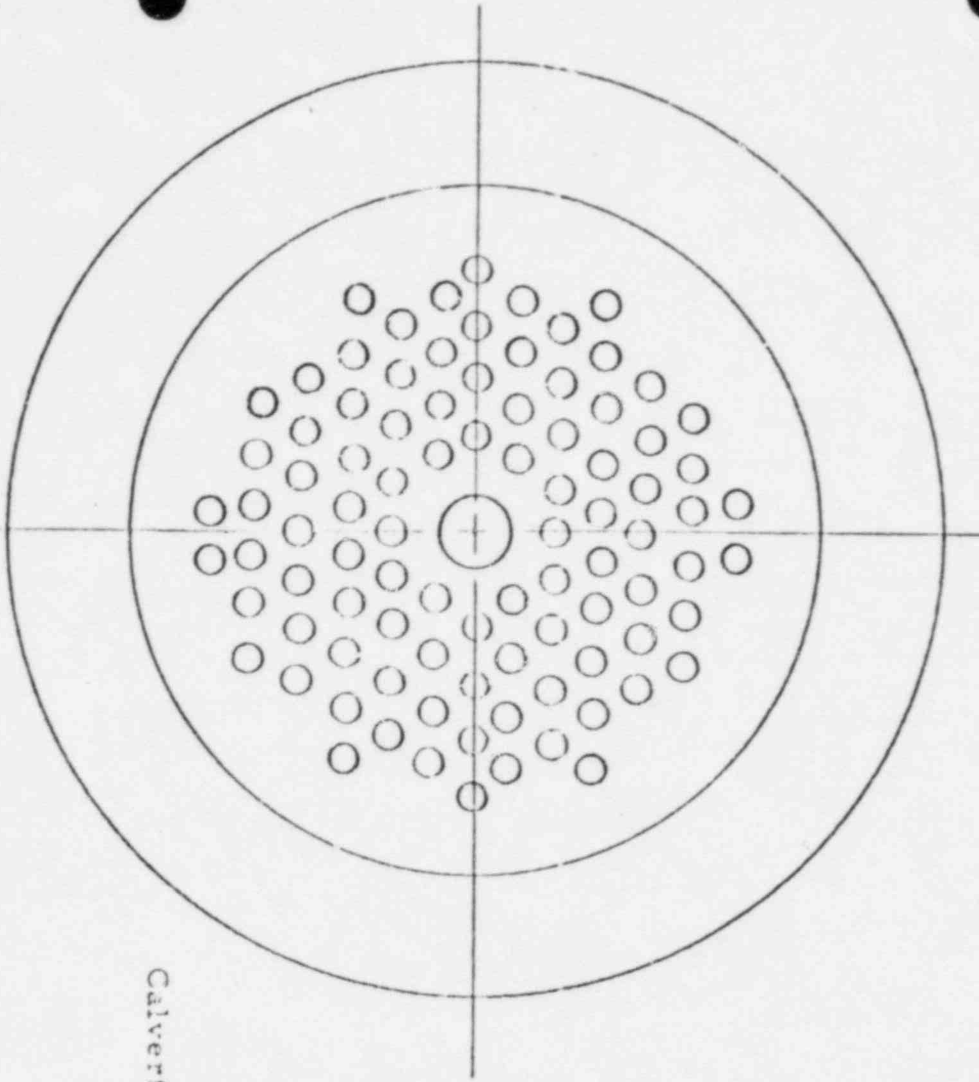
Sample Taken yes Container Identification 1D24-4

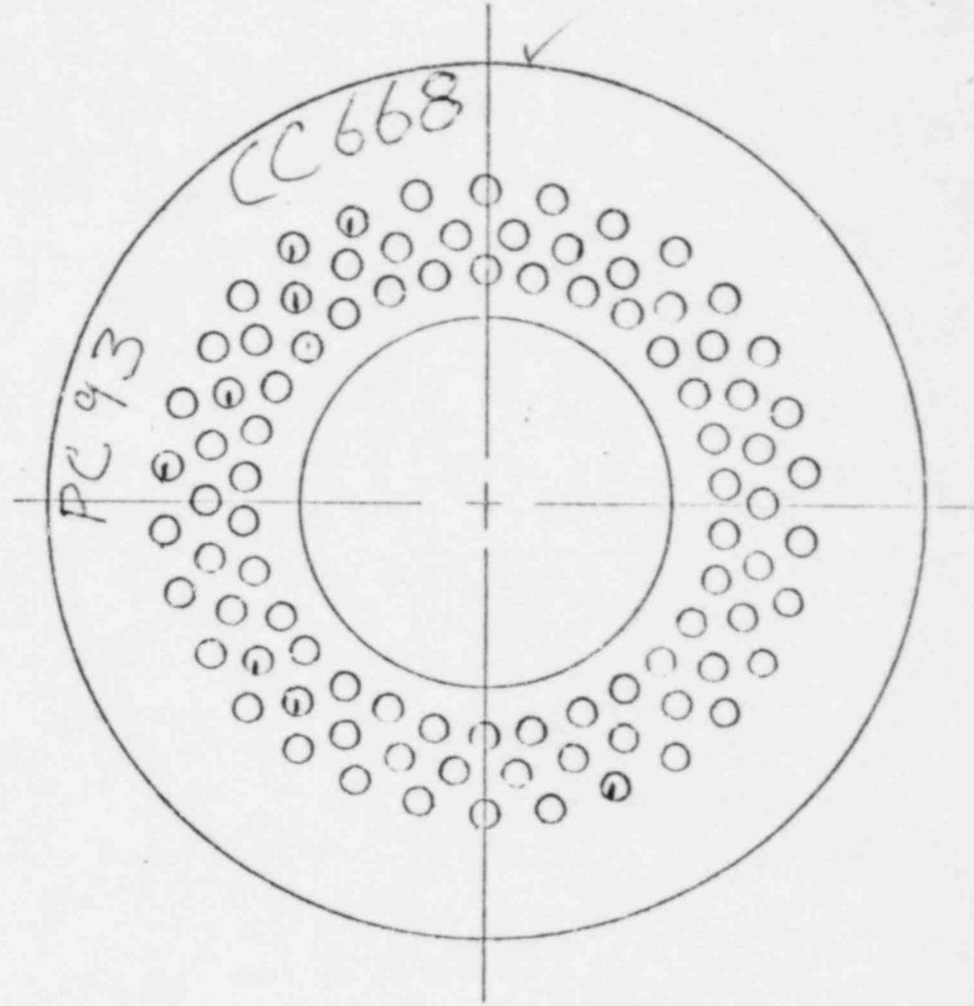
Data Recorded By: [illegible signature]

TENDON GREASE INSTALLATION

Date Installed	9-1-78
Exterior Temp.	
Interior Temp.	Pumped From Other End
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ____________ Date ________





WIRE ANCHORAGE

Closest Buttress 4

Off-Size Buttonhead 8 too large

Buttonhead with Split none

Wire Removed Previously none

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 1D24

By [illegible]

Date 9-1-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY J.C. Rickell

DATE 9-1-78

TENDON NUMBER 1D24 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ Corrected Seating Stress	182.83 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	~~Domes~~	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	176.01
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 (σ4 x A_W)	8.64 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s (σ_s x A_W)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.03 Kips
	Number of effective wires N_e	82 Wires
	Expected lift off force, F_L (F_{LE} x N_e)	658.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress (F_{max} x N_e)	713. Kips
	Predicted min. effective prestress (F_{pmin} x N_e)	585. Kips
	Absolute min. effective prestress (F_{min} x N_e)	571 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	773. Kips
	Force at 1 kip per wire (1 x N_e)	82 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram# 404500405000 8 Gauge# 4215103 Date Cal. 7-20-78		
	Hydraulic Pressure at expected Lift Off	5170 psi	psi
	Hydraulic Pressure at maximum effective prestress	5600 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4600 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4500 psi	psi
	Hydraulic Pressure at 0.8f's	6070 psi	psi

Data Recorded By Z.C. Kuckell

Date 9-1-78

TENDON NUMBER: 1024

Ram# 404500 4050008
Gauge # 4215108
Date Cal 7-20-78

Note: New Cal. On 12" Ram.

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5240 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	663 Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ $\frac{663+695}{2} = 674$	~~679~~ Kips → 668.5	
Force Per Wire ($F_{LAV} \div N_e$)	~~8.28~~ ~~Kips~~ → 7.43	
Time since initial stressing of Tendon	6.6 Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified Z.C. Kuckell

Date 9-1-78

Ram# 404500 4050008
Gauge# 4215108 Date Cal 7-20-78

	RAM (1) ~~S/N~~	RAM(2) S/N
Number of wires removed this surveillance N_R	none Wires	
Number of effective wires N_e	82 Wires	
0.8f's (9.43 x N_e)	773 Kips	
Hydraulic Force @ 0.8f's	6070 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5240. psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5740 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 1024

CLOSEST BUTTRESS 4

DATE: 9-1-78 DATA RECRODED BY: [illegible]

RAM S/N: 40450040500108 GAUGE S/N: 4215108 Date Cal. 7-20-78

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	5 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off expected 5170 psi	avg 5240 **	5300	5250	5250	5250	5150
VI.B.5	Pressurize to 0.8f's	6070 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	5 1/2"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 psi **	✓				
VI.B.7	Elongation at 1 kip/wire		~~1 3/16~~ 1 3/4"				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	650 psi **	✓				
VIII.4	Elongation at 1 kip/wire		1 3/4"				
VIII.5	Pressurize to 0.8f's	6070 psi **	✓				
VIII.5	Elongation at 0.8f's		6"				
VIII.6	Pressure for shim measure	5740 psi **	✓				
VIII.7	Elongation at shim press		6 1/4"				
VIII.7	Shims installed added one 1" shim		6 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure avg 5720		5700	5700	5700	5750	5750
VIII.8	742 ≥ 679 AVG Lift Off ≥ Initial AVG Lift Off?	✓	yes				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 1D24

DATE: DATA RECORDED BY:

From Page (1)

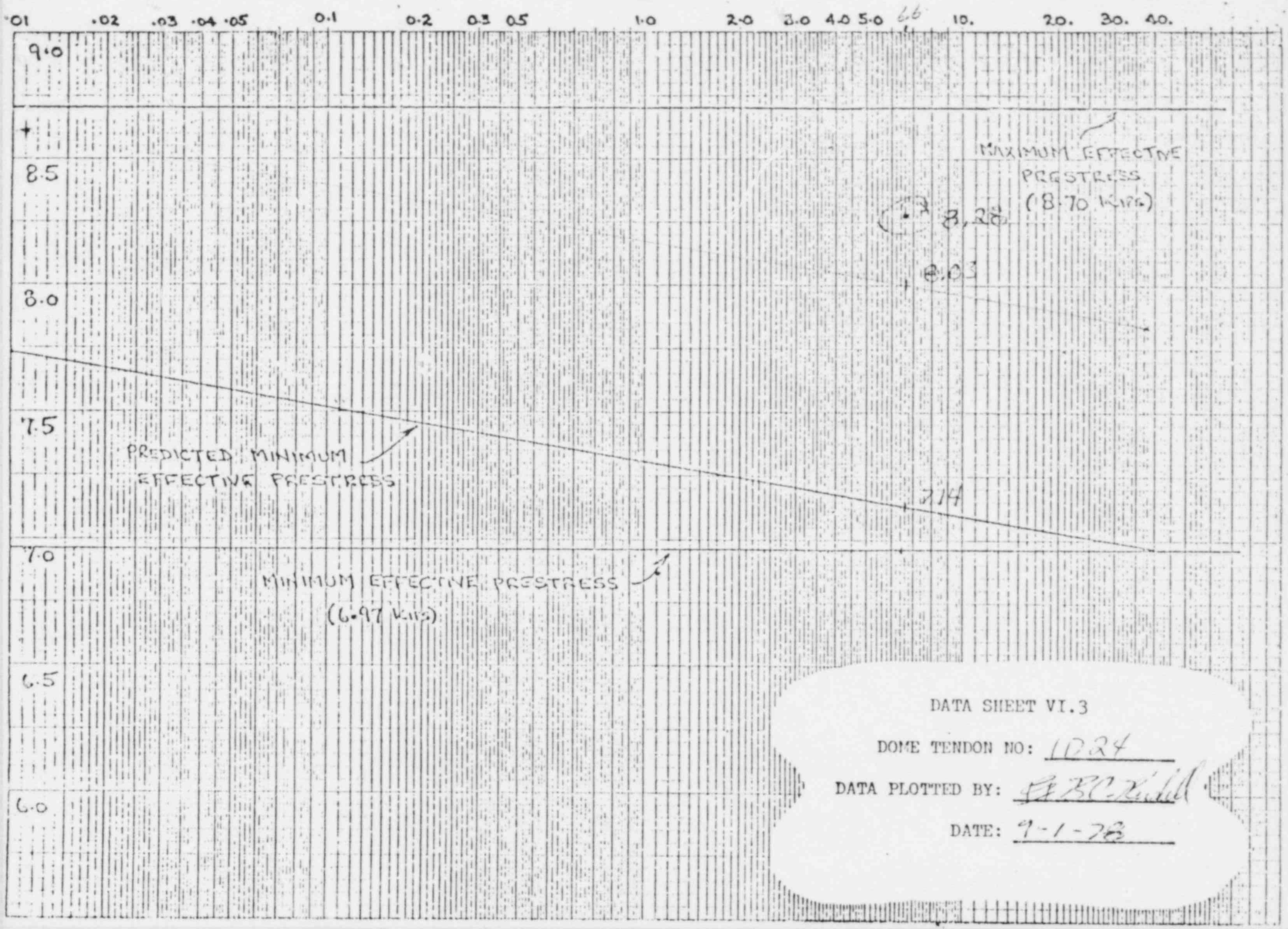
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME YEARS



DATA SHEET VI.3

DOME TENDON NO: 1D24

DATA PLOTTED BY: [signature]

DATE: 9-1-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 1D24

Closest Buttress	6
Grease Removal	9-1-78
Date Filler CAP Removed	9-1-78
Date Grease Removal Started	9-1-78
Exterior Temp.	71°F
Interior Temp.	119°F
Total Volume Removed	4 gal
Date Filler Cap Reinstalled	9-1-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100

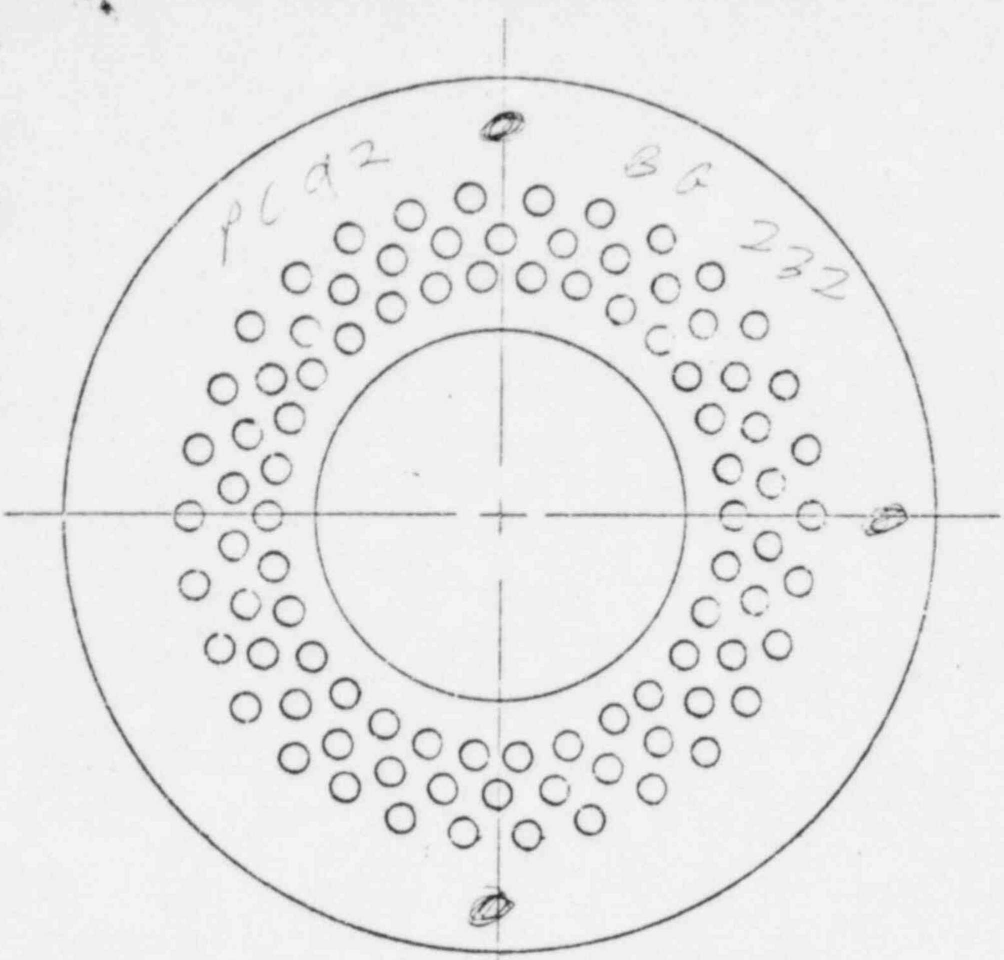
Sample Taken 1G+ Container Identification 1D24L

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	9-1-78
Exterior Temp.	71°
Interior Temp.	119°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	30 gal
Installation Pressure (if poured, N/A)	N/A

Data Recorded By: H. McCall Date 9-1-78



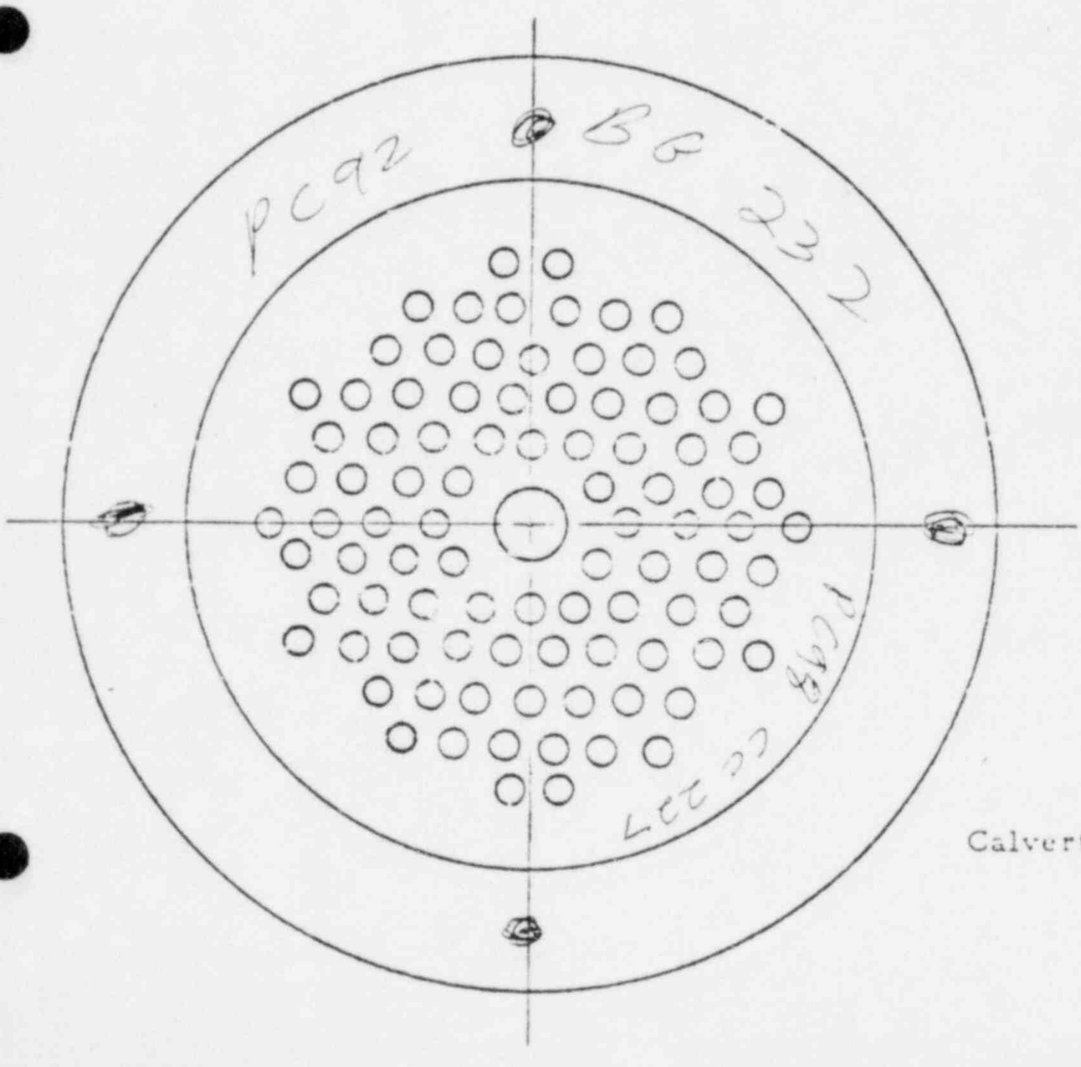
WIRE ANCHORAGE

Closest Buttress C

Tendon No. 1D34

By L. McCall

Date 9-1-78



WIRE ANCHORAGE

Closest Buttress ______

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY H McCall

DATE 9-1-78

TENDON NUMBER 1D24 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ — Corrected Seating Stress	182.83 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ -4 day loss)	176.01
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma 4 \times A_W$)	8.64 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	6.6 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.03 Kips
	Number of effective wires N_e	82 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	658.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	713 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	585 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	571 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	773 Kips
	Force at 1 kip per wire (1 x N_e)	82 Kips

RAM CALIBRATION CURVE		S/N 20 RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	4800 psi	psi
	Hydraulic Pressure at maximum effective prestress	5200 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4250 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4200 psi	psi
	Hydraulic Pressure at 0.8f's	5650 psi	psi
	Hydraulic Pressure at 1 Kip/wire	[illegible] psi	psi

Data Recorded By V. McCall

Date 9-1-78

TENDON NUMBER: 1D24

	RAM (1) S/N 20	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5090	5240
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	~~675~~ 673 Kips	663 Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	~~679~~ 668 Kips	
Force Per Wire ($F_{LAV} \div N_e$)	~~8.28~~ 7.43 Kips	
Time since initial stressing of Tendon	Years	

Note: New Cal. 12" Ram.

OK

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified V. McCall

Date 9-1-78

	RAM (1) S/N 20	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	82 Wires	
0.8f's (9.43 x N_e)	773 Kips	
Hydraulic Force @ 0.8f's	5650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5080 psi	5240 psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	0 psi
Shim Pressure (P_L + 500 - P_{RH})	5580 psi	5740 psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 1D24

CLOSEST BUTTRESS 6

DATE: 9-1-78 DATA RECRODED BY: U. McCall

RAM S/N: 4045020050012 GAUGE S/N: 4215004A

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	6"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	expect 4400 **	4900	5000	5100	5100	5100
VI.B.5	Pressurize to 0.8f's	5650 **	5100 avg 5080 = 700 kips				
VI.B.5	Elongation @ 0.8f's	-	7½"				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	600 **					
VI.B.7	Elongation at 1 kip/wire		2¼"				
VII.	Remove Wire - This End Cut?	***	No				
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	5650 **					
VIII.5	Elongation at 0.8f's		6 3/4"				
VIII.6	Pressure for shim measure	5580 **					
VIII.7	Elongation at shim press		6 1/8"				
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5500	5500	5550	5550	5600
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	yes	5540 = 760 kips				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 1D24

DATE: DATA RECORDED BY:

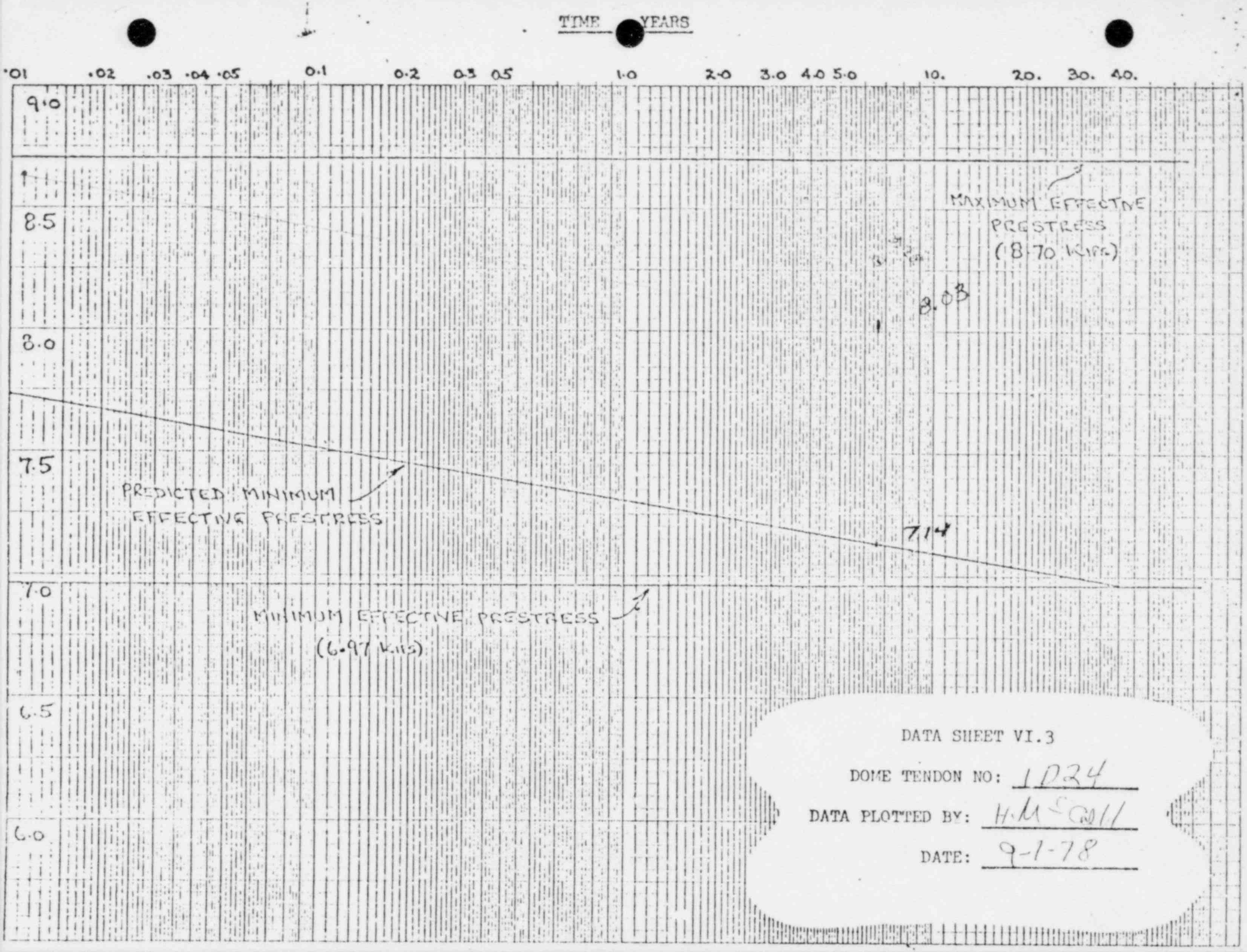
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	1 3/4	2 1/4	5 1/2	7 1/2	3 3/4	5 1/4	9
RESTRESS	1 3/4	2 1/4	6	6 3/4	4 1/4	4 1/2	8 3/4



DATA SHEET VI.3

DOME TENDON NO: 1D24

DATA PLOTTED BY: H. McCall

DATE: 9-1-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 2021

Closest Buttress: 2

Grease Removal: 9-9-78

Date Filler CAP Removed: 9-8-78

Date Grease Removal Started: 9-8-78

Exterior Temp.: 77°F

Interior Temp.: 118 °F

Total Volume Removed: 8 gal

Date Filler Cap Reinstalled: 9-8-78

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon: Dark Brown

Presence of Water Indicated: No

% (Approximate) Coverage of Components: 100%

Sample Taken: 1 Oz Container Identification: 2021 L

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed: 9-8-78

Exterior Temp.: 77°

Interior Temp.: 118°

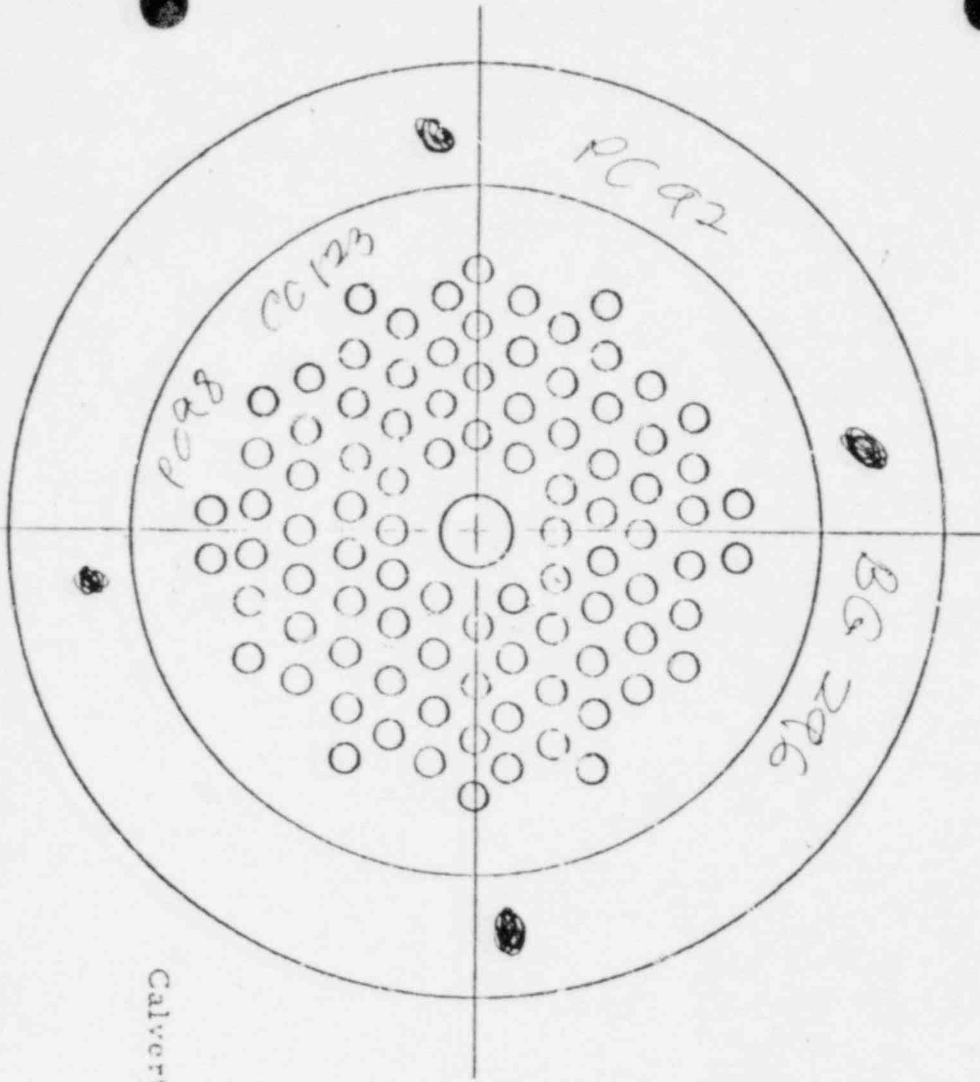
Filler Temp. @ Inlet Cap } Indicate if pumped or poured

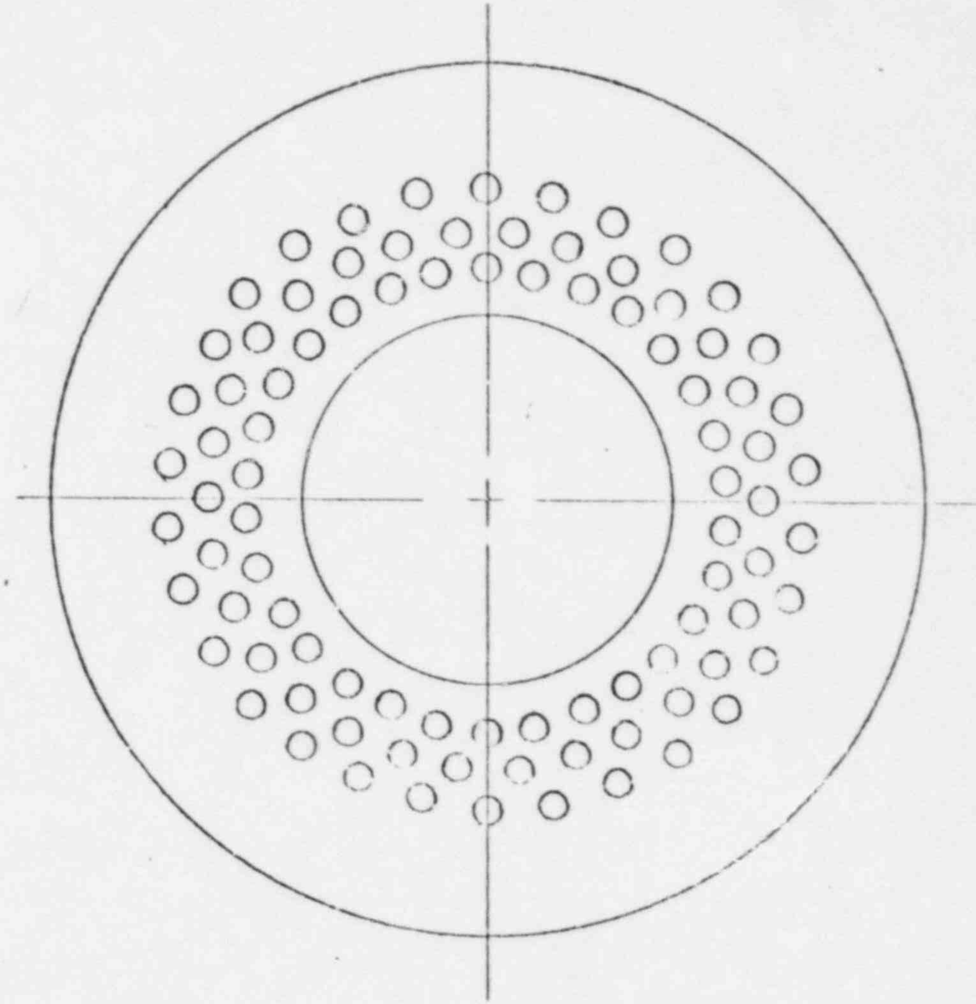
Filler Temp. @ Outlet Cap

Total Volume Installed: 22 gal.

Installation Pressure (if poured, N/A): N/A

Data Recorded By: H. McCall Date: 9-8-78





WIRE ANCHORAGE

Closest Buttress 2

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 3

Tendon No. 2D21

By H. McCall

Date 9-8-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY U McCall

DATE 9-8-78

TENDON NUMBER 2021 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	168.38 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.56
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.93 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-9-71 - 9-8-78	6.75 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.35 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	655.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783.0 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	641.7 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627.3 Kips
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	848.7 Kips
	Force at 1 kip per wire ($1 \times N_e$)	90. Kips

RAM CALIBRATION CURVES		S/N 20 RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	4800 psi	psi
	Hydraulic Pressure at maximum effective prestress	5700 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4700 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4600 psi	psi
	Hydraulic Pressure at 0.8f's	6200 psi	psi
	Hydraulic Pressure at 1 Kip/wire	650 psi	psi

Data Recorded By H. McCall

Date 9-8-78

TENDON NUMBER: 2021

	RAM (1) S/N 20	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5040	5250
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~692~~ 668 Kips	665 Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	~~675.5~~ 666.5 Kips	
Force Per Wire ($F_{LAV} \div N_e$)	~~7.54~~ 7.43 Kips	
Time since initial stressing of Tendon	Years	

Note: New Cal for 12" Ram

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified H. McCall

Date 9-8-78

	RAM (1) S/N 20		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e	90	Wires		
0.8f's (9.43 x N_e)	848.9	Kips		
Hydraulic Force @ 0.8f's	6200	psi		psi
Original Lift-Off Hydraulic pressure, P_L	5040	psi		psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0	psi		psi
Shim Pressure (P_L + 500 - P_{RH})	5540	psi		psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 2D21

CLOSEST BUTTRESS 2

DATE: 9-8-78 DATA RECRODED BY: H. McCall

RAM S/N: 40450200050012 GAUGE S/N:

~~4215024A~~ 4215004A

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-	5 1/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	expect 4900 **	5050	5050	5050	5000	5050
VI.B.5	Pressurize to 0.8f's	6200 **	5040 avg 692				
VI.B.5	Elongation @ 0.8f's	-	6 5/8"				
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	650 **					
VI.B.7	Elongation at 1 kip/wire		2 1/4"				
VII.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	** 650	0				
VIII.4	Elongation at 1 kip/wire		2 1/4"				
VIII.5	Pressurize to 0.8f's	** 6200					
VIII.5	Elongation at 0.8f's		7 1/4				
VIII.6	Pressure for shim measure	5540 **					
VIII.7	Elongation at shim press		6 5/8"			added 2 pairs 1/2"	
VIII.7	Shims installed		~~6 5/8"~~ 6 1/8"			[illegible]	
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5200	5150	5200	5250	5250
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	yes	avg 5210		715 kips		
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 2021

DATE: DATA RECORDED BY:

From Page (1)

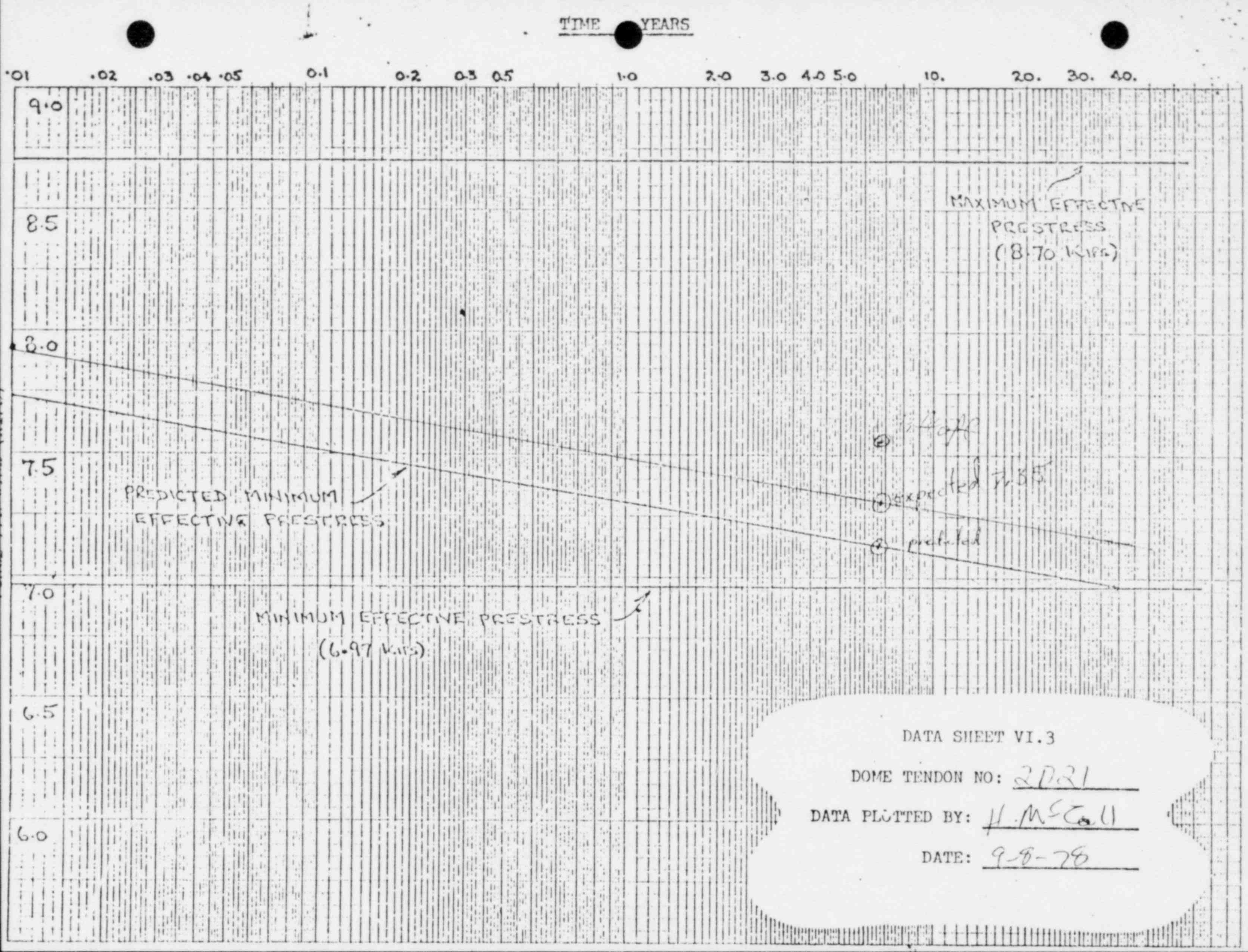
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

- 24 -



DATA SHEET VI.3

DOME TENDON NO: 2D21

DATA PLOTTED BY: H. McCall

DATE: 9-8-78

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 2021

Closest Buttress 4

Grease Removal ~~[illegible]~~ 12gal

Date Filler CAP Removed 9-8-78

Date Grease Removal Started 9-8-78

Exterior Temp. 77°F

Interior Temp. 118°F

Total Volume Removed 12gal

Date Filler Cap Reinstalled 9-8-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown no rust on washer surface

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes ✓ Container Identification 2021-4

Data Recorded By: B.C. Rudell

TENDON GREASE INSTALLATION

Date Installed N/A Pumped from other end

Exterior Temp. N/A

Interior Temp. N/A

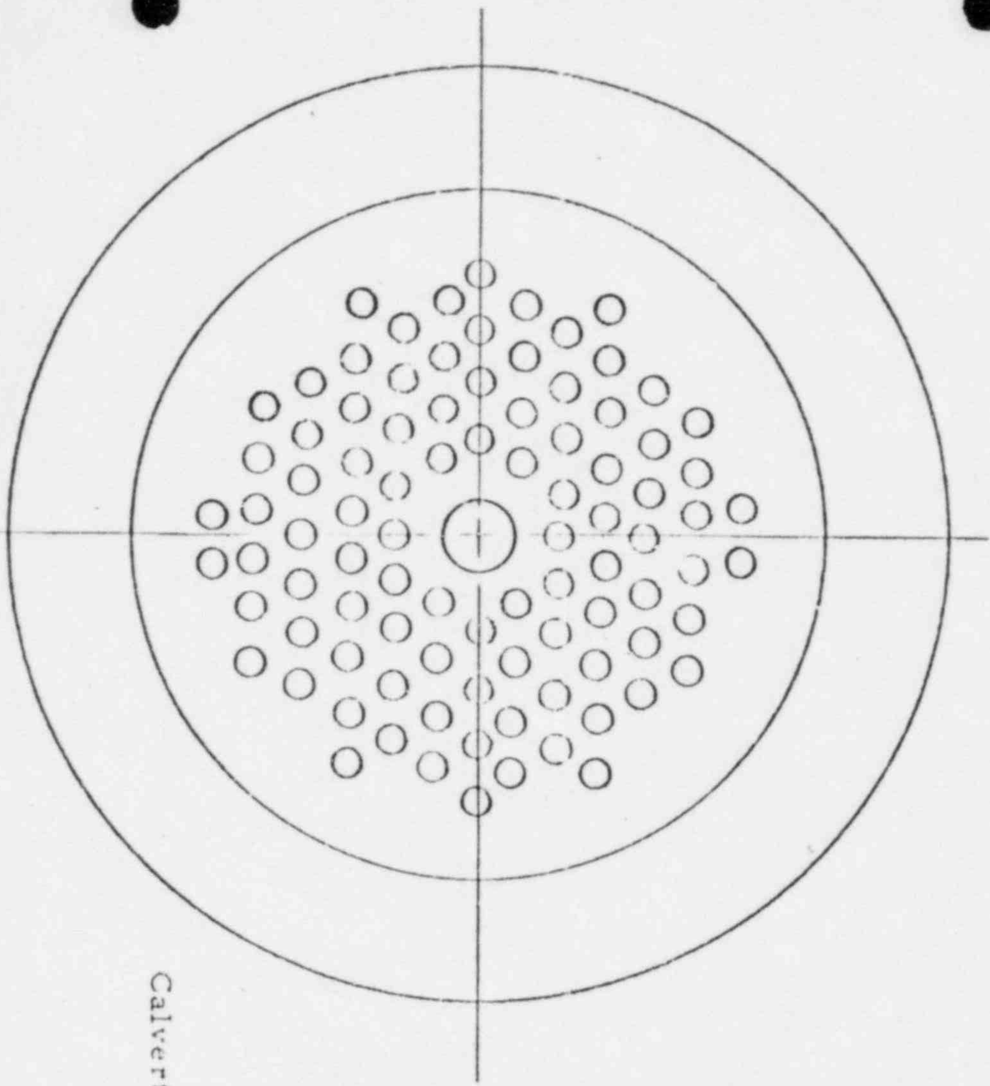
Filler Temp. @ Inlet Cap } Indicate if pumped or poured N/A

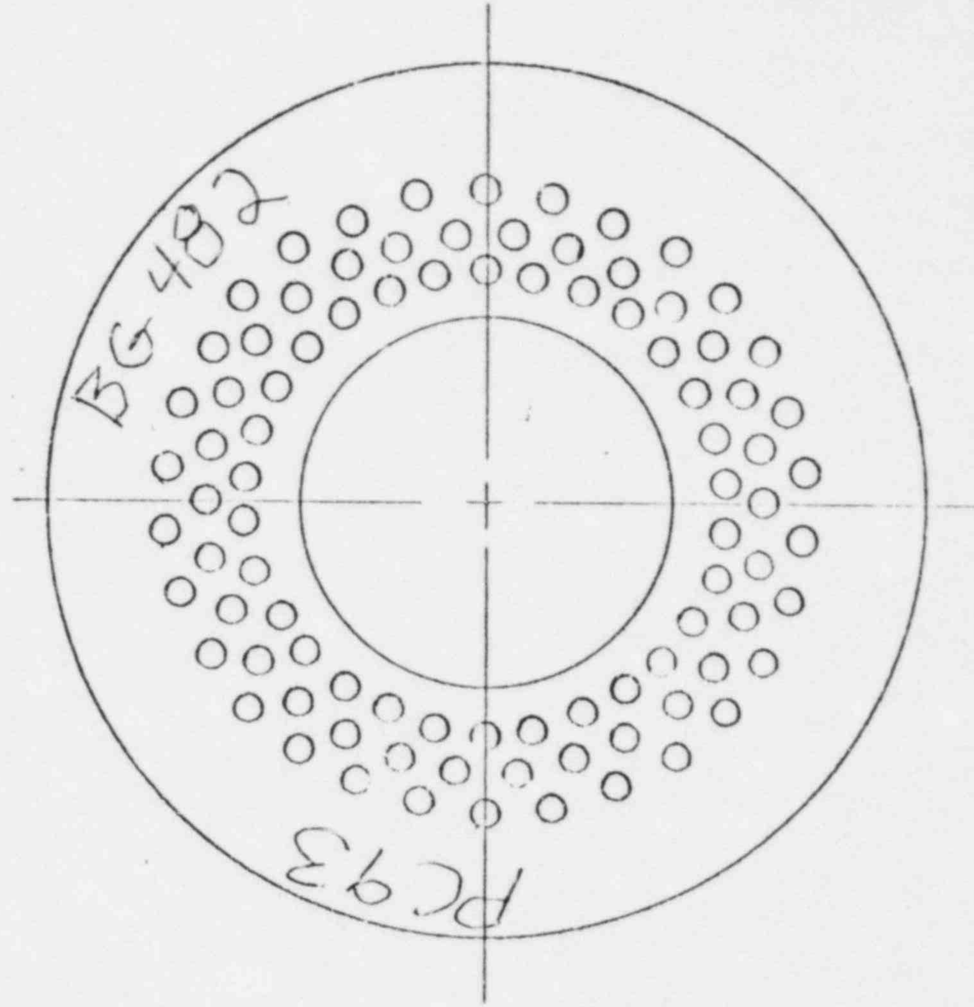
Filler Temp. @ Outlet Cap N/A

Total Volume Installed N/A from other side

Installation Pressure (if poured, N/A) N/A

Data Recorded By: B.C. Rudell Date 9-8-78





WIRE ANCHORAGE

Closest Buttress 4

All Good
90 wires

- Off-Size Buttonhead
- Buttonhead with Split
- Wire Removed Previously
- Discontinuous Wire Removed this surveillance
- Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 4

Tendon No. 2021

By [illegible]

Date 9-8-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY BC R. [illegible]

DATE 9-8-78

TENDON NUMBER 2D21 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	168.38 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.56
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.93 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-9-71 — 9-8-78	6.75 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.35 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	655.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783.0 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	641.7 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627.3 Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

Ram # 404500405000 8
Gauge # 4215108
Date Cal 7-20-78

RAM CALIBRATION CURVES	S/N RAM (1)	S/N RAM (2)
Hydraulic Pressure at expected Lift Off	5150 psi	psi
Hydraulic Pressure at maximum effective prestress	6150 psi	psi
Hydraulic Pressure at predicted minimum effective prestress	5060 psi	psi
Hydraulic pressure at absolute minimum effective prestress	4920 psi	psi
Hydraulic Pressure at 0.8f's	6650 psi	psi
Hydraulic Pressure at 1 Kip/wire	[illegible] psi	psi

Data Recorded By B.C. Rudell

Date 9-8-78

TENDON NUMBER: 2021

Ram # 4045004050008
Gauge # 4215108.
Date Cal. 7-20-78

Note: New Cal On 12" Ram.

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5250	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	665 Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	~~678.5~~ Kips 666.5	
Force Per Wire ($F_{LAV} \div N_e$)	~~7.54~~ Kips 7.43	
Time since initial stressing of Tendon	6.75 Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified yes B.C. Rudell

Date 9-8-78

Ram # 4045004050008
Gauge # 4216108
Date Cal. 7-20-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	none Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5250 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5750 psi	psi

DATA SHEET VI.2 Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 2021

CLOSEST BUTTRESS 4

DATE: 9-8-78 DATA RECRODED BY: E.C. Rudell

RAM S/N: 4045004050008 GAUGE S/N: 4215108

Date Cal 7-20-78 Ram I

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	* Shim closest to washer has 1/2" gap. Measure Shims	-	6 1/4" 5%				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off expect 5150	avg 5250 **	5250	5250	5250	5250	5250
VI.B.5	Pressurize to 0.8f's	6650 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	6 15/16"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	750 psi **	✓				
VI.B.7	Elongation at 1 kip/wire		1 1/2				
VII.	Remove Wire - This End Cut?	***	no				
VIII.3	Pressurize to 1 kip/wire	750 psi **	✓				
VIII.4	Elongation at 1 kip/wire		1 1/2				
VIII.5	Pressurize to 0.8f's	6650 psi **	✓				
VIII.5	Elongation at 0.8f's		6 3/8"				
VIII.6	Pressure for shim measure	5750 psi **	5750 psi				
VIII.7	Elongation at shim press		5 3/4 6 3/16 @ 5750 psi				
VIII.7	Same Shims reinstalled Shims installed @ Pressure of 6000 psi		6 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure avg 5770		5850	5750	5750	5750	5750
VIII.8	722.5 ≥ 678.5 ✓ AVG Lift Off ≥ Initial AVG Lift Off?	✓	Good				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 2021

DATE: 85 DATA RECORDED BY:

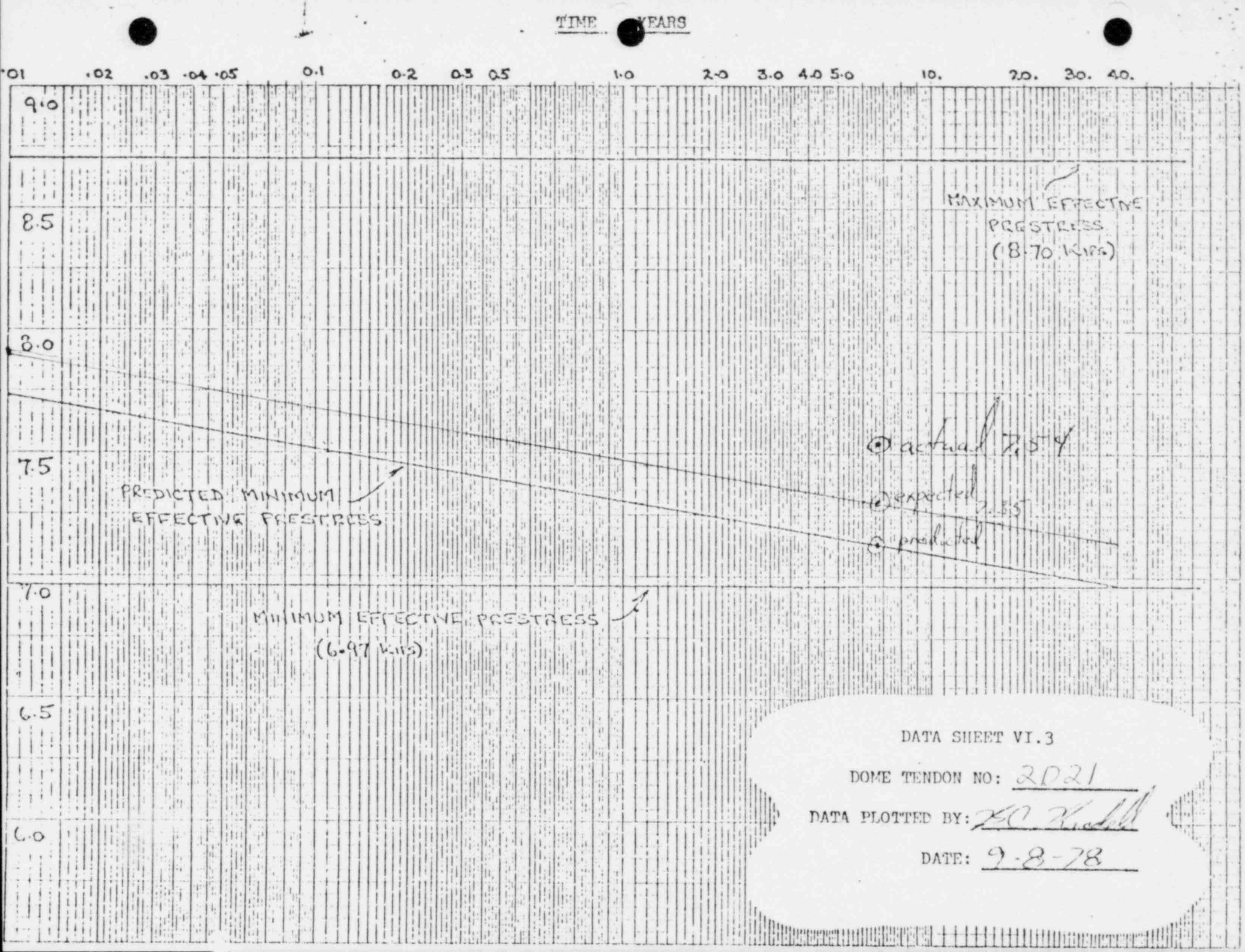
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	2 1/4	1 1/2	6 5/8	6 15/16	4 3/8	5 7/16	9 13/16
RESTRESS	2 1/4	1 1/2	7 1/4	6 3/8	5	4 7/8	9 7/8


TIME YEARS
.01 .02 .03 .04 .05 0.1 0.2 0.3 0.5 1.0 2.0 3.0 4.0 5.0 10. 20. 30. 40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 Kips)
actual 7.54
expected 7.35
predicted
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.97 Kips)
DATA SHEET VI.3
DOME TENDON NO: 2021
DATA PLOTTED BY:
DATE: 9-8-78

DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 3D14

Closest Buttress	6
Grease Removal	15 gal
Date Filler CAP Removed	9-9-78
Date Grease Removal Started	9-9-78
Exterior Temp.	74°F
Interior Temp.	118°F
Total Volume Removed (~~Quarts~~)	15 gal
Date Filler Cap Reinstalled	9-9 78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated none

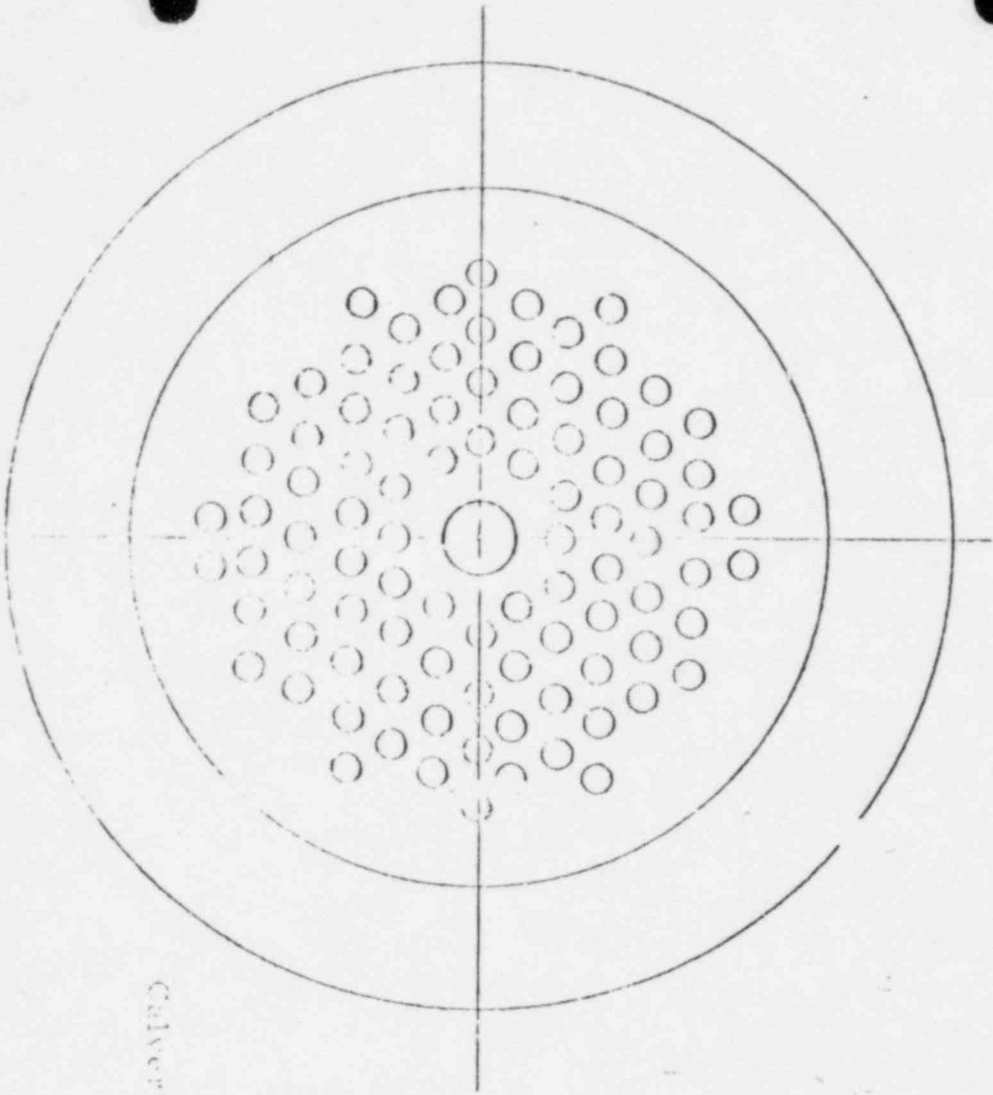
% (Approximate) Coverage of Components 100%

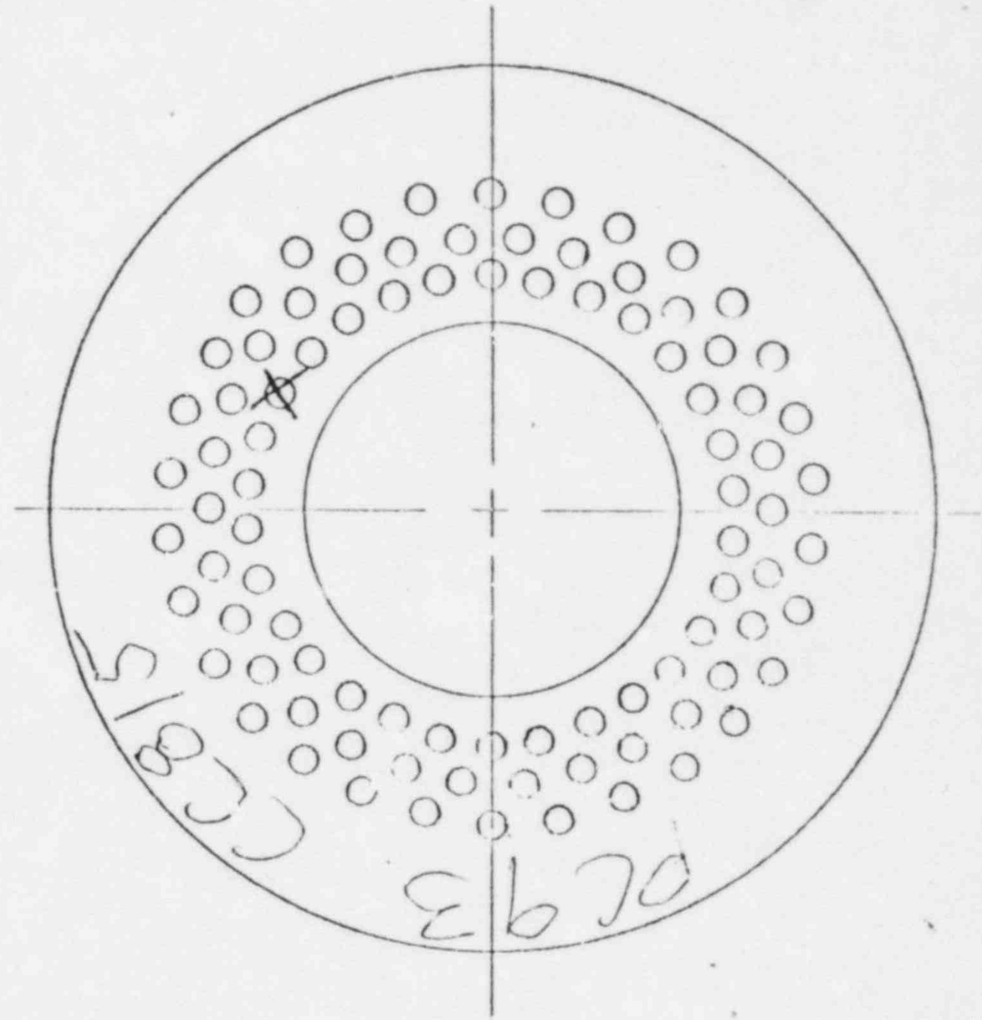
Sample Taken yes ✓ Container Identification 3D14

Data Recorded By: B.C. Kudell

TENDON GREASE INSTALLATION

Date Installed	9-11-78
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped	pumped from other end
Filler Temp. @ Outlet Cap } or poured	
Total Volume Installed	
Installation Pressure (if pumped, N/A)	





WIRE ANCHORAGE

Closest Buttress 4

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

All Good
No rust

WIRE ANCHORAGE

Closest Buttress 6

Tendon No. 3P14

By B.C. Kidd

Date 9-9-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1

DATA SHEET VI.1

DATA RECORDED BY [signature]

DATE 9-9-78

TENDON NUMBER 3D14 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.00 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.18
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	7.91 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-13-71 — 9-9-78	6.75 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.3 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	657 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	642 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

Ram# 404500 4050008
Gauge# 4215108
Date Cal. 7-20-78

	S/N RAM (1)	S/N RAM (2)
Hydraulic Pressure at expected lift off	5160 psi	psi
Hydraulic pressure at maximum effective prestress	6150 psi	psi
Hydraulic pressure at predicted minimum effective prestress	5050 psi	psi
[illegible]	4950 psi	
	6650 psi	

Data Recorded By B.C. [illegible signature]

Date 9-9-78

TENDON NUMBER: 7D14

Ram # 4045004050008
Gauge # 4215108
Date Cal 7-20-78

Note: New Cal On 12" Ram

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5520	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	705 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ ~~710~~ Kips → 696

Force Per Wire ($F_{LAV} \div N_e$) ~~7.89~~ Kips → 7.73

Time since initial stressing of Tendon 6.75 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified yes B.C. [illegible signature]

Date 9-9-78

Ram # 4045004050008
Gauge # 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM (2) S/N
Number of wires removed this surveillance N_R	1 Wires	
Number of effective wires N_e	89 Wires	
0.8f's (9.43 x N_e)	839.3 Kips	
Hydraulic Force @ 0.8f's	6560 psi	psi
Original Lift-Off hydraulic pressure, P_L	5520 psi	psi
Reduction in [illegible] pressure, P_{RM}, (N_R x 50)	50 psi	psi
[illegible]	5970 psi	psi

5520
450
5970

STRESSING - DESTRESSING

TENDON NUMBER 3D14

CLOSEST BUTTRESS 6

DATE: 9-9-78 DATA RECRODED BY: [illegible signature]

RAM S/N: 4045004 50008

GAUGE S/N: 4215108

Note Cal 7-20-78

STEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	5 3/4				
			Run 1	Run 2	Run 3	Run 4	Run
VI.B.3	Lift Off expect 5160	avg 5520 **	5400	5600	5600	5500	5500
VI.B.5	Pressurize to 0.8f's	6650 psi **	✓ 6650 psi				
VI.B.5	Elongation @ 0.8f's	-	6 5/16				
VI.B.6	Depressurize to zero	-	0 psi ✓				
VI.B.7	Pressurize to 1 kip/wire	750 psi **	✓				
VI.B.7	Elongation at 1 kip/wire		1 1/2"				
VII.	Remove Wire - This End Cut?	***	✓ Cut on other end & pulled from this end.				
VIII.3	Pressurize to 1 kip/wire 89 wires	~~750 psi~~ ** 540 psi	800 psi				
VIII.4	Elongation at 1 kip/wire ~~839 Kips~~		15/16 / 2"				
VIII.5	Pressurize to 0.8f's 839.3 Kips 6560 psi	~~6650~~ ** 6560 psi	✓ 6560				
VIII.5	Elongation at 0.8f's		6 1/16"				
VIII.6	Pressure for shim measure	5920 psi **	✓ 5920 psi				
VIII.7	Elongation at shim press		5 3/8" / 5 1/2"				
VIII.7	Shims installed Removed one Set 1/2" Shims Installed one Set 1/4" Shims		5 1/2" installed				
			Run 1	Run 2	Run 3	Run 4	Run
VIII.8	Lift Off pressure avg 5790		5700	5800	5800	5800	5850
VIII.8	avg 733 ≥ 710 AVG Lift Off ≥ Initial AVG Lift Off? If "NO" above	yes	753 ≥ 710 kips ✓				
VIII.9	Pressurize to 1000 psig above Initial avg. [illegible]						
	Shims [illegible]						
	Lift [illegible]						

** Obtain from Data Sheet VI.1

[illegible]

TENDON NUMBER 3D14

DATE: DATA RECORDED BY:

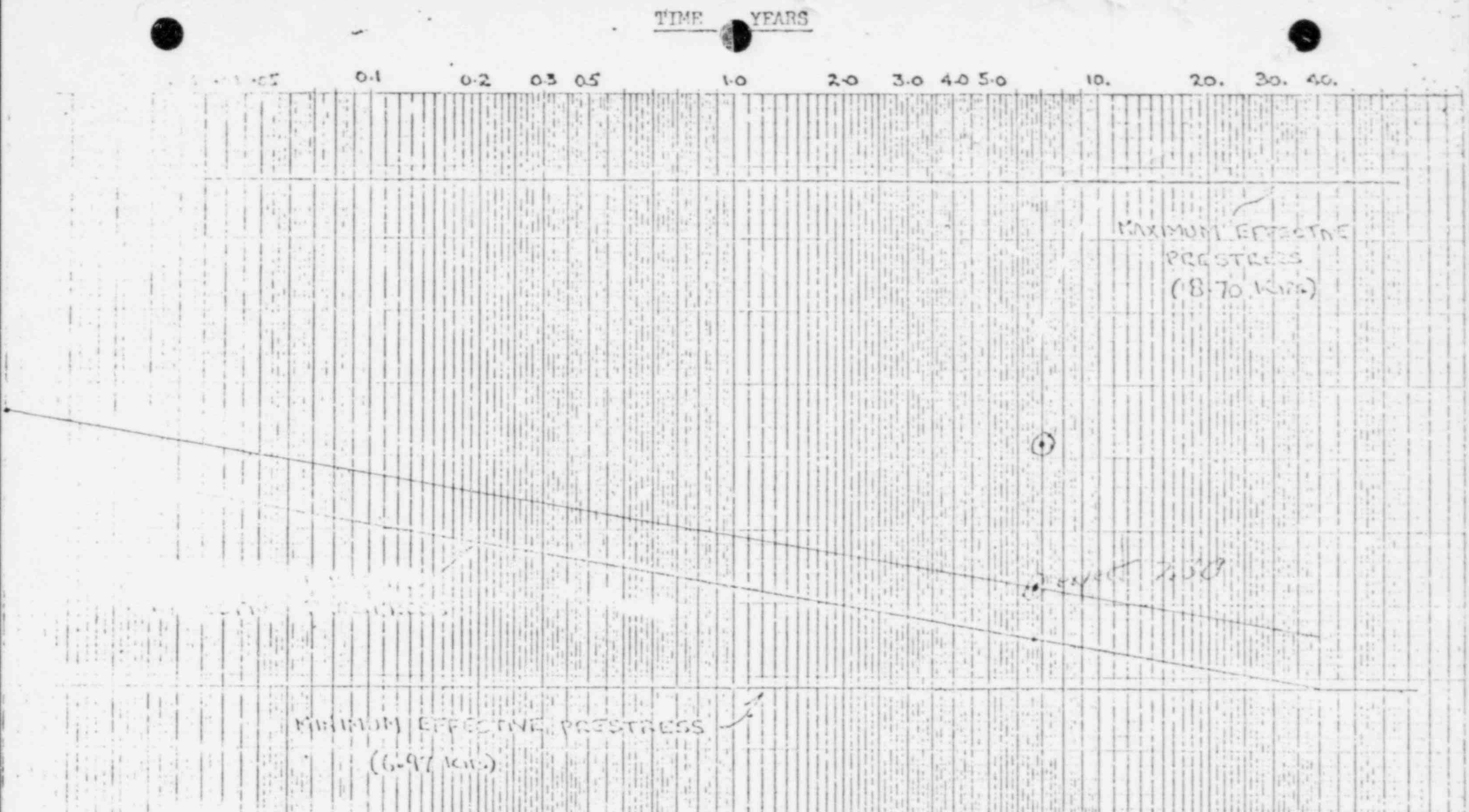
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

DOME TENDON NO: 3D14

DATA PLOTTED BY: KC Kudell

DATE: 9-9-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 3D14

Closest Buttress: 2

Grease Removal: 9-9-78

Date Filler CAP Removed: 9-9-78

Date Grease Removal Started: 9-9-78

Exterior Temp.: 74°F

Interior Temp.: 118°F

Total Volume Removed (Quarts): 10 gal

Date Filler Cap Reinstalled: 9-9-78

INSPECTION OF FILLER

Color of Replacement Filler

Color of Grease on Tendon: Dark Brown

Presence of Water Indicated: No

% (Approximate) Coverage of Components: 100%

Sample Taken: 1Qt Container Identification: 3D14 L

Data Recorded By: H McCall

TENDON GREASE INSTALLATION

Date Installed: 9-11-78

Exterior Temp.: 74°

Interior Temp.: 118°

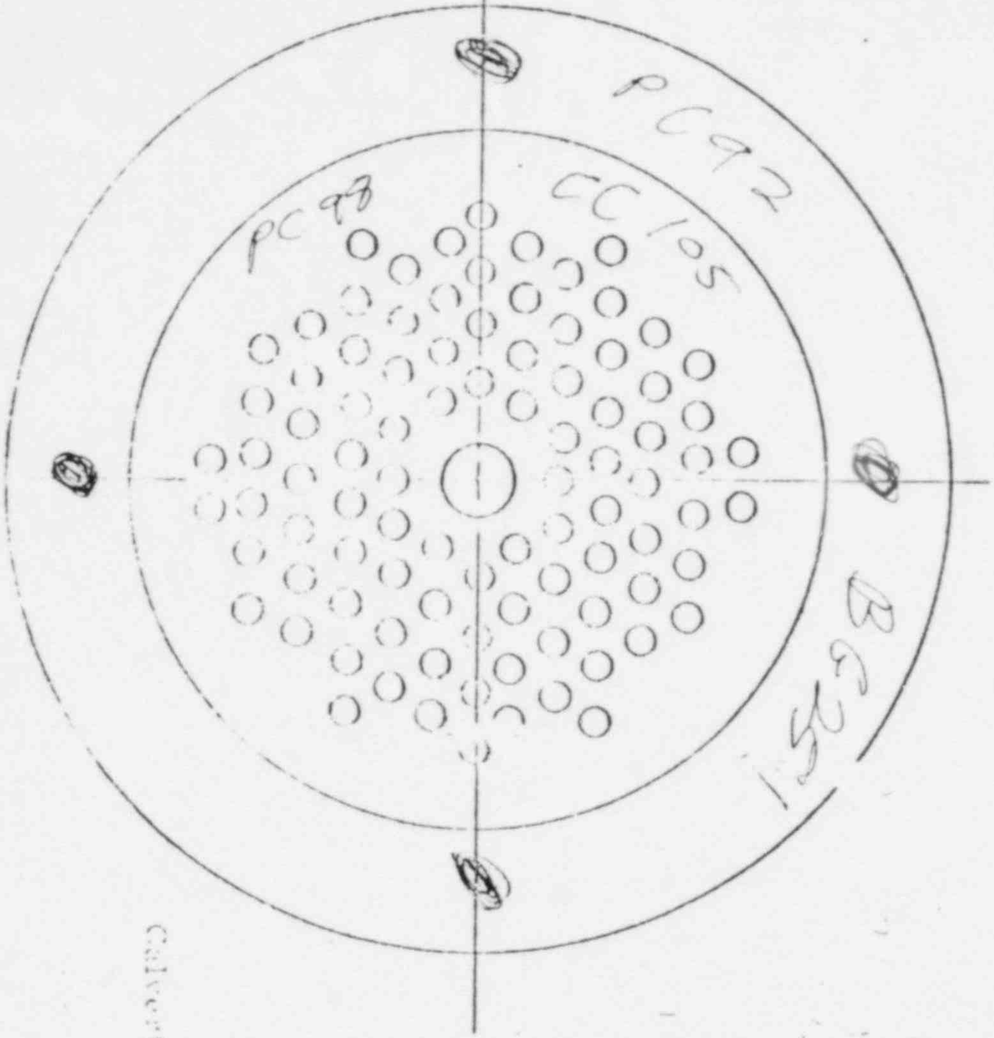
Filler Temp. @ Inlet Cap } Indicate if pumped or poured

Filler Temp. @ Outlet Cap }

Total Volume Installed: 24 gal

[illegible] Pressure ([illegible], N/A): N/A

[illegible]: H McCall : 9-11-78



WIRE ANCHORAGE

Closest Buttress ________

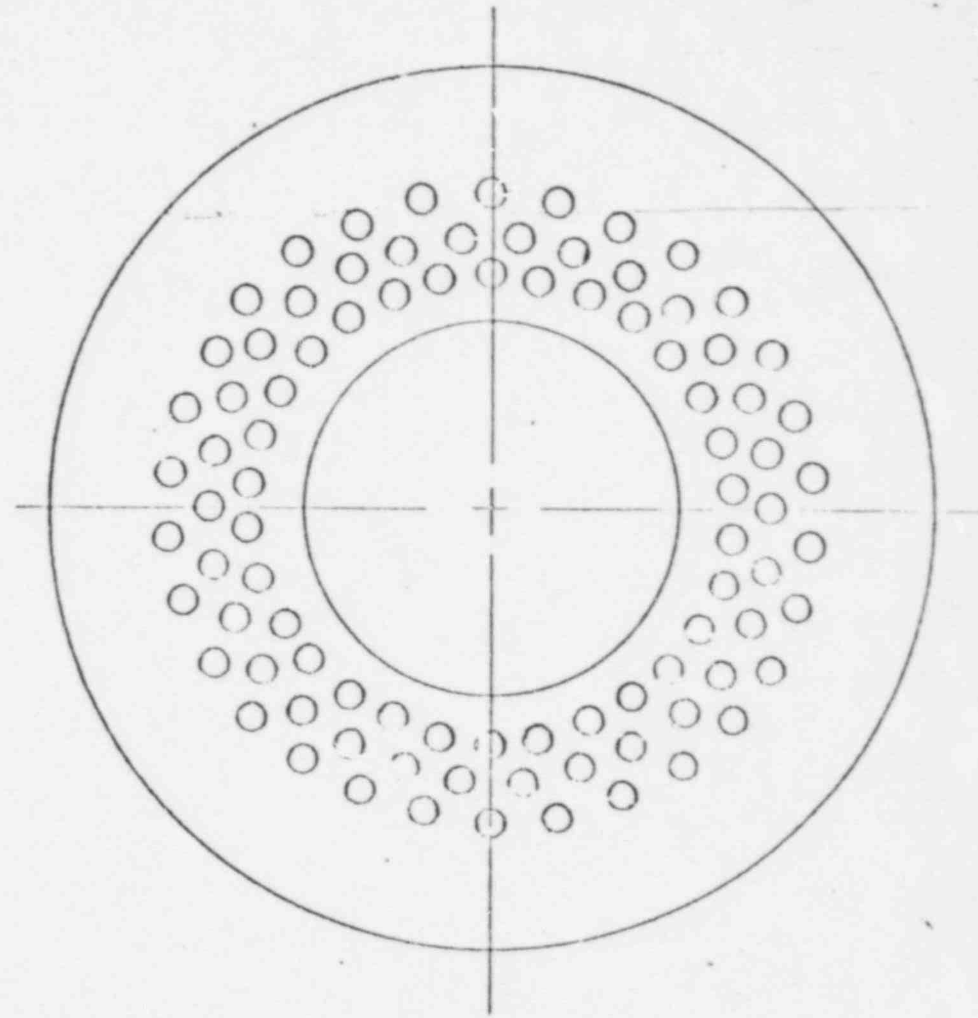
Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress's 2

Tendon No. 3D14

By V. McCall

Date 9-9-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1

DATA SHEET VI.1

DATA RECORDED BY H McColl

DATE 9-8-78

TENDON NUMBER 3D14 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	163.00 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.18 Ksi
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.91 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-1-71 - 9-9-78	6.75 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.3 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	657 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.13 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	642. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

	S/N 20 RAM (1)	S/N RAM (2)
Hydraulic Pressure at expected Lift Off	4800 psi	psi
Hydraulic Pressure at maximum effective prestress	5700 psi	psi
Hydraulic Pressure at predicted minimum effective prestress	4700 psi	psi
	4650	

Data Recorded By [illegible] McCall

Date 9-9-79

TENDON NUMBER: 3D14

Note: New Cal. Or 12" Ram

	RAM (1) S/N 20	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5220	5520
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	715 Kips	~~705~~ 692 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ ~~710~~ 696 Kips

Force Per Wire ($F_{LAV} \div N_e$) ~~7.89~~ 7.33 Kips

Time since initial stressing of Tendon 6.75 Years

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [illegible] McCall

Date 9-9-79

	RAM (1) S/N 20		RAM(2) S/N	
Number of wires removed this surveillance N_R	1	Wires		
Number of effective wires N_e	89	Wires		
0.8f's (9.43 x N_e)	839.27	Kips		
Hydraulic Force @ 0.8f's	6100	psi		psi
Original Lift-Off hydraulic pressure, P_L	5220	psi	5520	psi
Reduction in [illegible] pressure, P_{RM}, (N_R x 50)	50	psi	50	psi
[illegible]	5670	psi	5970	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 3014

CLOSEST BUTTRESS 2

DATE: 9-9-76   DATA RECRODED BY: H McCall

RAM S/N: 40450200500012   GAUGE S/N: 0215004A

STEP	DESCRIPTION	OBJECTIVE	
VI.B.2	Check Gauges	Zero	
VI.B.1	Measure Shims	-	4½"
VI.B.3	Lift Off	expect 4400 **	Run 1: 5200 / Run 2: 5200 / Run 3: 5200 / Run 4: 5200 / Run 5: 5300 5220
VI.B.5	Pressurize to 0.8f's	6200 **	
VI.B.5	Elongation @ 0.8f's	-	5¾"
VI.B.6	Depressurize to zero	-	
VI.B.7	Pressurize to 1 kip/wire	**	
VI.B.7	Elongation at 1 kip/wire		2¼"
VII.	Remove Wire - This End Cut?	***	yes
VIII.3	Pressurize to 1 kip/wire	650 **	
VIII.4	Elongation at 1 kip/wire		~~2⅞~~ 1¾"
VIII.5	Pressurize to 0.8f's	6100 **	
VIII.5	Elongation at 0.8f's		6¼"
VIII.6	Pressure for shim measure	5670 **	
VIII.7	Elongation at shim press		6"
VIII.7	Shims installed 1" Allied + 3/8" Allied		5⅞"
VIII.8	Lift Off pressure		Run 1: 5400 / Run 2: 5350 / Run 3: 5350 / Run 4: 5350 / Run 5: 5350
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	yes	5360 = 734 kips
VIII.9	If "NO" above Pressurize [illegible]	**	
	Shims [illegible] Initial avg. [illegible]		
	[illegible] Lift [illegible]		Run 1 / Run 2 / Run 3 / Run 4 / Run 5

** Obtain from Data Sheet VI.1

[illegible]

TENDON NUMBER 3D14

DATE: DATA RECORDED BY:

From Page (1)

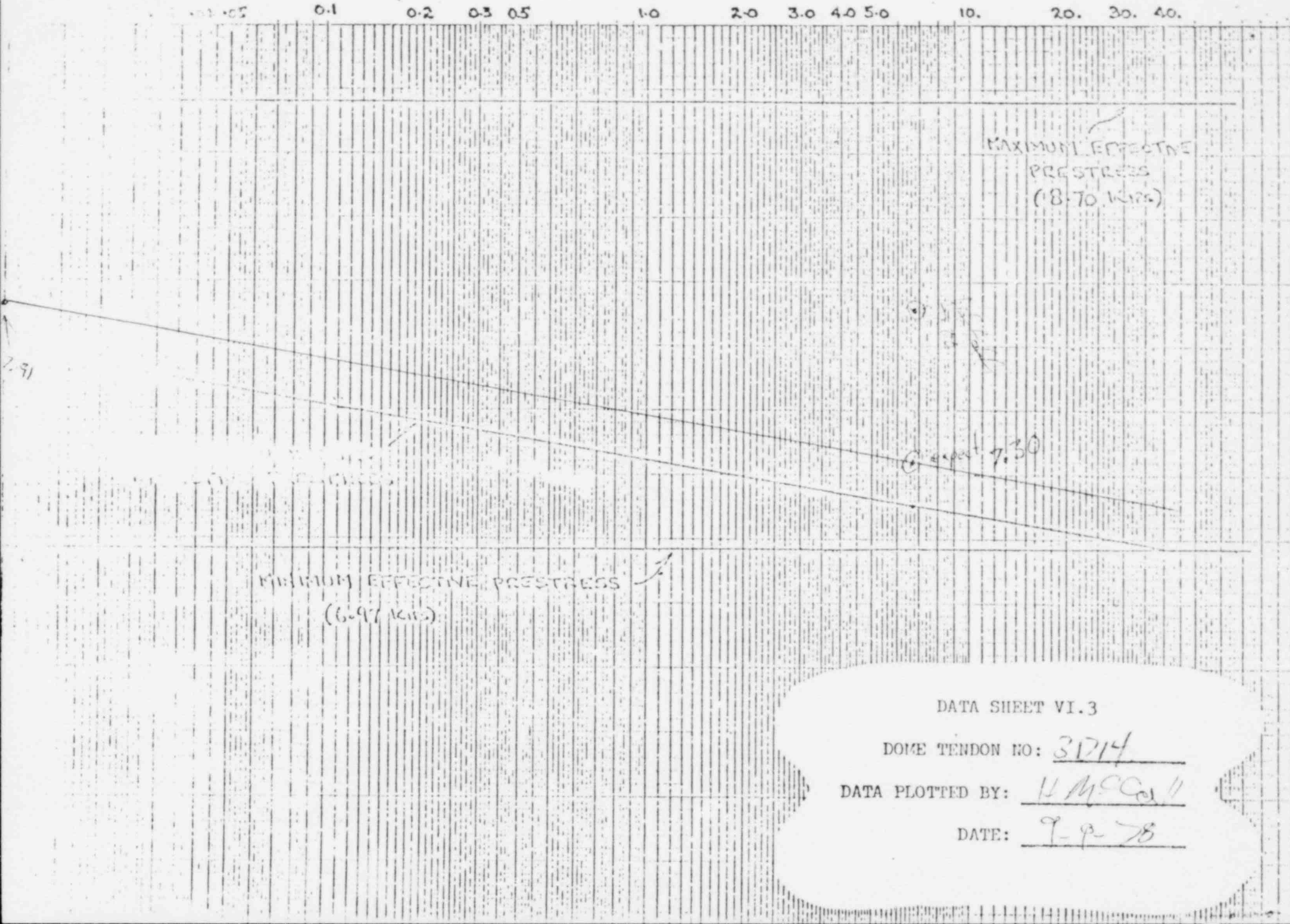
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 Kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	1 1/2	2 1/4	6 5/16	5 3/8	4 13/16	3 1/8	7 15/16
RESTRESS	2	1 3/4	6 1/16	6 1/4	4 1/16	4 1/2	8 9/16

TIME YEARS



DATA SHEET VI.3

DOME TENDON NO: 3D14

DATA PLOTTED BY: H McCall

DATE: 9-8-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 2D45

Closest Buttress	5
Grease Removal	9gal
Date Filler CAP Removed	9-6-78
Date Grease Removal Started	9-6-78
Exterior Temp.	79°F
Interior Temp.	119°F
Total Volume Removed	9gal
Date Filler Cap Reinstalled	9-6-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

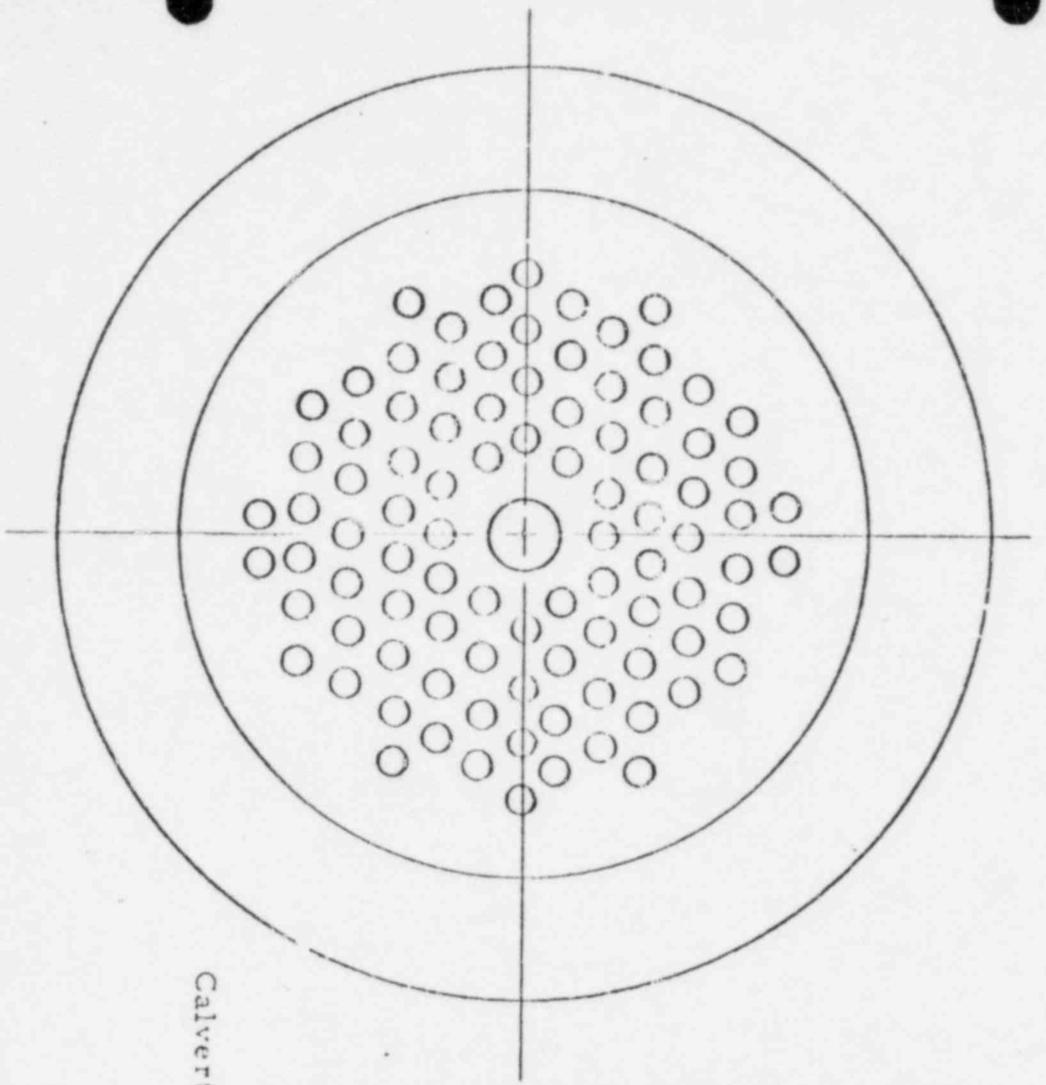
Sample Taken yes Container Identification 2D45

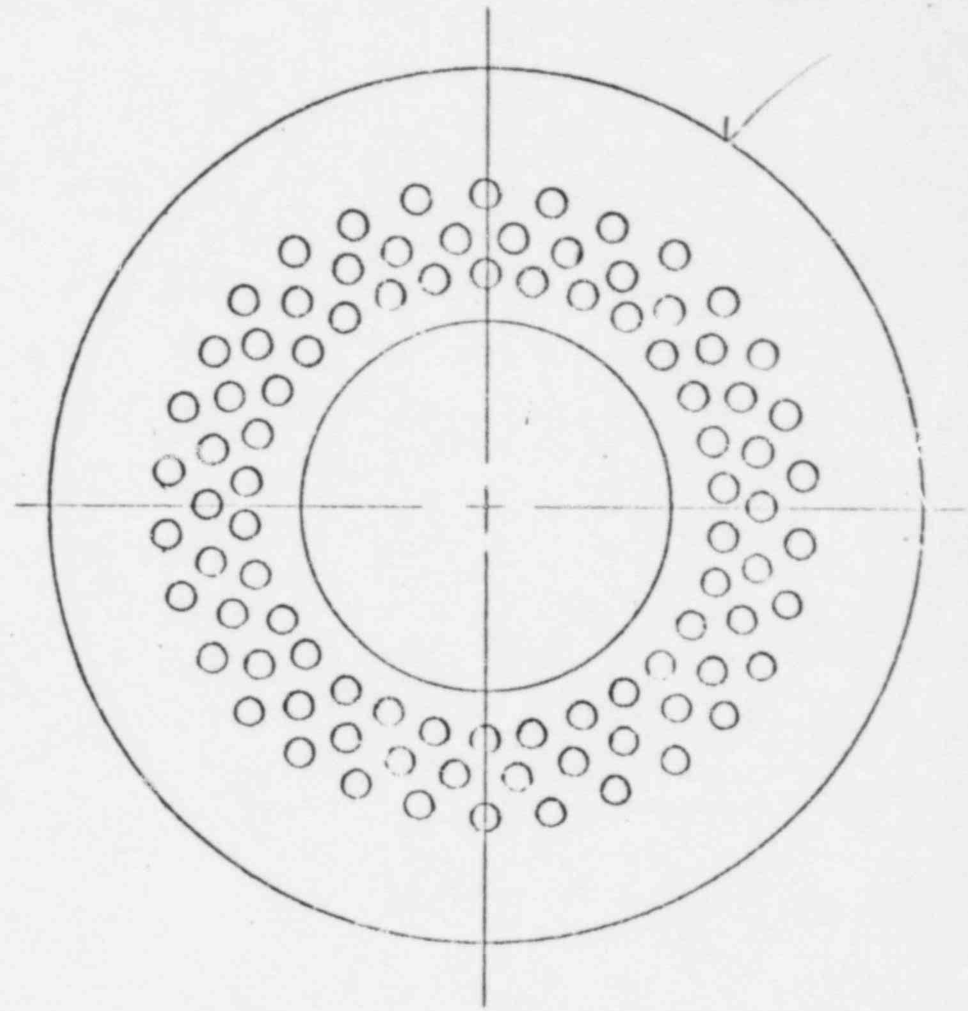
Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed	9-6-78 pumped from other end, vent on this end
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	NA
Filler Temp. @ Outlet Cap	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ______ Date ______





WIRE ANCHORAGE

Closest Buttress 5

Off-Size Buttonhead All Good

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 5

Tendon No. 2D45

By E.C. Kudell

Date 9-6-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

Page (1)

DATA RECORDED BY B.C. [illegible]

DATE 9-6-78

TENDON NUMBER 2045 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.72 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	161.90
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.95 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-1-71	6.75 Years ?
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.30 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	657 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 ~~[illegible]~~ Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	643. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram# 404500 4050008 Gauge# 4215108 Date Cal. 7-20-78		
	Hydraulic Pressure at expected Lift Off 657 kips	5170 psi	psi
	Hydraulic Pressure at maximum effective prestress 783. kips	6140 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress 643. kips	5070 psi	psi
	Hydraulic pressure at absolute minimum effective prestress 627. kips	4930 psi	psi
	Hydraulic Pressure at 0.8f's 849 kips	6650 psi	psi
	Hydraulic Pressure at 1 Kip/wire 90 kips	700 psi	psi

Data Recorded By B.C. Kudell

Date 9-6-78

TENDON NUMBER: 2045

Ram # 40450040500008
Gauge # 4215108
Date Cal 7-20-78

Note: New Cal. On 12" Ram

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	4980 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	635 Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	~~660.5~~ Kips ⇒ 647	
Force Per Wire ($F_{LAV} \div N_e$)	~~7.33~~ Kips ⇒ 7.19	
Time since initial stressing of Tendon	6.75 Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Kudell

Date 9-6-78

Ram # 40450040500008
Gauge # 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	none Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	849 Kips	
Hydraulic Force @ 0.8f's	6650 psi	psi
Original Lift-Off Hydraulic pressure, P_L	4980 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5480 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 2045

CLOSEST BUTTRESS 5

DATE: 9-6-78   DATA RECRODED BY: [illegible signature]

RAM S/N: 404500 450008   GAUGE S/N: 4215108   Date Cal. 7-20-78

STEP #	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	5 3/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off. input 5170 psi avg 4980	**	5050	5000	4950	4950	4950
VI.B.5	Pressurize to 0.8f's	6650 psi **	6650 psi ✓				
VI.B.5	Elongation @ 0.8f's	-	6 9/16" ✓				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	700 psi **	✓				
VI.B.7	Elongation at 1 kip/wire		1 5/8"				
VII.	Remove Wire - This End Cut?	***	none				
VIII.3	Pressurize to 1 kip/wire	700 psi **	✓				
VIII.4	Elongation at 1 kip/wire		1 5/8"				
VIII.5	Pressurize to 0.8f's	6650 psi **	✓				
VIII.5	Elongation at 0.8f's		6 1/4"				
VIII.6	Pressure for shim measure	5480 psi **	✓				
VIII.7	Elongation at shim press		4 15/16"	5 1/8"	6 1/2"	6 3/16"	6 1/2
VIII.7	Shims installed Removed 1/2" shim + added one 1/4" shim		5 1/2"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5400	5350	5300	5350	5400
VIII.8	5360 5170 680 AVG Lift Off ≥ Initial AVG Lift Off?		avg 715. ≥ 660. yes ✓ OK				
VIII.9	If above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 2045

DATE: DATA RECORDED BY:

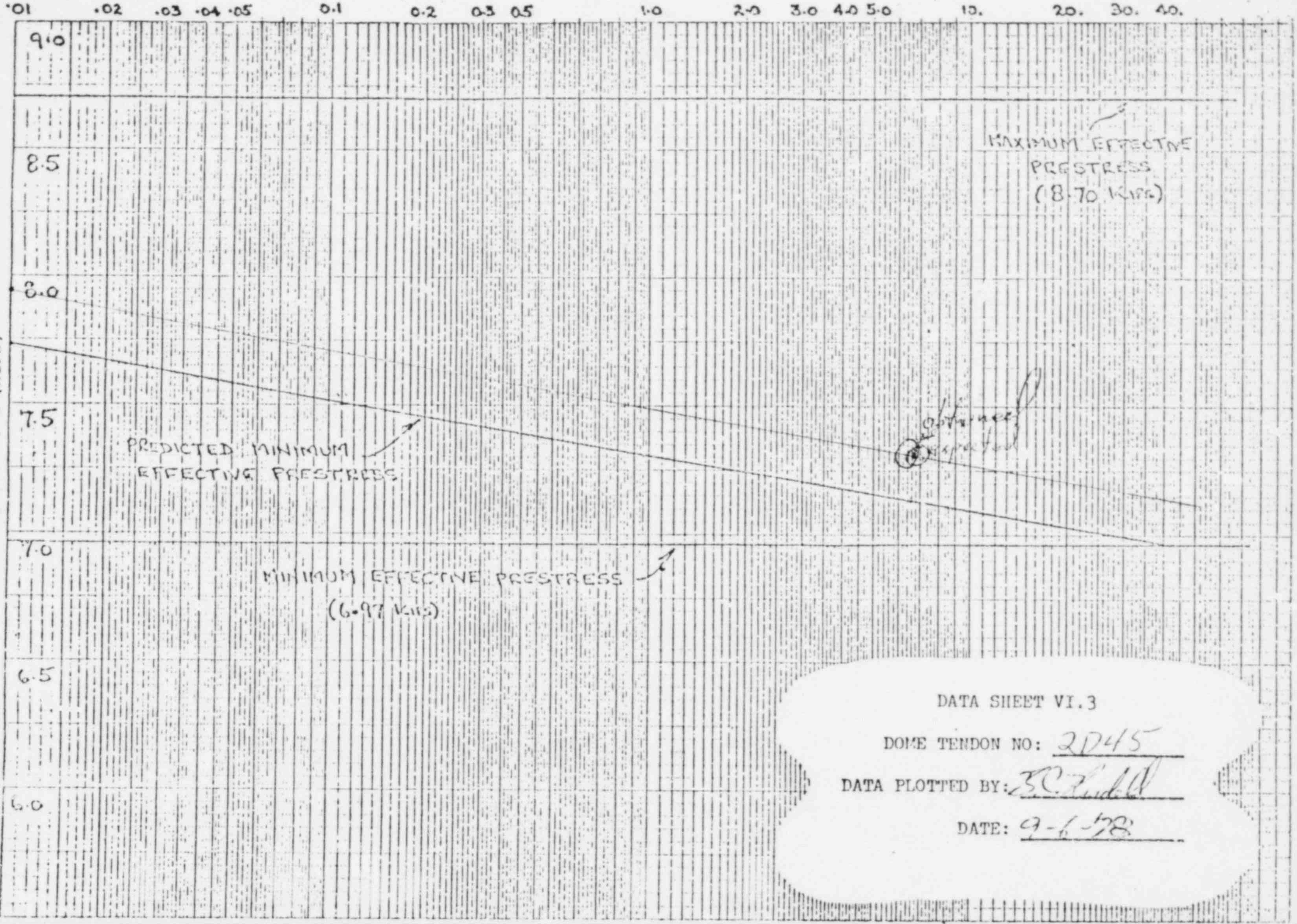
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							


TIME YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (8.70 KIPS)
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.97 KIPS)
DATA SHEET VI.3
DOME TENDON NO: 2D45
DATA PLOTTED BY:
DATE: 9-6-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 2D45

Closest Buttress	1
Grease Removal	9-6-78
Date Filler CAP Removed	9-6-78
Date Grease Removal Started	9-6-78
Exterior Temp.	79°F
Interior Temp.	119°F
Total Volume Removed	6
Date Filler Cap Reinstalled	9-6-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated No

% (Approximate) Coverage of Components 100

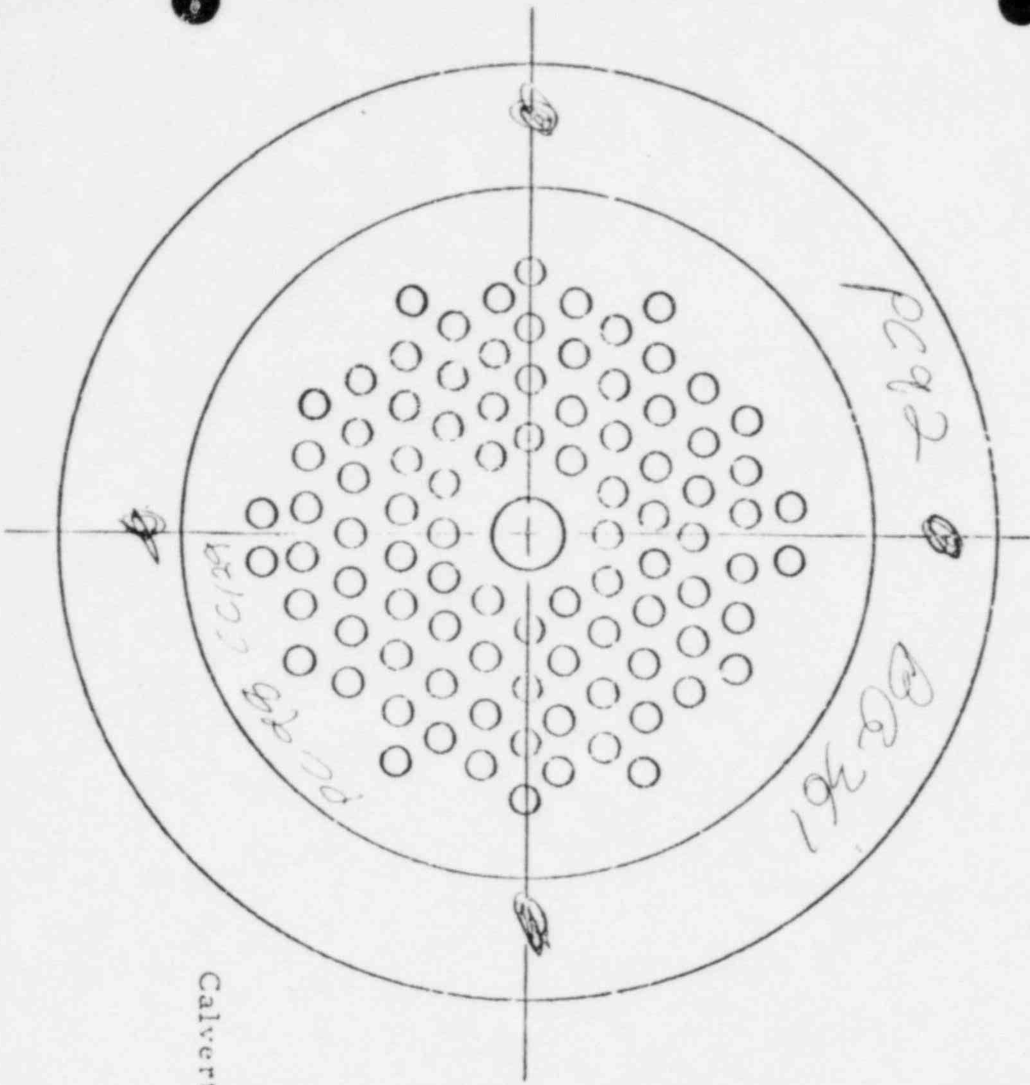
Sample Taken Yes Container Identification 2D45K

Data Recorded By: H. McCall

TENDON GREASE INSTALLATION

Date Installed	9-6-78
Exterior Temp.	79°
Interior Temp.	119°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap	
Total Volume Installed	16 gal
Installation Pressure (if poured, N/A)	N/A

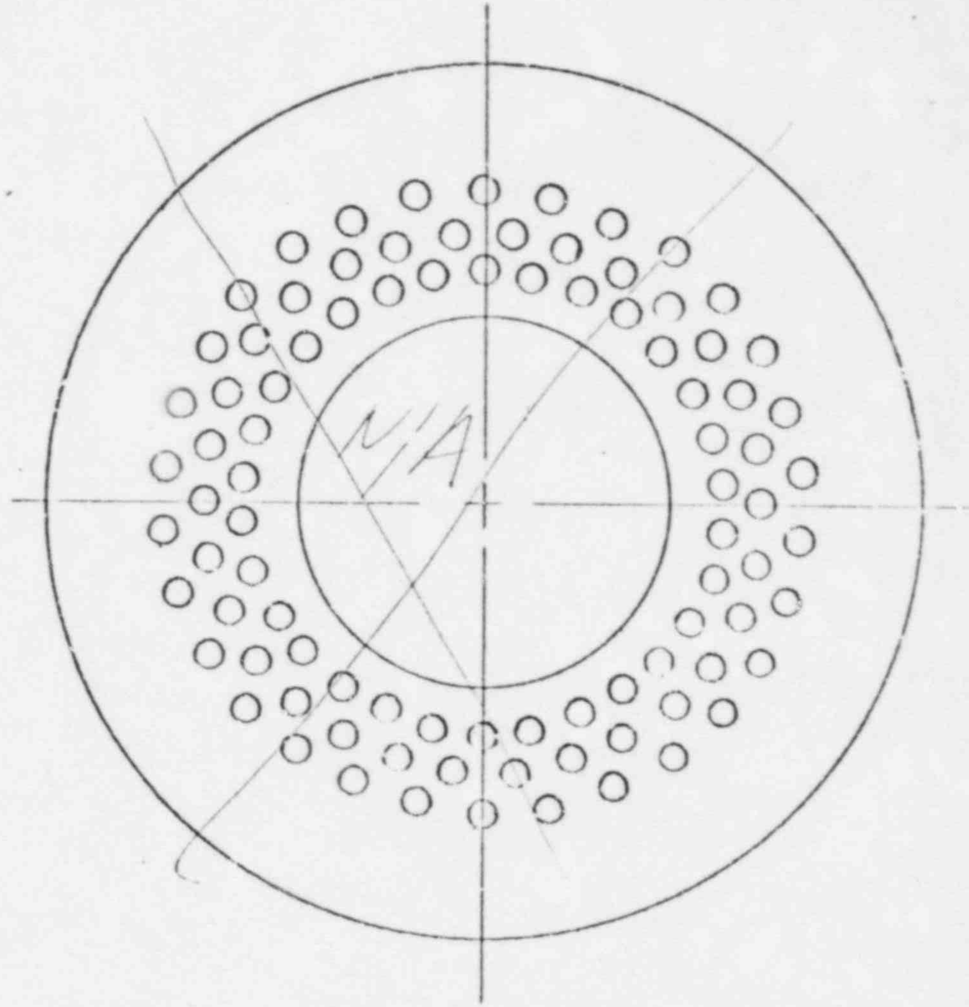
Data Recorded By: H. McCall Date 9-6-78



WIRE ANCHORAGE

Closest Buttress ________

- Off-Size Buttonhead
- Buttonhead with Split
- Wire Removed Previously
- Discontinuous Wire Removed this surveillance
- Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress's 1

Tendon No. 2D45

By H. McCall

Date 8-6-82

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY ____________

DATE ____________

TENDON NUMBER 2D45 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	168.72 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.90
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma 4 \times A_W$)	7.95 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-1-71 — 9-1-78	6.75 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.30 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	657 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.14 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.97 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	643. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	627 Kips
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	849 Kips
	Force at 1 kip per wire ($1 \times N_e$)	90 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By H. McColl

Date 9-6-79

TENDON NUMBER: 2045

Note: New Cal On 12" Ram

	RAM (1) S/N 20	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5000	4980
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	~~656~~ 664 Kips	635 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 647 ~~[illegible] 605~~ Kips

Force Per Wire ($F_{LAV} \div N_e$) ~~7.33~~ 7.19 Kips

Time since initial stressing of Tendon 6.75 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified H McColl

Date 9-6-79

	RAM (1) S/N		RAM(2) S/N	
Number of wires removed this surveillance N_R	0	Wires		
Number of effective wires N_e	90	Wires		
0.8f's (9.43 x N_e)	849.9	Kips		
Hydraulic Force @ 0.8f's	6200	psi		psi
Original Lift-Off Hydraulic pressure, P_L	5000	psi	4950	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0	psi	0	psi
Shim Pressure (P_L + 500 - P_{RH})	5500	psi	5450	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 2045

CLOSEST BUTTRESS 1

DATE: 9-6-70 DATA RECRODED BY: H. McCall

RAM S/N: 40450200500-2 GAUGE S/N: 4215004A

STEP	DESCRIPTION	OBJECTIVE	
VI.B.2	Check Gauges	Zero	
VI.B.1	Measure Shims	-	4 1/2
VI.B.3	Lift Off	4800 **	Run 1: 5000; Run 2: 5000; Run 3: 5000; Run 4: 5000; Run 5: 5000
VI.B.5	Pressurize to 0.8f's	**	avg 5000
VI.B.5	Elongation @ 0.8f's	6200 -	5 3/4
VI.B.6	Depressurize to zero	-	
VI.B.7	Pressurize to 1 kip/wire	650 **	~~2~~
VI.B.7	Elongation at 1 kip/wire		2"
VII.	Remove Wire - This End Cut?	***	
VIII.3	Pressurize to 1 kip/wire	650 **	
VIII.4	Elongation at 1 kip/wire		
VIII.5	Pressurize to 0.8f's	6200 **	
VIII.5	Elongation at 0.8f's		7"
VIII.6	Pressure for shim measure	**	5500
VIII.7	Elongation at shim press		6 1/2
VIII.7	Shims installed		6 7/8" [illegible] @ 1 pair 1/2 1 pair 1"
VIII.8	Lift Off pressure		Run 1: 5500; Run 2: 5500; Run 3: 5400; Run 4: 5500; Run 5: 5400
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5460 = 752,09 added 1 pair 7/8"
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	
	Shims installed		
	New Lift-Off pressure		Run 1: ; Run 2: ; Run 3: ; Run 4: ; Run 5:

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 2045

DATE: DATA RECORDED BY:

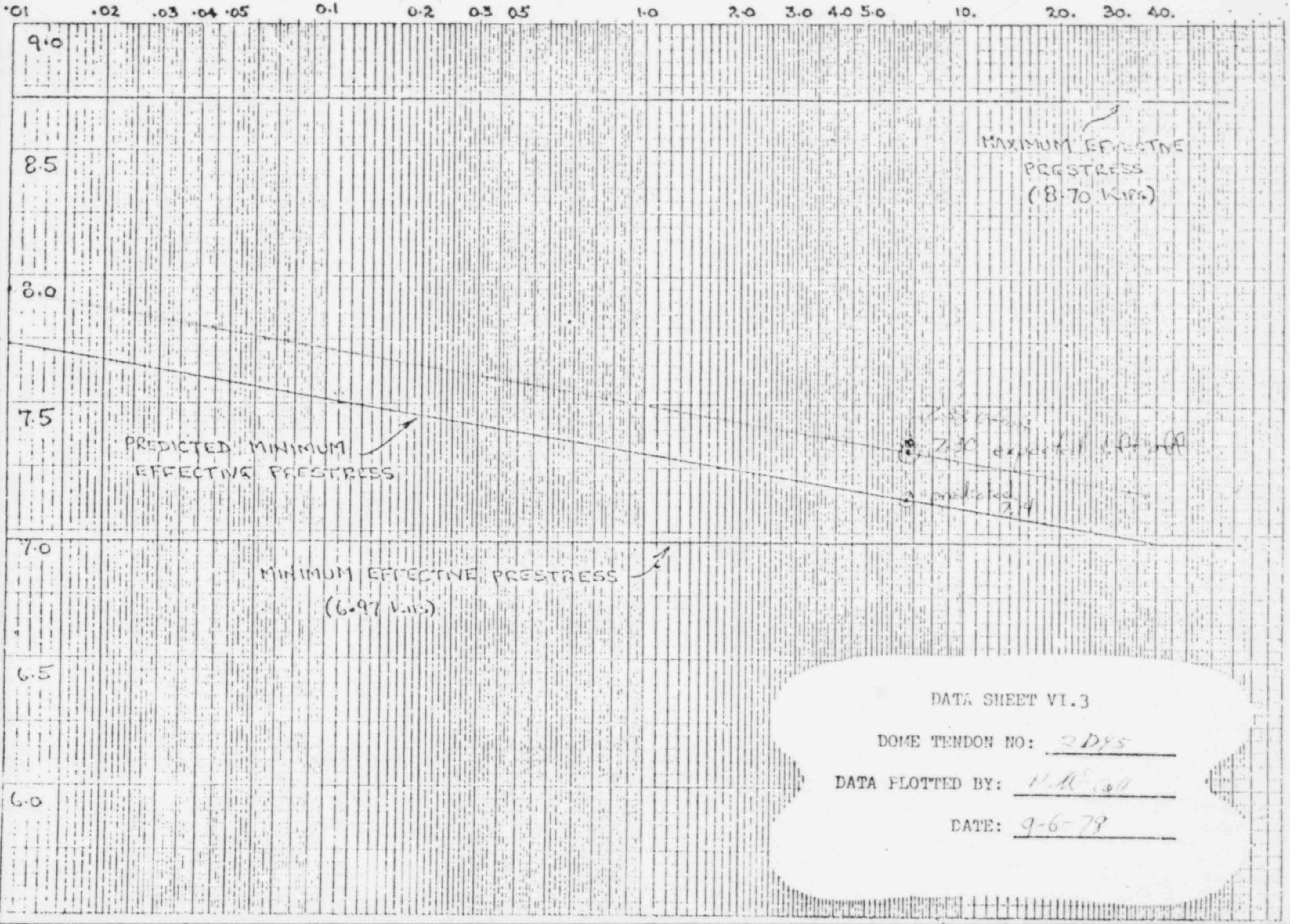
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	1 5/8"	2"	6 9/16	5 3/4	4 15/16	3 3/4	8 11/16
RESTRESS	1 5/8"	2"	6 1/4	7"	4 5/8	5	9 5/8



DATA SHEET VI.3

DOME TENDON NO: 2D45

DATA PLOTTED BY: H. McCall

DATE: 9-6-78

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 12V31

Closest Buttress: Top

Grease Removal: 2 gal

Date Filler CAP Removed: 12-4-78

Date Grease Removal Started: 12-4-78

Exterior Temp.: 68°

Interior Temp.: 98°

Total Volume Removed: 2c "

Date Filler Cap Reinstalled: 12-6-78

INSPECTION OF FILLER

Color of Replacement Filler: Dark Brown

Color of Grease on Tendon: Dark Brown

Presence of Water Indicated: None

% (Approximate) Coverage of Components: 100%

Sample Taken: yes   Container Identification: 12 V 31 Top

Data Recorded By: D.C. Rudell

TENDON GREASE INSTALLATION

Date Installed: ______

Exterior Temp.: ______

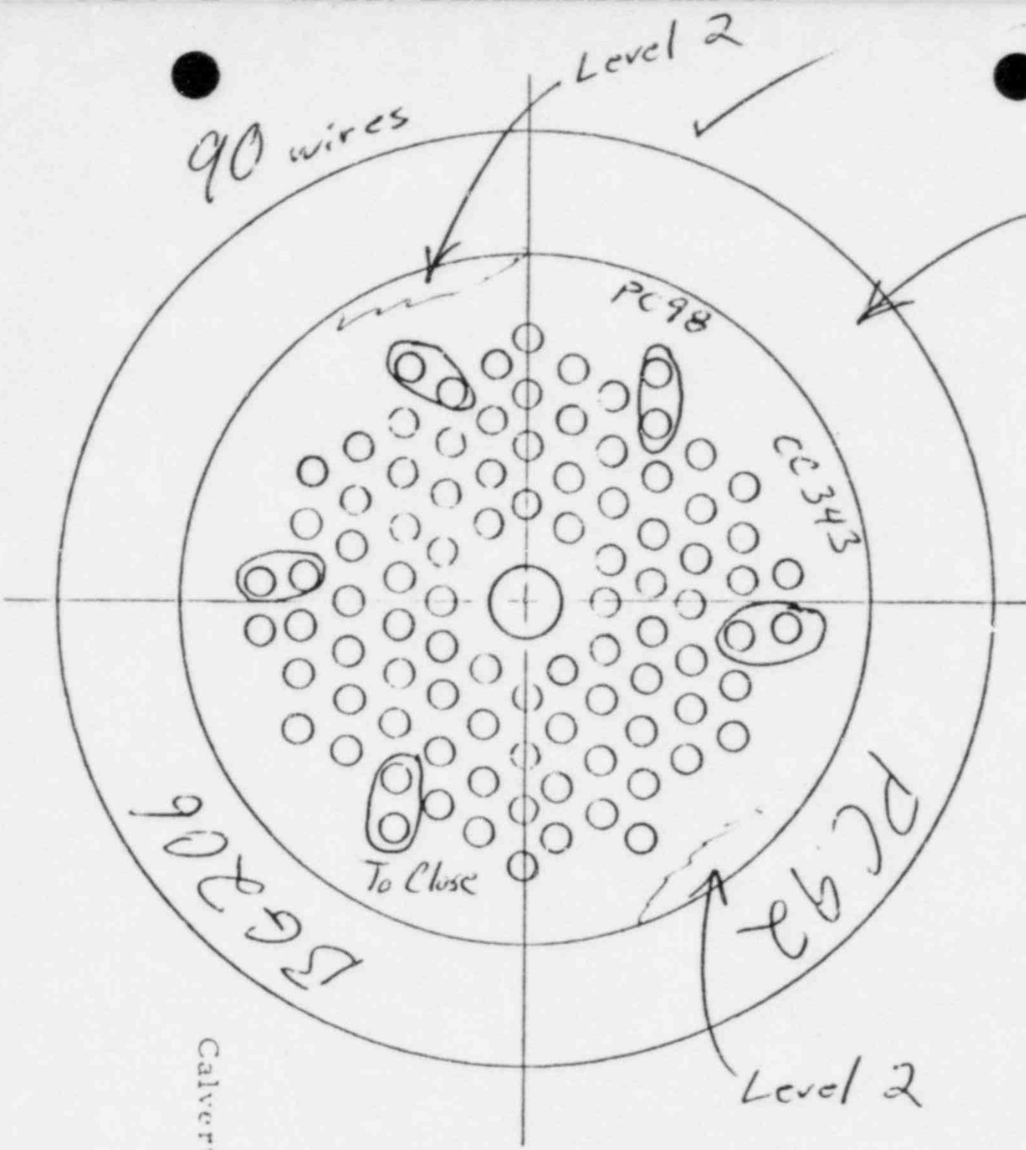
Interior Temp.: ______

Filler Temp. @ Inlet Cap / Filler Temp. @ Outlet Cap (Indicate ~~if pumped~~ or poured): Pumped From Bottom End

Total Volume Installed: ______

Installation Pressure (if poured, N/A): ______

Data Recorded By: ______ ______ Date ______



WIRE ANCHORAGE

Closest Buttress Top

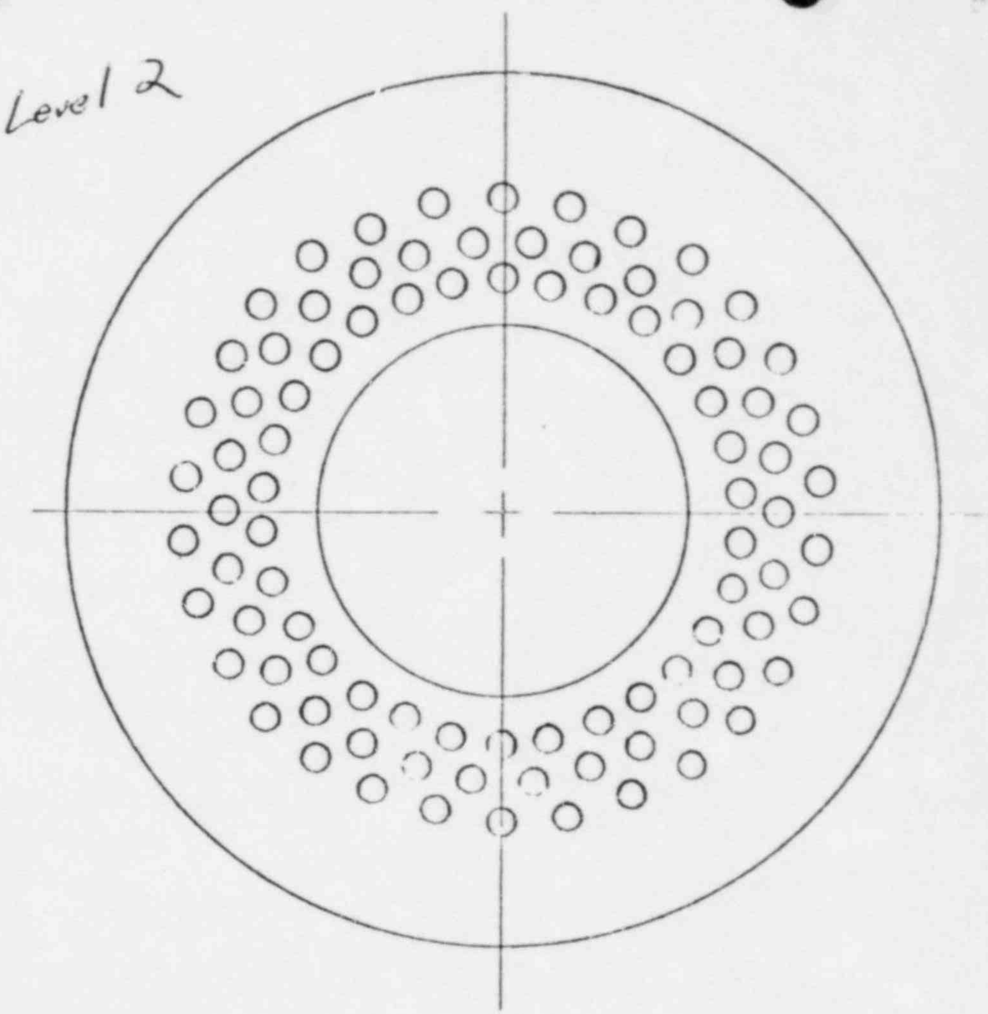
Off-Size Buttonhead / All circled are too close together to determine

Buttonhead with Split

Wire Removed Previously N/A

Discontinuous Wire Removed this surveillance N/A

Wire removed this surveillance for inspection N/A



WIRE ANCHORAGE

Closest Buttress

Tendon No. 12V31

By [signature]

Date 12-5-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY B.C. Kendell

DATE 12-5-78

TENDON NUMBER 12V31 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 12-11-71	166.59 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	159.47
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 (σ4 x A_W)	7.83 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s 02-12-73 156.71 KSI 7.69 kip	165.18 Ksi 2-20-73
	Force per wire at restressing F_s (σ_s x A_W)	8.11 Kips
	Time after initial stressing	1.25 yrs. until restress 7.0 Years Since 1st Stress
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.95 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L (F_{LE} x N_e)	715. Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.10 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.96 Kips
	Maximum effective prestress (F_{max} x N_e)	783. Kips
	Predicted min. effective prestress (F_{pmin} x N_e)	639. Kips
	Absolute min. effective prestress (F_{min} x N_e)	626. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	848.7 Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram# 40450200500012 Gauge# 4215004A Date Cal 7-17-78		N/A
	Hydraulic Pressure at expected Lift Off	5200 psi	psi
	Hydraulic Pressure at maximum effective prestress	5700 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4650 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4570 psi	psi
	Hydraulic Pressure at 0.8f's	6160 psi	psi
	Hydraulic Pressure at 1 Kip/wire	650 psi	psi

Data Recorded By BC Kudell

Date 12-5-78

TENDON NUMBER: 12V31

Ram # 40450200500-12
Gauge # 4215004A
Date Cal 7-19-78

Note: New Cal. On 12" Ram. 3-14-79

	RAM (1) S/N	RAM (2) S/N NA
Average Hydraulic pressure at Lift-Off	avg 5350	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~233.5~~ BCR ~~720~~ ~~732.5~~ Kips ← 710	Kips

Average Lift Off Force F_{LAV} ~~$\frac{(F_L(1) + F_L(2))}{2}$~~ NA Kips

Force Per Wire ($F_{LAV} \div N_e$) 7.88 ~~8.14~~ BCR ~~8.1~~ Kips

Time since initial stressing of Tendon 7.0 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified Bernard C. Kudell

Date 12-5-78

	RAM (1) S/N	RAM (2) S/N NA
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	848.7 Kips	
Hydraulic Force @ 0.8f's	6160 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5350 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5850 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 12V31

CLOSEST BUTTRESS Top

DATE: 12-5-78 DATA RECRODED BY: B.C. Hubell

RAM S/N: GAUGE S/N:

40450200500-12 4215004A

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	16 3/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 5350 psi	expect 5200 psi **	5400	5350	5450	5250	5300
VI.B.5	Pressurize to 0.8f's	6160 psi **	6150 psi ✓				
VI.B.5	Elongation @ 0.8f's	-	17 1/2"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 psi **	700 psi				
VI.B.7	Elongation at 1 kip/wire		6 1/4"				
VI.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire		6 1/4"				
VIII.5	Pressurize to 0.8f's	6160 psi **	✓				
VIII.5	Elongation at 0.8f's		17 1/2"				
VIII.6	Pressure for shim measure	5850 psi **	✓				
VIII.7	Elongation at shim press		16 3/4"				
VIII.7	Shims installed (added 1 set 1/4" Shims)		16 5/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure		5600	5800	5800	5800	5700
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		5740 ≥ 5350 ✓				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	8.72 kip/wire		8.45 ≥ 7.88		
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

5400
5150

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 12V31

DATE: DATA RECORDED BY:

From Page (1)

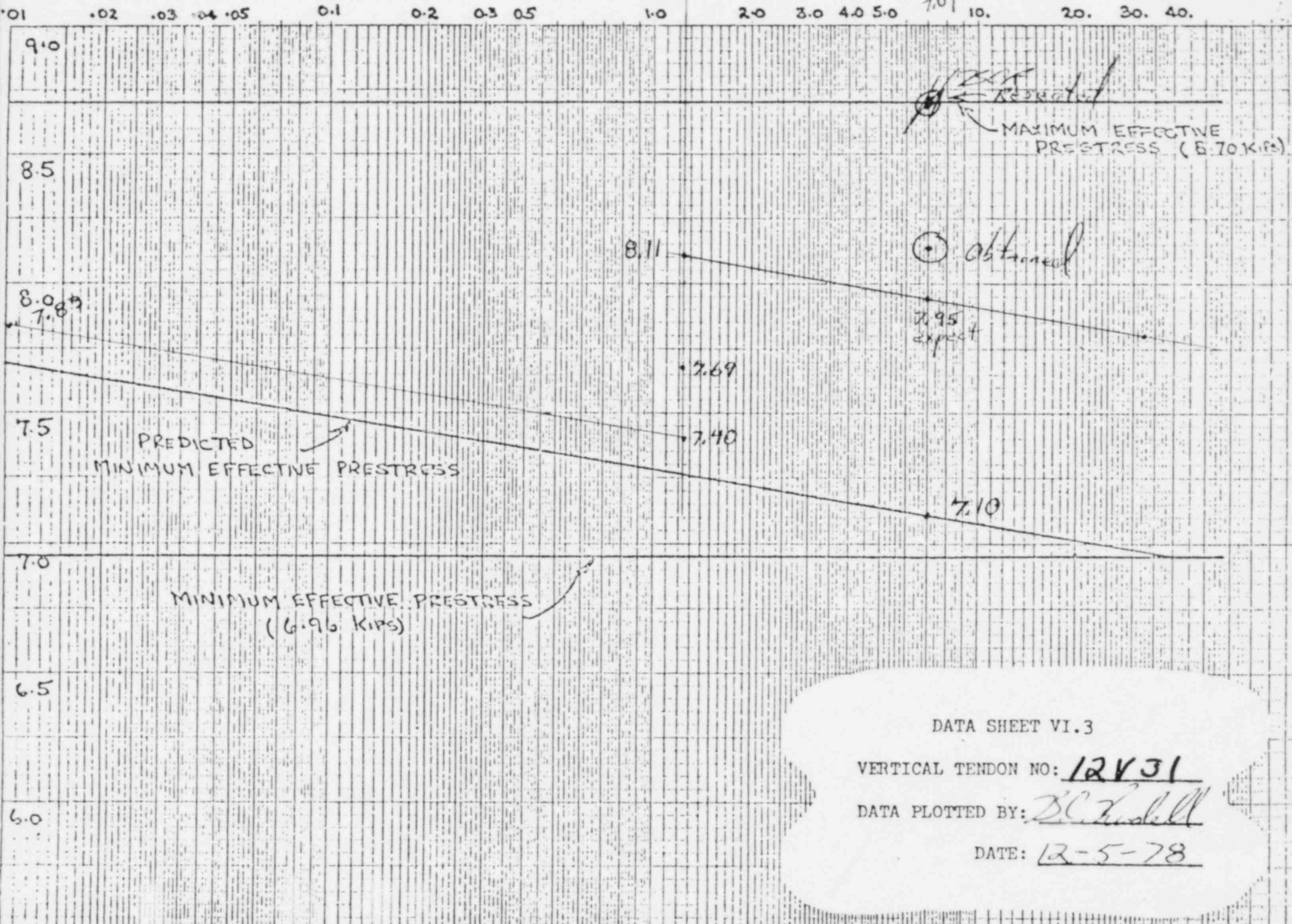
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	6 1/4		17 1/2		11 1/4		11 1/4
RESTRESS	6 1/4		17 1/2		11 1/4		11 1/4

TIME IN YEARS



DATA SHEET VI.3

VERTICAL TENDON NO: 12V31

DATA PLOTTED BY: B.C. Kudell

DATE: 12-5-78

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 12V31

Closest Buttress: Bottom

Grease Removal: 1/2 Drum

Date Filler CAP Removed: 12-4-78

Date Grease Removal Started: 12-4-78

Exterior Temp.: 68°

Interior Temp.: 98°

Total Volume Removed: 1/2 Drum

Date Filler Cap Reinstalled: 12-7-78

INSPECTION OF FILLER

Color of Replacement Filler: Dark Brown

Color of Grease on Tendon: Dark Brown

Presence of Water Indicated: None

% (Approximate) Coverage of Components: 100%

Sample Taken: yes Container Identification: 12V31 Bottom

Data Recorded By: B.C. Rudell

† TENDON GREASE INSTALLATION

Date Installed: 1-1-79

Exterior Temp.: ~~#~~ 34°

Interior Temp.: 20°

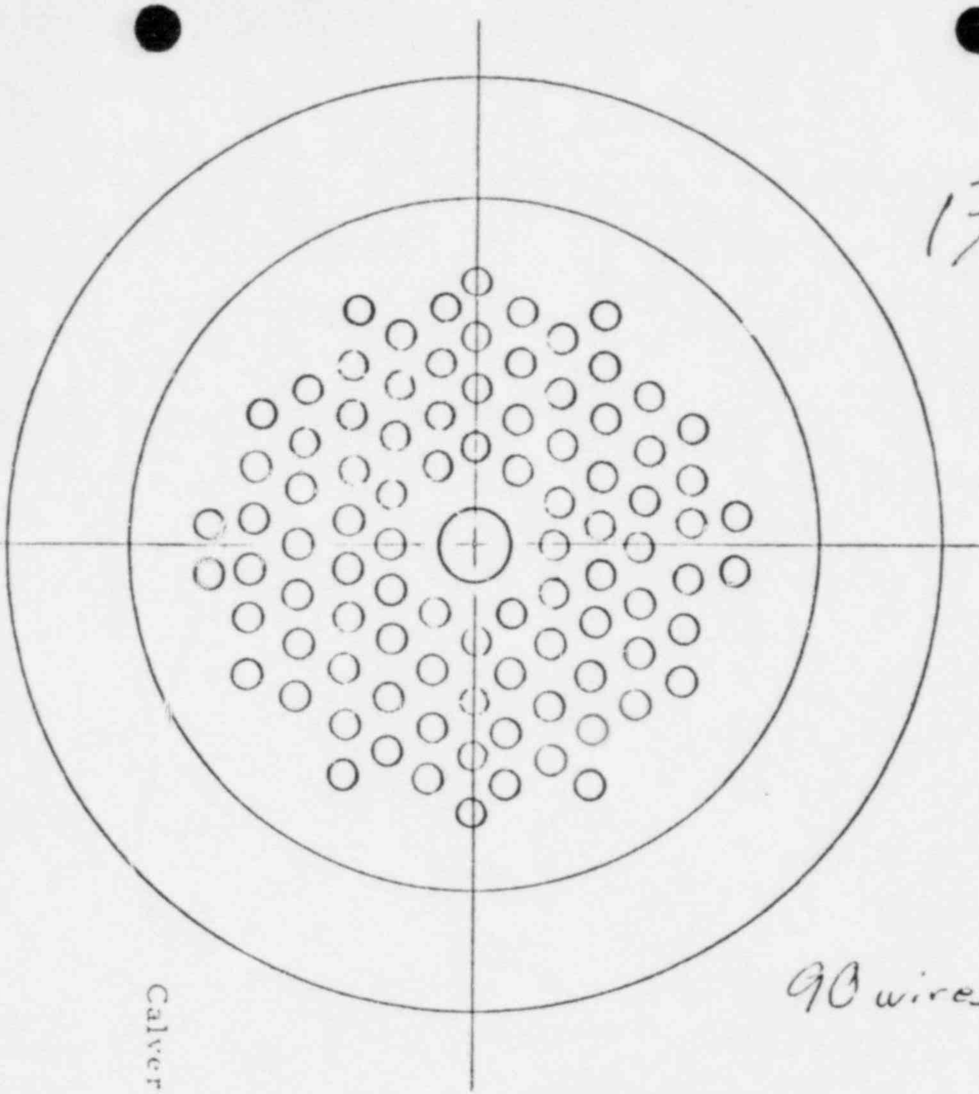
Filler Temp. @ Inlet Cap } Indicate if pumped or poured: pumped

Filler Temp. @ Outlet Cap

Total Volume Installed: 37 gal

Installation Pressure (if poured, N/A): 90 psi

Data Recorded By: B.C. Rudell Date 2-28-79



WIRE ANCHORAGE

Closest Buttress Bottom

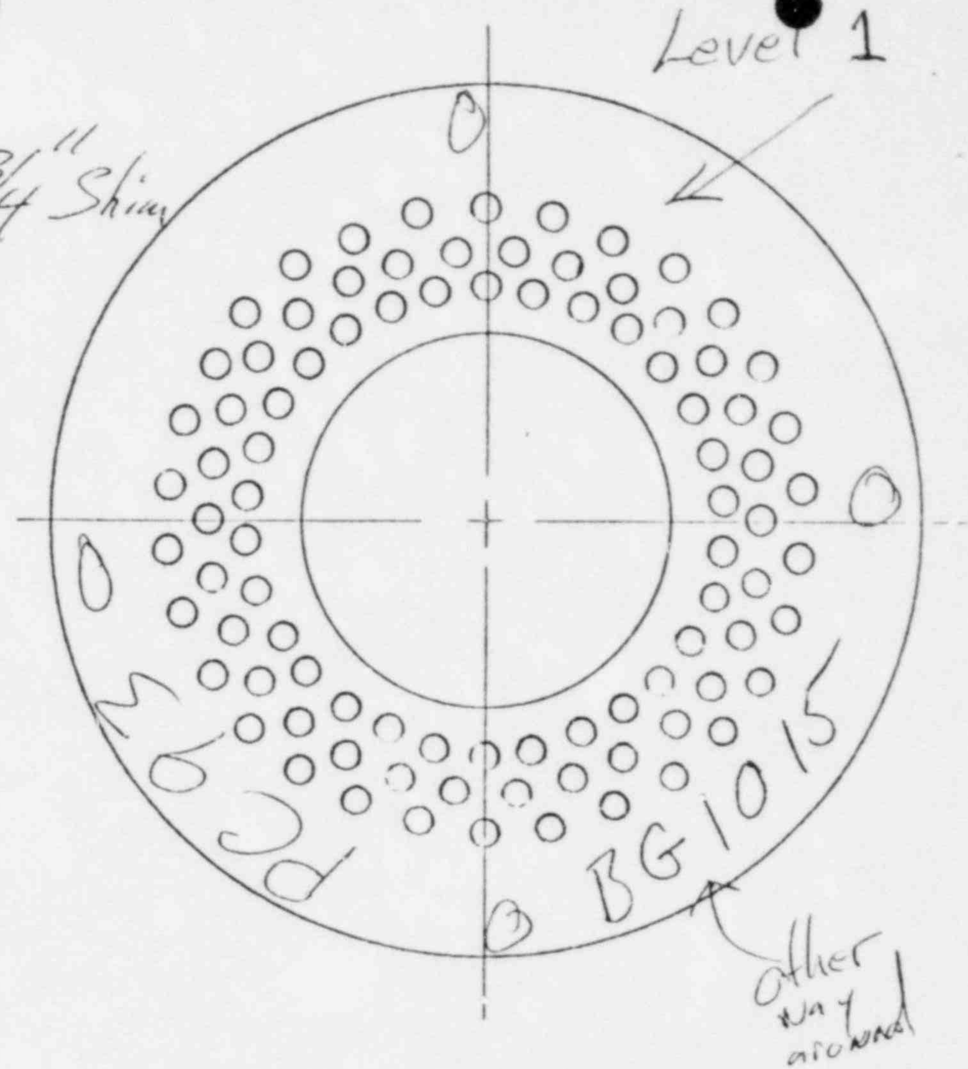
Off-Size Buttonhead none

Buttonhead with Split none

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 12V31

By B.C. Bardell

Date 12-5-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ______________________

DATE ______________________

TENDON NUMBER   DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma_4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires Ne	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimum effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	Kips
	Force at 1 kip per wire (1 x N_e)	Kips

Section	Item	S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______________________

Date ______________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, ,P_L	psi	psi
Reduction in shim pressure, P_{RH},(N_R x 50)	psi	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ______________

DATE: __________________ DATA RECRODED BY: ______________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
VI.B.3	Lift Off	**	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
VI[illegible]	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
VIII.8	Lift Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
	New Lift-Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

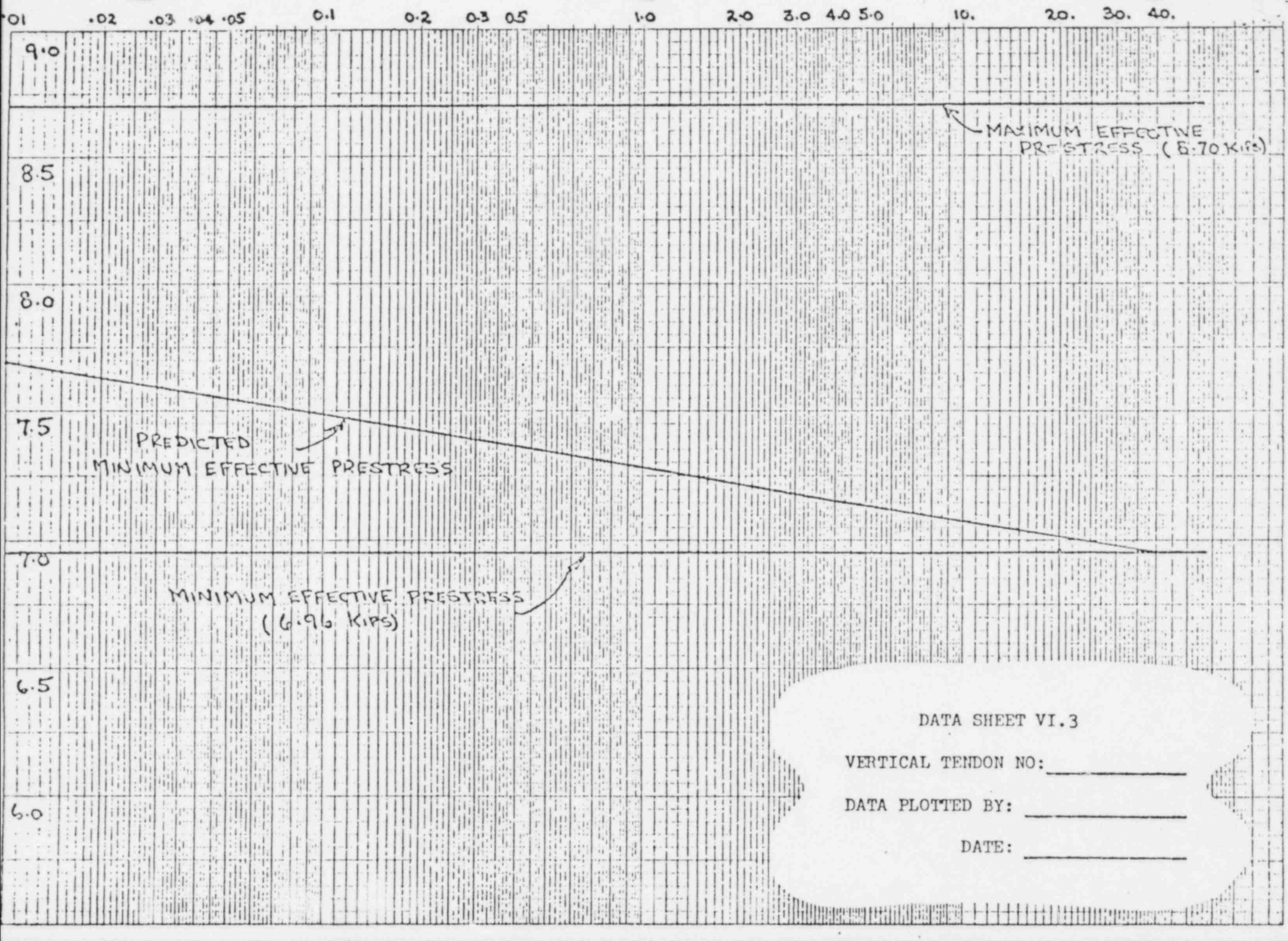
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 61V1 Sub

Closest Buttress	Top
Grease Removal	2 gal
Date Filler CAP Removed	12-7-78
Date Grease Removal Started	12-7-78
Exterior Temp.	50°
Interior Temp.	100°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	12-7-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

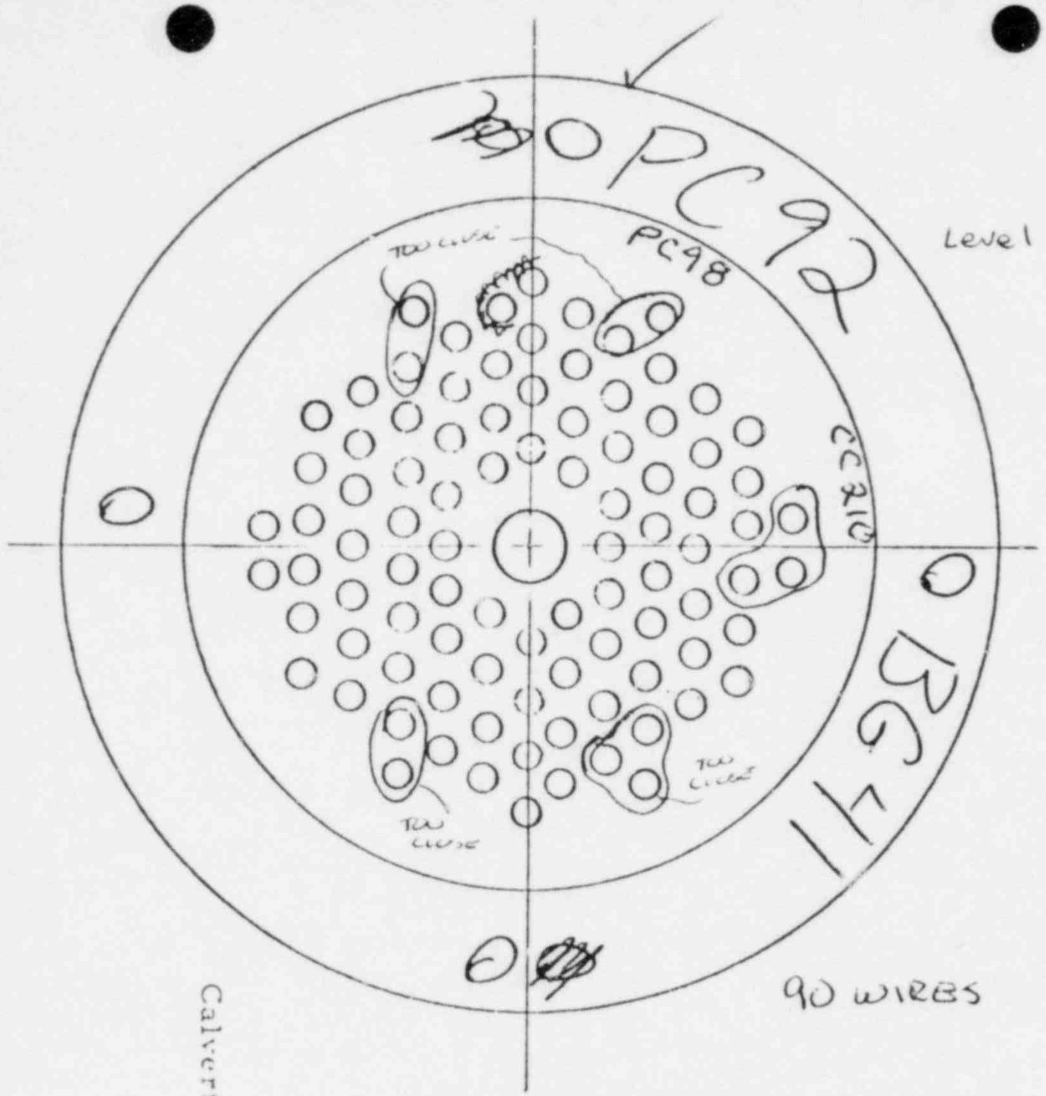
Sample Taken yes Container Identification 61V1 Top

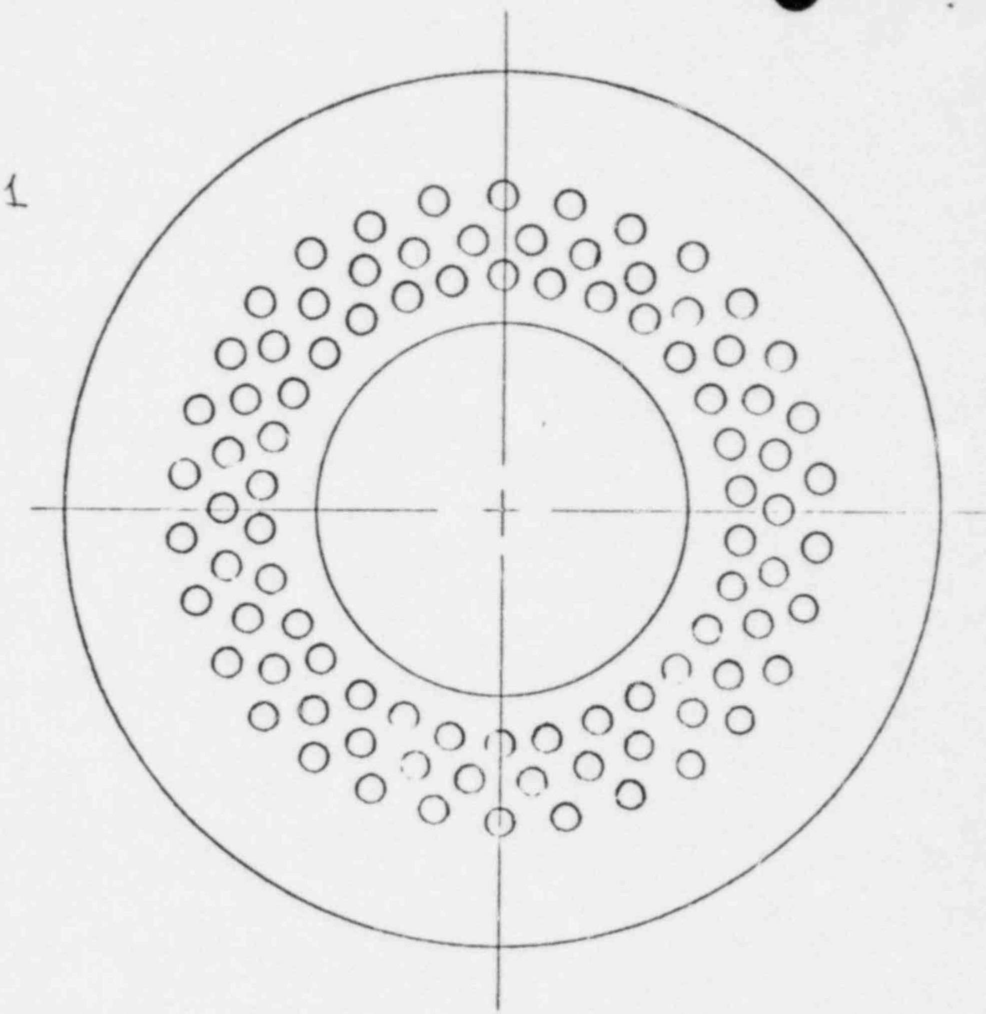
Data Recorded By: H.C. Kudell

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	pumped from other end
Filler Temp. @ Outlet Cap	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ______ Date ______





WIRE ANCHORAGE

Closest Buttress Top

Off-Size Buttonhead ~~None~~

Buttonhead with Split ~~None~~

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Top

Tendon No. 61V11

By B.C. Kudell

Date 12-7-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY D.C. Liddell

DATE 12-7-78

TENDON NUMBER 61V1 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 11-8-71	170.18 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	163.06
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	8.00 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s @ 2-20-73 168.72 KSI 8.28 KIP	168.72 Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	8.28 Kips
	Time after initial stressing	1.25 yrs. until restress 7.0 Years Since 1st Stress
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.12 Kips
	Number of effective wires N_e	89 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	723. Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.10 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.96 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	774. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	632 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	619. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	839. Kips
	Force at 1 kip per wire (1 x N_e)	89. Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Ram # 40450200500-12 Gauge# 4215004A Date Cal 7-19-78		
	Hydraulic Pressure at expected Lift Off	5250 psi	psi
	Hydraulic Pressure at maximum effective prestress	5650 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4620 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4500 psi	psi
	Hydraulic Pressure at 0.8f's	6100 psi	psi
	Hydraulic Pressure at 1 Kip/wire	[illegible] psi	psi

Data Recorded By D.C. Rudell

Date 12-7-78

TENDON NUMBER: 61V1

Ram# 404502 00500-12
Gauge# 4215004A
Date Cal ~~7-19-78~~

Note: New Cal. On 12" Ram 3-14-79

	RAM (1) S/N	RAM (2) S/N NA
Average Hydraulic pressure at Lift-Off	5840 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~800~~ 775 Kips	Kips
Average Lift Off Force F_{LAV} ~~$\frac{F_L(1) + F_L(2)}{2}$~~	~~800~~ Kips → 775	
Force Per Wire ($F_{LAV} \div N_e$) 90	~~→8.89~~ →8.99 Kips/wire 8.61	
Time since initial stressing of Tendon	7.0 Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified D.C. Rudell

Date 12-7-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires ?	
Number of effective wires N_e	90 Wires - 89	
0.8f's (9.43 x N_e)	840 Kips	
Hydraulic Force @ 0.8f's	6100 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5840 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	6340 psi	psi

To High Above 6100

STRESSING - DESTRESSING

TENDON NUMBER 61V1

CLOSEST BUTTRESS Top

DATE: 12-7-78 DATA RECRODED BY: B.C. Kndell

RAM S/N: GAUGE S/N:

40450200500-12 4215C04A Date Cal 7-19-78

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	14 7/8"				
		expect 5250 psi	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg. 5840	**	5850	5850	5850	5800	5850
VI.B.5	Pressurize to 0.8f's	6100 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	15 1/2" ✓				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 psi **	650 psi				
VI.B.7	Elongation at 1 kip/wire		4"				
VI.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**	650 psi ✓				
VIII.4	Elongation at 1 kip/wire		4"				
VIII.5	Pressurize to 0.8f's	6100 psi **	✓				
VIII.5	Elongation at 0.8f's		15 1/2				
VIII.6	Pressure for shim measure	6000 psi **	✓				
VIII.7	Elongation at shim press	6000 psi	15 3/8				
VIII.7	Shims installed add 1/4" Set Shim		15 1/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure	avg 5780	5850	5800	5850	5700	5700
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?	✓	~~794 kip~~ 768		~~8.02 kip/wire~~ 8.61		
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

Note: Don't want to seat higher than 1st liftoff because that was higher than maximum effective prestress.

TENDON NUMBER 61V1

DATE: DATA RECORDED BY:

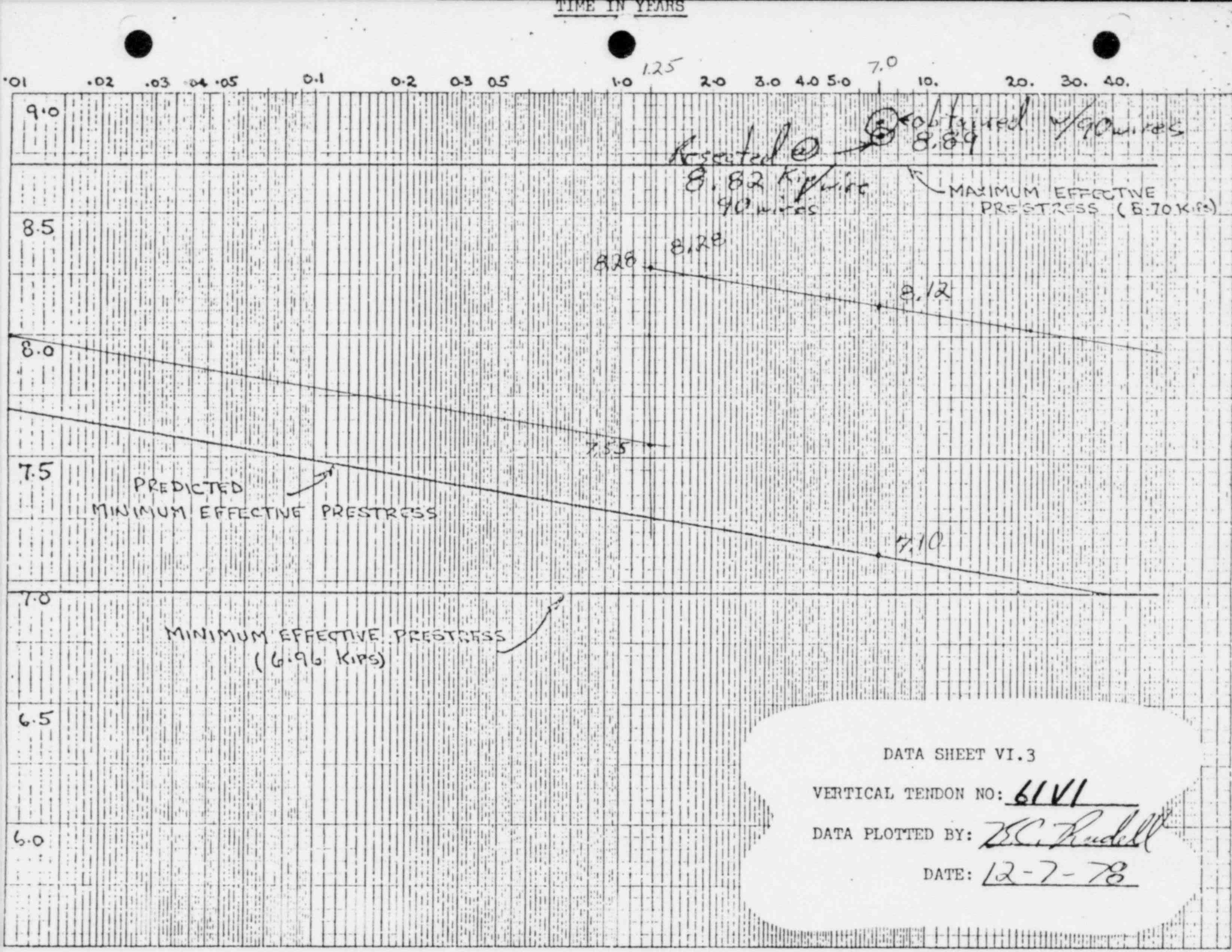
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	4"		15 1/2		11 1/2		11 1/2
RESTRESS	4"		15 3/8		11 3/8		11 3/8


TIME IN YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
1.25
2.0
3.0
4.0
5.0
7.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
Rejected
8.82 Kip/wire
90 wires
obtained w/90 wires
8.89
MAXIMUM EFFECTIVE PRESTRESS (8.70 Kips)
8.28
8.28
8.12
7.55
7.10
PREDICTED MINIMUM EFFECTIVE PRESTRESS
MINIMUM EFFECTIVE PRESTRESS (6.96 Kips)
DATA SHEET VI.3
VERTICAL TENDON NO: 61V1
DATA PLOTTED BY: B.C. Rudell
DATE: 12-7-78

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 61V1

Closest Buttress	Bottom
Grease Removal	~~the~~ 1/2 barrel
Date Filler CAP Removed	12-5-78
Date Grease Removal Started	12-5-78
Exterior Temp.	48°
Interior Temp.	99°
Total Volume Removed	1/2 barrel
Date Filler Cap Reinstalled	12-7-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

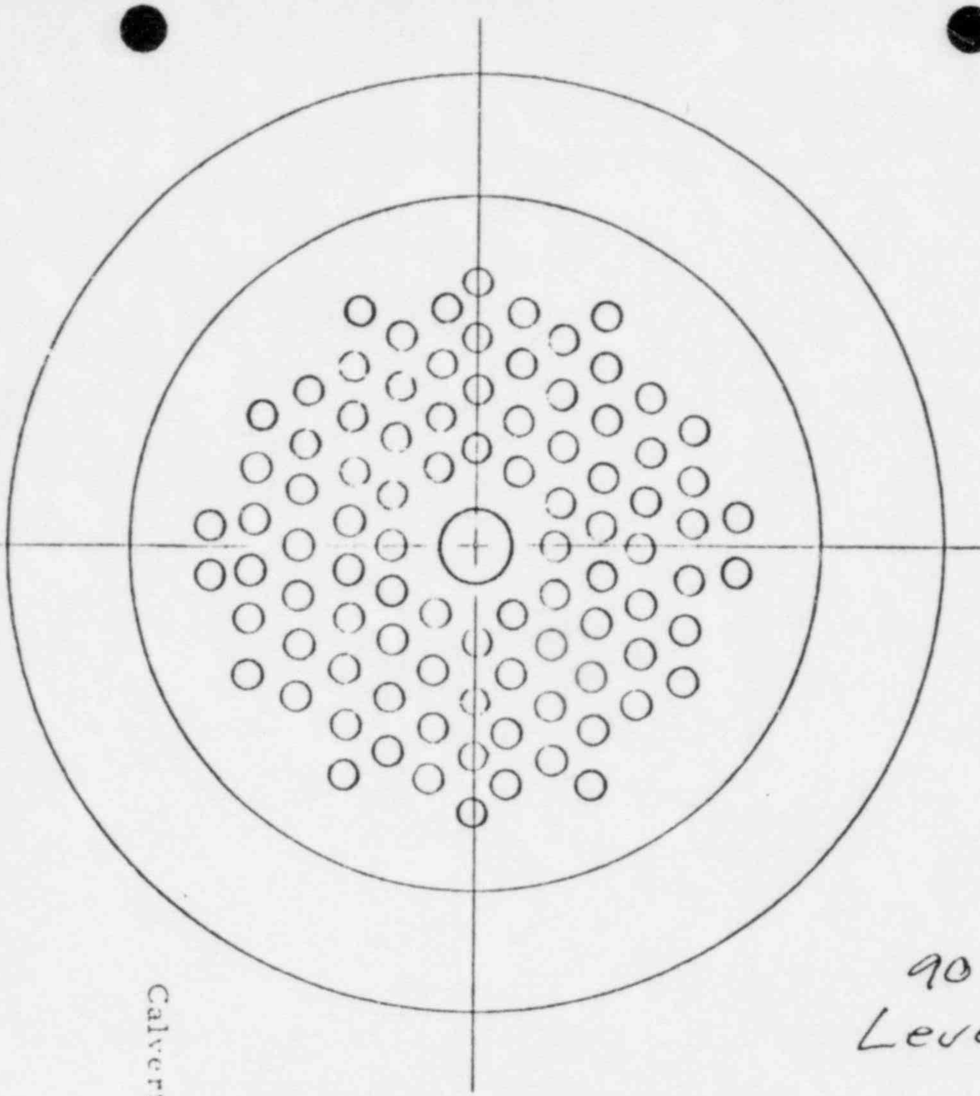
Sample Taken yes Container Identification 61V1 Bottom

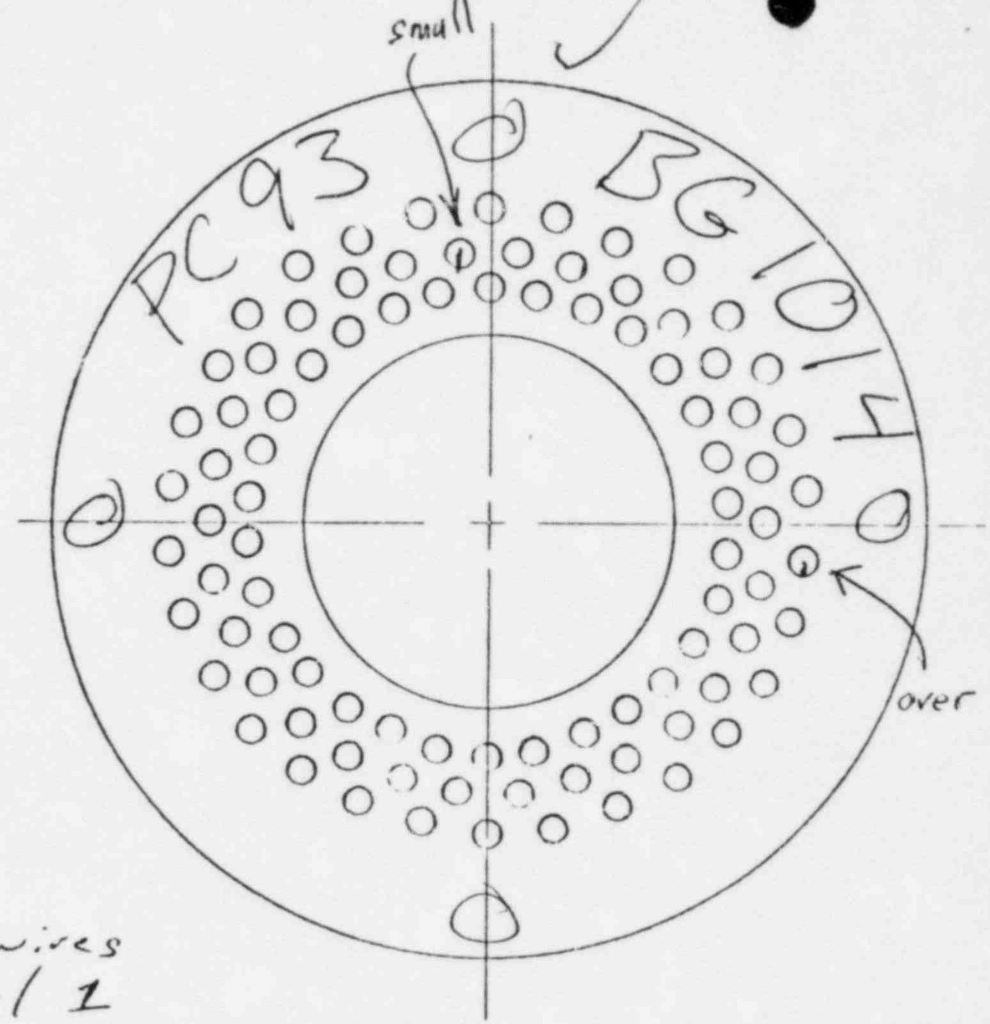
Data Recorded By: B. C. Kendell

TENDON GREASE INSTALLATION

Date Installed	12-16-78
Exterior Temp.	48°
Interior Temp.	95°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	pumped
Filler Temp. @ Outlet Cap	
Total Volume Installed	41 gal
Installation Pressure (if poured, N/A)	900 psi

Data Recorded By: B. C. Kendell Date 2-28-79





90 wires
Level 1

WIRE ANCHORAGE

Closest Buttress Bottom

Off-Size Buttonhead 2

Buttonhead with Split none

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 61V1

By D.C. Hodell

Date 12-7-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ____________

DATE ____________

TENDON NUMBER DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	Horizontals	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma$-4 day loss)		
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips	
	Time after initial stressing	Years	
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips	
	Number of effective wires N_e	Wires	
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips	
	Maximum Effective Prestress per wire, F_{max}	Kips	
	Predicted minimum effective prestress (per wire F_{pmin})	Kips	
	Absolute minimum effective prestress per wire (F_{min})	Kips	
	Maximum effective prestress ($F_{max} \times N_e$)	Kips	
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips	
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips	
	80% min. ultimate strength (.8f's) (9.43 x N_e)	Kips	
	Force at 1 kip per wire (1 x N_e)	Kips	
RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______________________

Date ______________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER ___________

CLOSEST BUTTRESS ___________

DATE: ______________ DATA RECRODED BY: ____________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
VI.B.3	Lift Off	**	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
V.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
VIII.8	Lift Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
	New Lift-Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

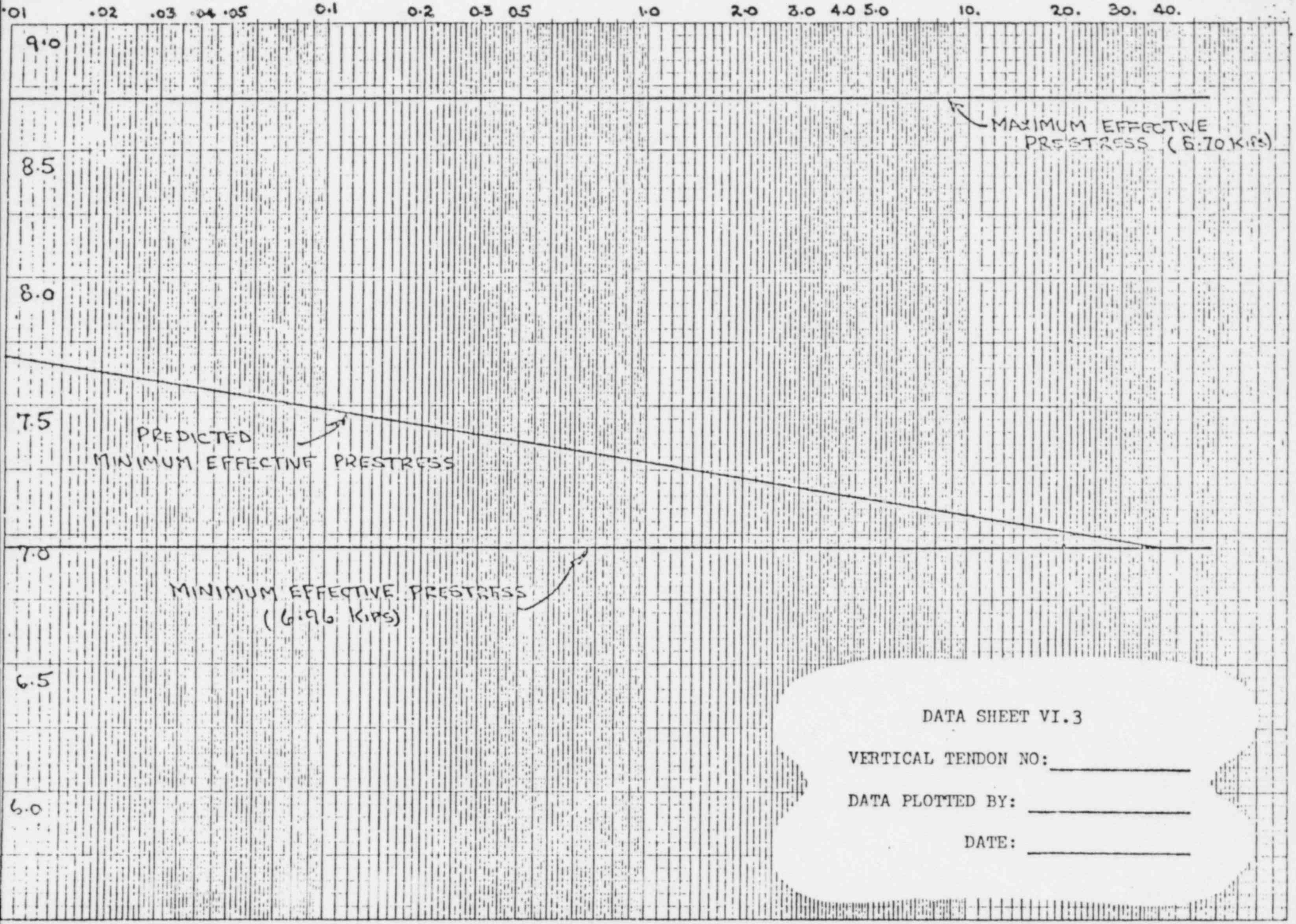
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 65V28

Closest Buttress	Top
Grease Removal	2 gal
Date Filler CAP Removed	12-8-78
Date Grease Removal Started	12-8-78
Exterior Temp.	66°
Interior Temp.	99°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	12-8-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

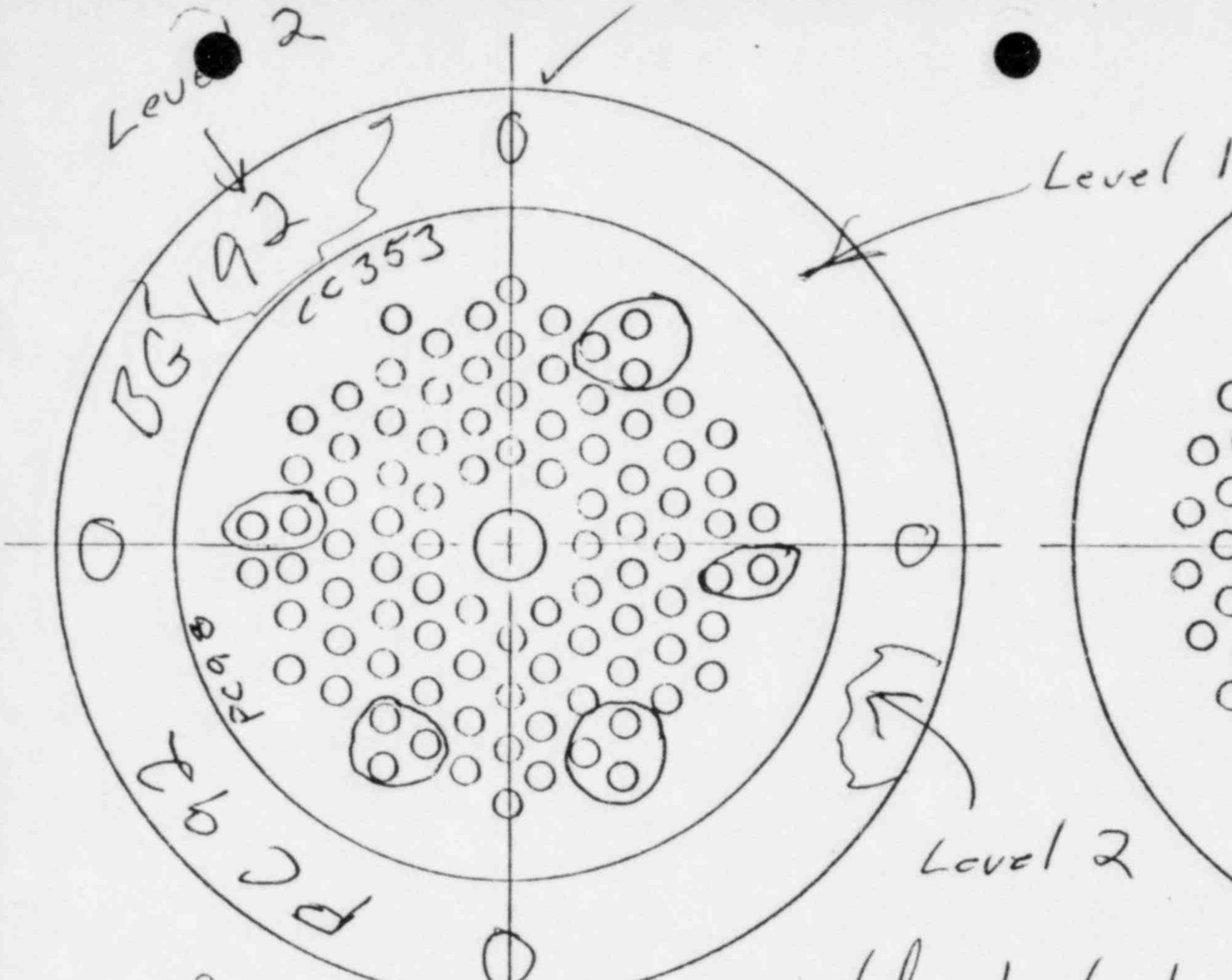
Sample Taken yes Container Identification 65V28 Top

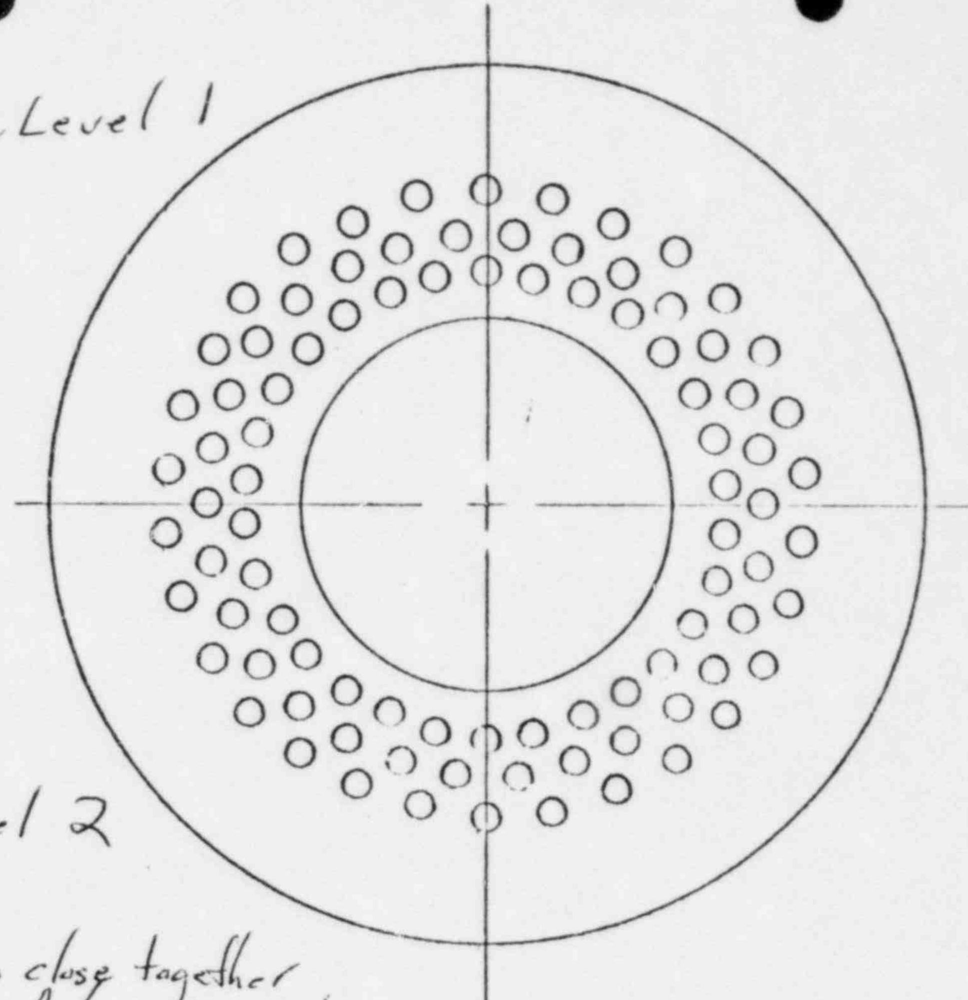
Data Recorded By: DC Rudell

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	pumped from other end
Filler Temp. @ Outlet Cap } Indicate if pumped or poured	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ________ Date ______





Circled - to close together to determine size.

WIRE ANCHORAGE

Closest Buttress Top

Off-Size Buttonhead None Some Undeterminable

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance None

Wire removed this surveillance for inspection None

WIRE ANCHORAGE

Closest Buttress Top

Tendon No. 65V28

By B.C. Kudell

Date 12-8-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY Z.C. Ludell

DATE 12-8-78

TENDON NUMBER 65V28 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 12-13-71	169.42 Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	Horizontals	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	162.3 KSI	
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.97 Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s ~~@2-5-73~~ 2ck @2-12-73 165.82 8.14	168.72 Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	8.28 Kips	
	Time after initial stressing	1.17 yrs. until restress 7.0 Years Since 1st Stress	
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.1 Kips	
	Number of effective wires N_e	90 Wires	
	Expected lift off force, F_L ($F_{LE} \times N_e$)	729 Kips	
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips	
	Predicted minimum effective prestress (per wire F_{pmin})	7.10 Kips	
	Absolute minimum effective prestress per wire (F_{min})	6.96 Kips	
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips	
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	639. Kips	
	Absolute min. effective prestress ($F_{min} \times N_e$)	626. Kips	
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	849. Kips	
	Force at 1 kip per wire ($1 \times N_e$)	90. Kips	
RAM CALIBRATION CURVES	Ram# 40450200500-12 Gauge# 4215004A Date Cal. 7-19-78	S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5300 psi	psi
	Hydraulic Pressure at maximum effective prestress	5730 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4650 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4580 psi	psi
	Hydraulic Pressure at 0.8f's	6170 psi	psi

DATA SHEET 1 VI.1

Data Recorded By B.C. Kudell

Date 12-8-78

TENDON NUMBER: 65V28

Ram # 40450200500-12 Gauge # 4215004A Date Cal 7-19-78	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	4840	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~665~~ Kips	642 Kips

Note: New Cal. On 12" Ram

Average Lift Off Force F_{LAV} $\frac{F_L(1) + F_L(2)}{2}$	~~665~~	Kips	642
Force Per Wire ($F_{LAV} \div N_e$)	~~7.39~~	Kips	7.13
Time since initial stressing of Tendon	7.0	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Kudell

Date 12-8-78

Ram # 40450200500-12 Gauge # 4215004A Date Cal 7-19-78	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	90 Wires	
0.8f's (9.43 x N_e)	849 Kips	
Hydraulic Force @ 0.8f's	6170 psi	psi
Original Lift-Off Hydraulic pressure,, P_L	4840 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5340 psi	psi

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 65V28

CLOSEST BUTTRESS Top

DATE: 12-8-78 DATA RECRODED BY: D.C. Kodell

Note: Use New Cal Date 3-14-79

RAM S/N: GAUGE S/N:

404502005OO-12 4215004A Date Cal 7-19-78

TEP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero	✓				
I.B.1	Measure Shims	-	15 3/8"				
	verified by movement of shims @ 4950	expect 5300	Run 1	Run 2	Run 3	Run 4	Run 5
I.B.3	Lift Off avg 4840	**	4850	4900	4850	4800	4800
I.B.5	Pressurize to 0.8f's	6170 psi **	6150 psi				
I.B.5	Elongation @ 0.8f's	-	~~16 1/2~~ 16 7/16"				
I.B.6	Depressurize to zero	-	✓				
I.B.7	Pressurize to 1 kip/wire	650 psi **	✓				
I.	Elongation at 1 kip/wire		5 1/4"				
II.	Remove Wire - This End Cut?	***	NA				
III.3	Pressurize to 1 kip/wire	**					
III.4	Elongation at 1 kip/wire		5 1/4"				
III.5	Pressurize to 0.8f's	6170 **	✓				
III.5	Elongation at 0.8f's		16 1/2				
III.6	Pressure for shim measure	5340 psi **	5400 psi ✓				
III.7	Elongation at shim press		15" went to 5700 psi.				
III.7	Shims installed Installed original shims		15 3/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
III.8	Lift Off pressure	avg 5270	5300	5300	5250	5300	5200
III.8	AVG Lift Off ≥ Initial AVG Lift Off?		5270 ≥ 4840 ✓				
III.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	= ~~223~~ Kip = ~~8.03~~ Kip/wire 700 = 7.78				
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER 65V28

DATE: DATA RECORDED BY:

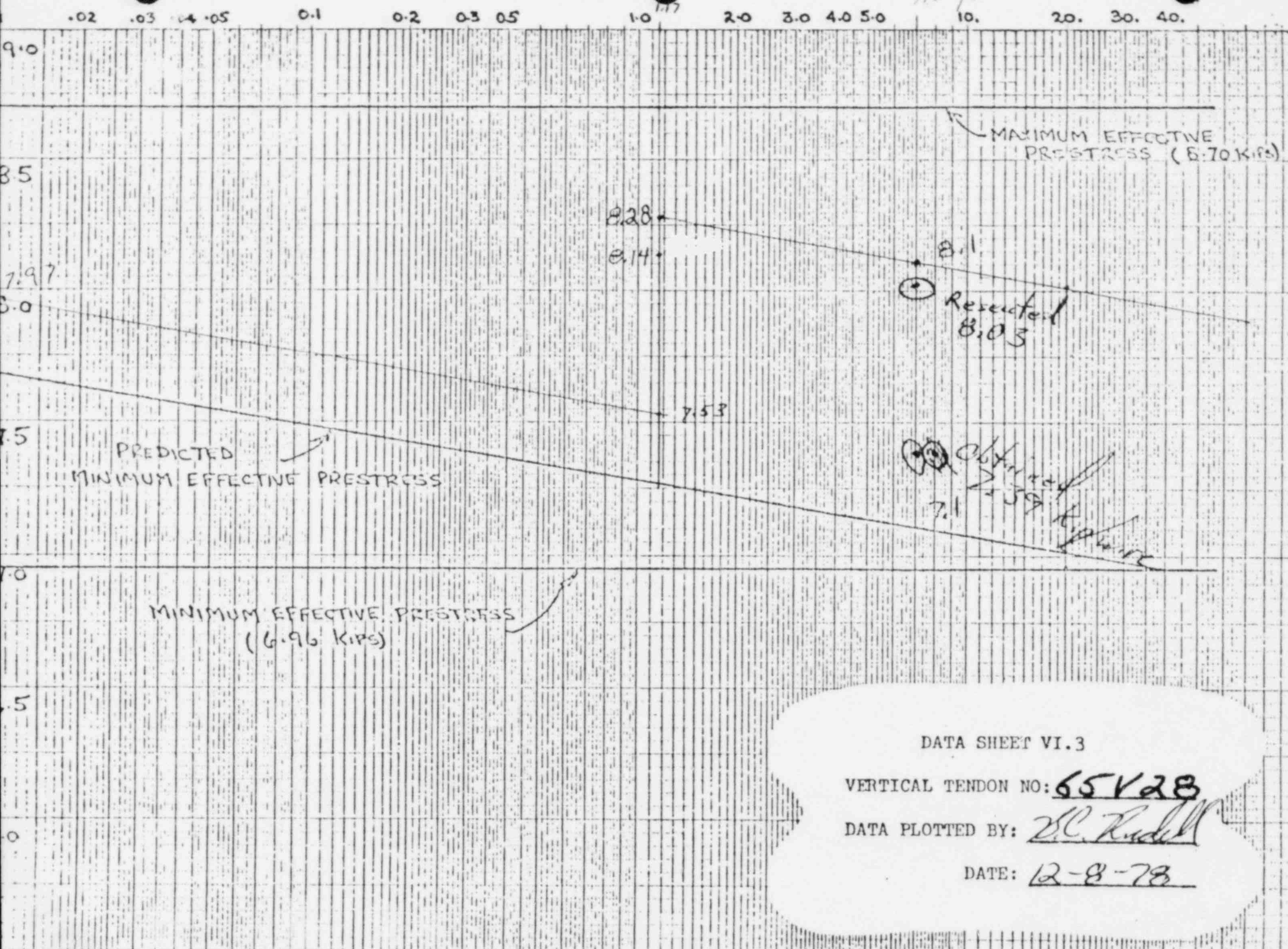
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	5 1/4		16 7/16		11 3/16		11 3/16
RESTRESS	5 1/4		16 1/2		11 1/4		11 1/4



DATA SHEET VI.3

VERTICAL TENDON NO: 65V28

DATA PLOTTED BY: D.C. Rudell

DATE: 12-8-78

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 65V28

Closest Buttress Bottom

Grease Removal 1/4 Barrel

Date Filler CAP Removed 12-6-78

Date Grease Removal Started 12-6-78

Exterior Temp. 55°

Interior Temp. ~~1/4 Barrel~~ 99°

Total Volume Removed 1/4 Barrel

Date Filler Cap Reinstalled

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 65-V28 Bottom

Data Recorded By: B.C. Kidd

TENDON GREASE INSTALLATION

Date Installed 12-16-78

Exterior Temp. 44°

Interior Temp. 93°

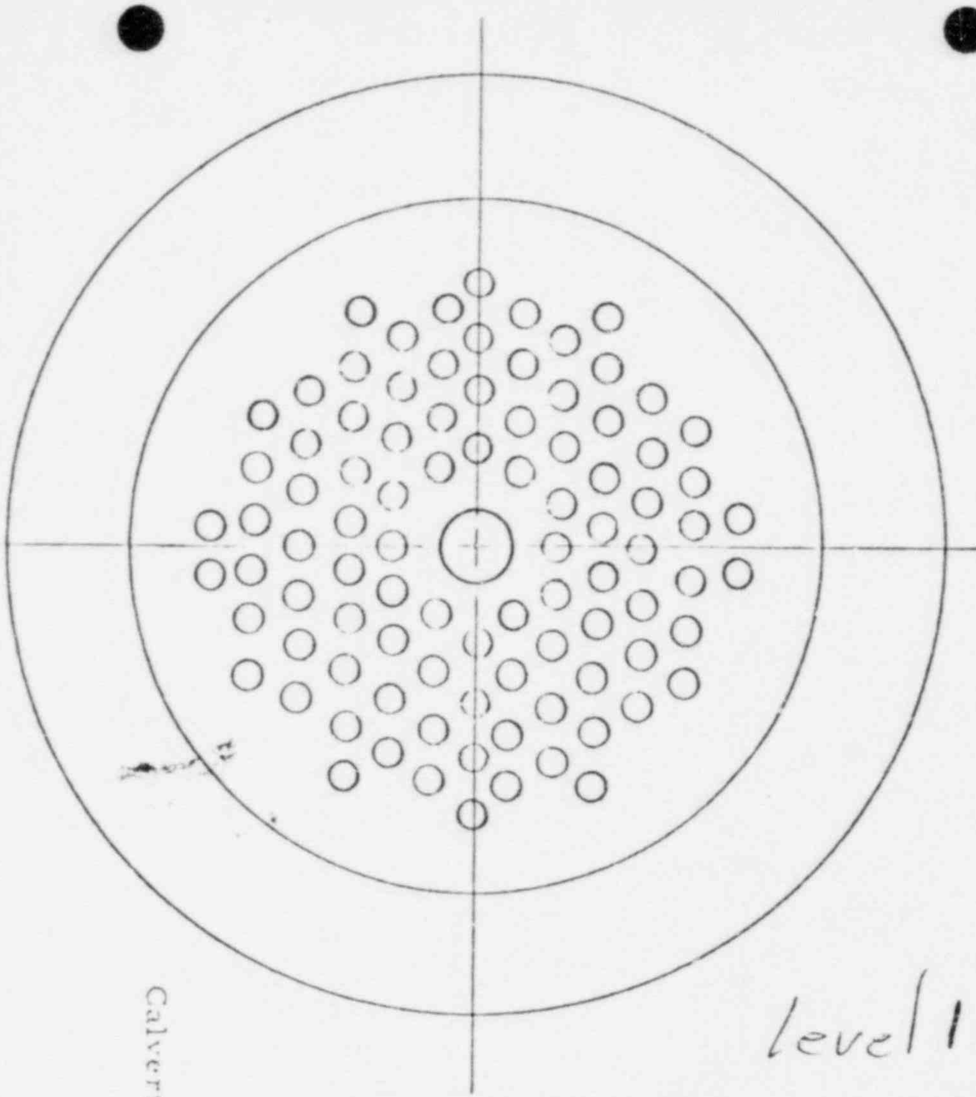
Filler Temp. @ Inlet Cap } Indicate if pumped or poured pumped

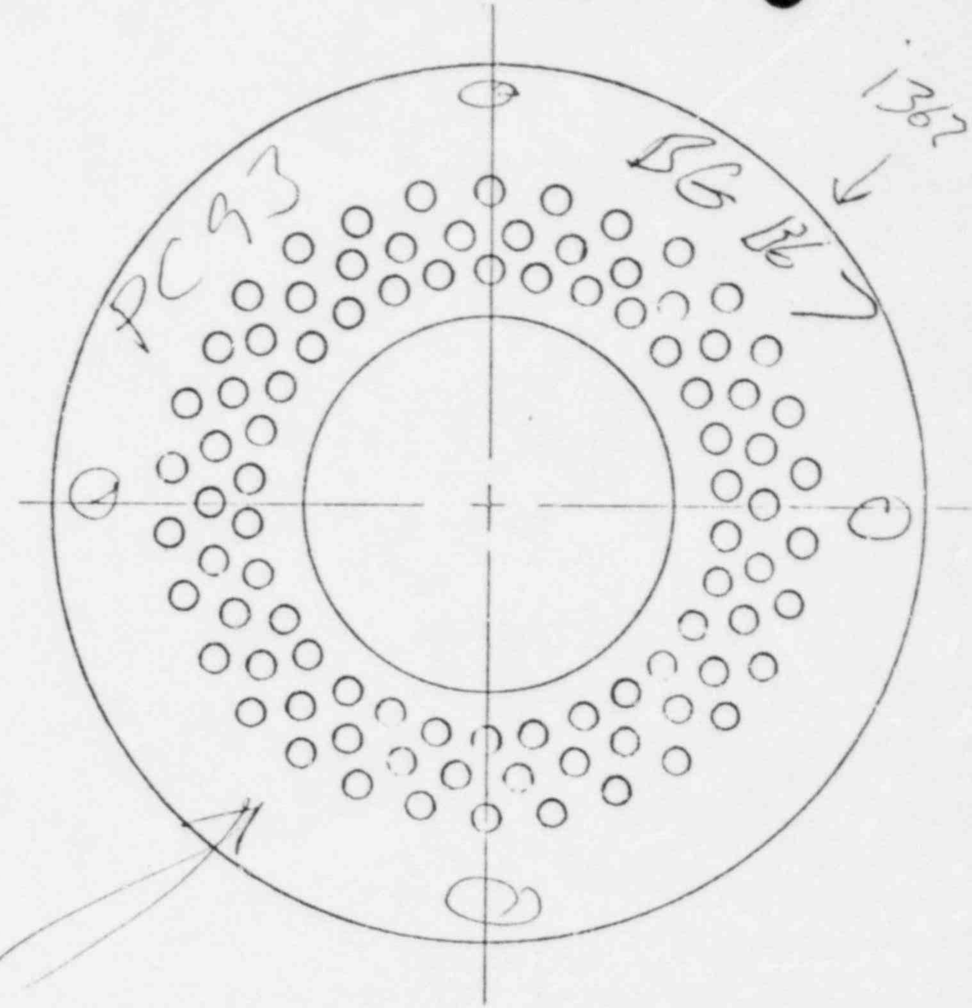
Filler Temp. @ Outlet Cap

Total Volume Installed 25 gal

Installation Pressure (if poured, N/A) 90 ps

Data Recorded By: B.C. Kidd Date 2-28-79





level 1

WIRE ANCHORAGE

Closest Buttress Bottom

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None 90 wire

Discontinuous Wire Removed this surveillance None

Wire removed this surveillance for inspection None

WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 65V28

By B.C. Trudell

Date 12-9-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ____________________

DATE ____________________

TENDON NUMBER DESTRESSING

Section	Item	
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σs	Ksi
	Force per wire at restressing F_s ($\sigma s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires N_e	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimur effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	Kips
	Force at 1 kip per wire ($1 \times N_e$)	Kips

Section	Item	S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______________

Date ______________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________

Date ______________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's ($9.43 \times N_e$)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, ($N_R \times 50$)	psi	psi
Shim Pressure ($P_L + 500 - P_{RH}$)	psi	psi

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ____________ DATA RECRODED BY: ____________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
V_	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

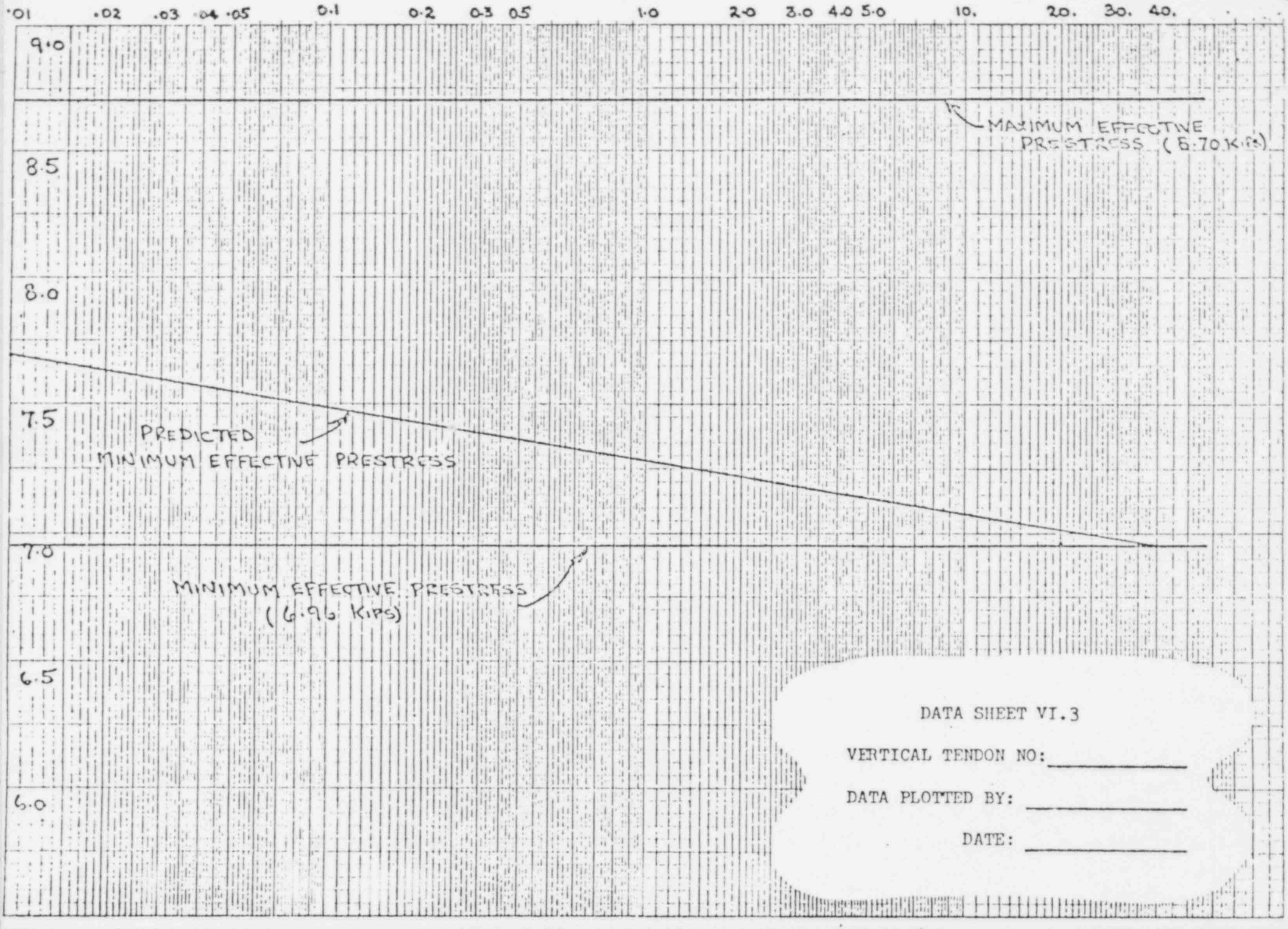
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET IV.1

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 54V14

Closest Buttress	Top
Grease Removal	2 gal
Date Filler CAP Removed	12-11-78
Date Grease Removal Started	12-11-78
Exterior Temp.	34°
Interior Temp.	100°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	12-11-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Two Tone Light Brown + Dark Brown

Presence of Water Indicated Yes - Some Ice in Top of Tendon

% (Approximate) Coverage of Components 80 %

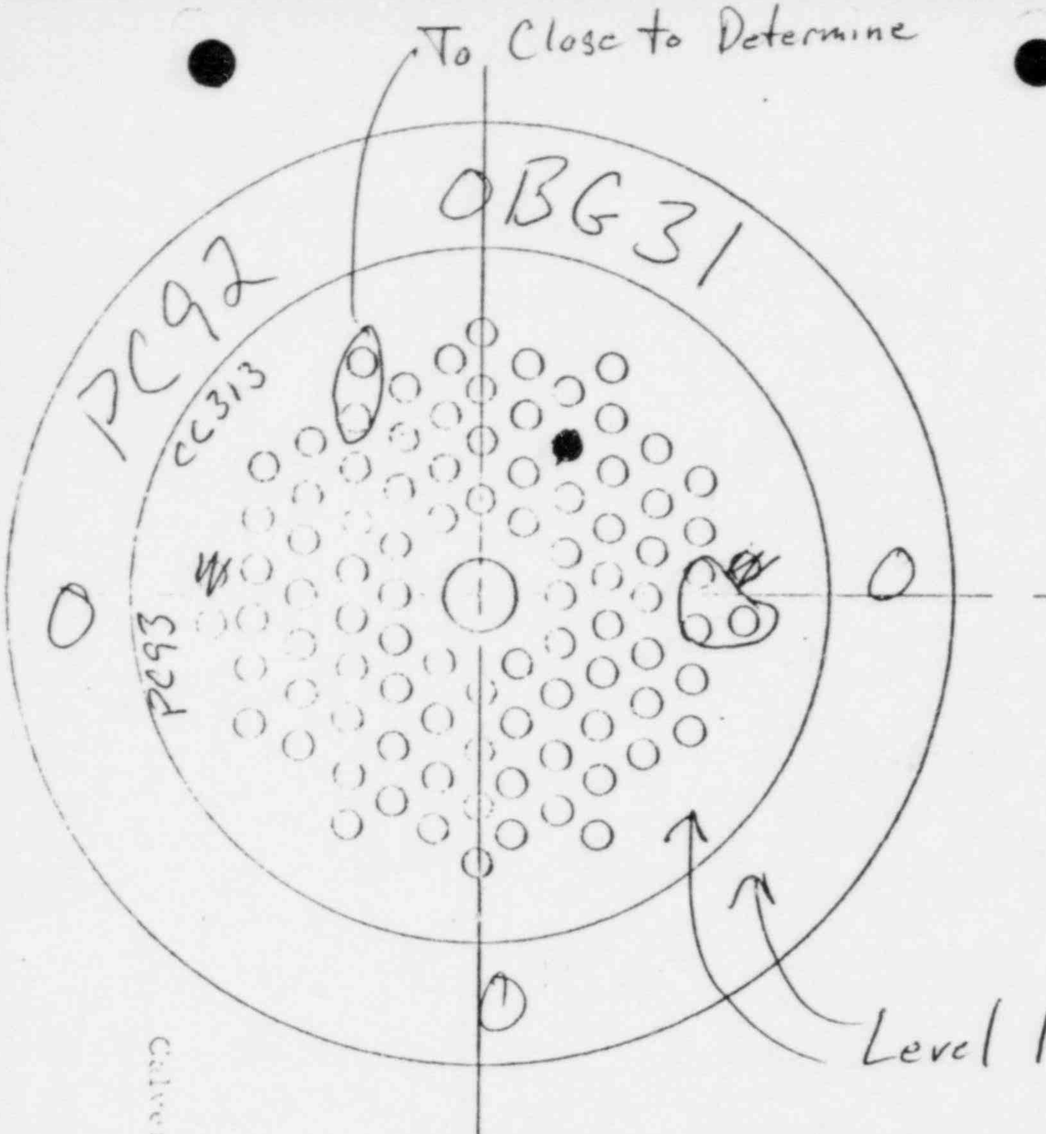
Sample Taken yes Container Identification 54V14 Top

Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	pumped from other end
Filler Temp. @ Outlet Cap }	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ________ Date ________



WIRE ANCHORAGE

Closest Buttress Top

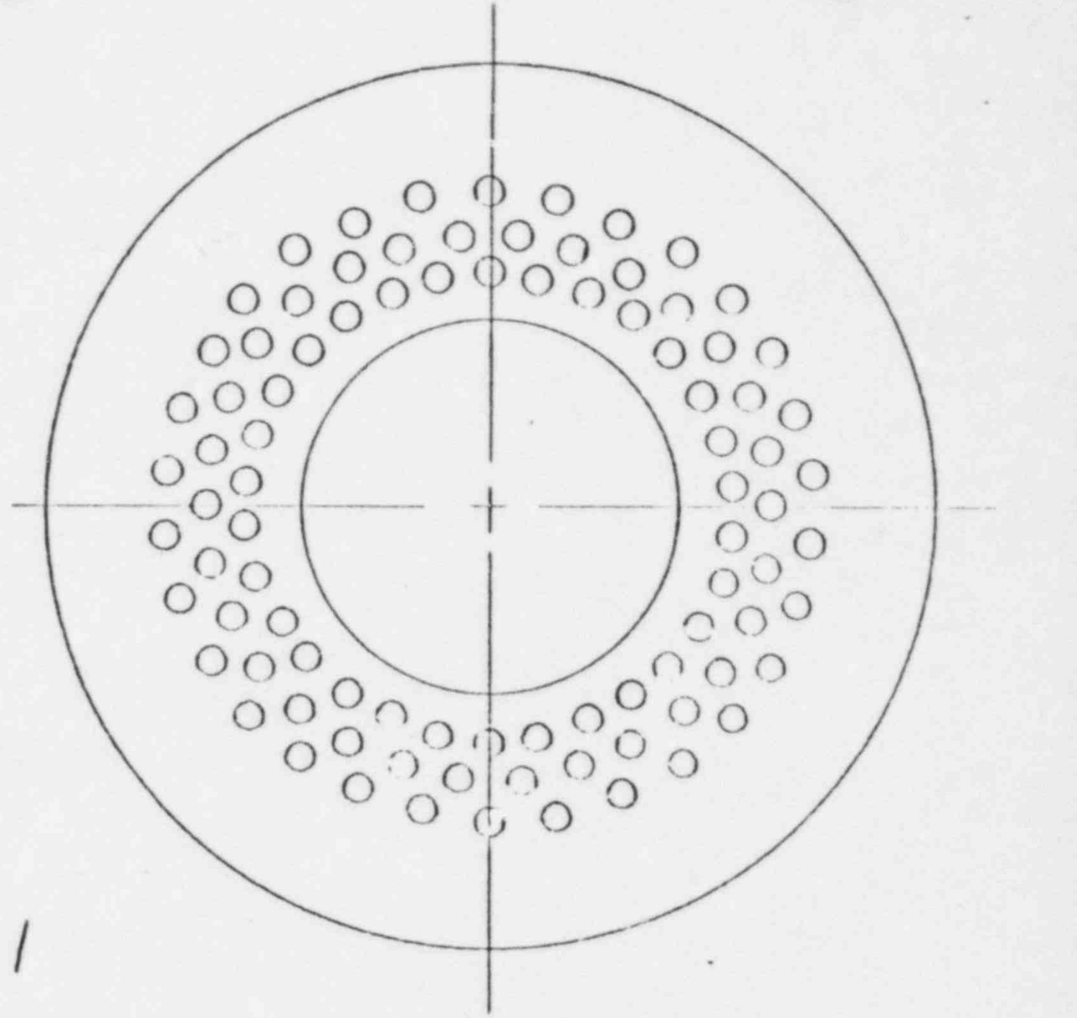
Off-Size Buttonhead None

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress Top

Tendon No. 54 V 14

By Z.C. Lindell

Date 12-11-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor S... Form
Fi...

DATA SHEET VI.1

DATA RECORDED BY [signature]

DATE 12-11-78

TENDON NUMBER 54V14 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 11-5-71	162.91 Ksi
	Four Day Losses: ~~Verticals~~	-7.12 Ksi
	Horizontals	-5 48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	155.79
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.65 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s 3-19-73 168.72 KSI 8.28 KIP	167.27 Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	8.21 Kips
	Time after initial stressing	1.3 yrs until restress 7.0 Years Since 1st stress
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.05 Kips
	Number of effective wires N_e	89 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	716. Kips
	Maximum Effective Prestress per wire, F_{max}	8.70 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.10 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.96 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	774. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	632. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	619. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	839.3 Kips
	Force at 1 kip per wire (1 x N_e)	89 Kips

		S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVES	Ram # 40450200500-12 Gauge # 4215004A Date Cal 7-19-78		N/A
	Hydraulic Pressure at expected Lift Off	5200 psi	psi
	Hydraulic Pressure at maximum effective prestress	5650 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4600 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4500 psi	psi
	Hydraulic Pressure at 0.8f's	6100 psi	psi

DATA SHEET 1 VI.1

Page (2)

Data Recorded By B.C. Ruddell

Date 12-11-78

TENDON NUMBER: 54V14

Ram# 4C450200500-12
Gauge# 4215004A
Date Cal 7-19-78

Note: Use New Cal For 12" Ram 3-14-79

	RAM (1) S/N	RAM (2) S/N NA
Average Hydraulic pressure at Lift-Off	4910 psi	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~675.~~ 652 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ NA — ~~675~~ Kips 652

Force Per Wire ($F_{LAV} \div N_e$) — ~~7.58~~ Kips 7.32

Time since initial stressing of Tendon — 7.0 Years

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Ruddell

Date 12-11-78

Ram# 4C450200500-12
Gauge# 4215004A
Date Cal 7-19-78

	RAM (1) S/N	RAM (2) S/N NA
Number of wires removed this surveillance N_R	0 Wires	
Number of effective wires N_e	89 Wires	
0.8f's (9.43 x N_e)	839 Kips	
Hydraulic Force @ 0.8f's	6100 psi	psi
Original Lift-Off Hydraulic pressure, P_L	4910 psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	0 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	5410 psi	psi

DATA SHEET VI.2 Page (1)

STRESSING - DESTRESSING

TENDON NUMBER 54V14

CLOSEST BUTTRESS Top

DATE: 12-11-79 DATA RECRODED BY: W.C. Kendall

Use New Cal Date 3-14-79

RAM S/N: GAUGE S/N:

4045020050-12 4215004A Date Cal 7-19-78

STEP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero	✓				
I.B.1	Measure Shims	-	12 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
I.B.3	Lift Off avg 4910	expect 5200 **	4900	4900	4900	4900	4950
I.B.5	Pressurize to 0.8f's	6100 psi **	6180				
I.B.5	Elongation @ 0.8f's	-	13 9/16				
I.B.6	Depressurize to zero	-	✓				
I.B.7	Pressurize to 1 kip/wire	650 psi **	✓				
I.[illegible]	Elongation at 1 kip/wire		2 13/16				
II.	Remove Wire - This End Cut?	N/A ***					
III.3	Pressurize to 1 kip/wire	**	✓				
III.4	Elongation at 1 kip/wire		2 13/16				
III.5	Pressurize to 0.8f's	6100 **	✓				
III.5	Elongation at 0.8f's		13 13/16				
III.6	Pressure for shim measure	5410 psi **	5500 psi				
III.7	Elongation at shim press		12 3/8"				
III.7	Shims installed added 1 set 1/4" Shims.		12 1/2				
			Run 1	Run 2	Run 3	Run 4	Run 5
III.8	Lift Off pressure		5350	5350	5350	5350	5350
III.8	AVG Lift Off ≥ Initial AVG Lift Off?		5350 ≥ 4910 ✓				
III.9	If "NO" above Pressurize to 1000 psig above	**	~~735/89 = 8.26 kip/wire~~ resulting stress				
	Initial avg. liff-off Shims installed		710/89 = 7.98				
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2 Page (2)

TENDON NUMBER 54V14

DATE: DATA RECORDED BY:

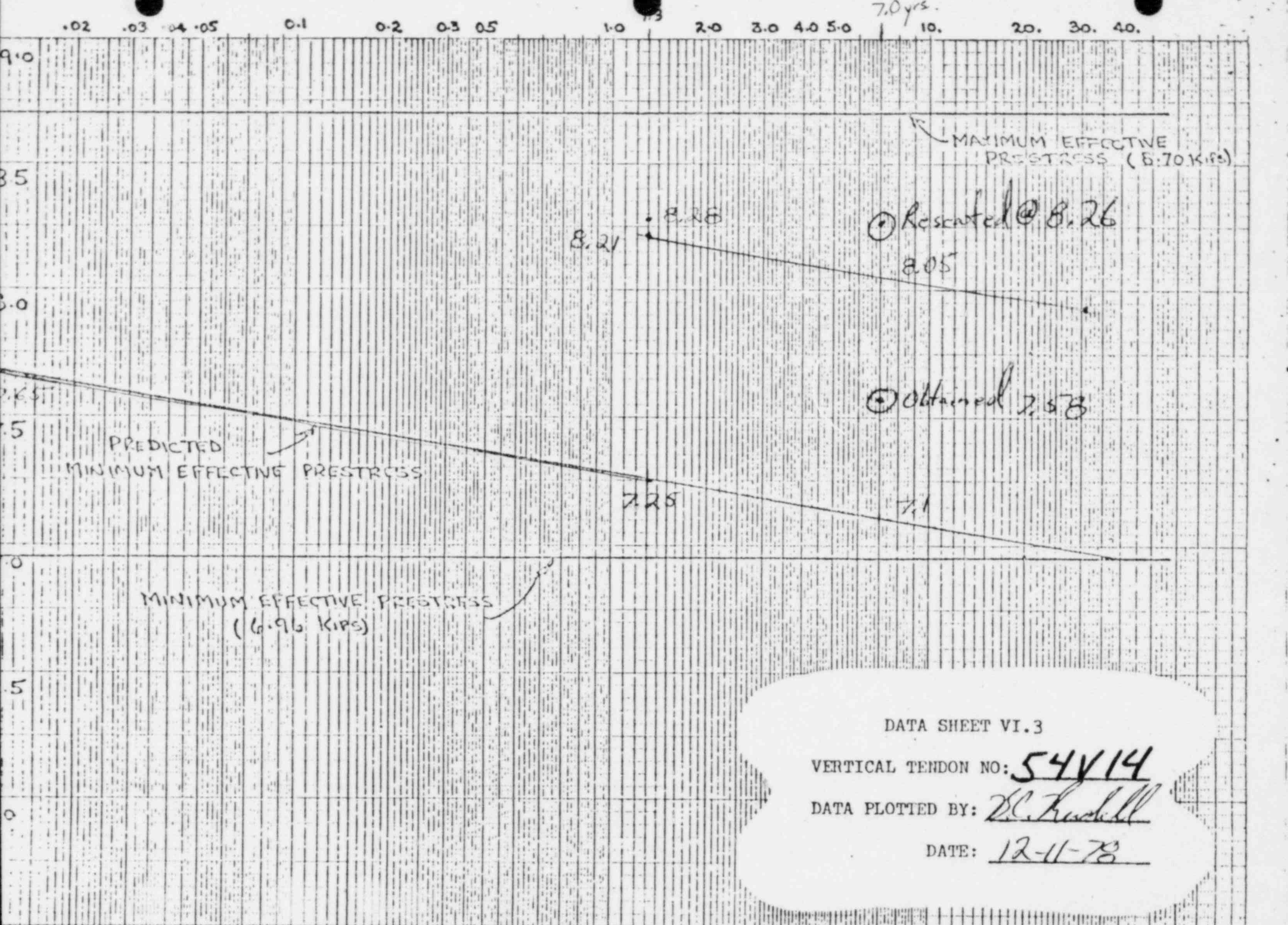
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	2 13/16		13 9/16		10 3/4		10 3/4
RESTRESS	2 13/16		13 13/16		11		11



DATA SHEET VI.3

VERTICAL TENDON NO: 54V14

DATA PLOTTED BY: D.C. Ruddell

DATE: 12-11-78

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 54V14

Closest Buttress	Bottom
Grease Removal	1/2 Barrel
Date Filler CAP Removed	12-7-78
Date Grease Removal Started	12-7-78
Exterior Temp.	50°
Interior Temp.	100°
Total Volume Removed	1/2 Barrel
Date Filler Cap Reinstalled	

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

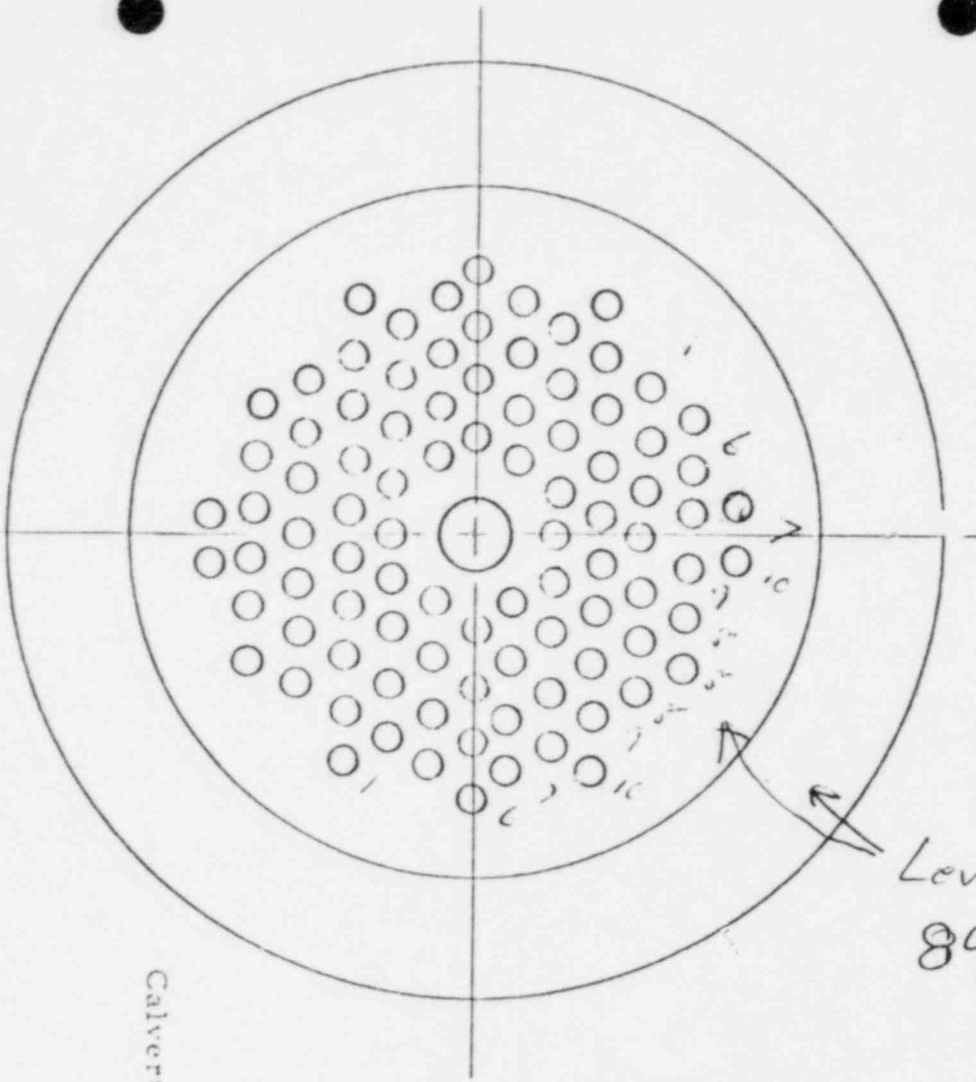
Sample Taken yes Container Identification 54-V14 Bottom

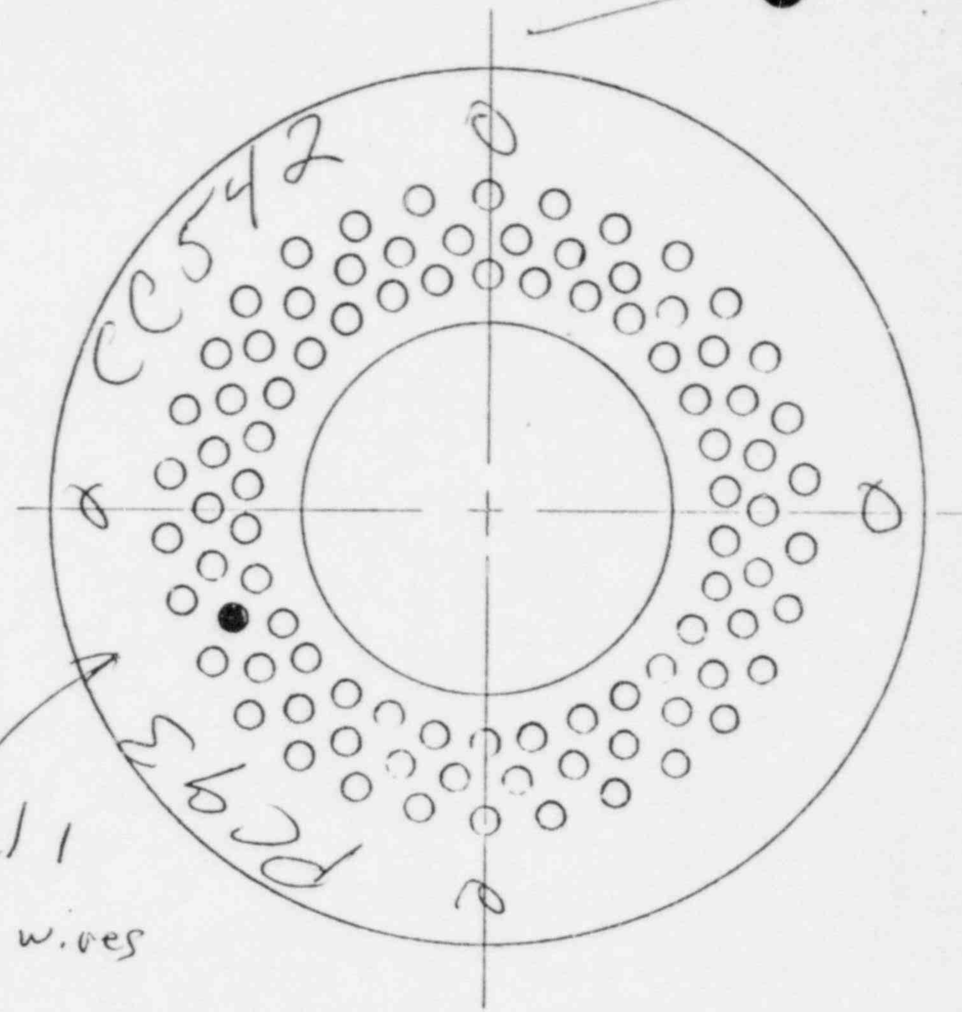
Data Recorded By: D. C. Kendall

TENDON GREASE INSTALLATION

Date Installed	1-9-79
Exterior Temp.	24°
Interior Temp.	79°
Filler Temp. @ Inlet Cap (Indicate if pumped or poured)	pumped
Filler Temp. @ Outlet Cap (Indicate if pumped or poured)	
Total Volume Installed	22 gal
Installation Pressure (if poured, N/A)	90 psi

Data Recorded By: D. C. Kendall Date 2-28-79





WIRE ANCHORAGE

Closest Buttress Bottom

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously 1

Discontinuous Wire Removed this surveillance None

Wire removed this surveillance for inspection None

WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 54V14

By M Burkell

Date 12-9-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY ______________

DATE ______________

TENDON NUMBER 54 V 14 DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires N_e	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimum effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	Kips
	Force at 1 kip per wire ($1 \times N_e$)	Kips

Section	Item	S/N RAM (1)	S/N RAM (2)
RAM CALIBRATION CURVE	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ______________

DATE: ______________ ___ DATA RECRODED BY: ___________________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
VI.B.3	Lift Off	**	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
V.	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
VIII.8	Lift Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
	New Lift-Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

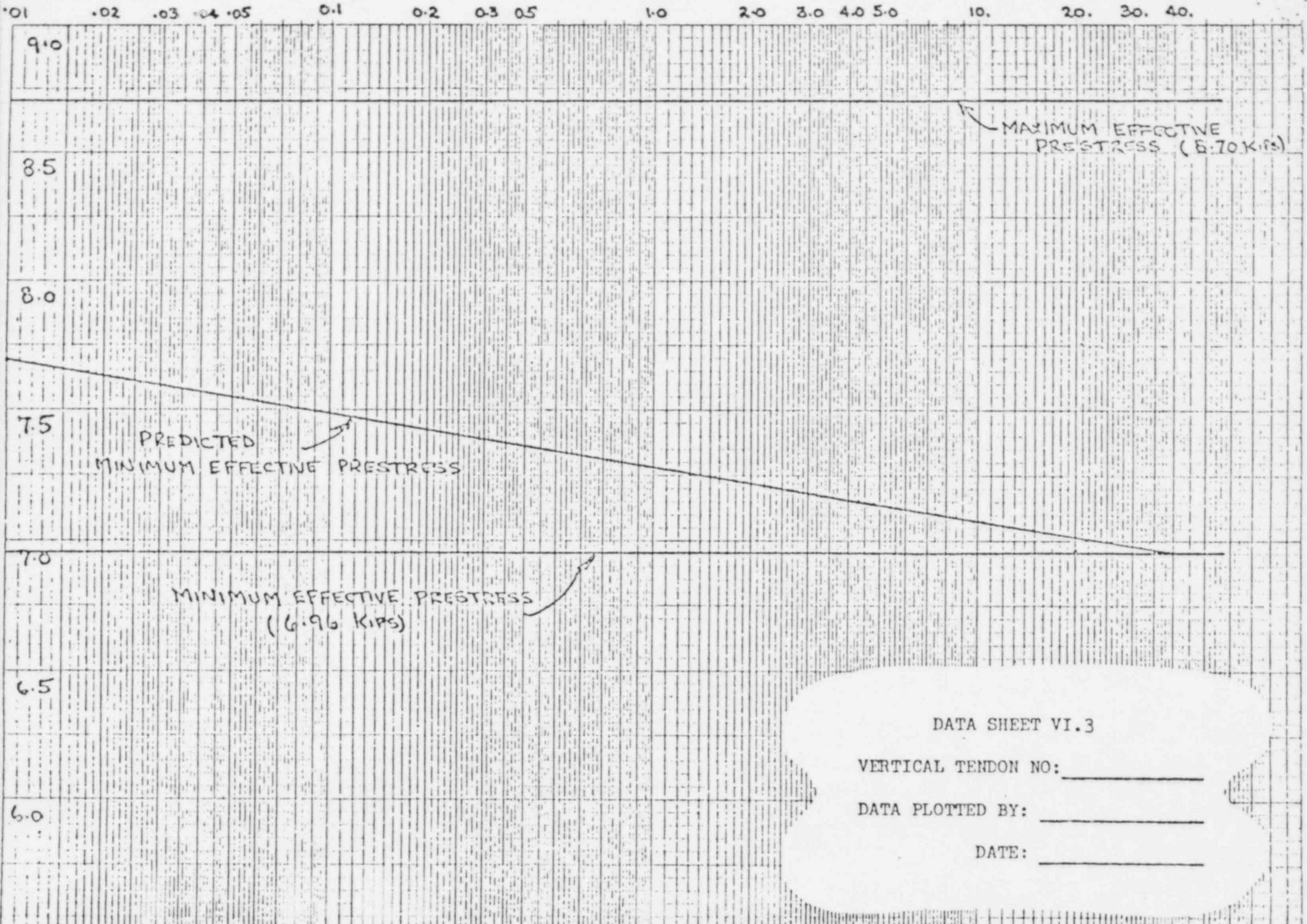
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET VI.3

VERTICAL TENDON NO: ______________

DATA PLOTTED BY: ______________

DATE: ______________

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 43V8

Closest Buttress	Top
Grease Removal	2gal
Date Filler CAP Removed	12-13-78
Date Grease Removal Started	12-13-78
Exterior Temp.	54°
Interior Temp.	75°
Total Volume Removed	2gal
Date Filler Cap Reinstalled	12-13-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

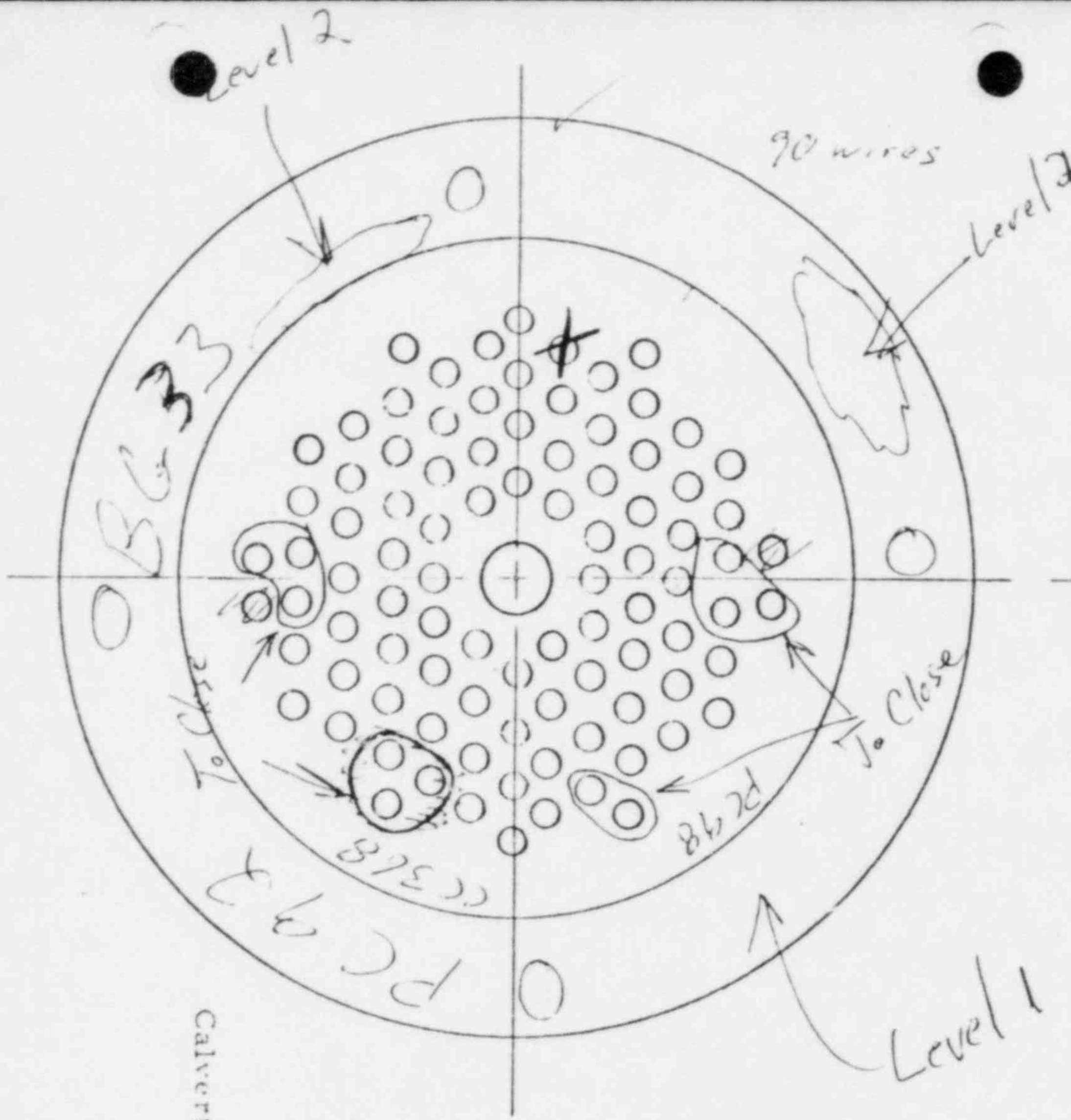
Sample Taken yes Container Identification 43V8 Top

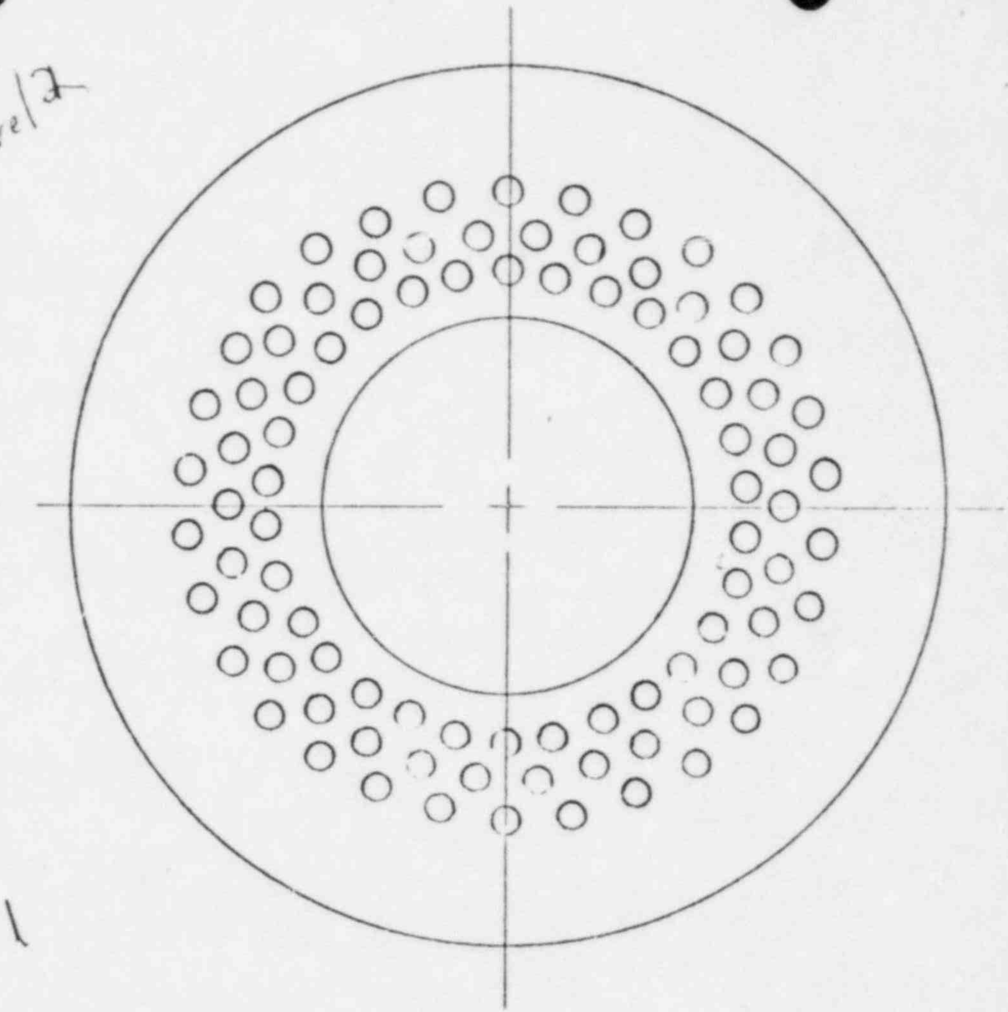
Data Recorded By: B. C. Riddell

TENDON GREASE INSTALLATION

Date Installed	
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	pumped from other end
Filler Temp. @ Outlet Cap }	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ____________ Date ______





WIRE ANCHORAGE

Closest Buttress Top

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Top

Tendon No. 43V8

By B. C. Kndll

Date 12-15-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY [illegible signature]

DATE 12-13-78

TENDON NUMBER 43V8 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 12-17-71	168.00 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)	160.88
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.89 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s 1-11-73 168.72 8.28	171.63 Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	8.42 Kips
	Time after initial stressing	1.1 until restress 7.0 Years since 1st stress
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	8.15 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	733. Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.1 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.96 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783. Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	639. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	626. Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

Ram # 40450200500-12
Gauge # 4215004A Date Cal 7-19-78

RAM CALIBRATION CURVE		S/N RAM (1)	S/N NA RAM (2)
	Hydraulic Pressure at expected Lift Off	5340 psi	psi
	Hydraulic Pressure at maximum effective prestress	5700 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4650 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4550 psi	psi
	Hydraulic Pressure at 0.8f's	6150 psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By B.C. Rudell

Date 12-13-78

TENDON NUMBER: 43V8

Ram# 404502005OO-12
Gauge# 4215004A
Date Cal 7-19-78

Note: Use New Cal Date On 12" Ram

	RAM (1) S/N	RAM (2) S/N NA
Average Hydraulic pressure at Lift-Off	5580	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~765~~ Kips	740 Kips

Average Lift Off Force F_{LAV} $\frac{F_L(1) + F_L(2)}{2}$ ~~765~~ Kips 740

Force Per Wire ($F_{LAV} \div N_e$) ~~8.39~~ ~~765~~ Kips/wire 8.22

Time since initial stressing of Tendon 7.0 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Rudell

Date 12-13-78

Ram# 404502005OO-12
Gauge# 4215004A
~~Date Cal~~ 7-19-78

	RAM (1) S/N	RAM (2) S/N NA
Number of wires removed this surveillance N_R	1 Wires	
Number of effective wires N_e	89. Wires	
0.8f's (9.43 x N_e)	839. Kips	
Hydraulic Force @ 0.8f's	6100 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5580. psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	50 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	6030 psi	psi

~~530~~

8.7
89
783
696
774.3 = 5650 psi

STRESSING - DESTRESSING

TENDON NUMBER 43V8

CLOSEST BUTTRESS 1-2

DATE: 12-13-78 DATA RECRODED BY: R.C. Kiedell

RAM S/N: 40450 20050042 GAUGE S/N: 42150004A Date Cal. 7-19-78

Use New Cal Date 3-14-79 For 12" Ram

5890 5300 5400 5000

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	16 5/16"				
VI.B.3	Lift Off avg 5580	expect 5340 **	Run 1: 5500	Run 2: 5600	Run 3: 5600	Run 4: 5500	Run 5: 5700
VI.B.5	Pressurize to 0.8f's	6150 psi **	✓				
VI.B.5	Elongation @ 0.8f's	-	17 1/8"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 psi **	✓				
VI.B.7	Elongation at 1 kip/wire		6"				
VI	Remove Wire - This End Cut? yes	***					
VIII.3	Pressurize to 1 kip/wire	**	650 psi				
VIII.4	Elongation at 1 kip/wire		5 11/16"				
VIII.5	Pressurize to 0.8f's	6100 psi **	✓				
VIII.5	Elongation at 0.8f's		17 7/16"				
VIII.6	Pressure for shim measure	6000 **	✓				
VIII.7	Elongation at shim press		17 3/8"				
VIII.7	Added 1 set 1/2" + 1 set 1/4" Shims installed		16 15/16"				
VIII.8	Lift Off pressure		Run 1: 5600	Run 2: 5300	Run 3: 5400	Run 4: 5400	Run 5:
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		NO				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**	6100 psi				
	Shims installed		added 3/16" ShimSet 17 1/8"				
	New Lift-Off pressure avg 5500		Run 1: 5500	Run 2: 5500	Run 3: 5500	Run 4: 5500	Run 5: 5500

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

1/2 15/16

~~755 kip~~

8.48 kip/wire ≥ 8.39 kip/wire ✓

Reseated @ 8.20 kip/wire

TENDON NUMBER 43V8

DATE: DATA RECORDED BY:

From Page (1)

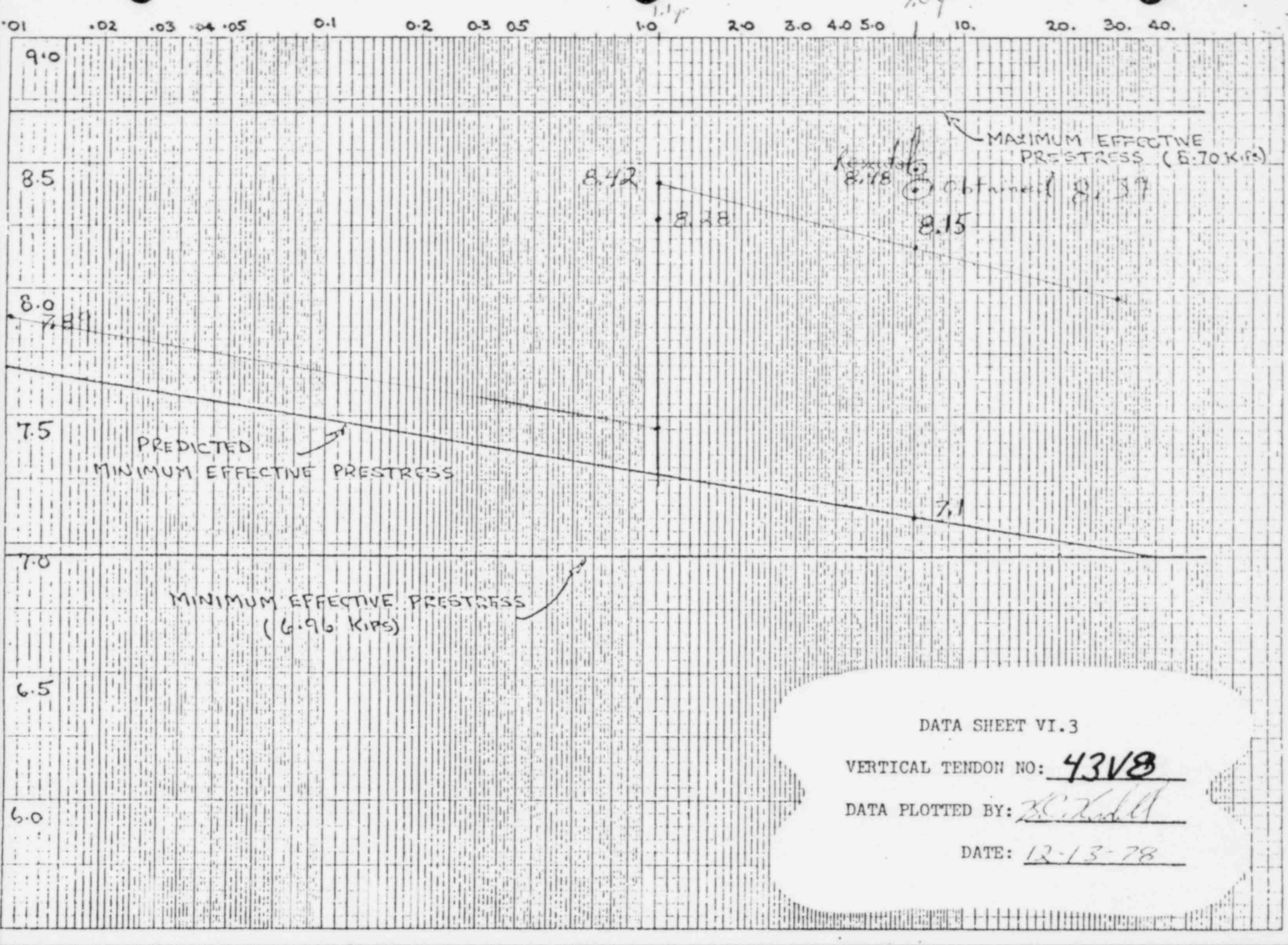
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	6"		17 1/8		11 1/8		11 1/8
RESTRESS	5 11/16		17 7/16		11 3/4		11 3/4

TIME IN YEARS



TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 43 V8

Closest Buttress	Bottom
Grease Removal	1/2 Barrel
Date Filler CAP Removed	12-4-78
Date Grease Removal Started	12-4-78
Exterior Temp.	68°
Interior Temp.	98°
Total Volume Removed	1/2 Barrel
Date Filler Cap Reinstalled	12-14-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

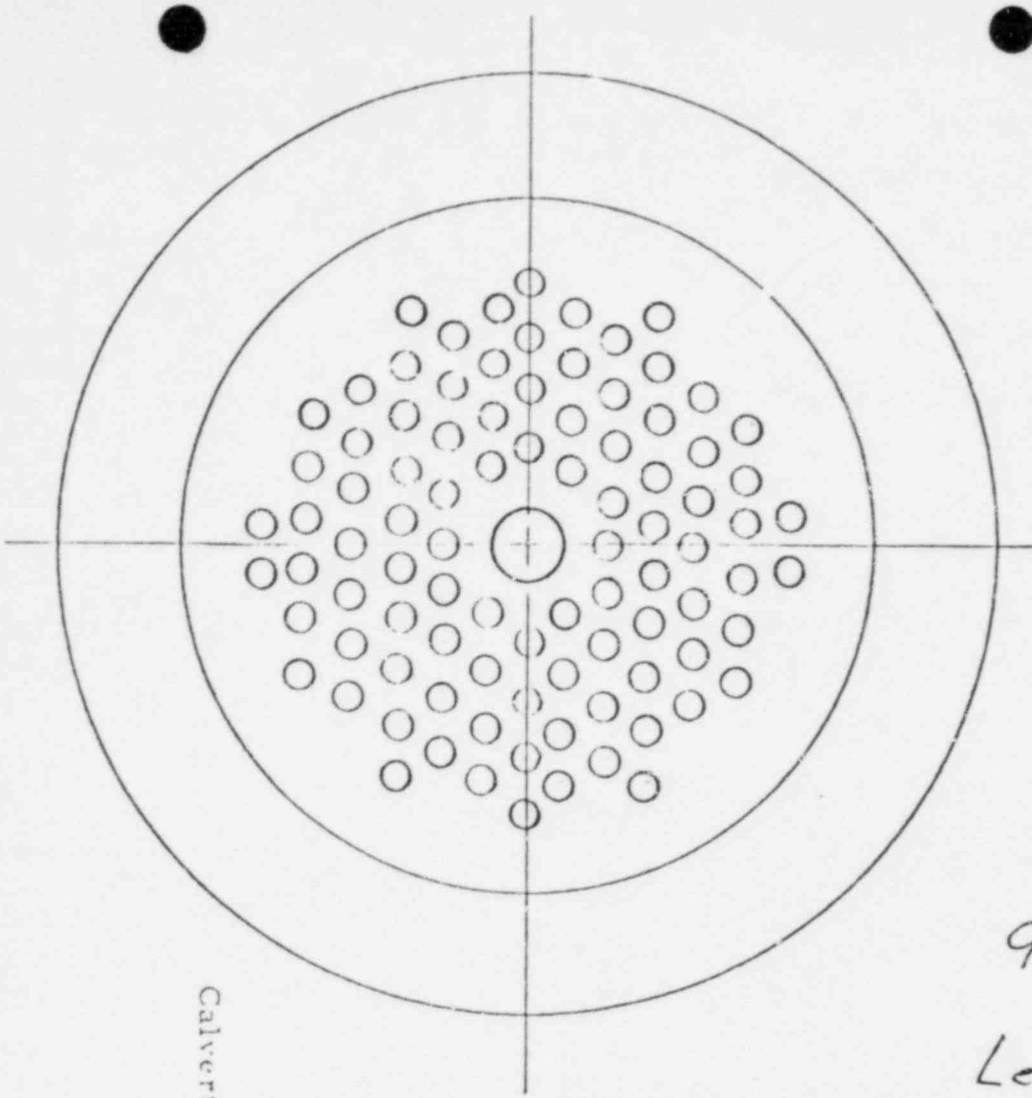
Sample Taken yes Container Identification 43V8 - Bottom

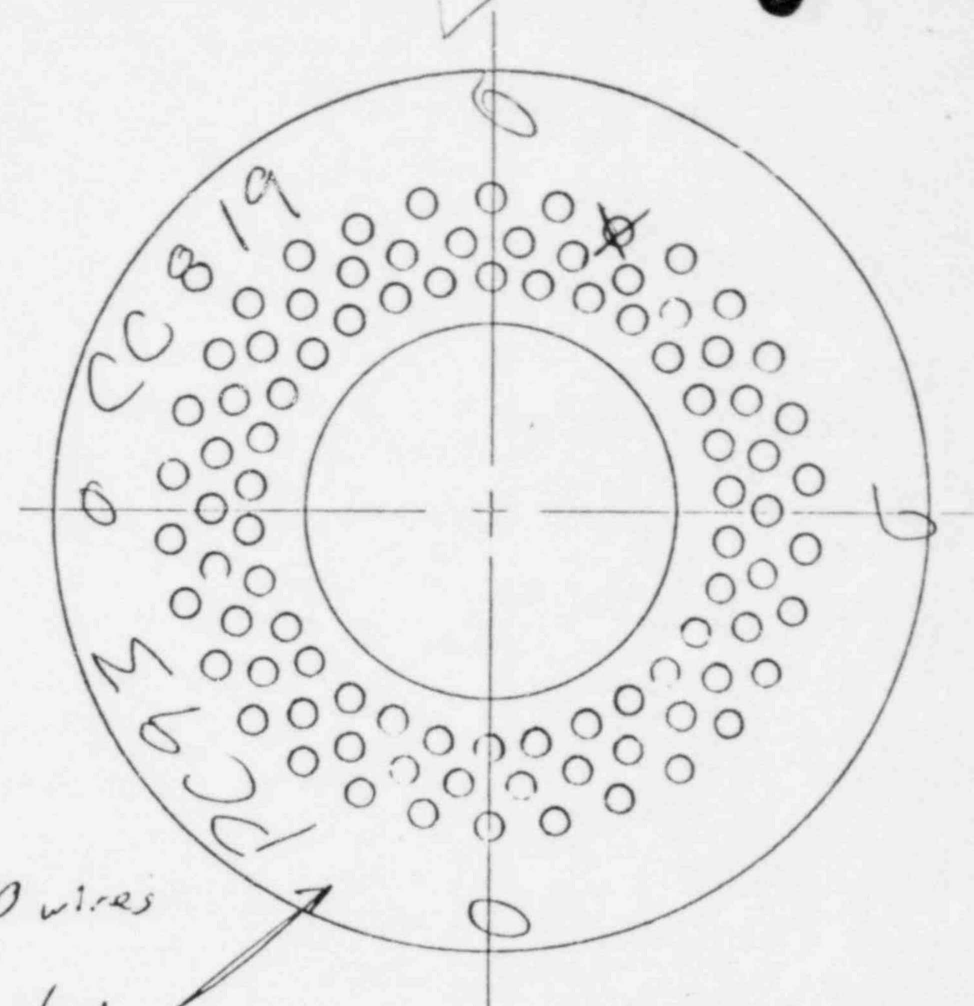
Data Recorded By: K.C. Rudell

TENDON GREASE INSTALLATION

Date Installed	1-6-79
Exterior Temp.	34°
Interior Temp.	70°
Filler Temp. @ Inlet Cap } Indicate if pumped	pumped
Filler Temp. @ Outlet Cap } or poured	
Total Volume Installed	25 gal
Installation Pressure (if poured, N/A)	90 psi

Data Recorded By: K.C. Rudell Date 2-28-79





WIRE ANCHORAGE

Closest Buttress Bottom

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuous Wire Removed this surveillance None

Wire removed this surveillance for inspection Yes New 89 Wires

WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 43V8

By B.C. Hudell

Date 12-9-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY ____________________

DATE ____________________

TENDON NUMBER DESTRESSING

Section	Item	Value	
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	Horizontals	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma$ - 4 day loss)		
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips	
	Time after initial stressing	Years	
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips	
	Number of effective wires N_e	Wires	
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips	
	Maximum Effective Prestress per wire, F_{max}	Kips	
	Predicted minimum effective prestress (per wire F_{pmin})	Kips	
	Absolute minimum effective prestress per wire (F_{min})	Kips	
	Maximum effective prestress ($F_{max} \times N_e$)	Kips	
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips	
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips	
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	Kips	
	Force at 1 kip per wire ($1 \times N_e$)	Kips	
RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ Kips

Force Per Wire ($F_{LAV} \div N_e$) Kips

Time since initial stressing of Tendon Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date __________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure,, P_L	psi	psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	psi	psi
Shim Pressure (P_L + 500 - P_{RH})	psi	psi

STRESSING - DESTRESSING

TENDON NUMBER ___________

CLOSEST BUTTRESS ___________

DATE: ______________ DATA RECRODED BY: ____________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off	**					
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
V	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure						
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure						

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (

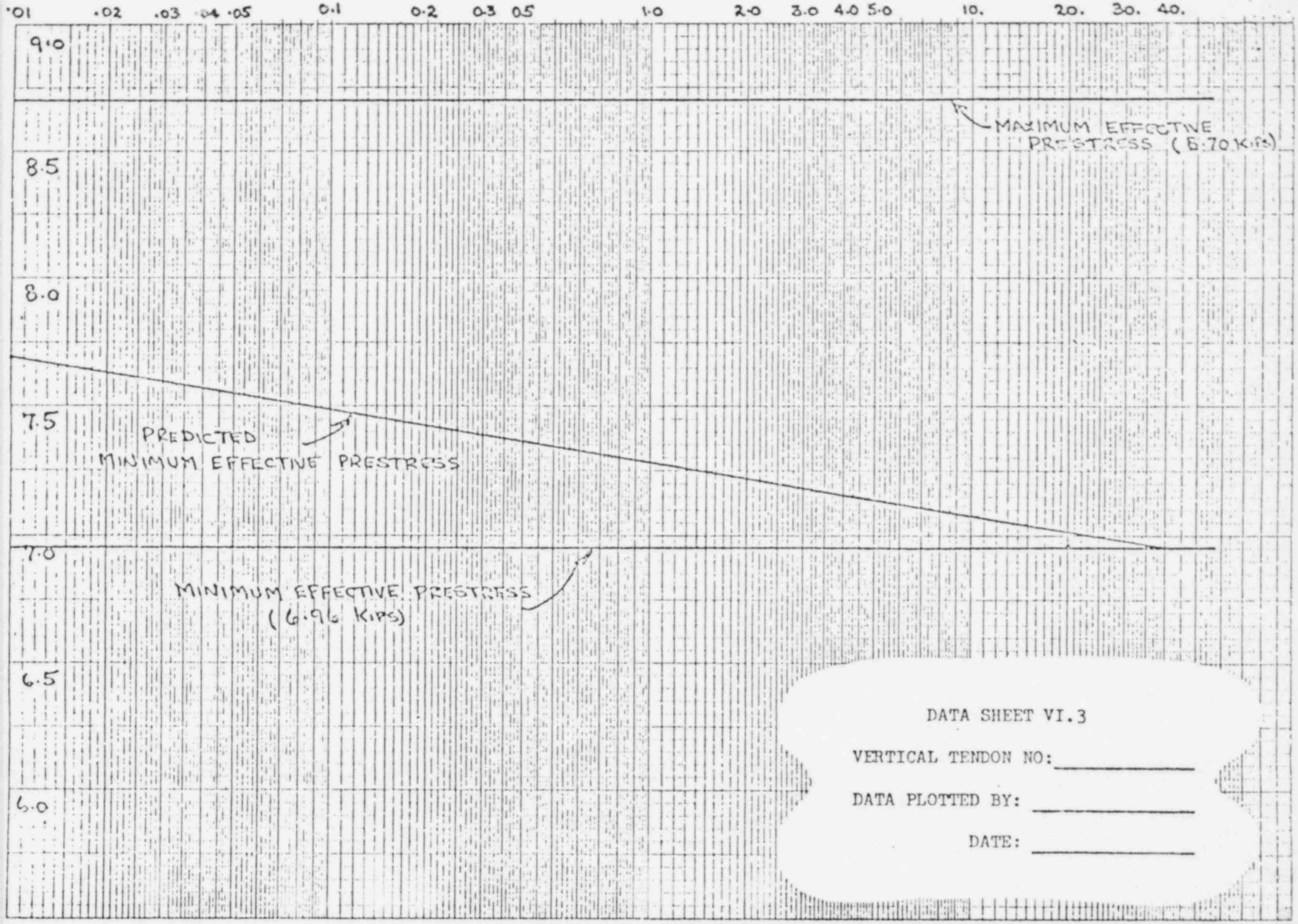
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 31H1

Closest Buttress	1
Grease Removal	2 gal
Date Filler CAP Removed	11-16-78
Date Grease Removal Started	11-16-78
Exterior Temp.	46°
Interior Temp.	104°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	11-17-78

Data Recorded By: [signature]

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 31H1-1

Data Recorded By: [signature]

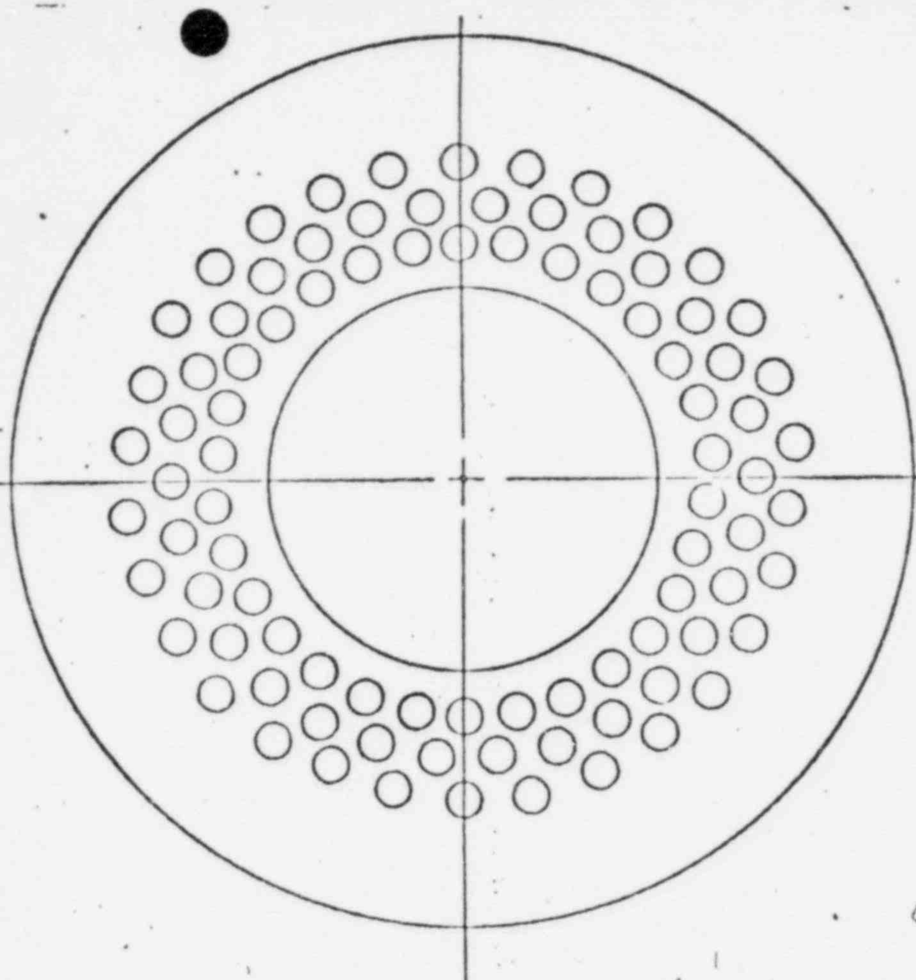
TENDON GREASE INSTALLATION

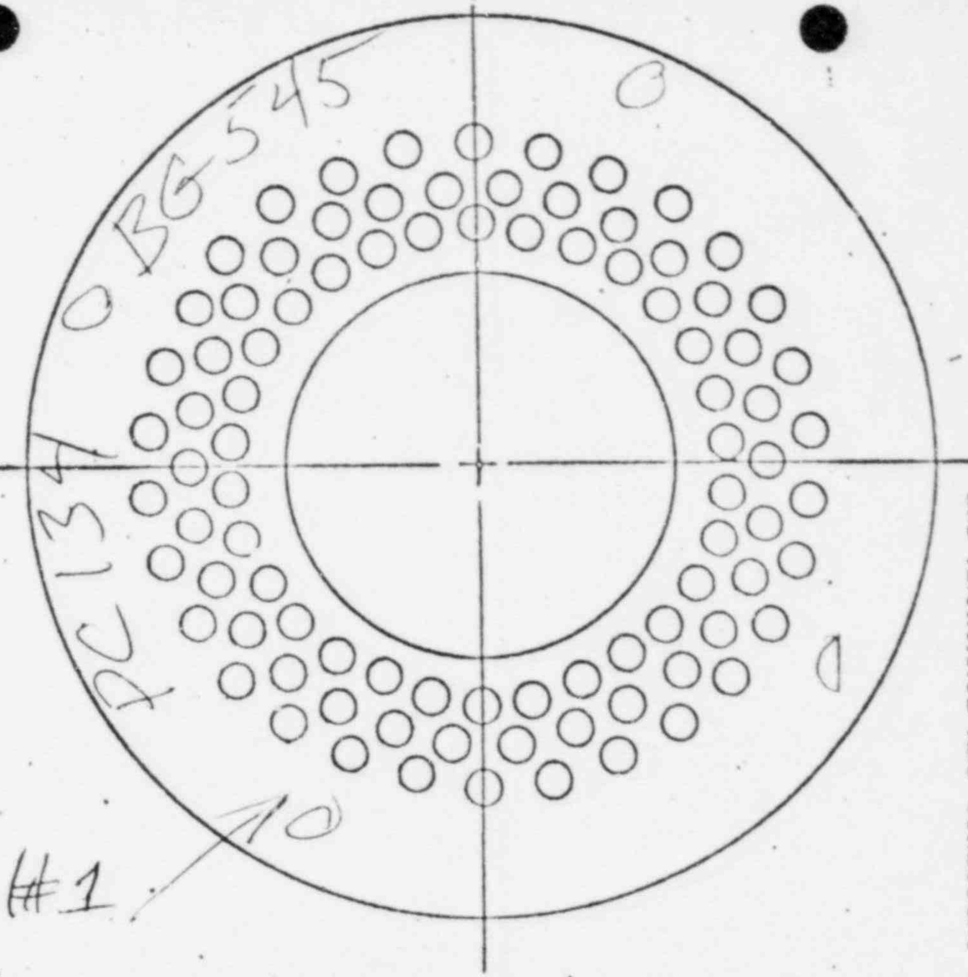
Date Installed	11-18-78
Exterior Temp.	46°
Interior Temp.	104°
Filler Temp. @ Inlet Cap } Indicate if pumped or poured	
Filler Temp. @ Outlet Cap }	
Total Volume Installed	10 gal.
Installation Pressure (if poured, N/A)	

Data Recorded By: [signature] Date 11-20-78

DATA SHEET V.1

END ANCHORAGE AND STRESSING WASHER INSPECTION SHEET





Level #1

Found Piece On Signode Strap In Grease Behind Washer

WIRE ANCHORAGE

Closest Buttress 1

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None.

Discontinuos wire removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 1

Tendon No. 3H1

By BC Kudell

Date 11-17-78

Tendon Surveillance
Calvert Cliffs Nuclear Power
Unit 1
End Anchor Sketch Form

DATA SHEET VI.1

Page (1)

DATA RECORDED BY D.C. Riddell

TENDON NUMBER: 31H1

DATE 11-16-78

TENDON NUMBER	DESTRESSING	
INITIAL PRESTRESS	Wire Stress at seating, σ	165.12 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	159.64
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F4 ($\sigma 4 \times A_W$)	7.85 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 12-14-72 – 11-16-78	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.07 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	636.3 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.03 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	633 Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	~~805.~~ Kips 615.
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90. Kips

Ram # 40450200600-12
Gage # 4215004A
Date Cal 7-19-78

RAM CALIBRATION CURVE		S/N RAM (1)	~~S/N~~ RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	4650 psi
	Hydraulic Pressure at maximum effective prestress	psi	5700 psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	4650 psi
	Hydraulic pressure at absolute minimum effective prestress	psi	4500 psi
	Hydraulic Pressure at 0.8f's	psi	6180 psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By A. Bartt

Date 11-17-78

TENDON NUMBER: 31H1

Ram # 404502005 00-12

Gauge # 4215004A

Date Cal ~~7-19-78~~ 3-14-79 Re Cal

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		5100
Tendon Lift Offs Acceptable?		Yes
Lift Off Force, F_L	Kips	~~696~~ 677 Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$ 677 ~~Kips~~ ~~685.5~~

Force Per Wire ($F_{LAV} \div N_e$) 7.52 ~~Kips~~ ~~7.62~~

Time since initial stressing of Tendon Years 6.8

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified A. Bartt

Date 11-17-78

	RAM (1) S/N	RAM(2) S/N	
Number of wires removed this surveillance N_R	Wires 0		
Number of effective wires N_e	Wires 90		
0.8f's (9.43 x N_e)	Kips 849		
Hydraulic Force @ 0.8f's	psi	6180	psi
Original Lift-Off Hydraulic pressure,, P_L	psi	5100	psi
Reduction in shim pressure, P_{RH},(N_R x 50)	psi	0	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	5600	psi

Data Recorded By: RC Kudell

Date: 11-17-78

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H1

CLOSEST BUTTRESS 1

DATE: 11-17-78 DATA RECRODED BY: [illegible signature]

RAM S/N: GAUGE S/N:

404502005OO-12 4215004A Date Cal 7-19-78

STEP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero					
I.B.1	Measure Shims	-	2 1/4				
I.B.3	Lift Off	expect 4650 psi **	Run 1: 5100	Run 2: 5100	Run 3: 5100	Run 4: 5100	Run 5: 5100
I.B.5	Pressurize to 0.8f's	6180 psi **	✓				
I.B.5	Elongation @ 0.8f's	-	3 1/8				
I.B.6	Depressurize to zero	-	✓				
I.B.7	Pressurize to 1 kip/wire	640 psi **	✓				
I.	Elongation at 1 kip/wire		+2 7/8 - 3 1/2 = -5/8				
II.	Remove Wire - This End Cut?	***	X				
III.3	Pressurize to 1 kip/wire	640 psi **	X -5/8				
III.4	Elongation at 1 kip/wire		X				
III.5	Pressurize to 0.8f's	6180 psi **	✓				
III.5	Elongation at 0.8f's		3 3/8				
III.6	Pressure for shim measure	5600 **	✓				
III.7	Elongation at shim press		2 7/8				
III.7	Shims installed		2 1/2				
III.8	Lift Off pressure	(Avg 4983.3)	Run 1: 5000	Run 2: 5000	Run 3: 4950	Run 4: Not [illegible]	Run 5: Not [illegible]
III.8	AVG Lift Off ≥ Initial AVG Lift Off?		Not ≥ initial liftoff avg.				
III.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	6100 **	✓				
	Shims installed		None				
	New Lift-Off pressure	Avg. 5010	Run 1: 5000	Run 2: 5000	Run 3: 5000	Run 4: 5000	Run 5: 5050

Avg lift off 715 kips
7.94 Kips/wire
7.78 ≥ 7.52

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 31H1

DATE: DATA RECORDED BY:

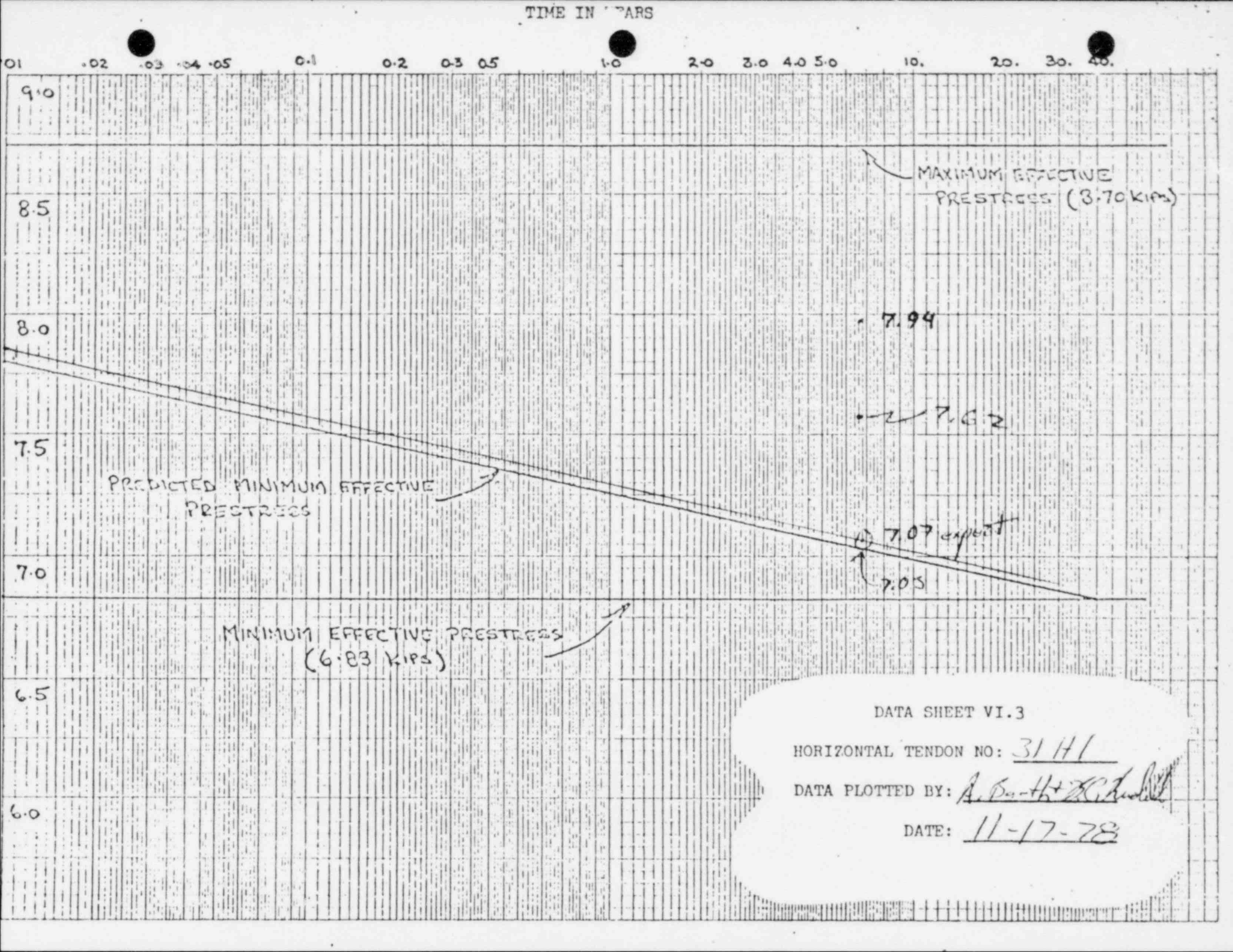
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							
INITIAL	____	____	____	____	____	____	



TIME IN YEARS
.01
.02
.03
.04
.05
0.1
0.2
0.3
0.5
1.0
2.0
3.0
4.0
5.0
10.
20.
30.
40.
9.0
8.5
8.0
7.5
7.0
6.5
6.0
MAXIMUM EFFECTIVE PRESTRESS (3.70 KIPS)
7.94
7.62
PREDICTED MINIMUM EFFECTIVE PRESTRESS
7.07 expect
7.05
MINIMUM EFFECTIVE PRESTRESS (6.83 KIPS)
DATA SHEET VI.3
HORIZONTAL TENDON NO: 31 H1
DATA PLOTTED BY:
DATE: 11-17-78

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 31H1

Closest Buttress	3
Grease Removal	2 gal
Date Filler CAP Removed	11-16-78
Date Grease Removal Started	11-16-78
Exterior Temp.	46°
Interior Temp.	104°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	11-17-78

Data Recorded By: B.C. Rudell

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated NO

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 31H1-3

Data Recorded By: B.C. Rudell

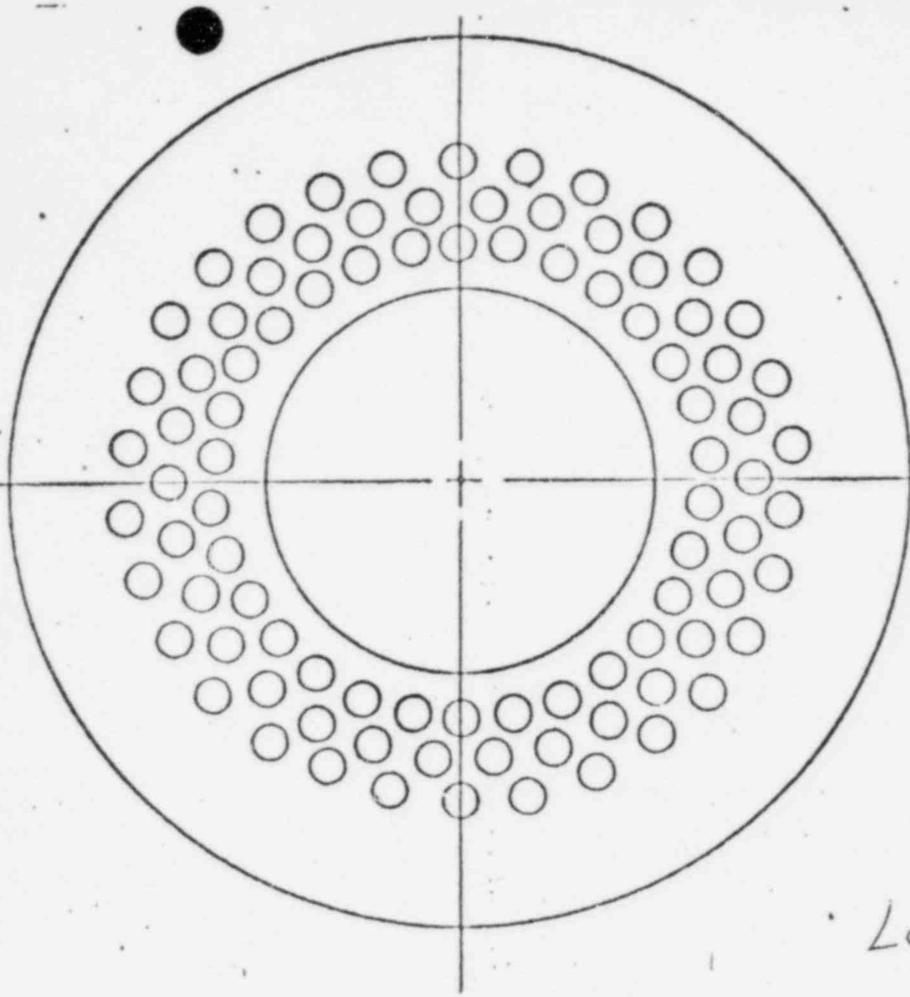
TENDON GREASE INSTALLATION

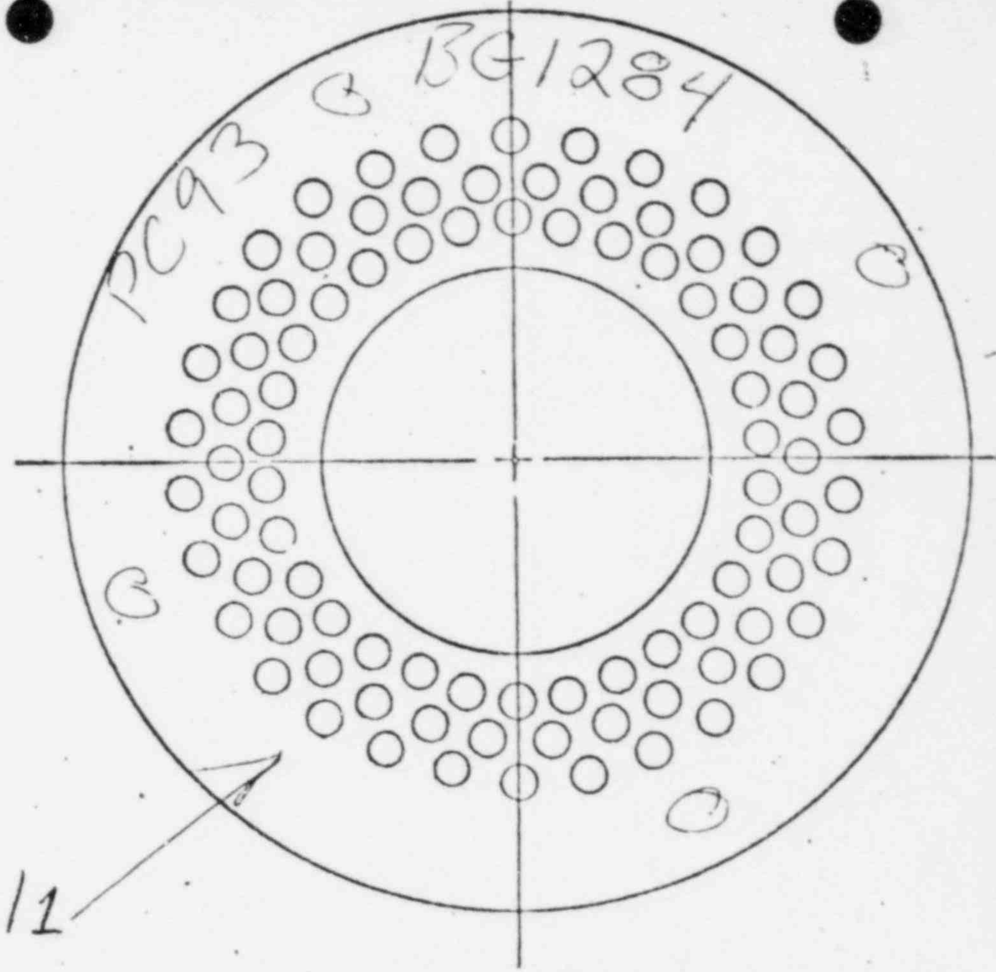
Date Installed	
Exterior Temp.	Pumped from
Interior Temp.	other end
Filler Temp. @ Inlet Cap } Indicate if pumped	vented @ this end
Filler Temp. @ Outlet Cap } or poured	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: B.C. Rudell Date 11-20-78

DATA SHEET V.1

END ANCHORAGE AND STRESSING WASHER INSPECTION SHEET





Level 1

WIRE ANCHORAGE

Closest Buttress 3

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously None

Discontinuos wire removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress 3

Tendon No. 31H1

By [illegible signature]

Date 11-16-78

Tendon Surveillance
Calvert Cliffs Nuclear Power
Unit 1
End Anchor Sketch Form

DATA RECORDED BY [signature]

TENDON NUMBER: 31 H1   DATE 11-17-78

TENDON NUMBER   DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	165.12 Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	159.64
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	7.85 Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing 2-14-72 - 11-16-78	6.8 Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	7.07 Kips
	Number of effective wires N_e	90 Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	636.5 Kips
	Maximum Effective Prestress per wire, F_{max}	8.7 Kips
	Predicted minimum effective prestress (per wire F_{pmin})	7.03 Kips
	Absolute minimum effective prestress per wire (F_{min})	6.83 Kips
	Maximum effective prestress ($F_{max} \times N_e$)	783 Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	633. Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	~~805~~ Kips 615
	80% min. ultimate strength (.8f's) (9.43 x N_e)	849. Kips
	Force at 1 kip per wire (1 x N_e)	90 Kips

Ram # 404500 4050008
Gauge # 4215108   Date Cal 7-20-78

RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	5000 psi	psi
	Hydraulic Pressure at maximum effective prestress	6150 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	5000 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4850 psi	psi
	Hydraulic Pressure at 0.8f's	6650 psi	psi
	Hydraulic Pressure at 1 Kip/wire	700 psi	psi

Data Recorded By B.C. Kudell

Date 11-17-78

TENDON NUMBER: 31H1

Ram # 4045004050008
Gauge # 4215108
Date Cal 7-20-78

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	avg 5350 psi	
Tendon Lift Offs Acceptable?	Yes	
Lift Off Force, F_L	675 Kips	Kips

Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$ $\frac{675 + 696}{2}$ 685.5 ~~Kips~~ 677

Force Per Wire ($F_{LAV} \div N_e$) New Cal On 12" Ram 7.62 ~~Kips~~ 7.52

Time since initial stressing of Tendon 6.8 Years

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified B.C. Kudell

Date 11-17-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure,,P_L	psi	psi
Reduction in shim pressure, P_{RH},(N_R x 50)	psi	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	psi

Data Recorded By: __________

Date: __________

DATA SHEET VI.2

STRESSING - DESTRESSING

TENDON NUMBER 31H1

CLOSEST BUTTRESS 3

DATE: 11-17-78 DATA RECRODED BY: R.C. Riddell

RAM S/N: GAUGE S/N:

4045004050008 4215108 Date Cal 7-20-78

EP	DESCRIPTION	OBJECTIVE					
I.B.2	Check Gauges	Zero	✓				
I.B.1	Measure Shims	-	2 1/8"				
		expect 5000 psi	Run 1	Run 2	Run 3	Run 4	Run 5
I.B.3	Lift Off avg. 5350	**	5250	5300	5400	5400	5400
I.B.5	Pressurize to 0.8f's	6650 psi **	6650 psi ✓				
I.B.5	Elongation @ 0.8f's	-	3 1/8"				
I.B.6	Depressurize to zero	-	✓ 1 1/16" - 3 1/2 = -2 7/16"				
I.B.7	Pressurize to 1 kip/wire	700 psi **	✓				
I	Elongation at 1 kip/wire		1 1/8" - 3 1/2 = -2 3/8" RCR				
II.	Remove Wire - This End Cut?	*** N					
III.3	Pressurize to 1 kip/wire	**					
III.4	Elongation at 1 kip/wire		1 1/8" - 3 1/2 = -2 3/8"				
III.5	Pressurize to 0.8f's	6650 psi **	✓				
III.5	Elongation at 0.8f's		3"				
III.6	Pressure for shim measure	**	5850 psi ✓				
III.7	Elongation at shim press	5850	1 7/8", 2 3/8"				
III.7	Shims installed Removed 1 set 3/8" + Added 1 set 1/2" shims		2 1/4"				
			Run 1	Run 2	Run 3	Run 4	Run 5
III.8	Lift Off pressure		5300	5200	5250		
III.8	AVG Lift Off ≥ Initial AVG Lift Off?		Not ≥ 5350				
III.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	6350 psi **	6350				
	Shims installed		Added 3/16" Shims, 2 7/16" all total				
		avg 5800	Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure		5700	5700	5900	5800	5900

** Obtain from Data Sheet VI.1

$\frac{690+740}{2}$ = 715 kip 715 ≥ 685 kip ✓

*** If required by Data Sheet II.1

DATA SHEET VI.2

TENDON NUMBER 31H1

DATE: DATA RECORDED BY:

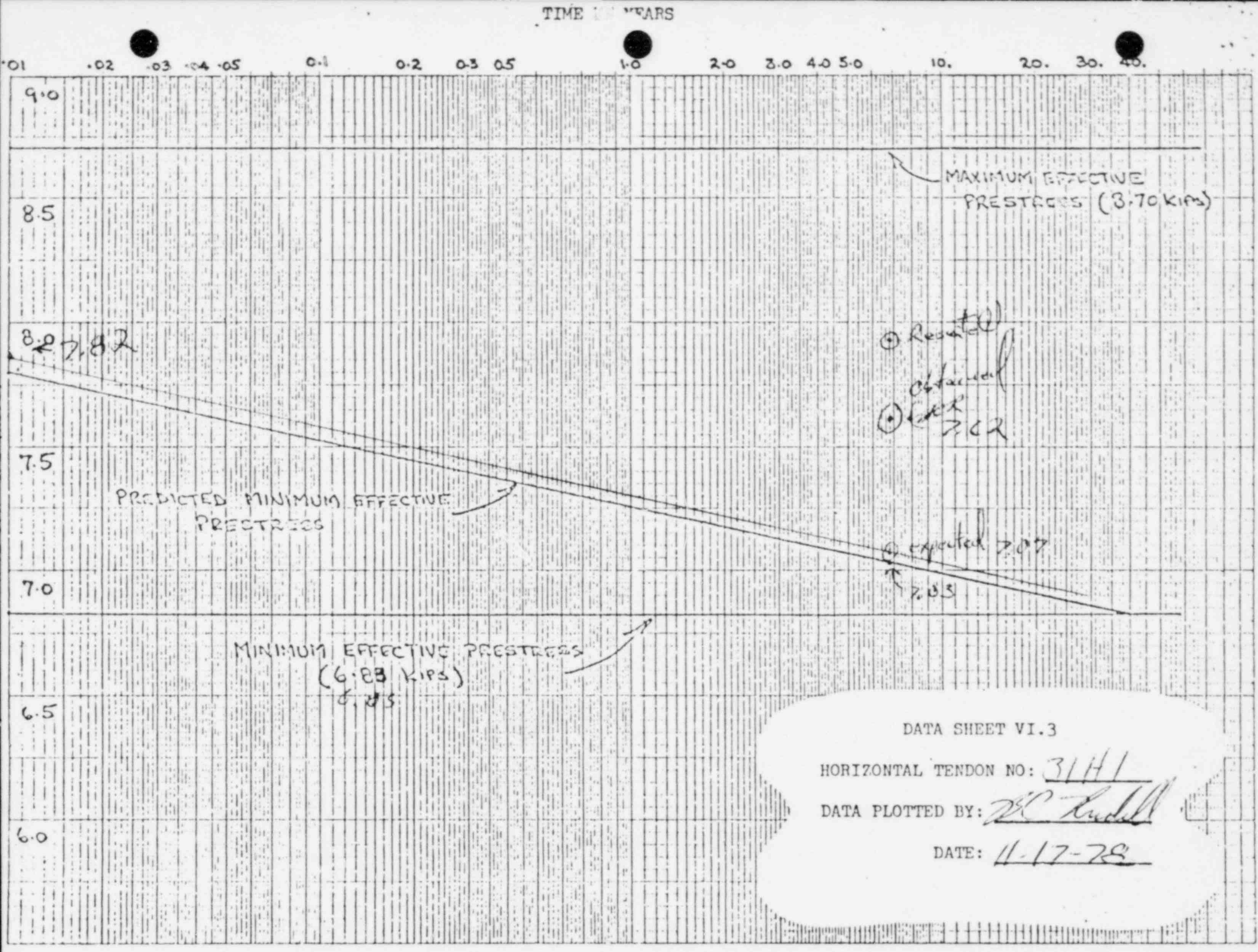
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	-5/8	-2 3/8	3 1/8	3 1/4"	3 3/4	5 5/8	9 3/8
RESTRESS	-5/8	-2 3/8	3 3/8	3"	4	5 3/8	9 3/8
~~INITIAL~~							



DATA SHEET VI.3

HORIZONTAL TENDON NO: 31H1

DATA PLOTTED BY: DC Rudell

DATE: 11-17-78

UNIT 1

TENDON DEGREASE/GREASE & INSPECTION RECORD

Tendon No. 23V8 Found a wire missing during grease inspection

Closest Buttress	Top
Grease Removal	2 gal
Date Filler CAP Removed	12-4-78
Date Grease Removal Started	12-4-78
Exterior Temp.	68°
Interior Temp.	98°
Total Volume Removed	2 gal
Date Filler Cap Reinstalled	12-7-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dork Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

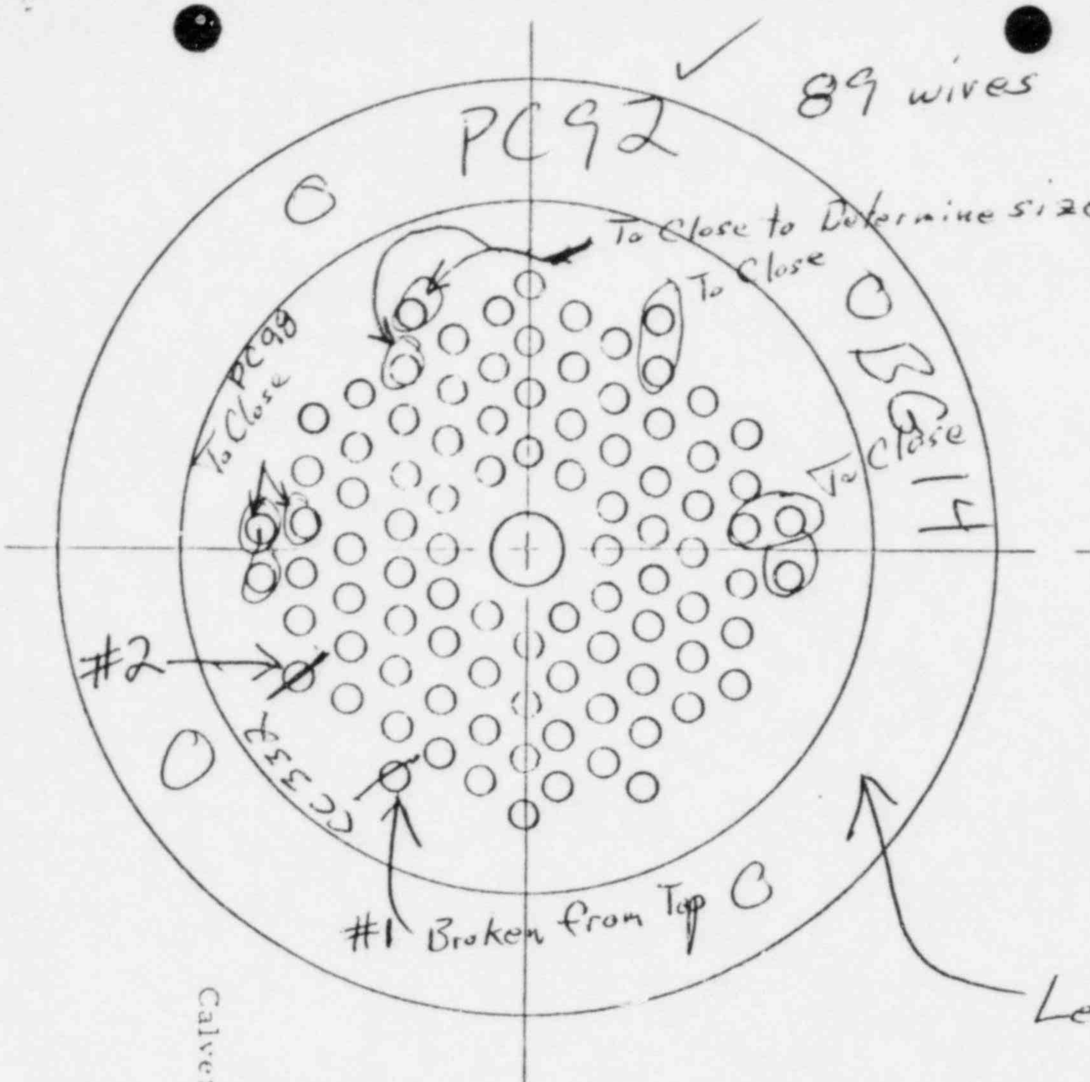
Sample Taken yes Container Identification 23V8 Top

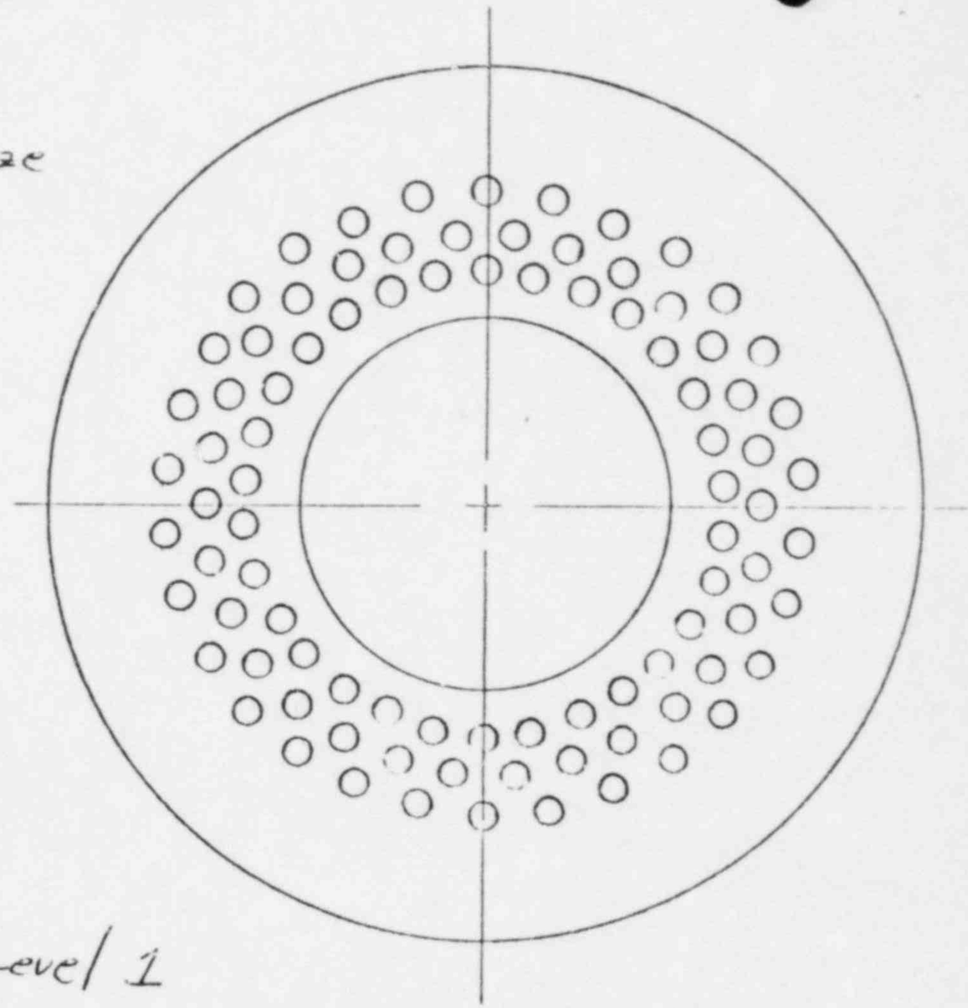
Data Recorded By: [signature]

TENDON GREASE INSTALLATION

Date Installed	Pumped from Other End
Exterior Temp.	
Interior Temp.	
Filler Temp. @ Inlet Cap (Indicate if pumped or poured)	
Filler Temp. @ Outlet Cap (Indicate if pumped or poured)	
Total Volume Installed	
Installation Pressure (if poured, N/A)	

Data Recorded By: ________ Date ______





WIRE ANCHORAGE

Closest Buttress Top

Off-Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Top

Tendon No. 23V8

By B.C. Kudell

Date 12-5-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA RECORDED BY B.C. Riddell

DATE 12-6-78

TENDON NUMBER 23V8 DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ 11-8-71	168.72 Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	Horizontals	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	161.6	
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F4 ($\sigma 4 \times A_W$)	7.93 Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s 3-8-73 158.12 7.76	170.83 Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	8.39 Kips	1.3 yrs until restress
	Time after initial stressing 12-1-78	7.08 Years	since 1st stress
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	~~8.24~~ Kips	8.24
	Number of effective wires N_e	~~90~~ Wires	89
	Expected lift off force, F_L ($F_{LE} \times N_e$)	~~742.~~ Kips	733.
	Maximum Effective Prestress per wire, F_{max}	~~8.7~~ Kips	8.7
	Predicted minimum effective prestress (per wire F_{pmin})	~~7.1~~ Kips	7.1
	Absolute minimum effective prestress per wire (F_{min})	~~6.96~~ Kips	6.96
	Maximum effective prestress ($F_{max} \times N_e$)	~~783.~~ Kips	774.
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	~~639.~~ Kips	632.
	Absolute min. effective prestress ($F_{min} \times N_e$)	~~626.~~ Kips	619.
	80% min. ultimate strength (.8f's) (9.43 x N_e)	~~849.~~ Kips	839.
	Force at 1 kip per wire (1 x N_e)	~~90~~ Kips	89.

		S/N RAM (1)	S/N N/A RAM (2)
RAM CALIBRATION CURVE	Ram# 40450200500-12 Gauge# 4215004A Date Cal 7-19-78		
	Hydraulic Pressure at expected Lift Off	5350 psi	psi
	Hydraulic Pressure at maximum effective prestress	5650 psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	4600 psi	psi
	Hydraulic pressure at absolute minimum effective prestress	4500 psi	psi
	Hydraulic Pressure at 0.8f's	6100 psi	psi
	Hydraulic Pressure at 1 Kip/wire	650 psi	psi

Data Recorded By [signature]

Date 12-6-78

TENDON NUMBER: 23V8

Ram# 40450200500-12
Gauge# 4215004A
7-19-78

Note: New Cal On 12" Ram

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off	5630	
Tendon Lift Offs Acceptable?	yes	
Lift Off Force, F_L	~~775~~ Kips	745 Kips

Average Lift Off Force F_{LAV} $\cancel{\frac{F_L(1) + F_L(2)}{2}}$ ~~775~~ Kips 745

Force Per Wire ($F_{LAV} \div N_e$) either 89 or 88 wires 8.7/89 wires 8.8/88 wires Kips 8.46

Time since initial stressing of Tendon 7.0 years ~~Years~~

Unable to determine if second wire broke during stressing or was previously broken. Probable previously broken because no noise was heard to indicate breakage during stressing.

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified [signature]

Date 12-6-78

Ram# 40450200500-12
Gauge# 4215004A Date Cal 7-19-78

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	2 Wires	
Number of effective wires N_e	88 Wires	
0.8f's (9.43 x N_e)	830 Kips	
Hydraulic Force @ 0.8f's	6050 psi	psi
Original Lift-Off Hydraulic pressure, P_L	5630 psi	or 8.8 kip/wire psi
Reduction in shim pressure, P_{RH}, (N_R x 50)	100 psi	psi
Shim Pressure (P_L + 500 - P_{RH})	6030 ~~psi~~	psi

To High over 8.7 kip/wire
9.4 kip/wire

STRESSING - DESTRESSING

TENDON NUMBER 23V8

CLOSEST BUTTRESS Top

DATE: 12-6-78 DATA RECRODED BY: [illegible]

RAM S/N: 40450200500-12 GAUGE S/N: 421:004A Date Cal. 7-19-78 3-14-79

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero	✓				
VI.B.1	Measure Shims	-	14 13/16"				
		expected	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.3	Lift Off avg 5630	**5350	5700	5600	5600	5650	5600
VI.B.5	Pressurize to 0.8f's	6100 psi **	6100 psi				
VI.B.5	Elongation @ 0.8f's Found another broken wire	88 wires -	15 13/16"				
VI.B.6	Depressurize to zero	-	✓				
VI.B.7	Pressurize to 1 kip/wire	650 psi ** ← same	✓				
VI.B.7	Elongation at 1 kip/wire		4 15/16"				
VI.	Remove Wire - This End Cut?	***	NA				
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire		4 15/16				
VIII.5	Pressurize to 0.8f's	~~6100 psi~~ 6050 psi **	✓				
VIII.5	Elongation at 0.8f's		16 1/8"				
VIII.6	Pressure for shim measure	6030 psi **	← To High will install original shims since lift off @ 8.8 kip/wire before.				
VIII.7	Elongation at shim press						
VIII.7	Shims installed		14 13/16"				
			Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	Lift Off pressure To Low →		4600	4600			
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?		4600 psi = 630 kip / 88 wire = 7.1 kip/wire				
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	5800 psi **	✓				
	Shims installed		added 1 set 1/2" shims 15 3/8"				
			Run 1	Run 2	Run 3	Run 4	Run 5
	New Lift-Off pressure avg 5640		5500	5700	5700	5600	5700

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

5640 psi = ~~775 kip / 88 wire = 8.8 kip/wire~~

750 / 88 = 8.52

TENDON NUMBER 23VB

DATE: DATA RECORDED BY:

From Page (1)

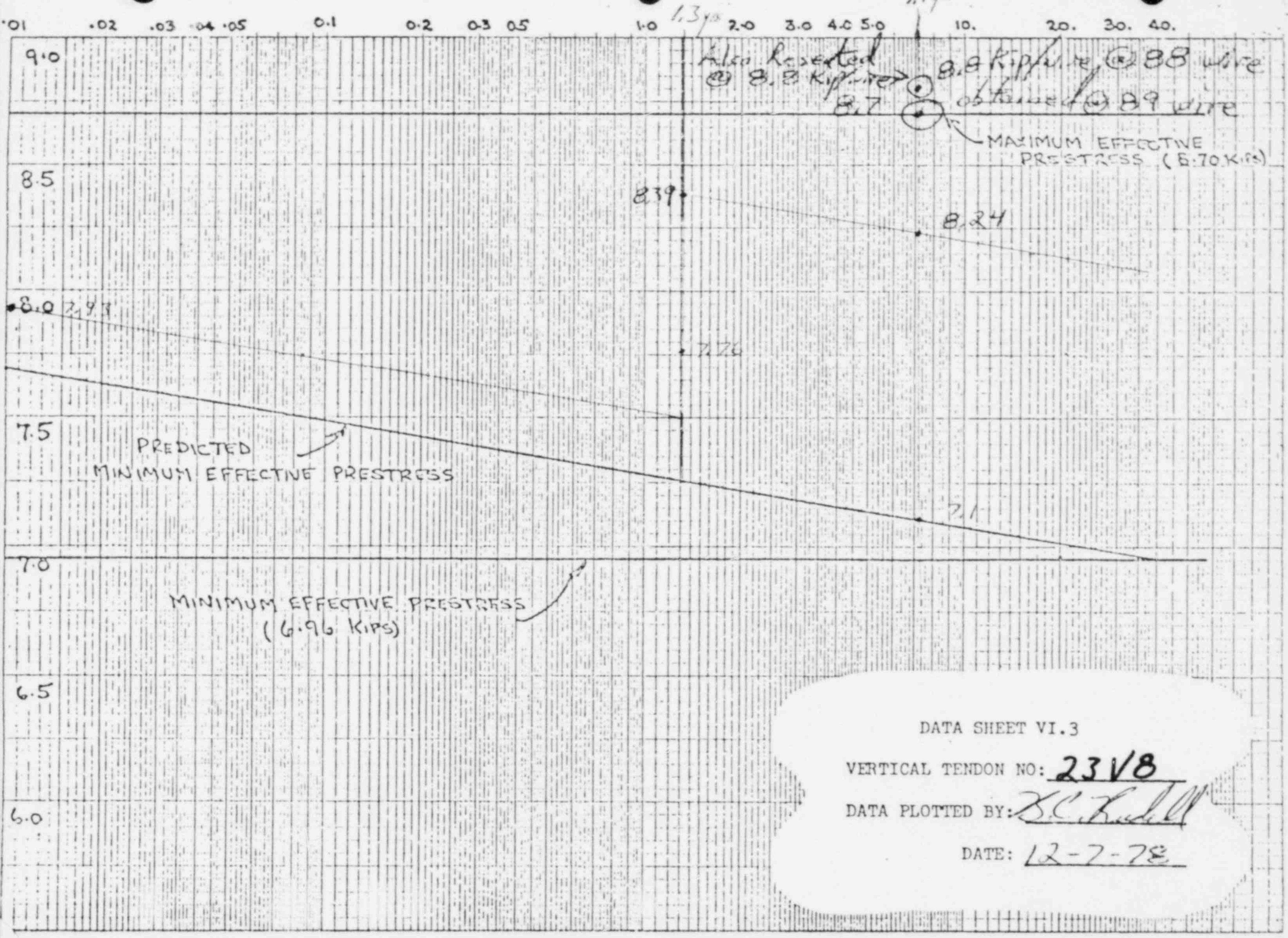
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS	4 15/16		15 13/16		10 7/8		10 7/8
RESTRESS	4 15/16		16 1/8		11 3/16		11 3/16

TIME IN YEARS



DATA SHEET VI.3

VERTICAL TENDON NO: 23V8

DATA PLOTTED BY: K.C. Kidd

DATE: 12-7-78

DATA SHEET IV.1

TENDON [illegible]/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. 23V8

Closest Buttress	Bottom
Grease Removal	3/4 barrel
Date Filler CAP Removed	12-6-78
Date Grease Removal Started	12-6-78
Exterior Temp.	55°
Interior Temp.	99°
Total Volume Removed	3/4 barrel
Date Filler Cap Reinstalled	12-7-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Two Tone Dark + Light Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

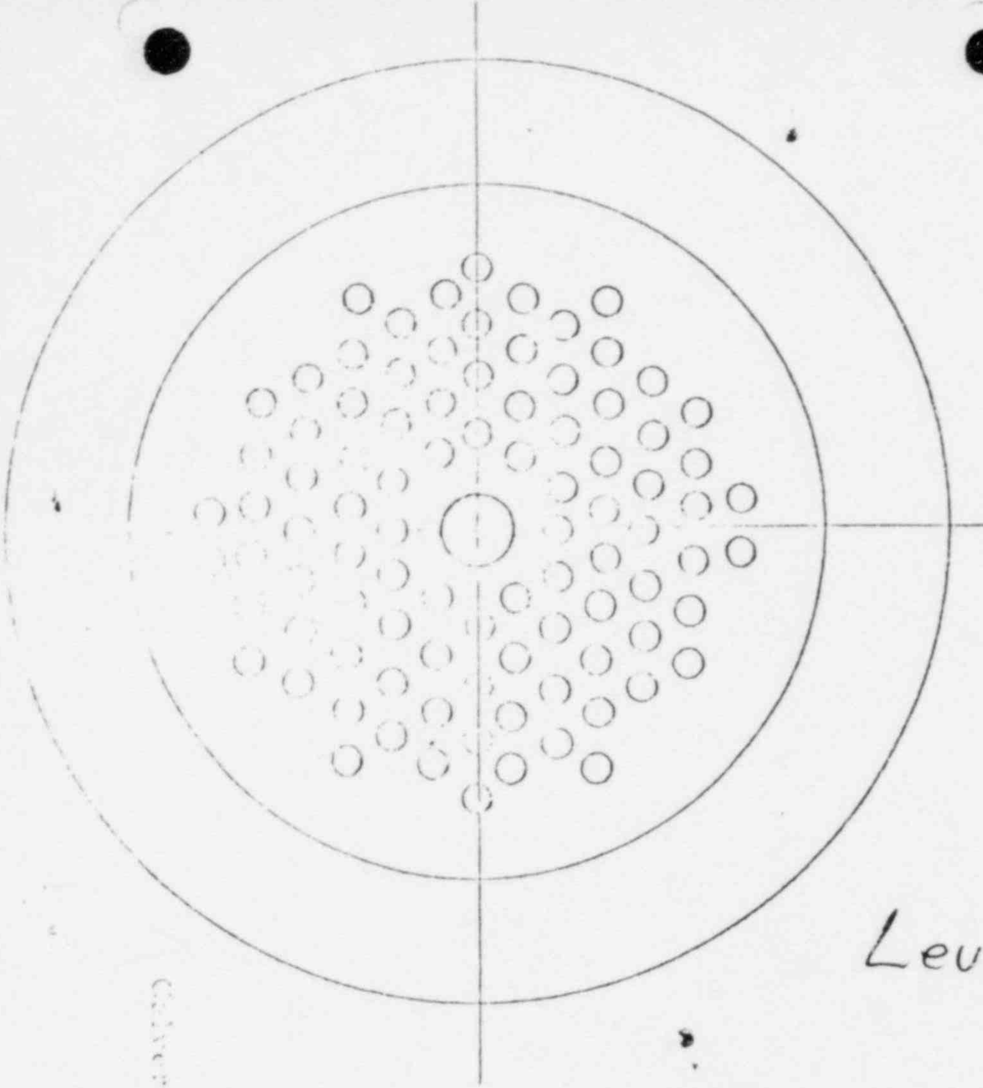
Sample Taken yes Container Identification 23V8 Bottom

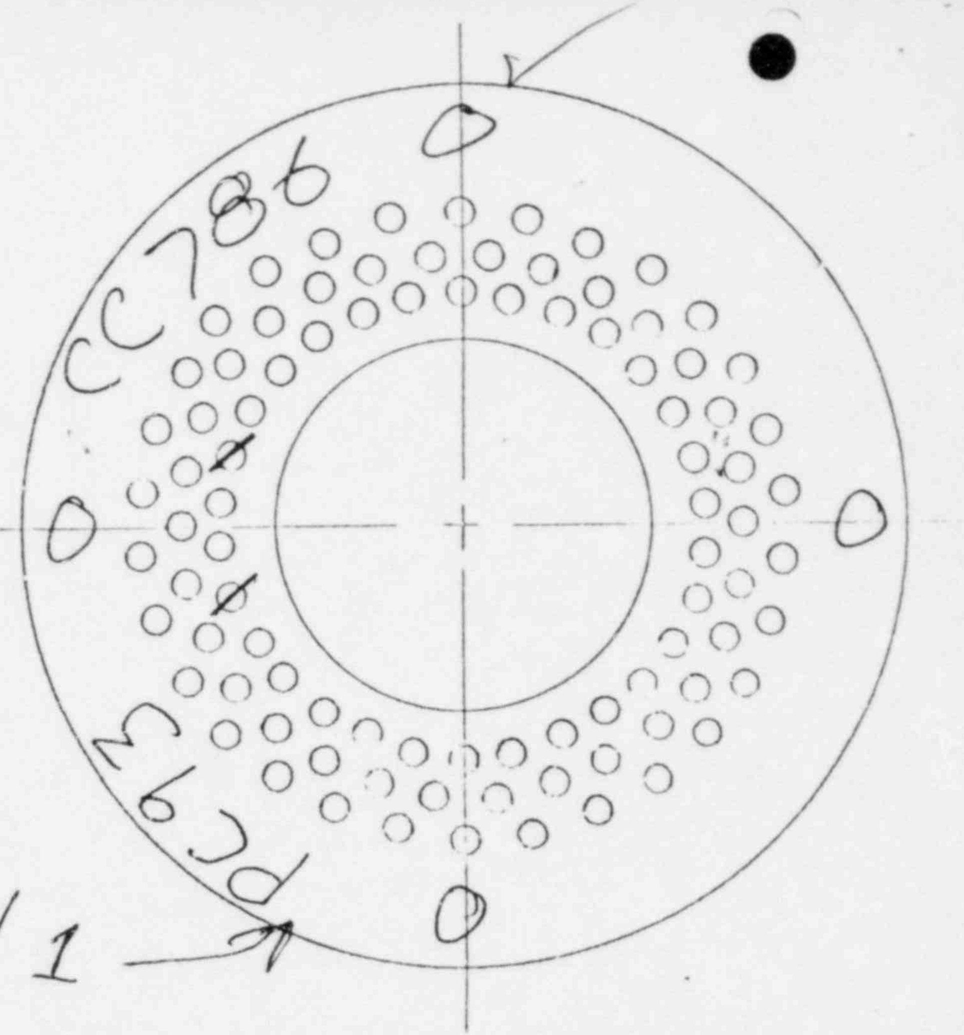
Data Recorded By: [illegible]

TENDON GREASE INSTALLATION

Date Installed	1-5-79
Exterior Temp.	32°
Interior Temp.	68°
Filler Temp. @ Inlet Cap } Indicate if pumped	Pumped
Filler Temp. @ Outlet Cap } or poured	
[illegible]	35 gal
[illegible]	85 psi

[illegible] 2-28-79





WIRE ANCHORAGE

Closest Buttress Bottom

(1) Off-Size Buttonhead None

(1) Buttonhead with Split None

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Bottom.

Tendon No. 23V8

By D.C. Kendall

Date 12-7-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	Kips	
Force Per Wire ($F_{LAV} \div N_e$)	Kips	
Time since initial stressing of Tendon	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date ____________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's ($9.43 \times N_e$)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off hydraulic pressure, P_L	psi	psi
Reduction in [illegible] pressure, [illegible] ([illegible] x 50)	psi	psi
[illegible]	psi	psi

DATA RECORDED BY ______________

DATE ______________

TENDON NUMBER

DESTRESSING

Section	Item	Value
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires N_e	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimum effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) (9.43 x N_e)	Kips
	Force at 1 kip per wire (1 x N_e)	Kips

	S/N [illegible]	S/N [illegible]
[illegible] Pressure at expected lift off	psi	psi
[illegible] ress	psi	psi
[illegible] predi[illegible] [illegible]ctive prestress	psi	psi
[illegible]ive prestress		

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ____________ DATA RECRODED BY: ____________________

RAM S/N: GAUGE S/N:

P	DESCRIPTION	OBJECTIVE					
.B.2	Check Gauges	Zero					
.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
.B.3	Lift Off	**					
.B.5	Pressurize to 0.8f's	**					
.B.5	Elongation @ 0.8f's	-					
.B.6	Depressurize to zero	-					
.B.7	Pressurize to 1 kip/wire	**					
.B.7	Elongation at 1 kip/wire						
I.	Remove Wire - This End Cut?	***					
II.3	Pressurize to 1 kip/wire	*					
II.4	Elongation at 1 kip/wire						
II.5	Pressurize to 0.8f's	**					
II.5	Elongation at 0.8f's						
II.6	Pressure for shim measure	**					
II.7	Elongation at shim press						
II.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
II.8	Lift Off pressure						
II.8	AVG Lift Off ≥ Initial AVG Lift Off?						
II.9	If NO above [illegible]	*					
	[illegible] Initial AVG. [illegible]						
	[illegible]						
			Run 1	Run 2	Run 3	Run 4	Run 5
	[illegible] pressure						

[illegible] from Data Sheet VI.1

[illegible]

TENDON NUMBER

DATE: DATA RECORDED BY:

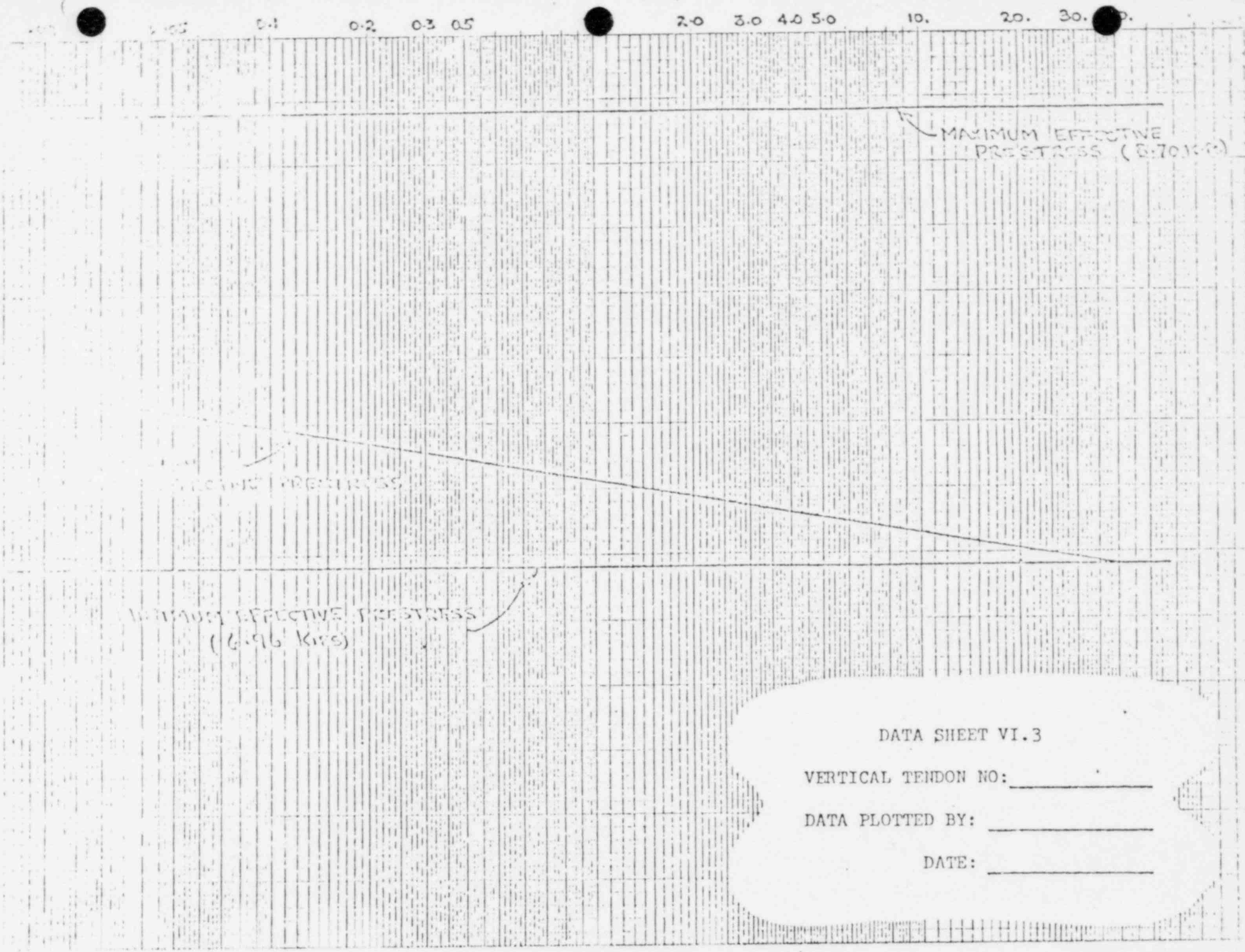
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

VERTICAL TENDON NO: ______________

DATA PLOTTED BY: ______________

DATE: ______________

DATA SHEET IV.1

UNIT 1

TENDON DISCHARGE/GREASE & INSPECTION RECORD

Tendon No. 56V12 (Grease surveillance stated two (2) wires missing)

Closest Buttress: Top

Grease Removal: 1 gal

Date Filler CAP Removed: 12-13-78

Date Grease Removal Started: 12-13-78

Exterior Temp.: 54°

Interior Temp.: 95°

Total Volume Removed: 1 gal

Date Filler Cap Reinstalled: 12-13-78

INSPECTION OF FILLER

Color of Replacement Filler: Dark Brown

Color of Grease on Tendon: Dark Brown

Presence of Water Indicated: None

% (Approximate) Coverage of Components: 50%

Sample Taken: No Container Identification: NA

Data Recorded By: B.C. Rudell

TENDON GREASE INSTALLATION

Date Installed: 12-13-78

Exterior Temp.: 54°

Interior Temp.: 95°

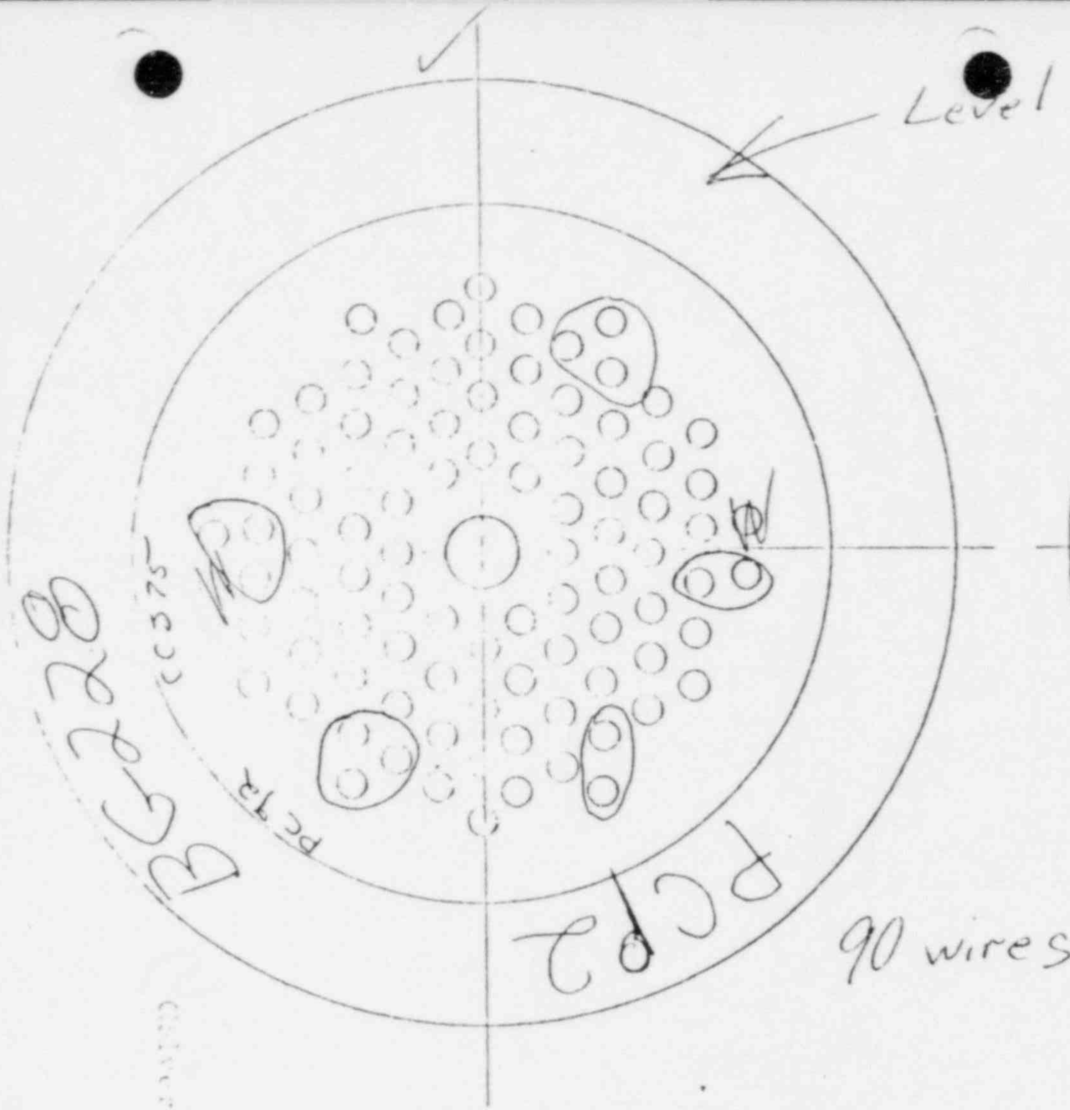
Filler Temp. @ Inlet Cap } Indicate if pumped or poured:

Filler Temp. @ Outlet Cap:

Total Volume Installed: 1 gal

Installation Pressure ([illegible]): NA

B.C. Rudell 12-13-78



WIRE ANCHORAGE

Closest Buttress Top

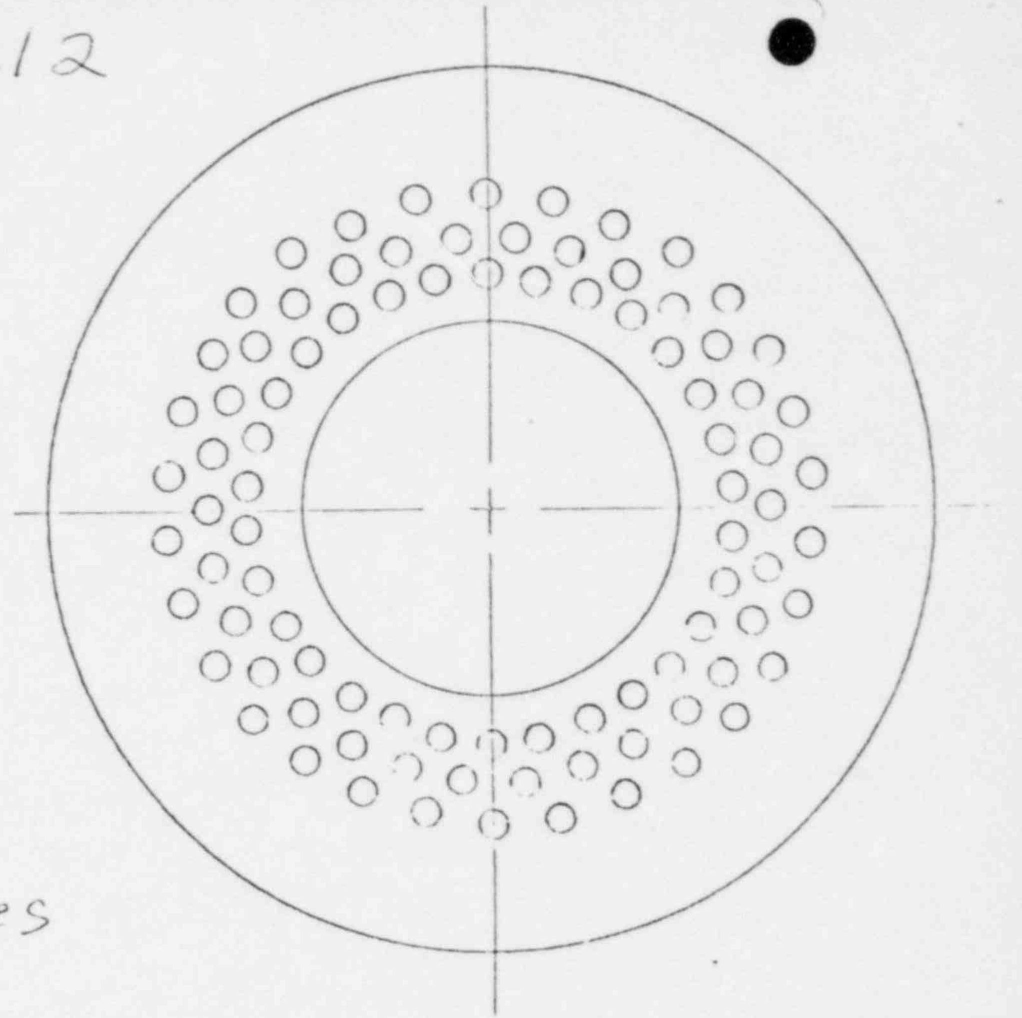
Off Size Buttonhead

Buttonhead with Split

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection



WIRE ANCHORAGE

Closest Buttress 56V12 Top

Tendon No. 56V12

By [signature]

Date 12-13-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1

Data Recorded By ____________________

Date ____________________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2))}{2}$	Kips	
Force Per Wire $(F_{LAV} \div N_e)$	Kips	
Time since initial stressing of Tendon	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ____________________

Date ________

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's $(9.43 \times N_e)$	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off hydraulic pressure, P_L	psi	psi
Reduction in pressure, P_{R}, $(N_R \times 50)$	psi	psi
[illegible]	psi	[illegible]

DATA RECORDED BY ____________________

DATE ____________________

TENDON NUMBER

DESTRESSING

INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi
	Four Day Losses: Verticals	-7.12 Ksi
	Horizontals	-5.48 Ksi
	Domes	-6.82 Ksi
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)	
	Area of wire, A_W	.04909 in^2
	Force per wire after 4 days, $F4$ ($\sigma 4 \times A_W$)	Kips
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips
	Time after initial stressing	Years
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips
	Number of effective wires N_e	Wires
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips
	Maximum Effective Prestress per wire, F_{max}	Kips
	Predicted minimum effective prestress (per wire F_{pmin})	Kips
	Absolute minimum effective prestress per wire (F_{min})	Kips
	Maximum effective prestress ($F_{max} \times N_e$)	Kips
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips
	80% min. ultimate strength (.8f's) (9.43 x [illegible])	Kips
	Force at 1 kip per wire (1 x N_e)	Kips

	S/N [illegible] (1)	S/N [illegible] (2)
[illegible] pressure at expected lift off	[illegible]	[illegible]
[illegible] ress	psi	[illegible]
[illegible] tive prestress	psi	psi
[illegible] ive prestress		

STRESSING - DESTRESSING

TENDON NUMBER ________

CLOSEST BUTTRESS ________

DATE: ________ DATA RECRODED BY: ________

RAM S/N: GAUGE S/N:

P	DESCRIPTION	OBJECTIVE					
.B.2	Check Gauges	Zero					
.B.1	Measure Shims	-					
			Run 1	Run 2	Run 3	Run 4	Run 5
.B.3	Lift Off	**					
.B.5	Pressurize to 0.8f's	**					
.B.5	Elongation @ 0.8f's	-					
.B.6	Depressurize to zero	-					
.B.7	Pressurize to 1 kip/wire	**					
.B.7	Elongation at 1 kip/wire						
I.	Remove Wire - This End Cut?	***					
II.3	Pressurize to 1 kip/wire	*					
II.4	Elongation at 1 kip/wire						
II.5	Pressurize to 0.8f's	**					
II.5	Elongation at 0.8f's						
II.6	Pressure for shim measure	**					
II.7	Elongation at shim press						
II.7	Shims installed						
			Run 1	Run 2	Run 3	Run 4	Run 5
III.[illegible]	Lift Off pressure						
III.3	AVG Lift Off ≥ Initial AVG Lift Off?						
III.[illegible]	If "NO" above [illegible]	[illegible]					
	[illegible]						
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] Data Sheet VI.1

[illegible]

TENDON NUMBER

DATE: DATA RECORDED BY:

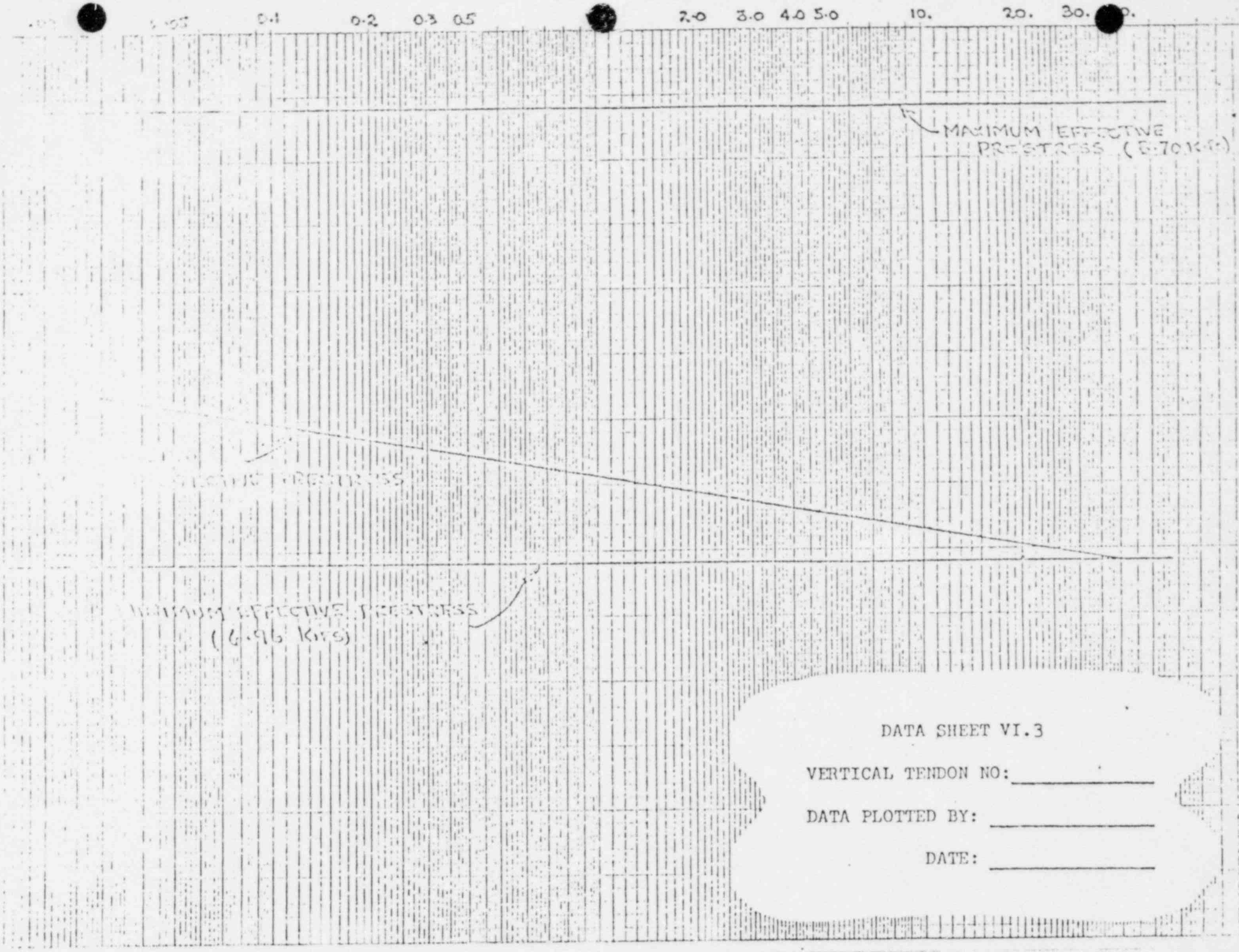
From Page (1)

1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							



DATA SHEET VI.3

VERTICAL TENDON NO: ______________

DATA PLOTTED BY: ______________

DATE: ______________

DATA SHEET IV.1

TENDON DEGREASE/GREASE & INSPECTION RECORD

UNIT 1

Tendon No. ~~23V8~~ 23V9 Wrong Cap

Closest Buttress Bottom

Grease Removal 1/2 Drum

Date Filler CAP Removed 12-4-78

Date Grease Removal Started 12-4-78

Exterior Temp. 68°

Interior Temp. 98°

Total Volume Removed 1/2 Barrel

Date Filler Cap Reinstalled 12-7-78

INSPECTION OF FILLER

Color of Replacement Filler Dark Brown

Color of Grease on Tendon Dark Brown

Presence of Water Indicated None

% (Approximate) Coverage of Components 100%

Sample Taken yes Container Identification 23V8 Bottom

Data Recorded By: B.C. Kudell

TENDON GREASE INSTALLATION

Date Installed 1-5-79

Exterior Temp. 32°

Interior Temp. 68°

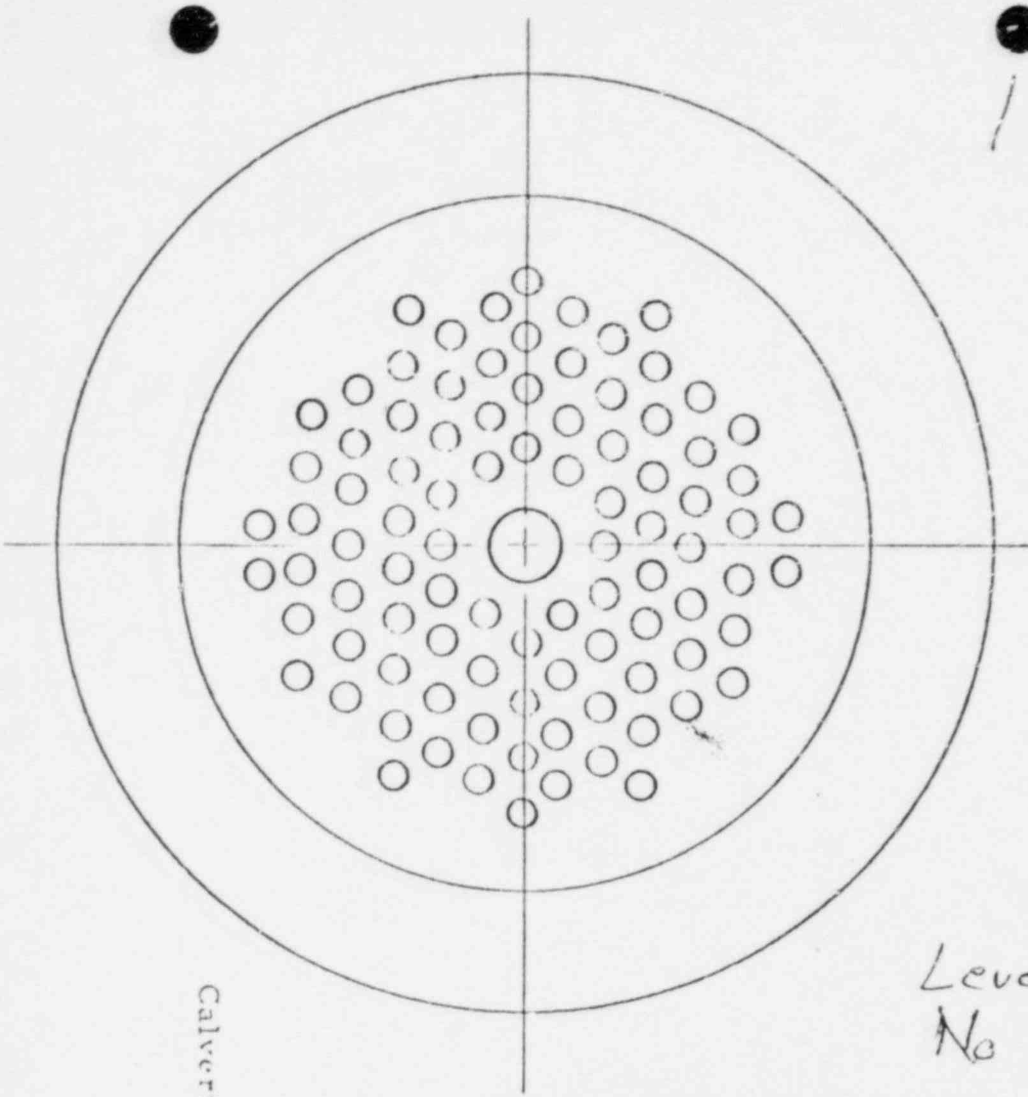
Filler Temp. @ Inlet Cap } Indicate if pumped or poured pumped

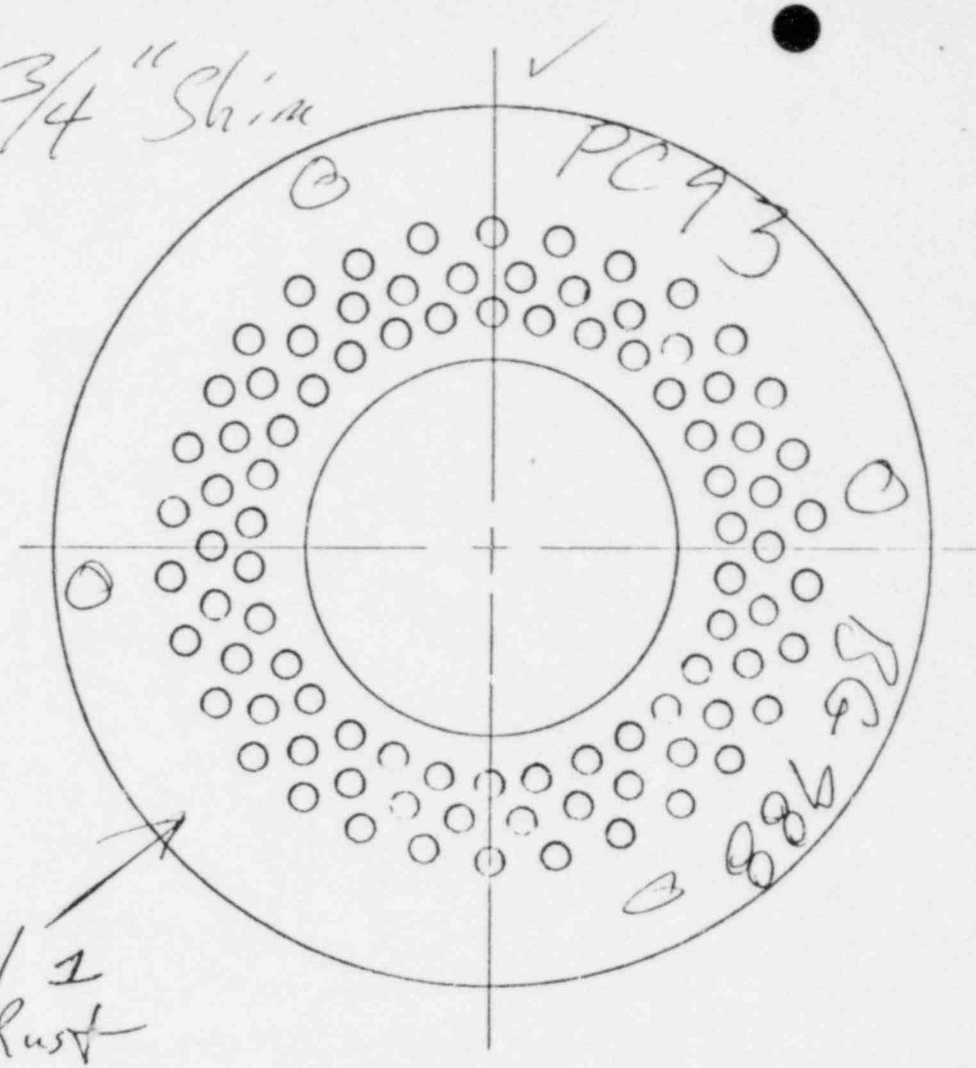
Filler Temp. @ Outlet Cap

Total Volume Installed 24 gal

Installation Pressure (if poured, N/A) 90 psi

Data Recorded By: B.C. Kudell Date 2-28-79





WIRE ANCHORAGE

Closest Buttress Bottom

Off-Size Buttonhead None

Buttonhead with Split None

Wire Removed Previously

Discontinuous Wire Removed this surveillance

Wire removed this surveillance for inspection

WIRE ANCHORAGE

Closest Buttress Bottom

Tendon No. 23V8

By BC Kimbell

Date 12-5-78

Tendon Surveillance
Calvert Cliffs Nuclear Power Plant
Unit 1
End Anchor Sketch Form
Figure

DATA SHEET VI.1

DATA RECORDED BY ______________________

DATE ______________________

	TENDON NUMBER DESTRESSING		
INITIAL PRESTRESS	Wire Stress at seating, σ	Ksi	
	Four Day Losses: Verticals	-7.12 Ksi	
	Horizontals	-5.48 Ksi	
	Domes	-6.82 Ksi	
	Wire Stress after four days ($\sigma_4 = \sigma - 4$ day loss)		
	Area of wire, A_W	.04909 in^2	
	Force per wire after 4 days, F_4 ($\sigma_4 \times A_W$)	Kips	
PREVIOUS PRESTRESS	Wire stress at restressing, σ_s	Ksi	
	Force per wire at restressing F_s ($\sigma_s \times A_W$)	Kips	
	Time after initial stressing	Years	
FORCE-TIME CURVE	Expected lift off force per wire, F_{LE}	Kips	
	Number of effective wires N_e	Wires	
	Expected lift off force, F_L ($F_{LE} \times N_e$)	Kips	
	Maximum Effective Prestress per wire, F_{max}	Kips	
	Predicted minimum effective prestress (per wire F_{pmin})	Kips	
	Absolute minimum effective prestress per wire (F_{min})	Kips	
	Maximum effective prestress ($F_{max} \times N_e$)	Kips	
	Predicted min. effective prestress ($F_{pmin} \times N_e$)	Kips	
	Absolute min. effective prestress ($F_{min} \times N_e$)	Kips	
	80% min. ultimate strength (.8f's) ($9.43 \times N_e$)	Kips	
	Force at 1 kip per wire ($1 \times N_e$)	Kips	
RAM CALIBRATION CURVE		S/N RAM (1)	S/N RAM (2)
	Hydraulic Pressure at expected Lift Off	psi	psi
	Hydraulic Pressure at maximum effective prestress	psi	psi
	Hydraulic Pressure at predicted minimum effective prestress	psi	psi
	Hydraulic pressure at absolute minimum effective prestress	psi	psi
	Hydraulic Pressure at 0.8f's	psi	psi
	Hydraulic Pressure at 1 Kip/wire	psi	psi

Data Recorded By ______________

Date ______________

TENDON NUMBER:

	RAM (1) S/N	RAM (2) S/N
Average Hydraulic pressure at Lift-Off		
Tendon Lift Offs Acceptable?		
Lift Off Force, F_L	Kips	Kips
Average Lift Off Force F_{LAV} $\frac{(F_L(1) + F_L(2)}{2}$	Kips	
Force Per Wire ($F_{LAV} \div N_e$)	Kips	
Time since initial stressing of Tendon	Years	

Enter Data into F.-T Curves and determine acceptance of Tendon

Condition as per Steps B.1 of Data Sheet VI.1. instructions

Tendon is satisfactory Verified ______________

Date ______

	RAM (1) S/N	RAM(2) S/N
Number of wires removed this surveillance N_R	Wires	
Number of effective wires N_e	Wires	
0.8f's (9.43 x N_e)	Kips	
Hydraulic Force @ 0.8f's	psi	psi
Original Lift-Off Hydraulic pressure, ,P_L	psi	psi
Reduction in shim pressure, P_{RH},(N_R x 50)	psi	psi
Shim Pressure (P_L+ 500 - P_{RH})	psi	psi

STRESSING - DESTRESSING

TENDON NUMBER ____________

CLOSEST BUTTRESS ____________

DATE: ________________ DATA RECRODED BY: ____________________________

RAM S/N: GAUGE S/N:

TEP	DESCRIPTION	OBJECTIVE					
VI.B.2	Check Gauges	Zero					
VI.B.1	Measure Shims	-					
VI.B.3	Lift Off	**	Run 1	Run 2	Run 3	Run 4	Run 5
VI.B.5	Pressurize to 0.8f's	**					
VI.B.5	Elongation @ 0.8f's	-					
VI.B.6	Depressurize to zero	-					
VI.B.7	Pressurize to 1 kip/wire	**					
VI.B.7	Elongation at 1 kip/wire						
VI	Remove Wire - This End Cut?	***					
VIII.3	Pressurize to 1 kip/wire	**					
VIII.4	Elongation at 1 kip/wire						
VIII.5	Pressurize to 0.8f's	**					
VIII.5	Elongation at 0.8f's						
VIII.6	Pressure for shim measure	**					
VIII.7	Elongation at shim press						
VIII.7	Shims installed						
VIII.8	Lift Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5
VIII.8	AVG Lift Off ≥ Initial AVG Lift Off?						
VIII.9	If "NO" above Pressurize to 1000 psig above Initial avg. liff-off	**					
	Shims installed						
	New Lift-Off pressure		Run 1	Run 2	Run 3	Run 4	Run 5

** Obtain from Data Sheet VI.1

*** If required by Data Sheet II.1

TENDON NUMBER

DATE: DATA RECORDED BY:

From Page (1)

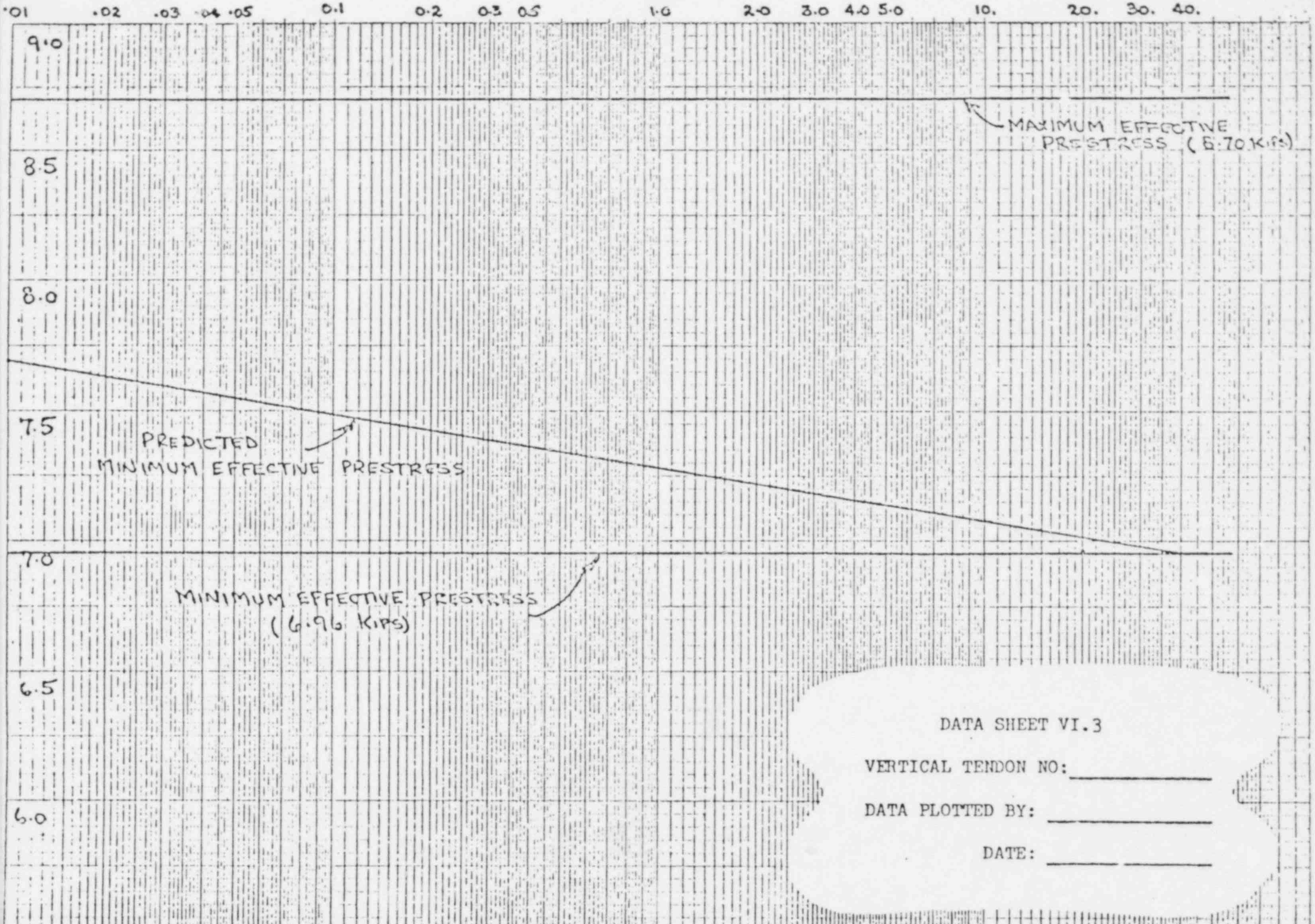
1. Find Elongation:

Elongation is the extension between an applied force of 1 kip/wire to 0.8f's. Distance is measured between the bearing plate and bearing force of the stressing washer. Total Elongation is the sum of the net elongations at each end.

Elongation = Elongation @ 0.8f's - Elongation @ 1 kip/wire Total = Elongation (End 1) + Elongation (End 2). Compare with initial Elongations indicated in Appendix D of the Prestressing Report. If any significant deviation from the initial value is indicated, in addition to a decrease in lift-off forces some reliable information may be gained as to tendon condition. There are no acceptance criteria for Elongation, but data will be a part of the evaluation by the Surveillance Test Engineer.

	END (1) 1 kip	END (2) 1 kip	END (1) 0.8f's	END (2) 0.8f's	END 1 Net	END 2 Net	TOTAL
DESTRESS							
RESTRESS							

TIME IN YEARS



DATA SHEET VI.3

VERTICAL TENDON NO: ____________

DATA PLOTTED BY: ____________

DATE: ______ ______

DATA SHEET VII.1

TENDON WIRE INSPECTION SHEET

UNIT 1

TENDON NUMBER: 3D14 CLOSEST BUTTRESS: 6

INSPECTION PERFORMED BY: B.C. Rudell DATE: 9-9-78

LENGTH: BUTTON HEAD TO SCRIBE ______________

Buttonhead cut @ closest buttress 2, Pulled from closest buttress 6.

Cut End

0 end 1 section A — end A sample 1 — 25'
c 15'0" — c 25'0"

25' end 2 section B — 50'

50' end B sample 2 — end 3 section C — 75'
c 55'0" — c 65'-0" — b 73'11"

75' — 100'
b 93'6" — b 98'

100' end C sample 3 — end 4 section D — 125'
c 100'-0" — b 102'4" — b 104'6" — c 110'-0" — b 124'0" — b 124'5" — b 124'7"

125' — 150'
d 126' - end of wire

150' — 175'

Scale 1/4' = 1'-0"

Corrosion Level 1

Indicate above:
- a. All Corrosion Levels
- b. Any scratches resulting from removal
- c. Sample locations
- d. Button head
- e. Any pertinent information indicating wire condition

CORROSION LEVELS

1. No visible oxidation
2. Visible oxidation, no pitting
3. $0 < \text{pitting} \leq 0.003"$
4. $0.003" < \text{pitting} \leq 0.006"$
5. $0.006" < \text{pitting} \leq 0.010"$

☆ Damage resulting from removal

TENDON WIRE INSPECTION SHEET

UNIT 1 65 15 80 90 110 170

TENDON NUMBER: 23V8 Wire #1 CLOSEST BUTTRESS:

INSPECTION PERFORMED BY: DATE: 12-9-78

LENGTH: BUTTON HEAD TO SCRIBE 174'5"

Cut End

Button Head (BOTTOM)

0 15' 25'

1A 1B 5' 2A 2B 3A

25' 50'

50' 75'

75' 80' 90' 100'

3B 4A 4A1 4A2

100' 125'

125' 150'

150' 160' 170' Removed 6" from end for inspection END 175'

4B 5A 5B 6A 6B TOP

Scale 1/4" = 1'-0"

Corrosion Level 1

CORROSION LEVELS

Indicate above:

a. All Corrosion levels
b. Any scratches resulting from removal
c. Sample locations
d. Button head
e. Any pertinent information indicating wire condition

1. No visible oxidation
2. Visible oxidation, no pitting
3. 0 < pitting ≤ 0.003"
4. 0.003" < pitting ≤ 0.006"
5. 0.006" < pitting ≤ 0.010"

☆ Damage resulting from removal

TENDON WIRE INSPECTION SHEET

UNIT 1

TENDON NUMBER: 23V8 Wire #2 CLOSEST BUTTRESS:

INSPECTION PERFORMED BY: DATE: 12-9-78

LENGTH: BUTTON HEAD TO SCRIBE 174' 5"

Button Head Bottom

Cut End 0 — 5' — 15' — 25'

1A 1B 2A 2B 3A

25' — 50'

50' — 75'

75' — 80' — 90' — 100'

3B 4A 4B 5A

100' — 125'

125' — 150'

150' — 160' — 170' — 175'

5B 6A 6B 7A

Removed 8" section for inspection 174' 5" End

7B

Scale 1/4' = 1'-0"

Corrosion Level 1

Indicate above:
a. All Corrosion levels
b. Any scratches resulting from removal
c. Sample locations
d. Button head
e. Any pertinent information indicating wire condition

CORROSION LEVELS
1. No visible oxidation
2. Visible oxidation, no pitting
3. 0 < pitting ≤ 0.002"
4. 0.002" < pitting ≤ 0.006"
5. 0.006" < pitting ≤ 0.010"

☆ Damage resulting from removal

TENDON WIRE INSPECTION SHEET

UNIT 1

TENDON NUMBER: 45V8

Top end cut

CLOSEST BUTTRESS: NA

INSPECTION PERFORMED BY: Carl McKenzie

DATE: 1-9-79

LENGTH: BUTTON HEAD TO SCRIBE 175' 3"

Cut End

0 — 5 FT — 10 FT — 5 FT — 25'

SAMPLE A

25' — 50'

50' — 75'

75' — 82' — 10 FT — 100'

SAMPLE B

100' — 125'

125' — 150'

150' — 10 FT — 175'

SAMPLE C

Scale 1/4' = 1'-0"

Corrosion Level 1

CORROSION LEVELS

1. No visible oxidation
2. Visible oxidation, no pitting
3. 0 ∠ pitting ≤ 0.003"
4. 0.003" ∠ pitting ≤ 0.006"
5. 0.006" ∠ pitting ≤ 0.010"

Indicate above:

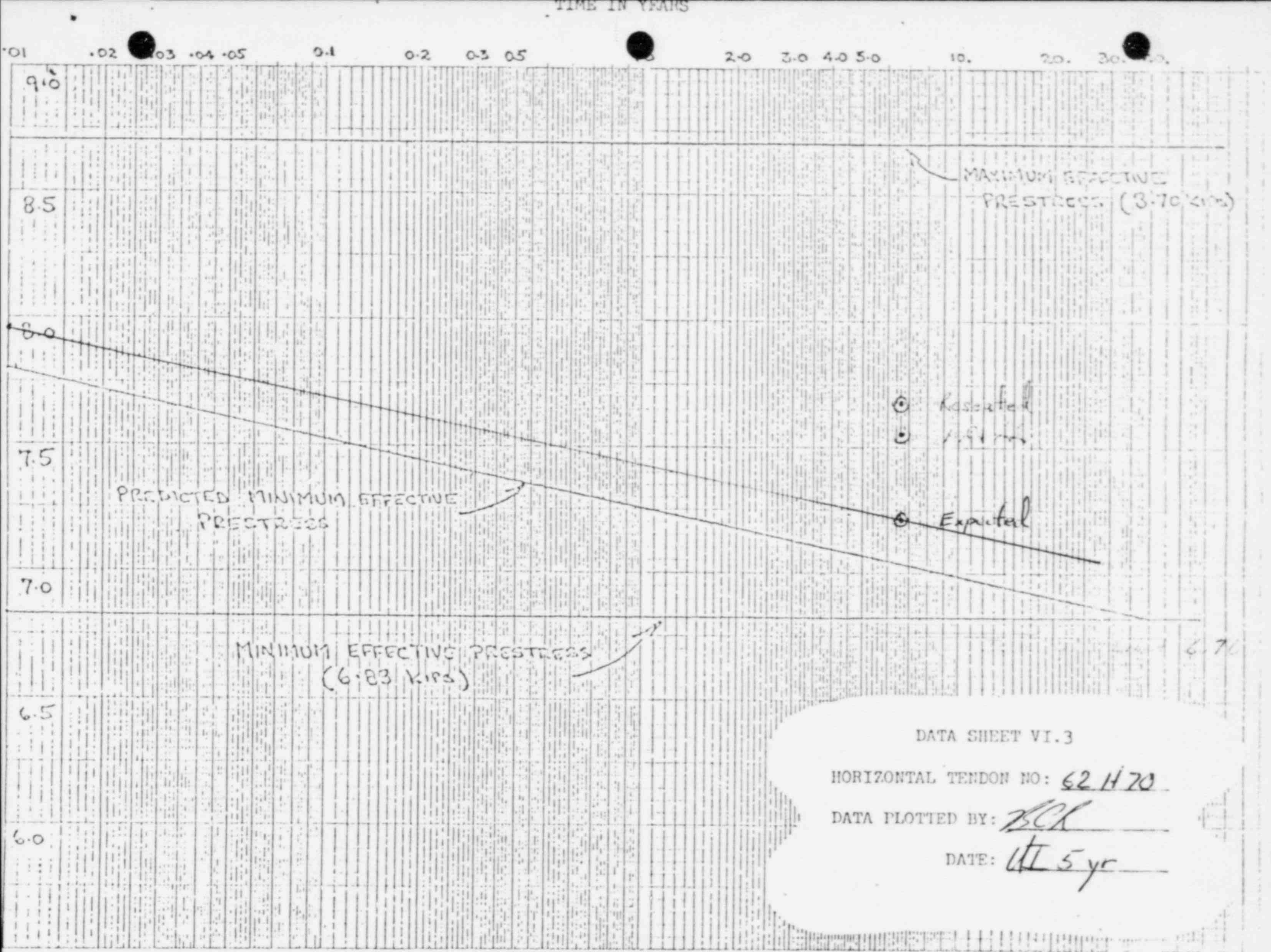
a. All Corrosion levels
b. Any scratches resulting from removal
c. Sample locations
d. Button head
e. Any pertinent information indicating wire condition

☆ Damage resulting from removal

	DESTRESS				RESTRESS				FILLER		WIRE (REMOVED)		
Tendon Ident.	Previous Lift-Off	Meas'd. Lift-Off	Previous Elong.	Meas'd Elong.	Effect. Wires	Final Lift-Off	Meas'd Elong.	Shims Installed	End Anchorage Inspect.	Filler Chem.	Tensile Tests	Wire Cond. or Change	Date Retension
62H70	7.96	7.56	10.19	9.25	89	7.68	9.25	3" + 3"	9-0	SAT	NA	NA	8-17-78
24H55	7.99	7.27	10.06	9.56	90	7.86	9.88	2½ + 2 15/16	1-0	SAT	NA	NA	8-18-78
31H50	7.95	7.50	10.25	9.50	90	7.66	9.56	3 + 2⅞	SAT	SAT	NA	NA	8-19-78
51H45	7.87	6.79	10.25	9.31	90	7.67	9.44	2 15/16 + 3	SAT	SAT	NA	NA	8-21-78
35H65	7.92	7.23	10.25	8.94	90	7.28	8.94	3 + 2¾	1-0	SAT	NA	NA	8-22-78
31H2	7.81	8.09	10.25	8.25	90	8.40	8.19	2⅞ + 1¾	SAT	SAT	NA	NA	11-16-78
31H1	7.85	7.52	10.12	9.38	90	7.78	9.38	2½ + 2¾	SAT	SAT	NA	NA	11-17-78
53H4	7.96	8.39	10.06	9.19	90	8.18	9.50	2¼ + 2¼	SAT	SAT	NA	NA	11-9-78
26H4	8.03	7.39	10.19	9.31	90	7.54	9.50	2¼ + 2½	SAT	SAT	NA	NA	11-3-78
64H40	7.92	6.78	10.19	9.12	90	7.56	9.75	2½ + 2¾	SAT	SAT	NA	NA	10-29-78
24H37	8.01	6.95	9.62	9.44	90/89	7.33	9.50	2⅝ + 2⅞	1-0	SAT	SAT	SAT	1-19-71
3D43	8.04	7.38	10.12	9.50	90	7.73	9.75	6¼ + 7¼	1-0	SAT	NA	NA	8-28-78
1D40	7.95	7.28	10.25	NO DATA	90	7.54	NO DATA	6¾ + 6¼	SAT	SAT	NA	NA	8-30-78
1D24	8.64	7.43	9.50	9.00	90 (82)	8.09	8.75	6¼ + 6"	8-0	SAT	NA	NA	9-1-78
2D21	7.93	7.40	9.62	9.81	90	7.90	9.88	6⅓ + 6¼	SAT	SAT	NA	NA	9-8-78
3D14	7.91	7.73	9.50	7.94	90/89	8.11	8.56	5½ + 5⅞	1-0	SAT	SAT	SAT	9-9-78
2D45	7.95	7.19	9.69	8.69	90	7.79	9.62	5½ + 6½	SAT	SAT	NA	NA	9-6-78
12V31	8.11	7.88	11.75	11.25	90	8.45	11.25	16⅝	10-0	SAT	NA	NA	12-5-78
23V8	8.39	8.46	10.88	10.88	90/88	8.52	11.19	14 13/16	8-0/2-0	NOT TAKEN	SAT/SAT	SAT/SAT	12-6-78
61V1	8.28	8.61	11.25	11.5	90	8.53	11.38	15⅛	12-0/2-0	SAT	NA	NA	12-7-78
65V28	8.28	7.13	11.50	11.19	90	7.78	11.25	15⅜	13-0	SAT	NA	NA	12-8-78
54V14	8.21	7.32	9.81	10.75	89	7.98	11.00	12½	5-0/1-0	SAT	NA	NA	12-11-78
43V8	8.42	8.22	12.00	11.12	90/89	8.20	11.75	17⅛	8-0/1-0	SAT	SAT	SAT	12-13-78
56V12	END	CAP	INSPECTION	ONLY	(TOP)				11-0	NOT TAKEN	NA	NA	NA
23V9	END	CAP	INSPECTION	ONLY	(BOTTOM)				SAT	SAT	NA	NA	NA

For inspections above indicate Satis./Not Satis.

Data Recorded by [signature]

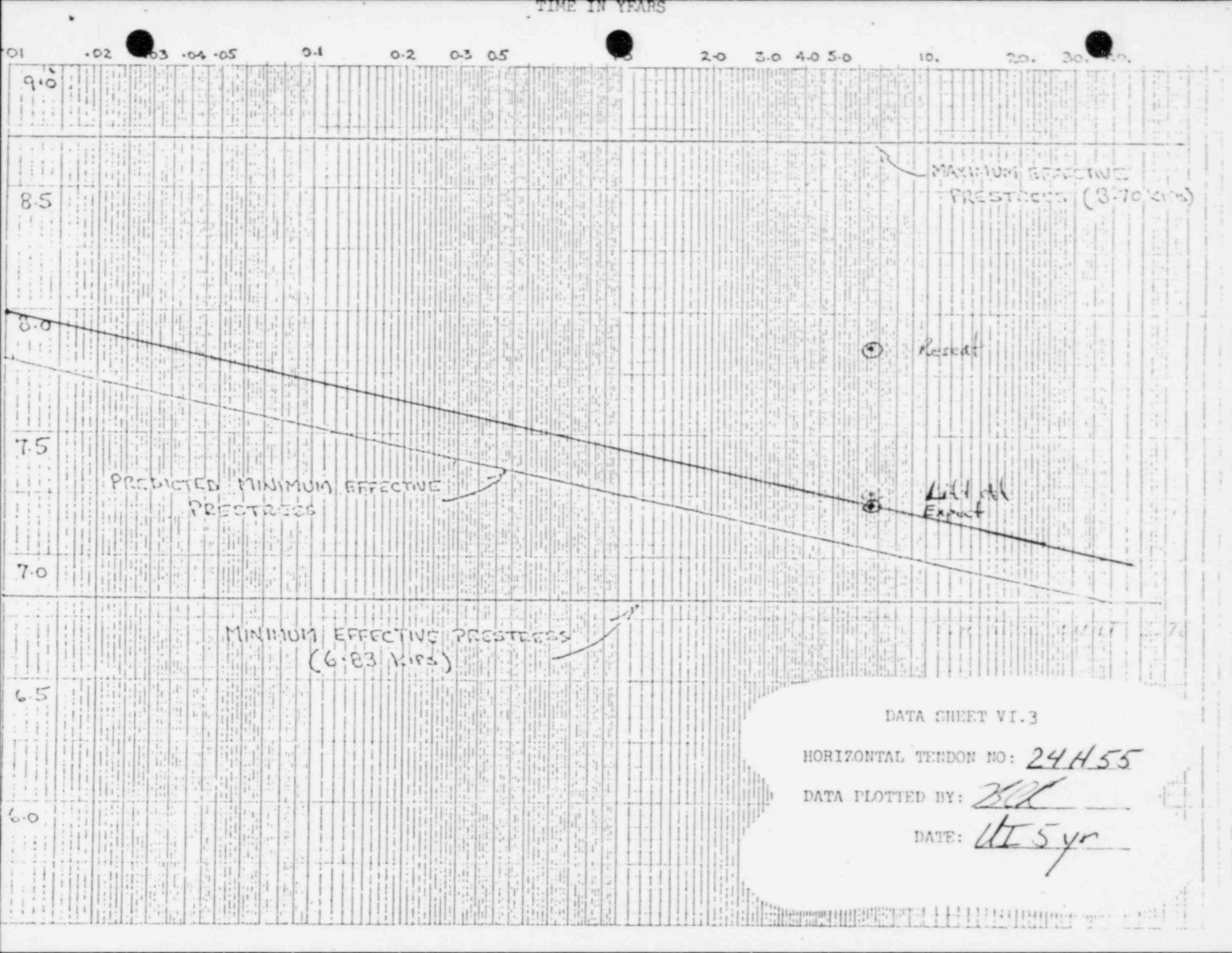


DATA SHEET VI.3

HORIZONTAL TENDON NO: 62 H 70

DATA PLOTTED BY: BCK

DATE: III 5 yr

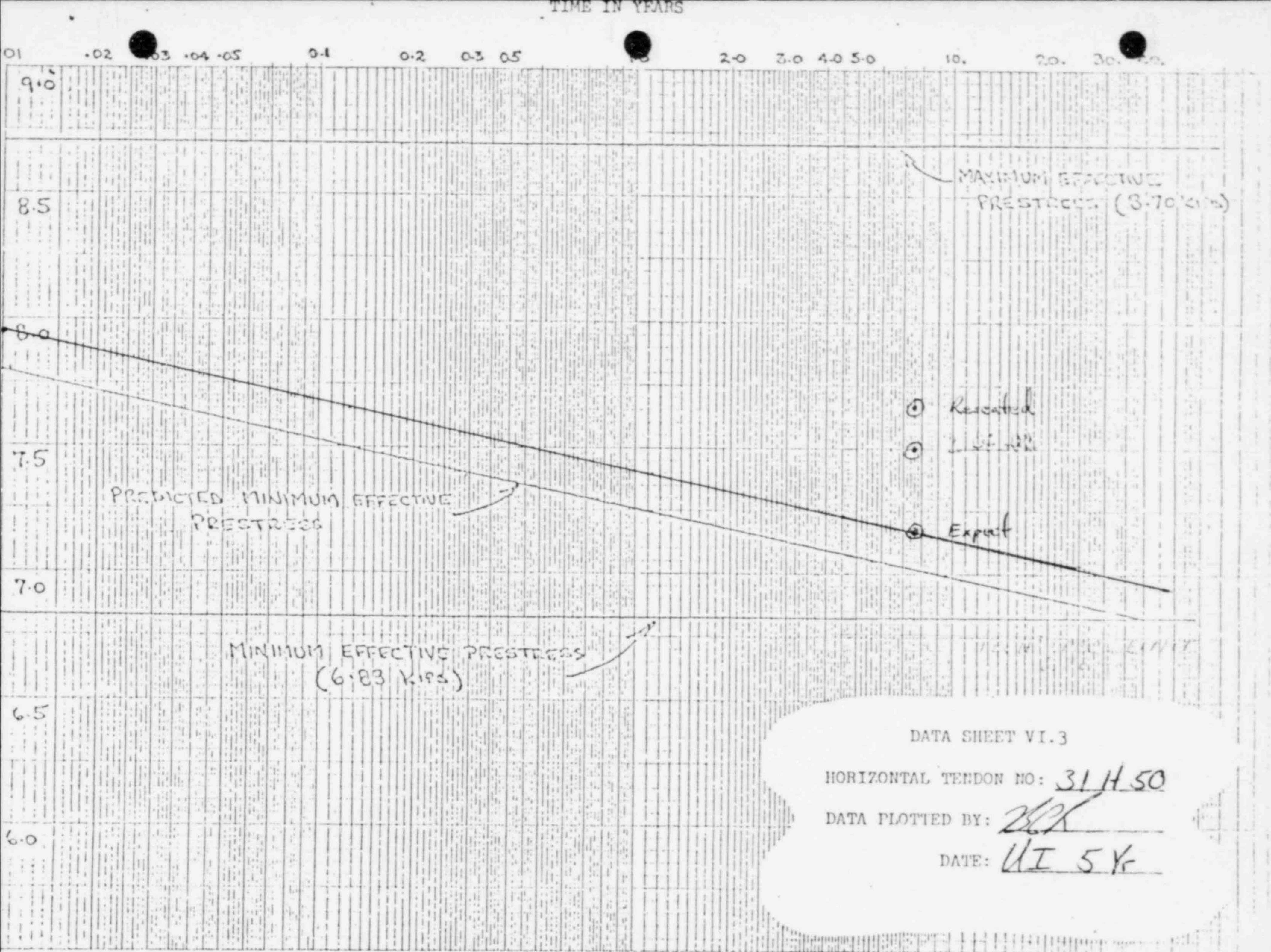


DATA SHEET VI.3

HORIZONTAL TENDON NO: 24H55

DATA PLOTTED BY: KC

DATE: UI 5 yr

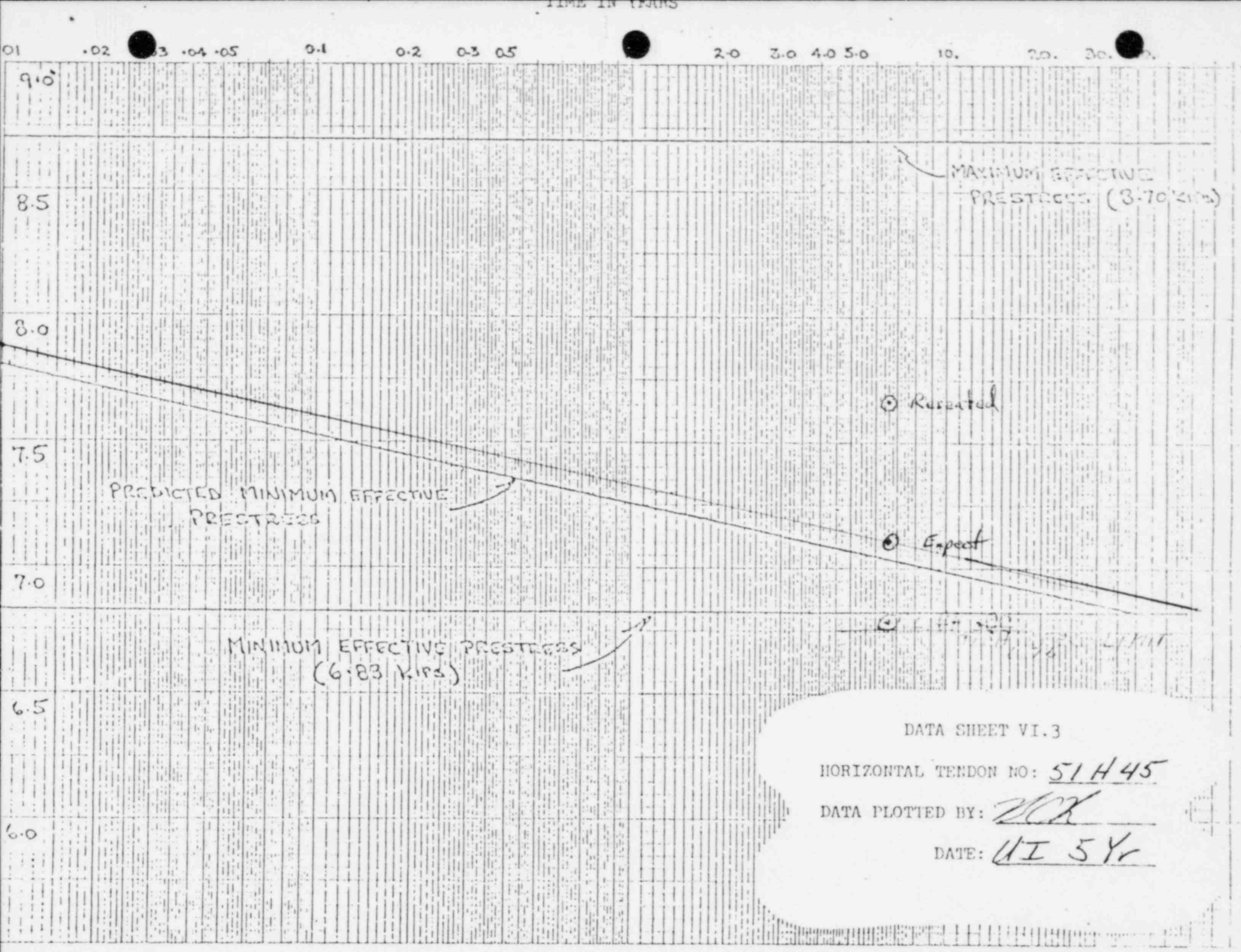


DATA SHEET VI.3

HORIZONTAL TENDON NO: 31 H 50

DATA PLOTTED BY: [illegible]

DATE: UI 5 Yr



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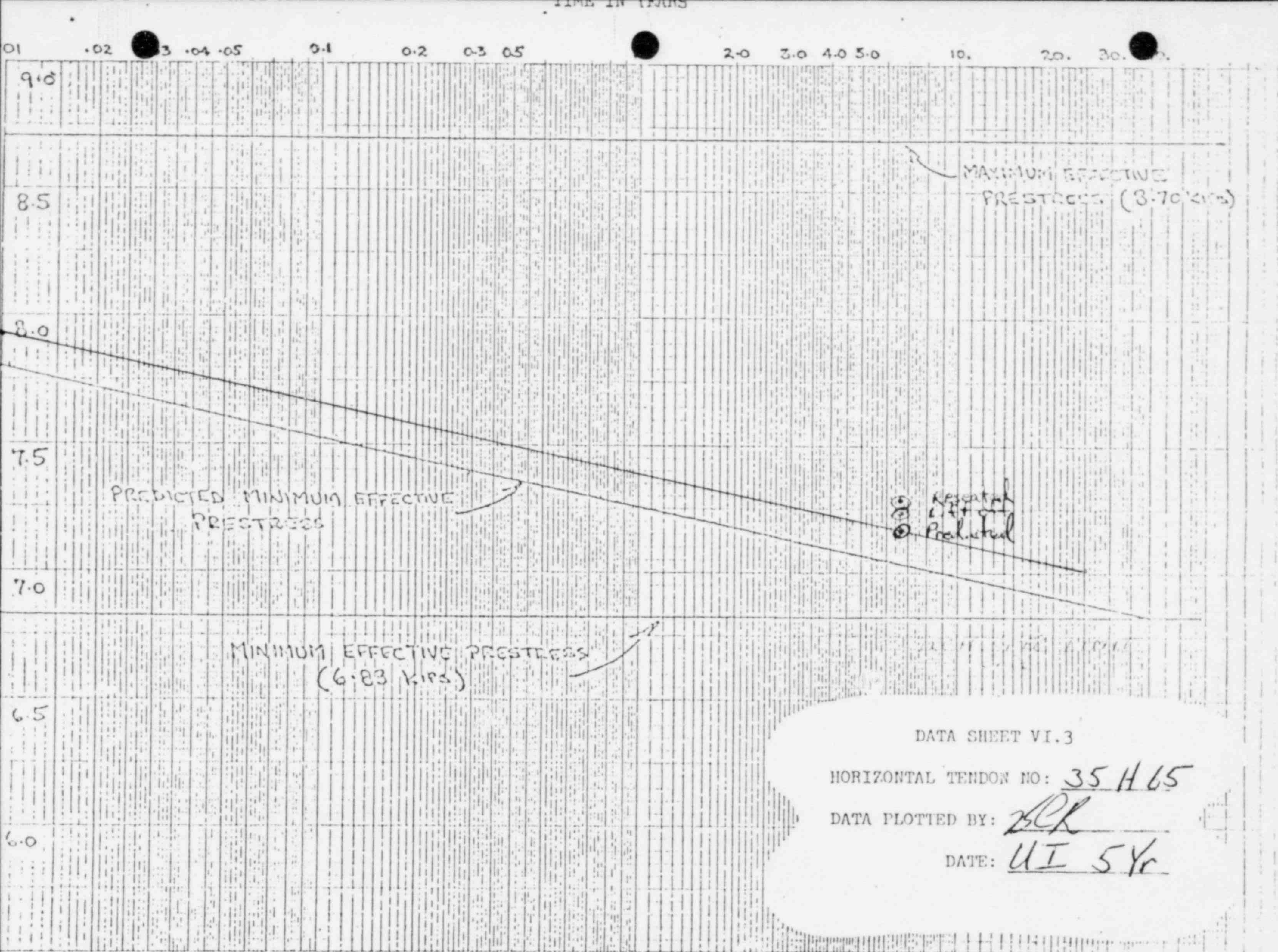
DATA PLOTTED BY: [illegible]

DATE: UI 5Yr

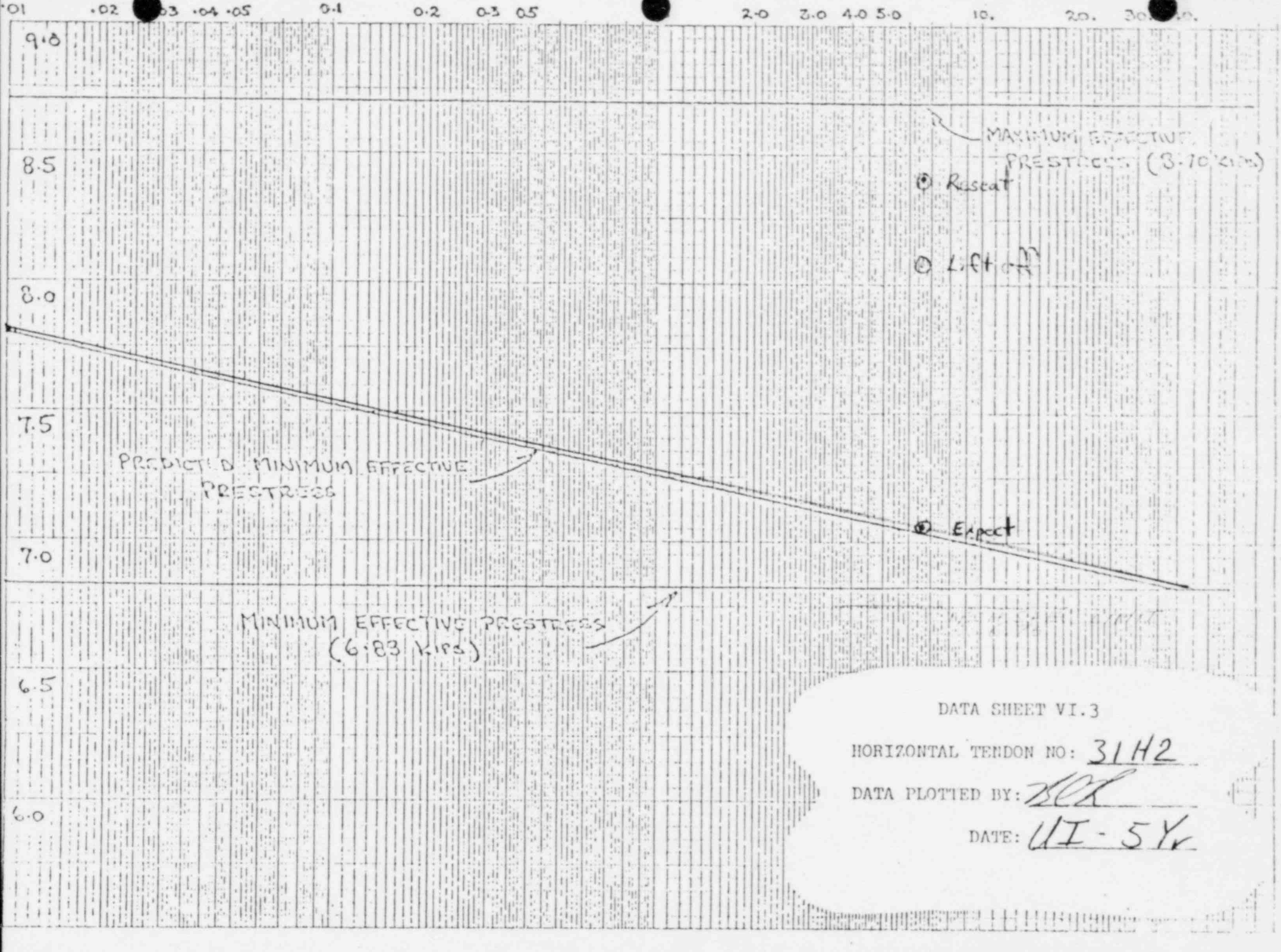


DATA SHEET VI.3

HORIZONTAL TENDON NO: 35 H 65

DATA PLOTTED BY: BCK

DATE: UI 5Yr

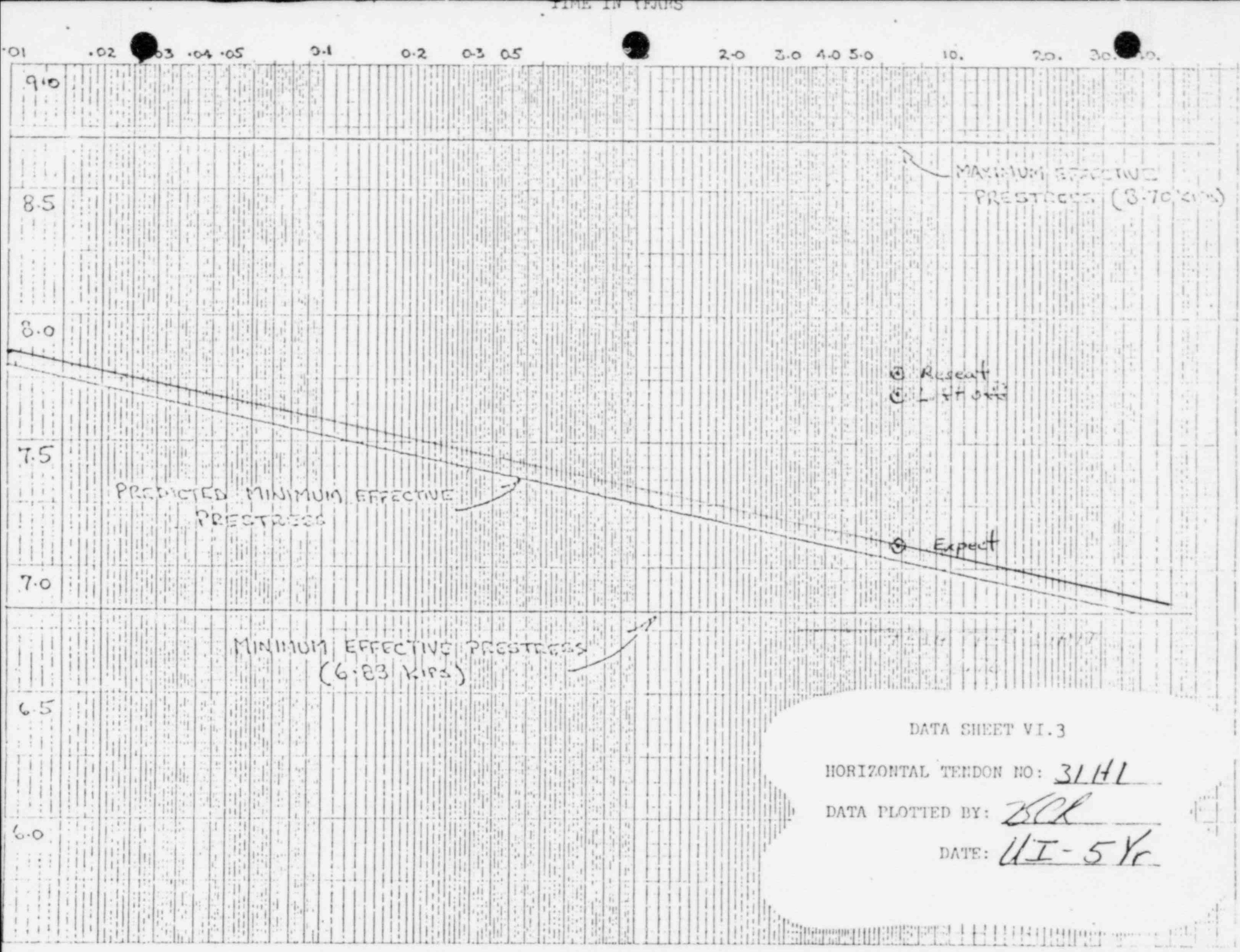


DATA SHEET VI.3

HORIZONTAL TENDON NO: 31H2

DATA PLOTTED BY: [illegible]

DATE: UI - 5 Yr

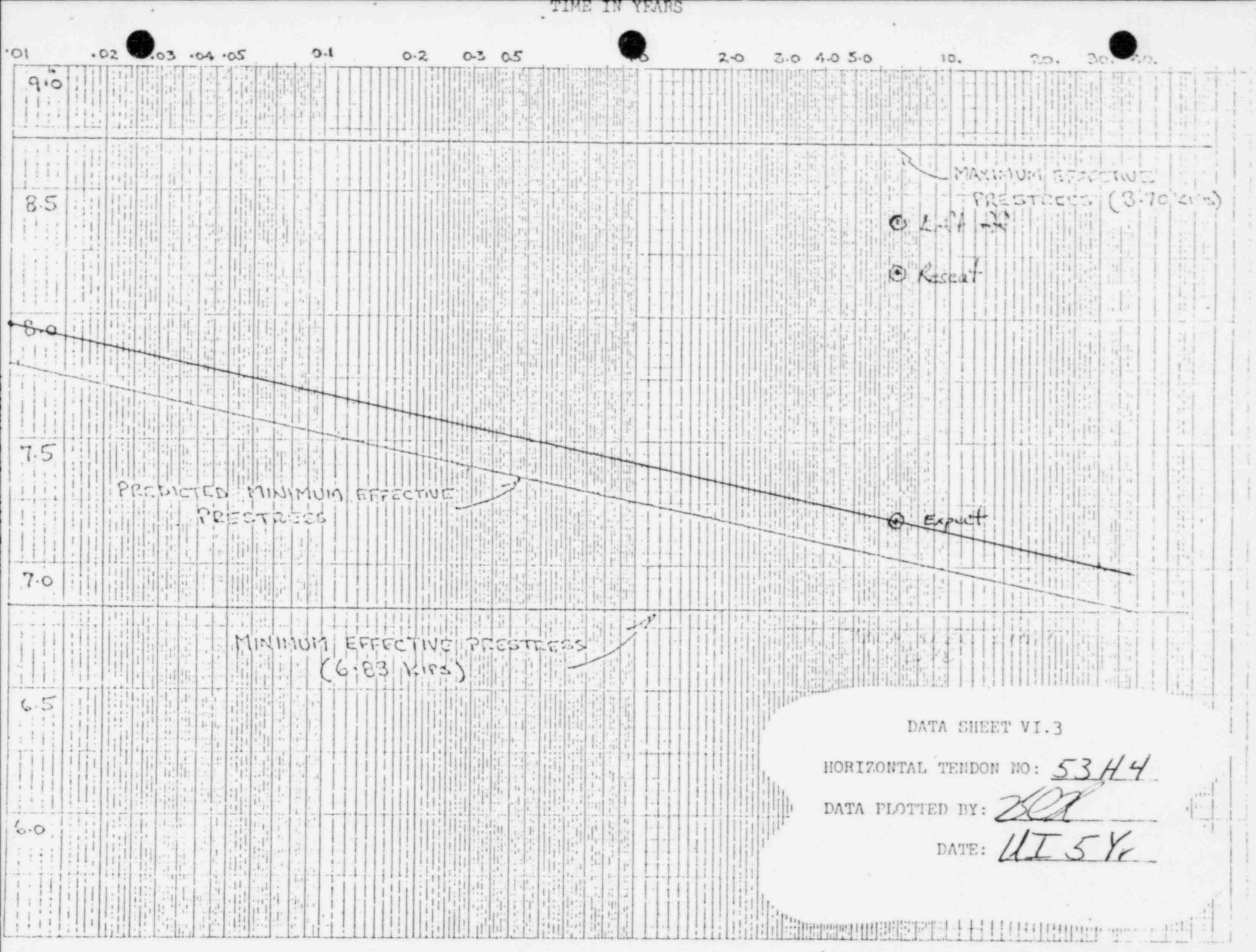


DATA SHEET VI.3

HORIZONTAL TENDON NO: 31H1

DATA PLOTTED BY: BCR

DATE: UI-5 Yr

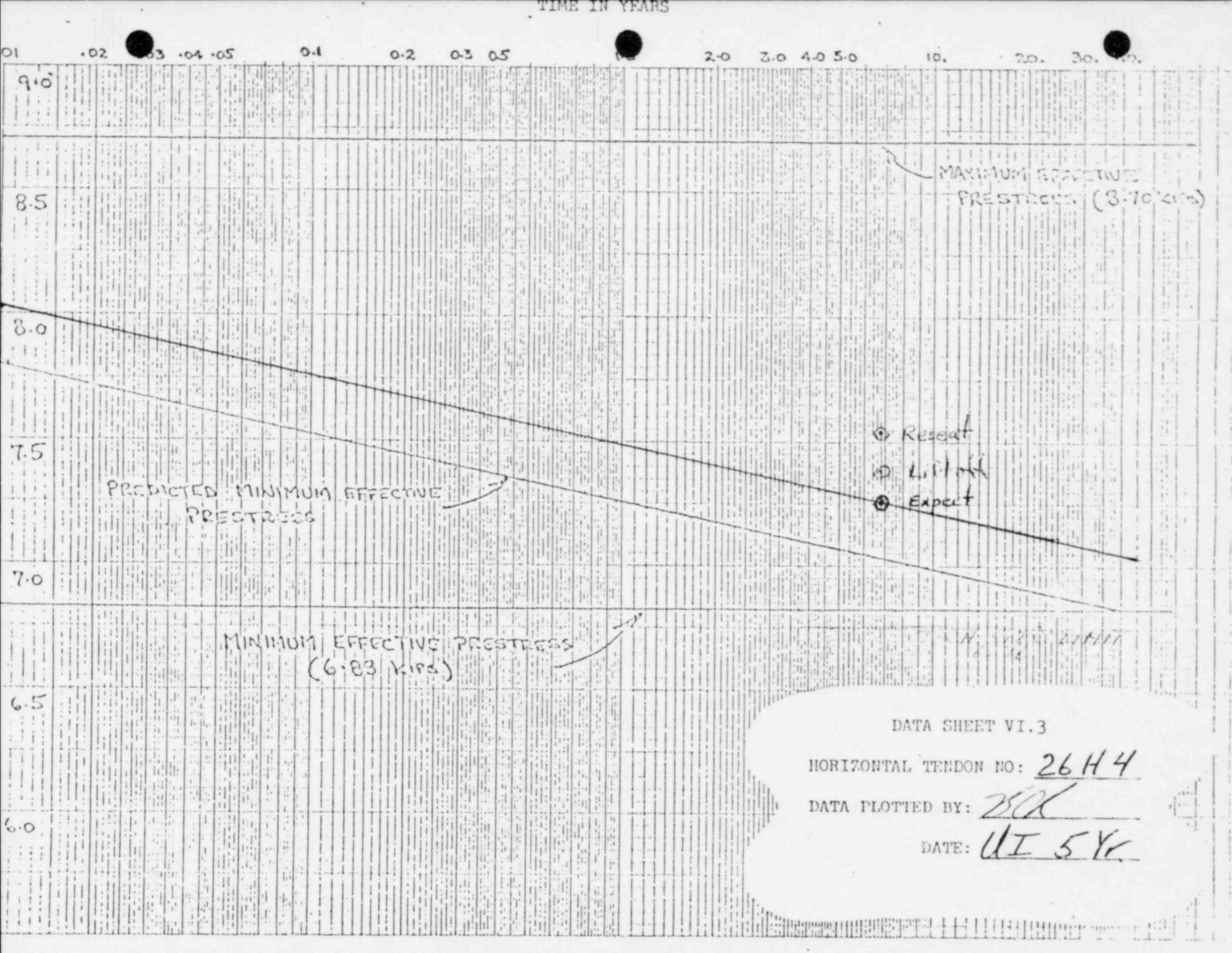


DATA SHEET VI.3

HORIZONTAL TENDON NO: 53H4

DATA PLOTTED BY: [illegible]

DATE: UI 5 Yr

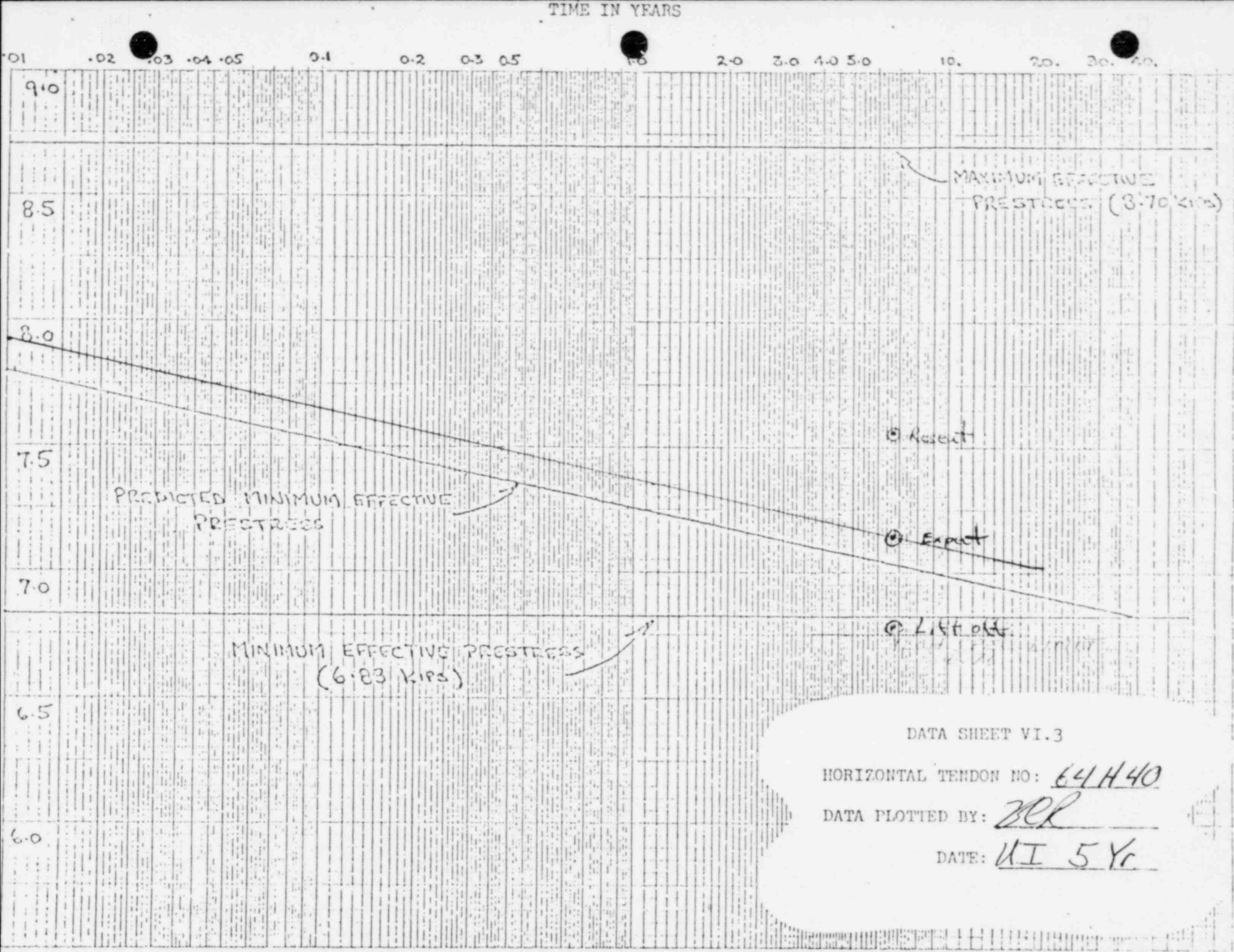


DATA SHEET VI.3

HORIZONTAL TENDON NO: 26H4

DATA PLOTTED BY: BK

DATE: UI 5 Yr.



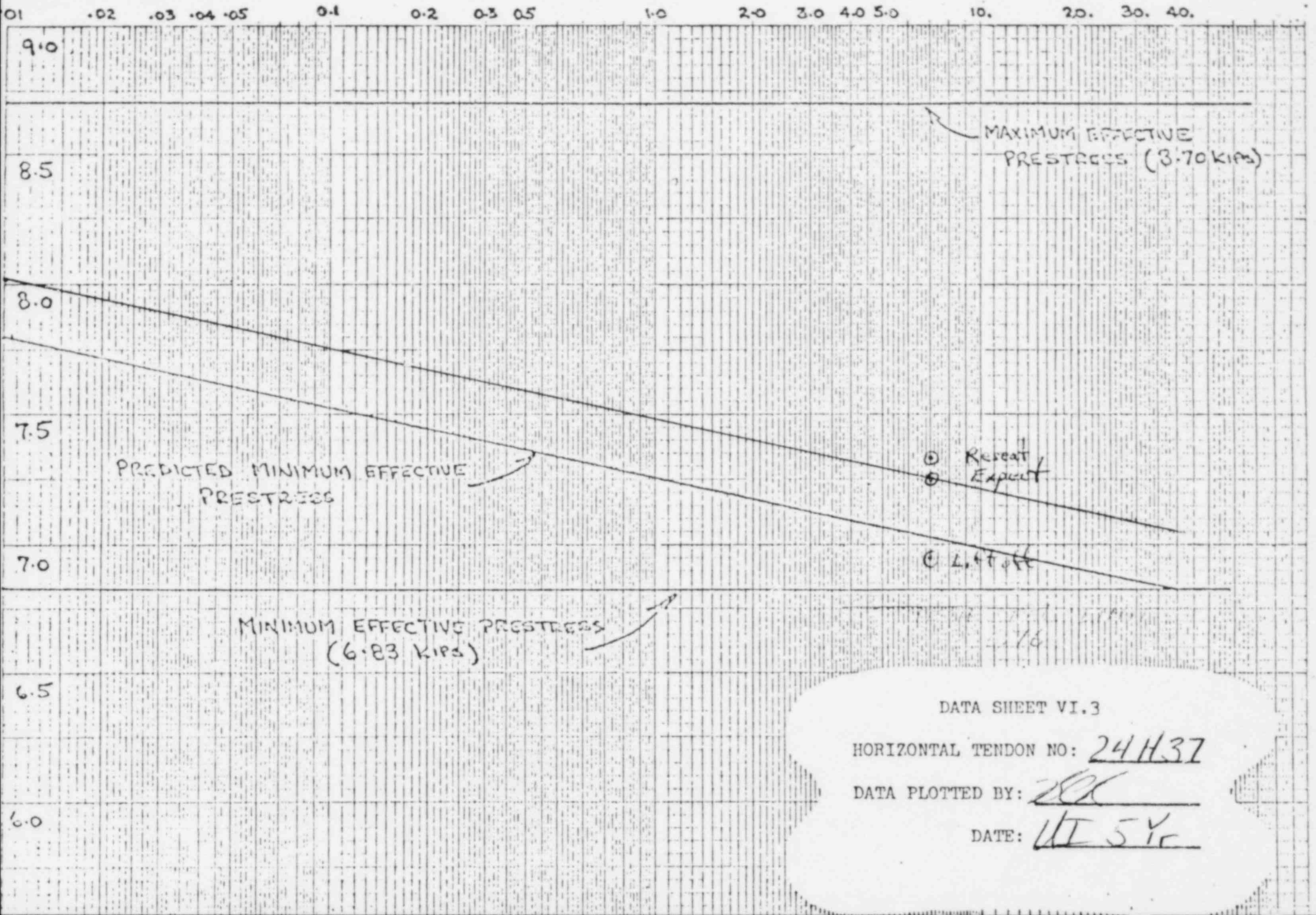
DATA SHEET VI.3

HORIZONTAL TENDON NO: 64H40

DATA PLOTTED BY:

DATE: UI 5 Yr

TIME IN YEARS



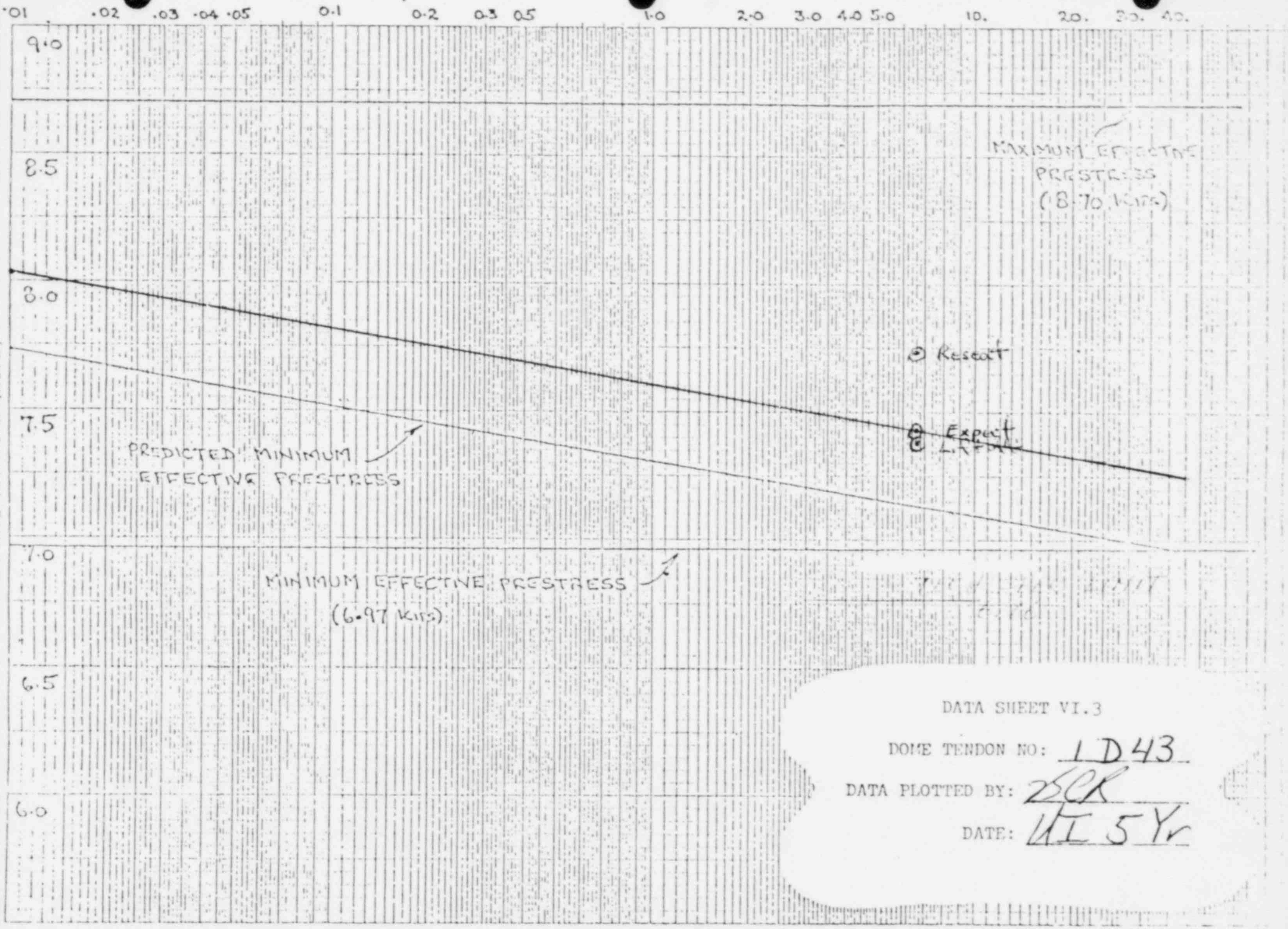
DATA SHEET VI.3

HORIZONTAL TENDON NO: 24H37

DATA PLOTTED BY: ZEK

DATE: UI 5 Yr

TIME IN YEARS

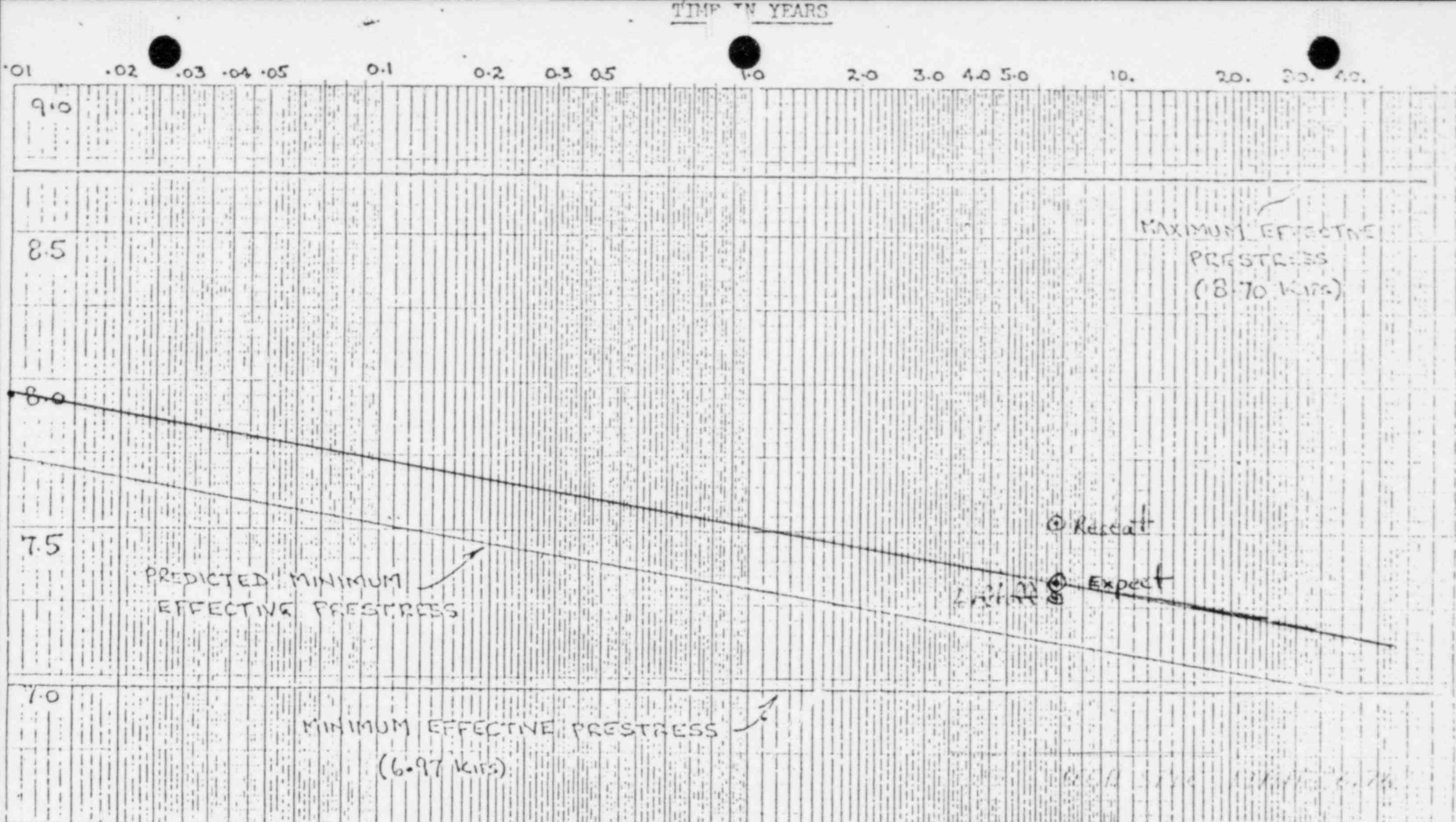


DATA SHEET VI.3

DOME TENDON NO: 1D43

DATA PLOTTED BY: ZCR

DATE: LL 5 Yr

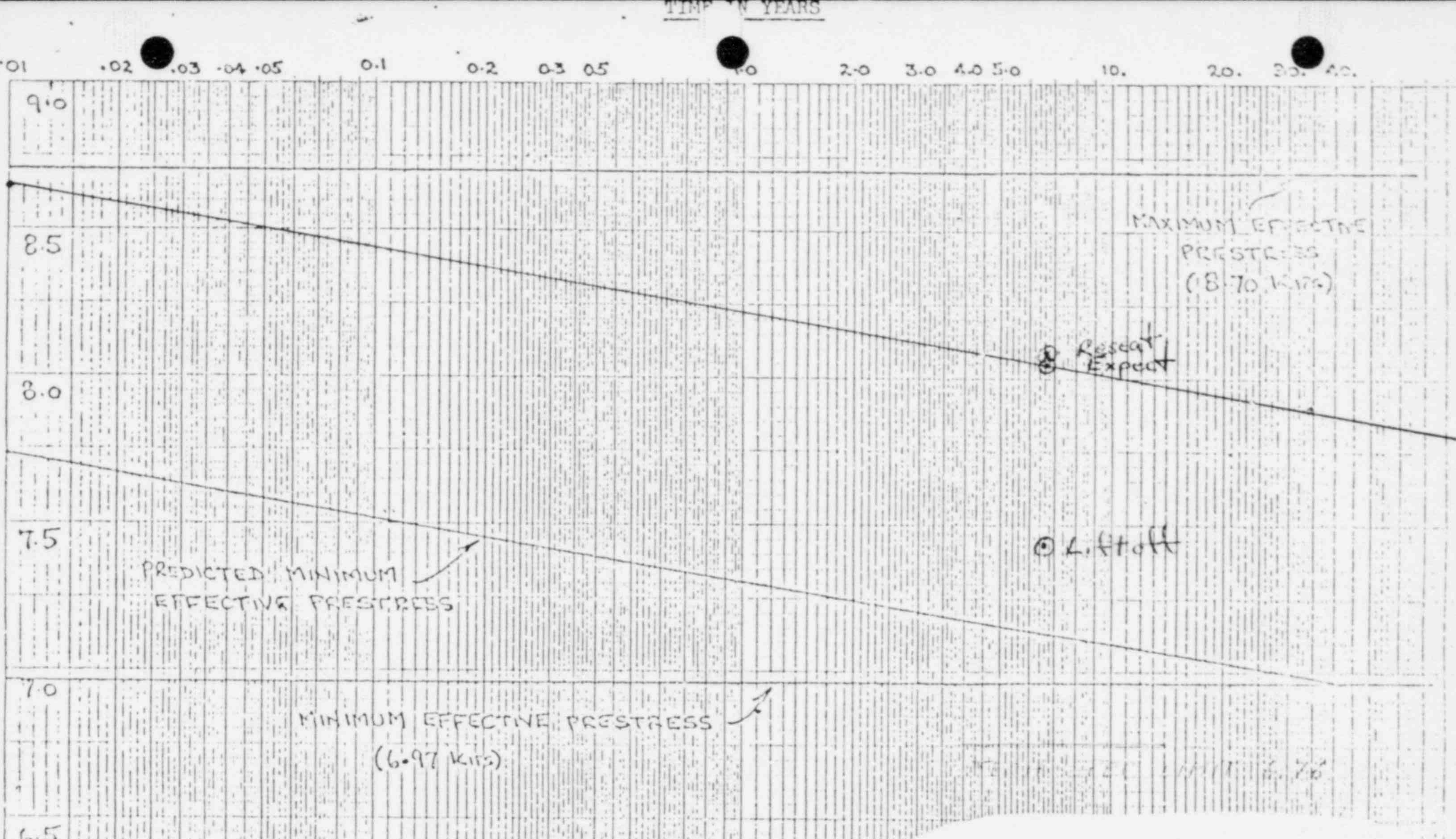


DATA SHEET VI.3

DOME TENDON NO: 1D40

DATA PLOTTED BY: BCK

DATE: UI 5Yr

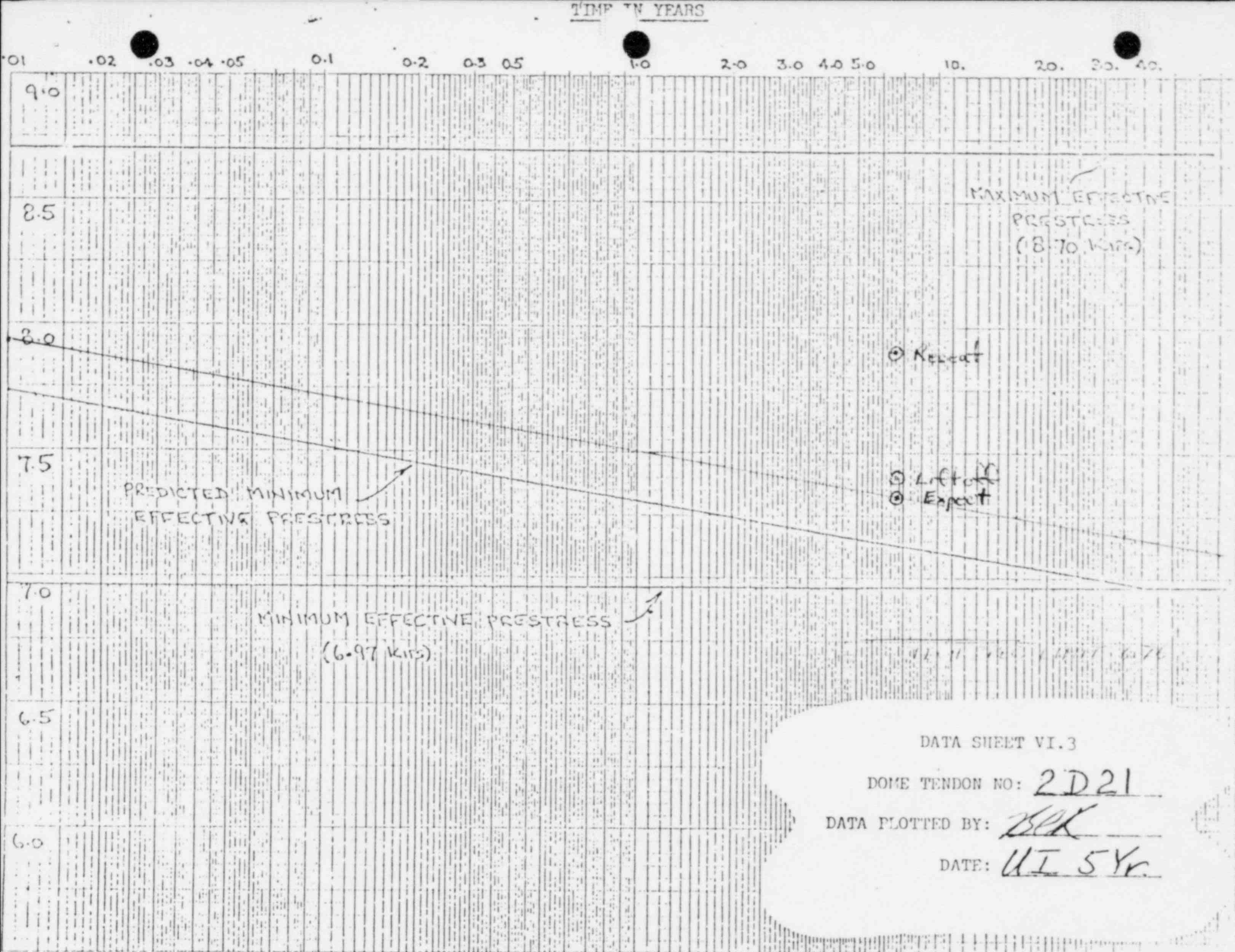


DATA SHEET VI.3

DOME TENDON NO: 1D24

DATA PLOTTED BY: 20K

DATE: UI 5 Yr

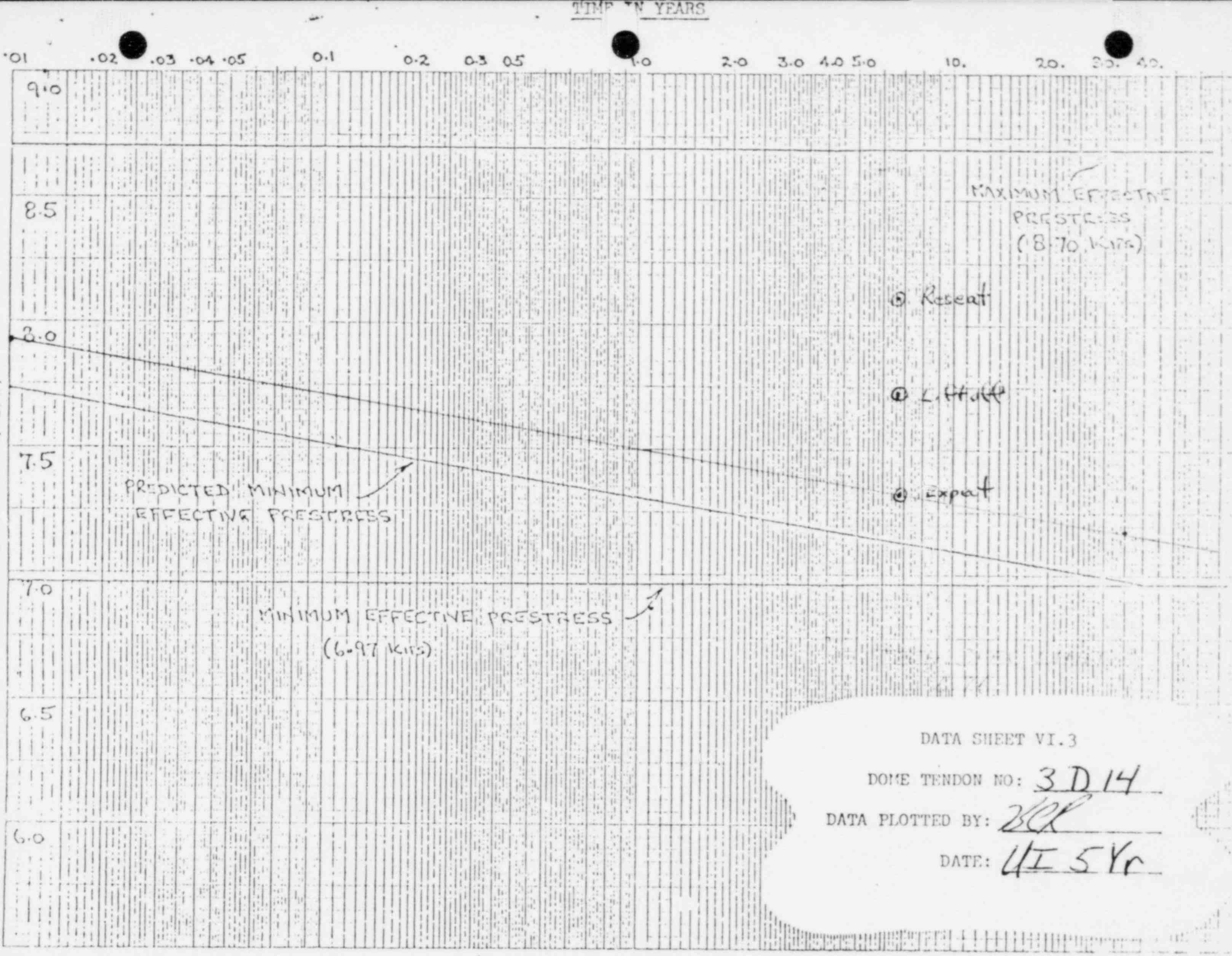


DATA SHEET VI.3

DOME TENDON NO: 2D21

DATA PLOTTED BY: BEK

DATE: UI 5Yr.

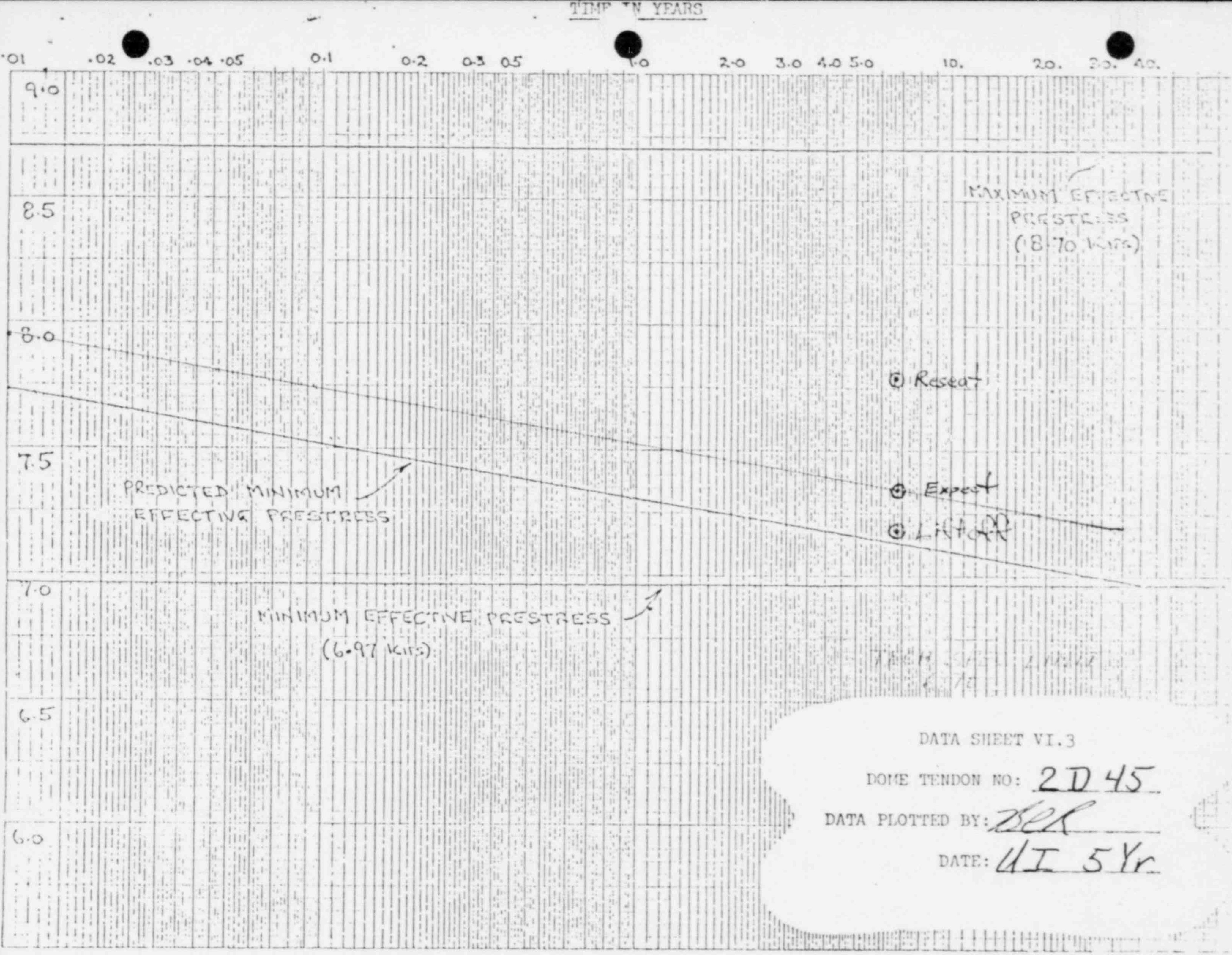


DATA SHEET VI.3

DOME TENDON NO: 3 D 14

DATA PLOTTED BY: BCK

DATE: 4I 5Yr

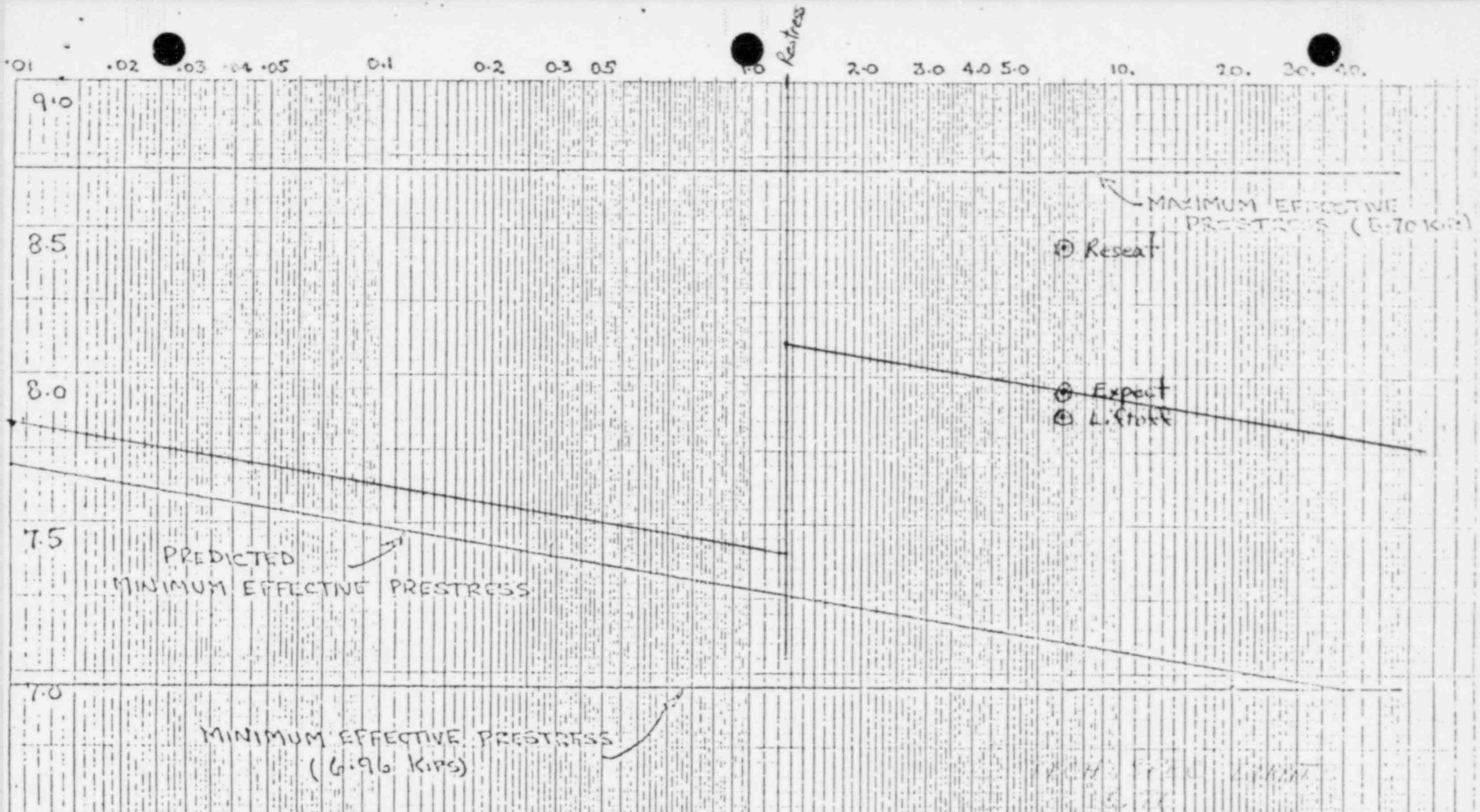


DATA SHEET VI.3

DOME TENDON NO: 2D45

DATA PLOTTED BY: BEK

DATE: UI 5Yr.

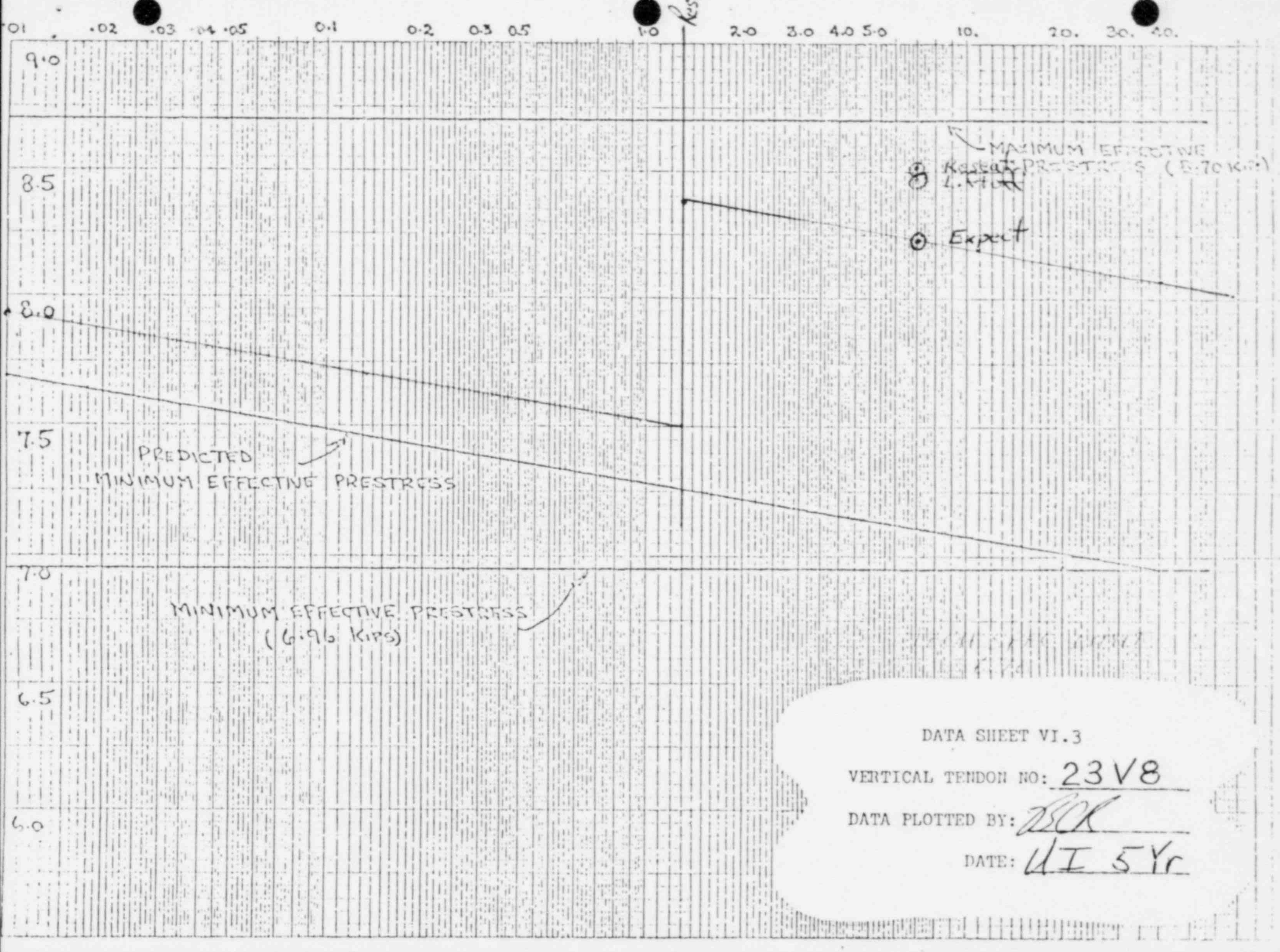


DATA SHEET VI.3

VERTICAL TENDON NO: 12 V 31

DATA PLOTTED BY: ZCK

DATE: UI 5 Yr

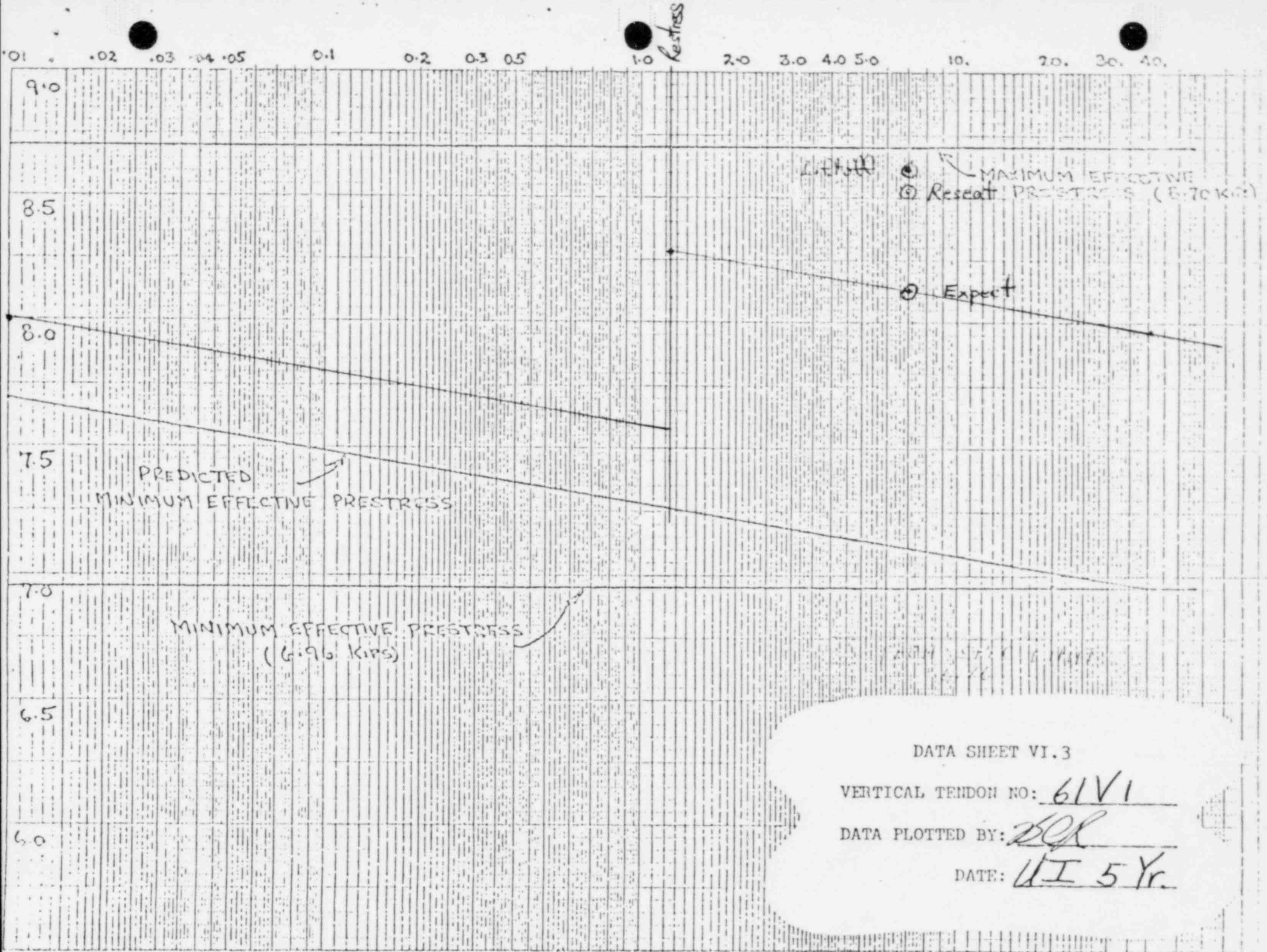


DATA SHEET VI.3

VERTICAL TENDON NO: 23V8

DATA PLOTTED BY: BCK

DATE: UI 5Yr

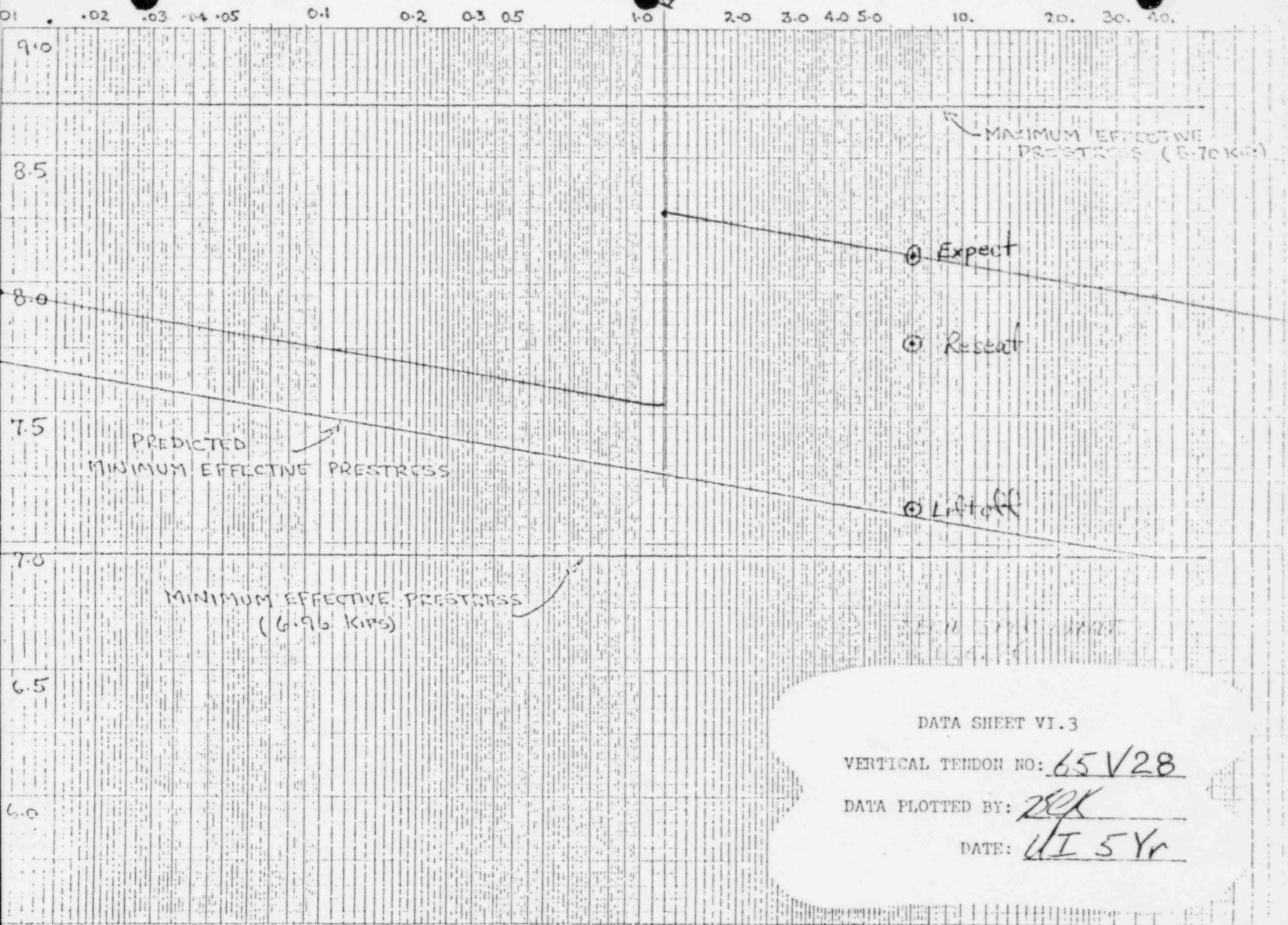


DATA SHEET VI.3

VERTICAL TENDON NO: 61V1

DATA PLOTTED BY: BQL

DATE: UI 5 Yr.

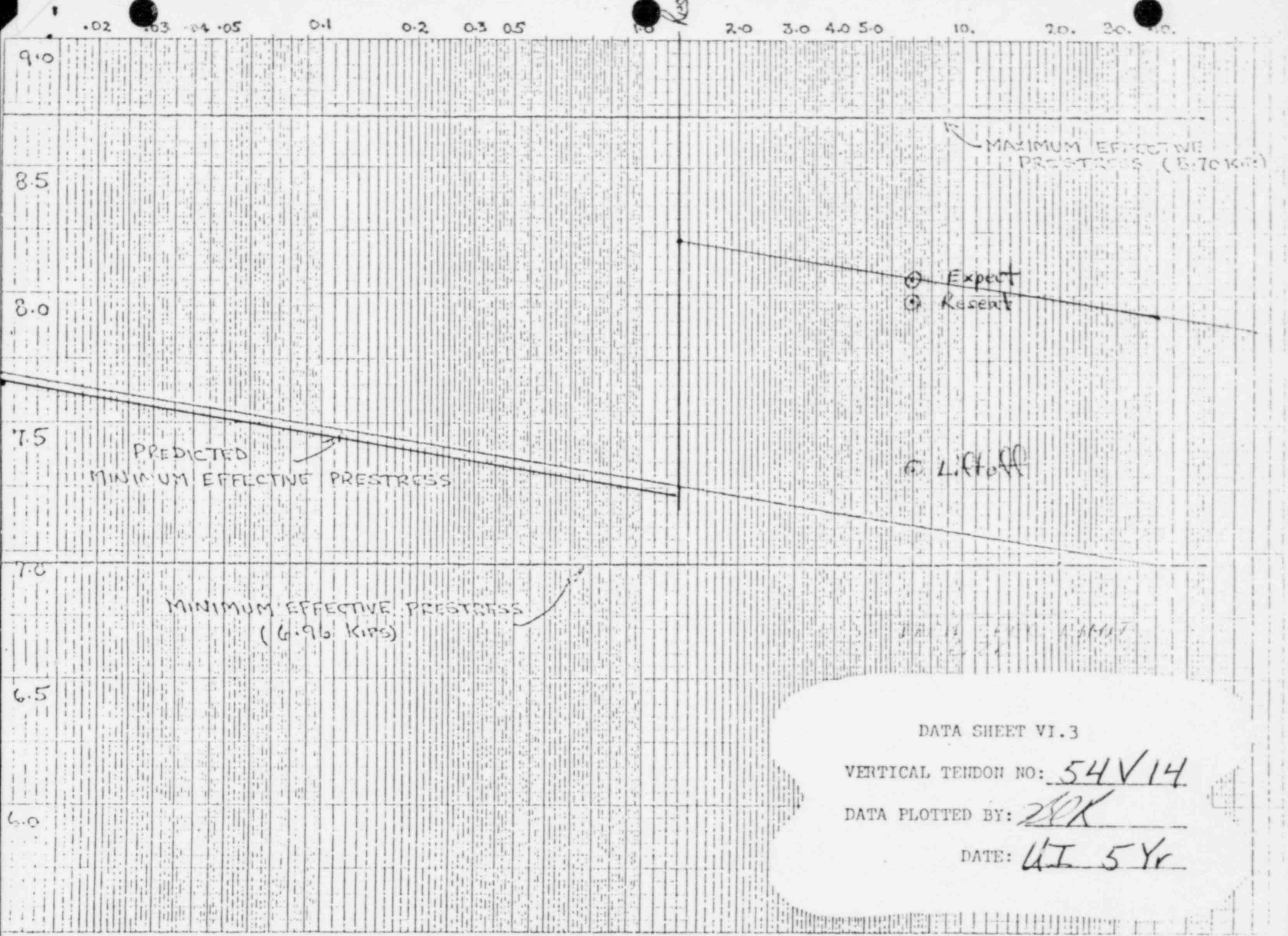


DATA SHEET VI.3

VERTICAL TENDON NO: 65V28

DATA PLOTTED BY: 2EK

DATE: UI 5Yr

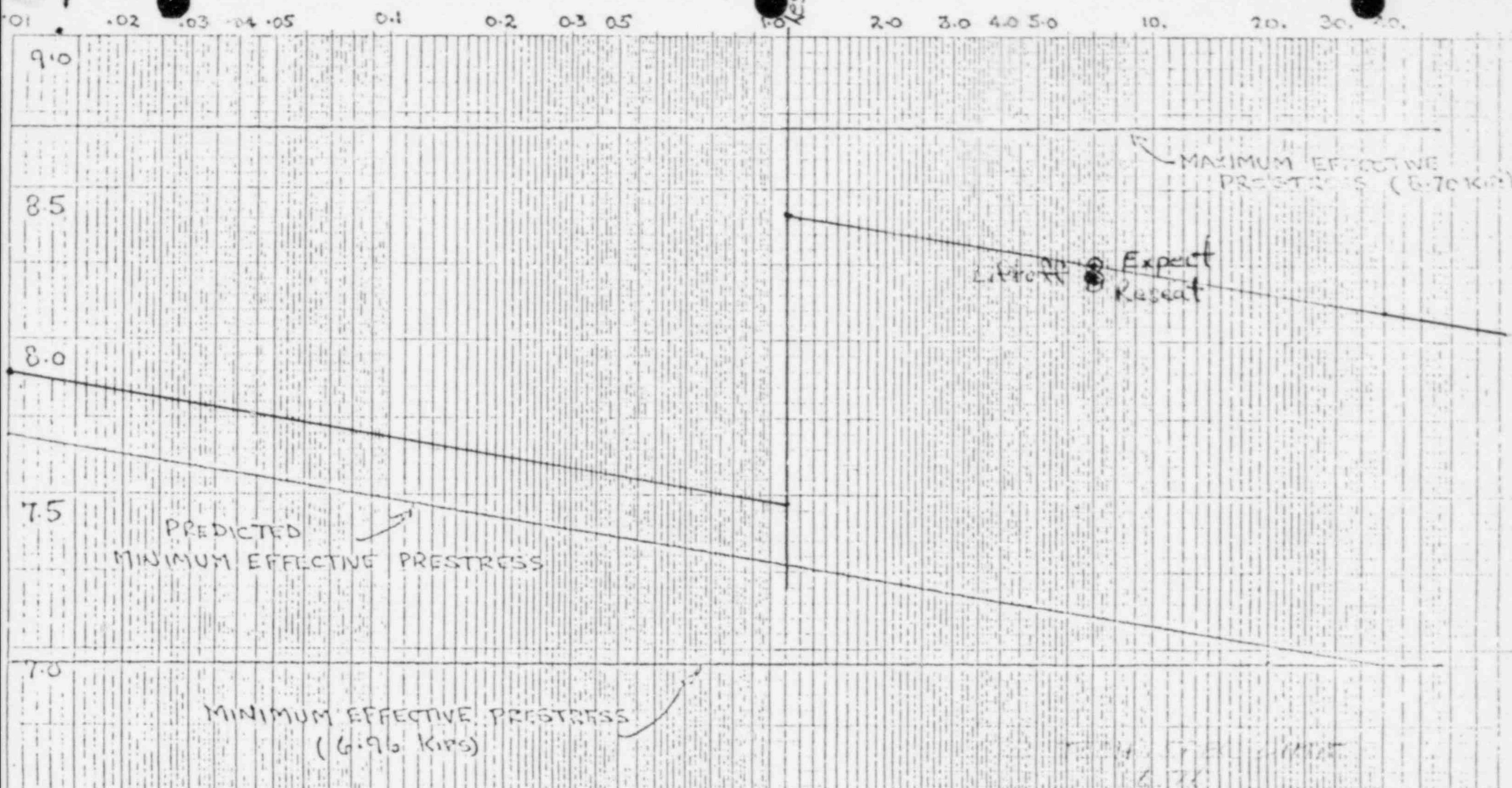


DATA SHEET VI.3

VERTICAL TENDON NO: 54V14

DATA PLOTTED BY: ZDK

DATE: UI 5 Yr



DATA SHEET VI.3

VERTICAL TENDON NO: 43V8

DATA PLOTTED BY: BCL

DATE: LI 5Yr

UNIT I 5 YR. SURVEILLANCE

TENDON	LIFT-OFF	NORMALIZE FACTOR	NORMALIZED LIFTOFF
62H70	7.56	1.002	7.58
24H55	7.27	.989	7.19
31H50	7.50	1.022	7.66
51H45	6.79	1.031	7.00
35H65	7.23	1.026	7.42
31H2	8.09	1.003	8.11
31H1	7.52	1.033	7.77
53H4	8.39	.985	8.26
26H4	7.39	.987	7.29
64H40	6.78	1.004	6.81
24H37	6.95	.985	6.84
	7.41		7.45
3D43	7.38	.977	7.21
1D40	7.28	.996	7.25
1D24	7.43	.983	7.30
2D21	7.40	.973	7.20
3D14	7.73	.969	7.49
2D45	7.19	.986	7.09
	7.40		7.26
12V31	7.88	1.023	8.06
23V8	8.46	.989	8.37
61V1	8.61	1.002	8.63
65V28	7.13	1.002	7.14
54V14	7.32	1.010	7.39
43V8	8.22	.985	8.10
	7.94		7.95

12" Cal 3/14/79
8" Cals 7/20/78

Ram #5 SN 4045005050008
Ram #4 SN 4045004050008
Ram #2 SN 40450200500-12

Gauge No. 4215106 Q-Code
Gauge No. 4215108 V-Code
Gauge No. 4215006A W-Code
Gauge No. 4215004A X-Code
Gauge No. G-224 Y-Code

HORIZONTAL TENDONS

TENDON-BUTTRESS	LIFT-OFF PRESSURE	RESEATING PRESSURE	*RAM/GAUGE	DATE CAL	LIFT-OFF KIP	RESEAT KIP	AVG. LIFTOFF	AVG. RESEATING
62H70-2	5290	5340	5/Q	7/20/78	670	678		
89 Wires					(673.5	683.5)	7.56	7.68
62H70-6	5355	5430	4/V	7/20/78	677	689		
24H55-4	5040	5530	4/V	7/20/78	640	702		
90 Wires					(654.	707.5)	7.27	7.86
24H55-2	5250	5600	5/W	7/20/78	668	713		
31H50-1	5270	5520	5/W	7/20/78	670	704		
90 Wires					(675	689.5)	7.50	7.66
31H50-3	5370	5330	4/V	7/20/78	680	675		
51H45-5	4810	5290	4/V	7/20/78	610	670		
90 Wires					(611	690.5)	6.79	7.67
51H45-1	4820	5580	5/W	7/20/78	612	711		
35H65-5	5050	5160	5/W	7/20/78	645	656		
90 Wires (States 86 Wires)					(651	655.5)	7.23	7.28
35H65-3	5190	5170	4/V	7/20/78	657	655		
31H2-1	5440	5708	2/X	3/14/79	722	757		
90 Wires					(728.5	756)	8.09	8.40
31H2-3	5780	5940	4/V	7/20/78	735	755		
31H1-1	5100	5010	2/X	3/14/79	677	665		
[illegible]0 Wires					(677	700.5)	7.52	7.78
31H1-3	5350	5800	4/V	7/20/78	677	736		

HORIZONTAL TENDONS (CONT'D)

TENDON-BUTTRESS	LIFT-OFF PRESSURE	RESEATING PRESSURE	*RAM/ GAUGE	DATE CAL	LIFT-OFF KIP	RESEAT KIP	AVG. LIFTOFF	AVG. RESEATING
53H4-5	6060	5700	5/Q	7/20/78	767	722		
90 Wires					(755.5	736.5)	8.39	8.18
53H4-3	5860	5920	4/V	7/20/78	744	751		
26H4-2	5270	5410	4/V	7/20/78	669	687		
90 Wires					(665.5	678.5)	7.39	7.54
26H4-6	5220	5300	5/Q	7/20/78	662	670		
64H40-6	4500	4820	2/X	3/14/79	597	640		
90 Wires					(610.5	680)	6.78	7.56
64H40-4	4940	5690	4/V	7/20/78	624	720		
[illegible]4H37-2	5050	5140	5/Q	7/20/78	639	650		
90 Wires lift-off/89 Wires Reseating					(625.5	652.5)	6.95	7.33
24H37-4	4820	5160	4/Y	7/20/78	612	655		

DEME TENDONS

TENDON-BUTTRESS	LIFT-OFF PRESSURE	RESEATING PRESSURE	*RAM/ GAUGE	DATE CAL	LIFT-OFF KIP	RESEAT KIP	AVG. LIFTOFF	AVG. RESEATING
3D43-4	5325	5460	4/V	7/20/78	674	691		
90 Wires					(664	695.5)	7.38	7.73
3D43-5	4940	5280	2/X	3/14/79	654	700		
1D40-1	5040	5220	2/X	3/14/79	667	692		
90 Wires					(655.5	678.5)	7.28	7.54
1D40-3	5080	5250	4/V	7/20/78	644	665		
1D24-4	5240	5720	4/V	7/20/78	664	724		
90 Wires (States 82)					(668.5	728.5)	7.43	8.09
1D24-6	5080	5540	2/X	3/14/79	673	733		
2D21-2	5040	5210	2/X	3/14/79	668	691		
90 Wires					(666.5	711.5)	7.40	7.90
2D21-4	5250	5770	4/V	7/20/78	665	732		
3D14-6	5520	5790	4/V	7/20/78	700	733		
90 Wires/89 Wires/Wire Removed					(696	722)	7.73	8.11
3D14-2	5220	5360	2/X	3/14/79	692	711		
2D45-5	4980	5360	4/V	7/20/78	630	679		
90 Wires					(647	701.5)	7.19	7.79
2D45-1	5000	5460	2/X	3/14/79	664	724		

VERTICAL TENDONS

TENDON-BUTTRESS	LIFT-OFF PRESSURE	RESEATING PRESSURE	*RAM/GAUGE	DATE CAL	LIFT-OFF KIP	RESEATED KIP	AVG. LIFT-OFF KIP/WIRE	AVG. RESEATING KIP/WIRE
12V31	5350	5740	2/X	3/14/79	710	761	7.88	8.45
90 Wires States 89								
23V8	5630	5640	2/X	3/14/79	745	750	8.46	8.52
88 Wires 2 Broken Found								
61V1	5840	5780	2/X	3/14/79	775	768	8.61	8.53
90 Wires								
65V28	4840	5270	2/X	3/14/79	642	700	7.13	7.78
90 Wires								
54V14	4910	5350	2/X	3/14/79	652	710	7.32	7.98
89 Wires								
43V8	5580	5500	2/X	3/14/79	740	730	8.22	8.20
90 Wires/89 Wires 1 Removed								

* RAM/GAUGE CODES

RAM NUMBER	CODE	
4045005050008	5	Calibration 7/20/78
4045004050008	4	Calibration 7/20/78
40450200500-12	2	Calibration 3/14/79

GAUGE NUMBER	CODE
4215106	Q
4215108	V
4215006A	W
4215004A	X
G-224	Y

February 27, 1979

TO: Mr. L. B. Russell

FROM: Mr. J. H. Pence Jr.

SUBJECT: Tensile Test of Containment Tendon Wires - Calvert Cliffs Unit No. 1

Fifteen lengths of wire (three each from five sections) were tested in accordance with BG&E QAP 27 and ASTM A-421; see attached results.

All fifteen lengths of wire meet the minimum physical requirements of ASTM A-421. Calibration of the instruments, Wire Extensometer serial No. 121246 and Tensile Machine serial No. 53761-2, used to perform these tests is traceable to the National Bureau of Standards.

The load versus elongation curve of each section of wire is attached.

J. B. Lyon, II
Metallurgical Laboratory

J. H. Pence Jr.
J. H. Pence Jr.
Metallurgical Laboratory

Approved L. Erik Titland
L. Erik Titland
Principal Metallurgist

JBL/JHP/dlp

cc: J. B. Bullock
J. J. Jones
J. R. Lemons
B. C. Rudell

No. 1 Containment Calvert Cliffs

Specimen Identification	23V3#2		
Section No.	2B	4B	6B
Diameter, Inches	.2505	.2509	.2506
Original Area, Square Inches	.04928	.04944	.04932
Initial Load, Pounds	1429	1434	1430
Elongation at Initial Load, Inches	.010	.010	.010
Gage Length, Inches	10	10	10
Elongation at 1% Extension, Inches	.100	.100	.100
Load at 1% Extension, Pounds	10,425	10,550	10,525
Stress at 1% Extension, PSI	211,546	213,390	213,402
Load at 4% Extension, Pounds	12,060	12,000	12,025
Stress at 4% Extension, PSI	244,724	242,718	243,815
Load at Failure, Pounds	12,225	12,225	12,200
Stress at Failure, PSI	248,072	247,269	247,364
Yield at 1% vs. Failure, Percent	85.3	86.3	86.3
Elongation at Failure, Percent	6.6	8.5	7.5
Location of Failure from Jaw, Inches	5	7.25	8

February 27, 1979

No. 1 Containment Calvert Cliffs

Specimen Identification	43V8		
Section No.	A	B	C
Diameter, Inches	.2508	.2507	.2507
Original Area, Square Inches	.04940	.04936	.04936
Initial Load, Pounds	1432	1431	1431
Elongation at Initial Load, Inches	.010	.010	.010
Gage Length, Inches	10	10	10
Elongation at 1% Extension, Inches	.100	.100	.100
Load at 1% Extension, Pounds	10,300	10,450	10,250
Stress at 1% Extension, PSI	208,500	211,710	207,658
Load at 4% Extension, Pounds	12,025	12,075	11,960
Stress at 4% Extension, PSI	243,421	244,631	242,301
Load at Failure, Pounds	12,175	12.175	12,125
Stress at Failure, PSI	246,457	246,557	245,644
Yield at 1% vs. Failure, Percent	84.6	85.8	84.5
Elongation at Failure, Percent	5.6	7.8	6.9
Location of Failure from Jaw, Inches	4.5	5	3.75

February 27, 1979

No. 1 Containment Calvert Cliffs

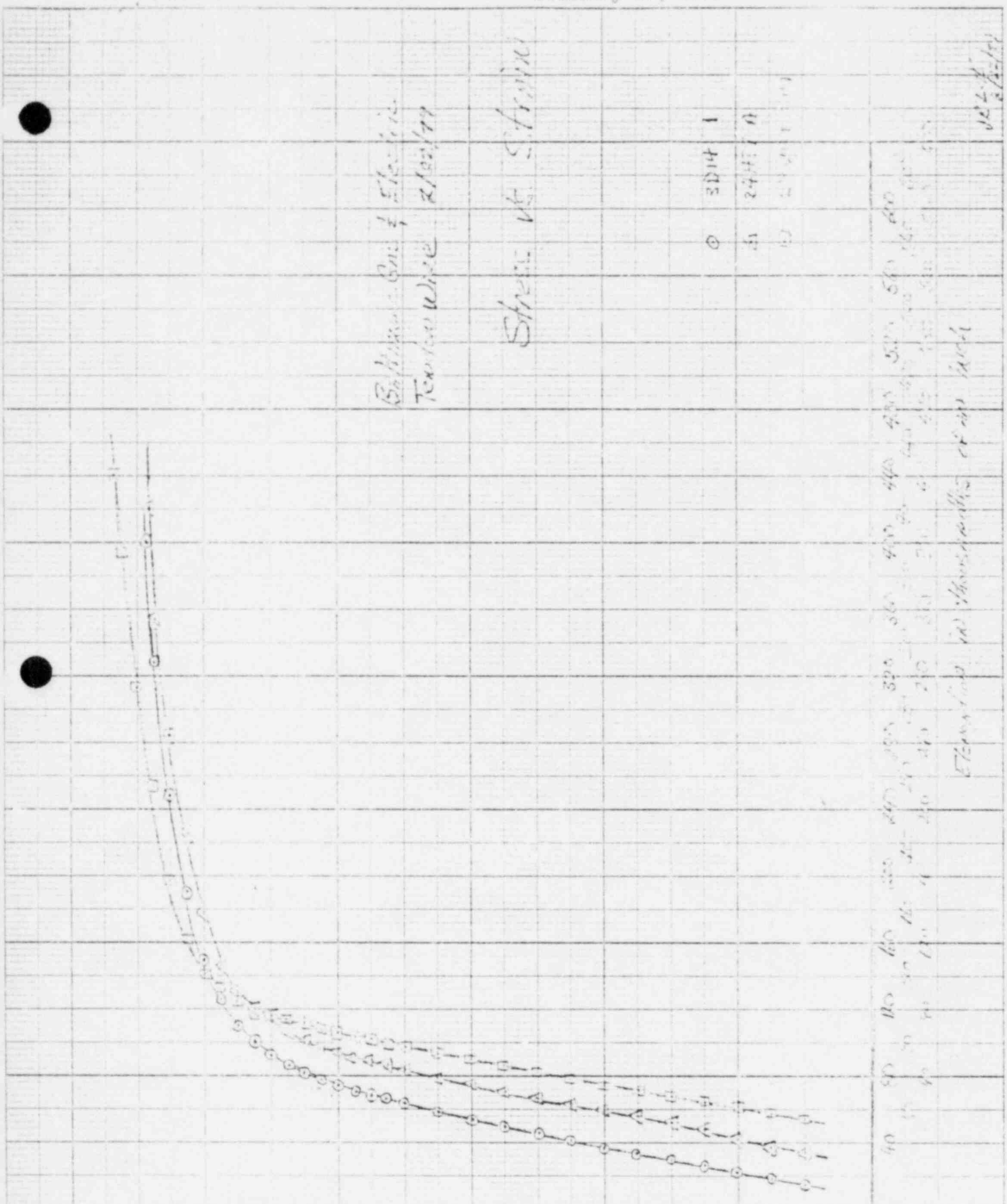
Specimen Identification	3D14		
Section No.	1	2	3
Diameter, Inches	.2505	.2506	.2503
Original Area, Square Inches	.04928	.04932	.04921
Initial Load, Pounds	1429	1430	1427
Elongation at Initial Load, Inches	.010	.010	.010
Gage Length, Inches	10	10	10
Elongation at 1% Extension, Inches	.100	.100	.100
Load at 1% Extension, Pounds	10,250	10,250	10,325
Stress at 1% Extension, PSI	207,995	207,826	209,815
Load at 4% Extension, Pounds	11,875	11,900	11,850
Stress at 4% Extension, PSI	240,970	241,281	240,804
Load at Failure, Pounds	11,975	11,975	11,950
Stress at Failure, PSI	242,999	242,802	242,837
Yield at 1% vs. Failure, Percent	85.6	85.6	86.6
Elongation at Failure, Percent	7.0	7.1	6.7
Location of Failure from Jaw, Inches	7.25	8.5	7

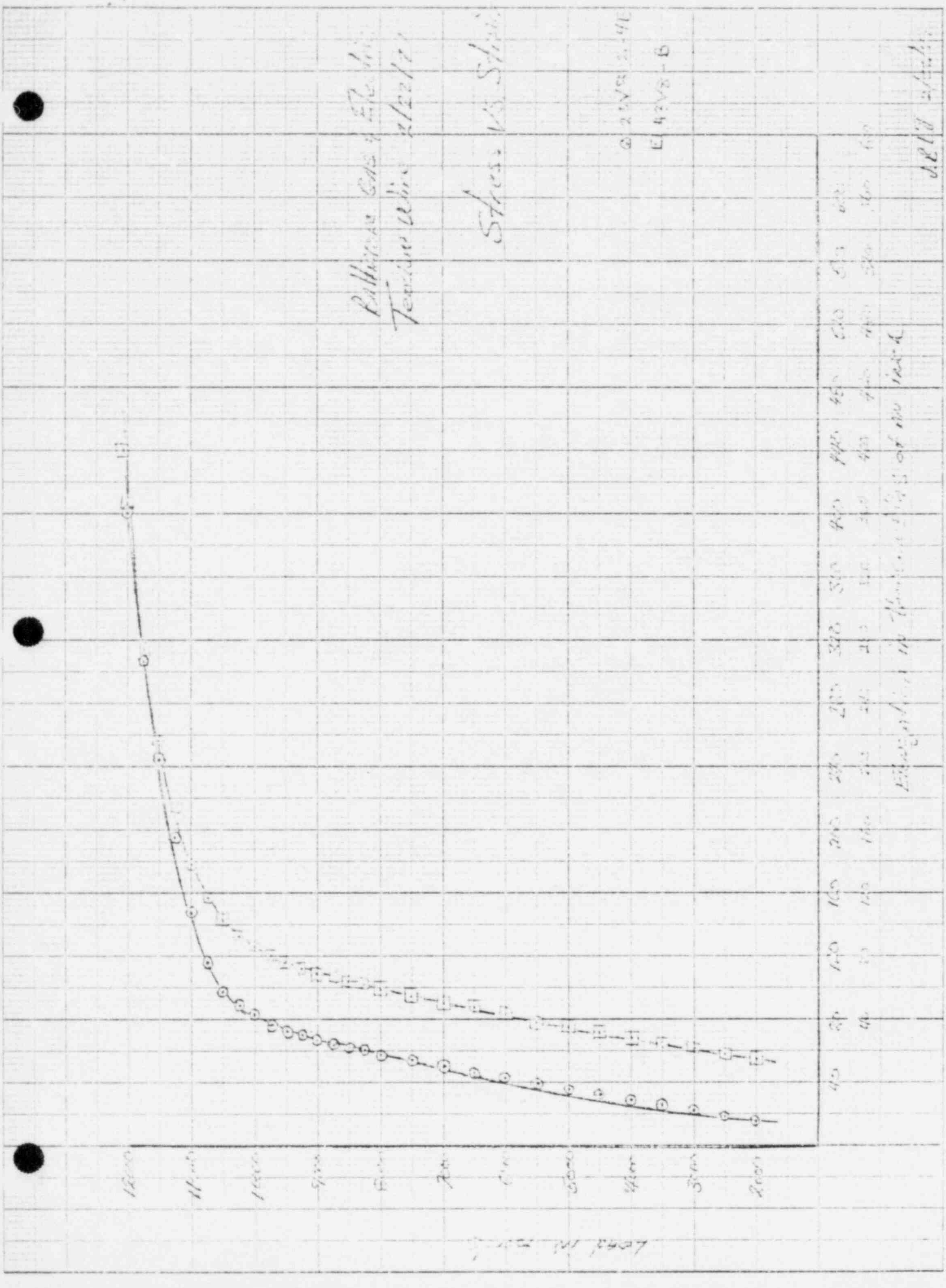
No. 1 Containment Calvert Cliffs

Specimen Identification	23V81 23V8 #1		
Section No.	4A1	2B	5B
Diameter, Inches	.2505	.2504	.2506
Original Area, Square Inches	.04928	.04924	.04932
Initial Load, Pounds	1429	1428	1430
Elongation at Initial Load, Inches	.010	.010	.010
Gage Length, Inches	10	10	10
Elongation at 1% Extension, Inches	.100	.100	.100
Load at 1% Extension, Pounds	10,975	10,800	10,925
Stress at 1% Extension, PSI	222,707	219,334	221,151
Load at 4% Extension, Pounds	12,350	12,375	12,350
Stress at 4% Extension, PSI	250,608	251,320	250,405
Load at Failure, Pounds	12,500	12,525	12,525
Stress at Failure, PSI	253,653	254,366	253,954
Yield at 1% vs. Failure, Percent	87.8	86.2	87.1
Elongation at Failure, Percent	7.3	6.8	7.3
Location of Failure from Jaw, Inches	5.5	8.5	66.5

No. 1 Containment Calvert Cliffs

Specimen Identification	24H37		
Section No.	A	B	C
Diameter, Inches	.2509	.2509	.2511
Original Area, Square Inches	.04944	.04944	.04952
Initial Load, Pounds	1434	1434	1436
Elongation at Initial Load, Inches	.010	.010	.010
Gage Length, Inches	10	10	10
Elongation at 1% Extension, Inches	.100	.100	.100
Load at 1% Extension, Pounds	10,275	10,525	10,450
Stress at 1% Extension, PSI	207,828	212,884	211,026
Load at 4% Extension, Pounds	11,875	11,925	11,925
Stress at 4% Extension, PSI	240,190	241,201	240,811
Load at Failure, Pounds	12,050	12,050	12,075
Stress at Failure, PSI	243,730	243,730	241,732
Yield at 1% vs. Failure, Percent	85.3	87.3	86.5
Elongation at Failure, Percent	7.5	6.8	7.5
Location of Failure from Jaw, Inches	5	8.75	6





March 12, 1979

TO: Mr. L. B. Russell

FROM: D. T. Ward

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1
Containment Structure Post-Tensioning System
Five-Year Surveillance

On March 7, 1979, there was a meeting in Bechtel's Gaithersburg office to discuss the results of the five-year tendon surveillance. The meeting was attended by Dr. Meyers and Mr. Vogelfanger of Bechtel, your Mr. Rudell and me. As part of the discussion, we reviewed the restressing lift-off values and concluded that they should be less than 8.7 kips per wire (upper limit for lift-off in present and proposed technical specifications).

Please modify the surveillance test procedure to use a working maximum of approximately 8.25 kips per wire. This corresponds to 0.7 times the minimum ultimate strength of the wire. We will be happy to review the exact wording. Also, the three tendons which have been reseated above 8.7 kips per wire (61V1, 23V8 and 12V31) should be restressed in the range of 7.5 to 8.25 kips per wire.

Original Signed By
D. T. Ward

Chief Civil Engineer
Electric Engineering Department

DTW:jch

cc: Mr. J. W. Brothers, Bechtel Power Corp.
Messrs. R. F. Ash
R. C. L. Olson
B. C. Rudell

STRESSING RAM

PRESSURE GAUGE COMBINATIONS

Calvert Cliffs Nuclear Project

for

Baltimore Gas and Electric

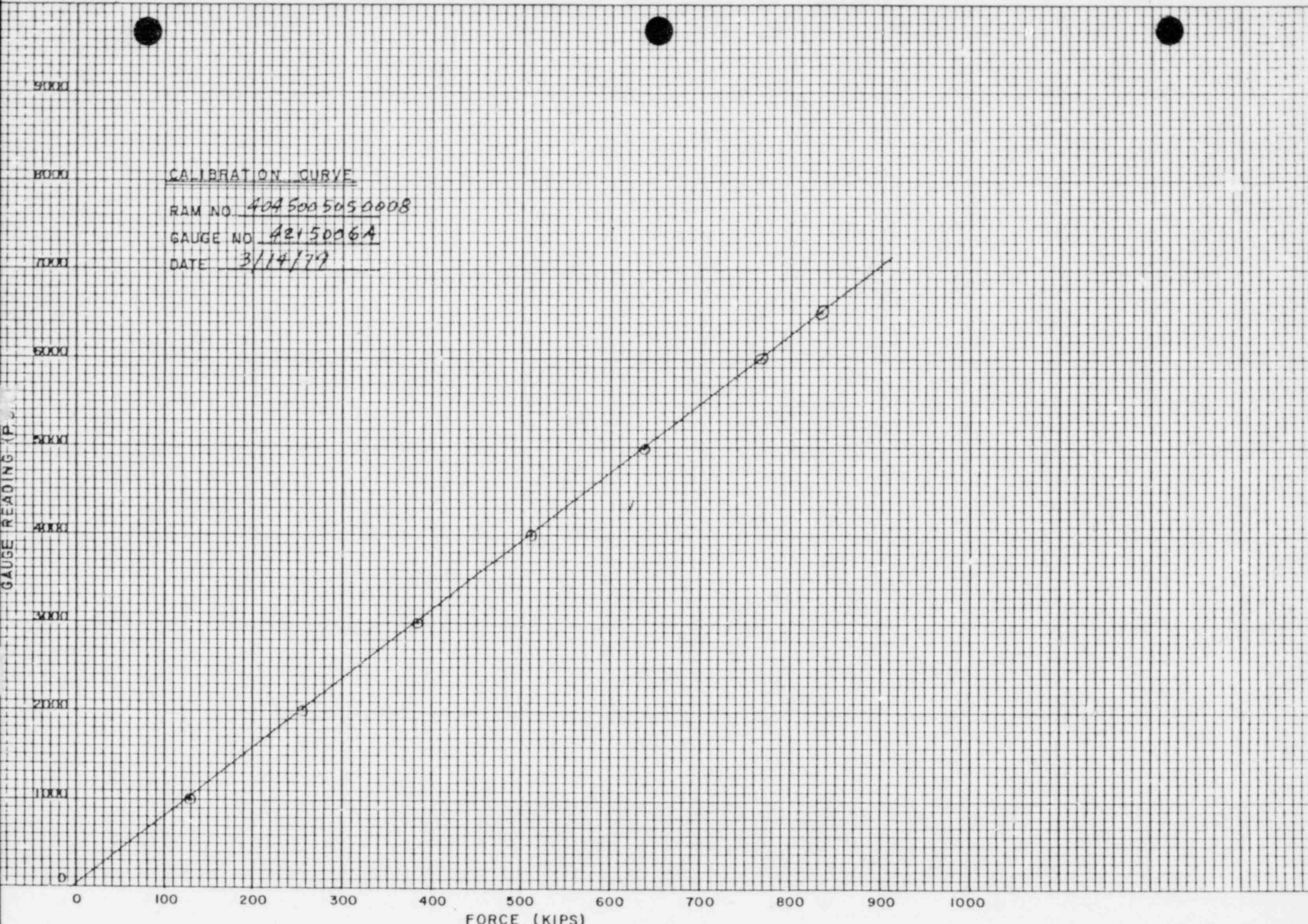
March 30, 1979

TABLE OF CONTENTS

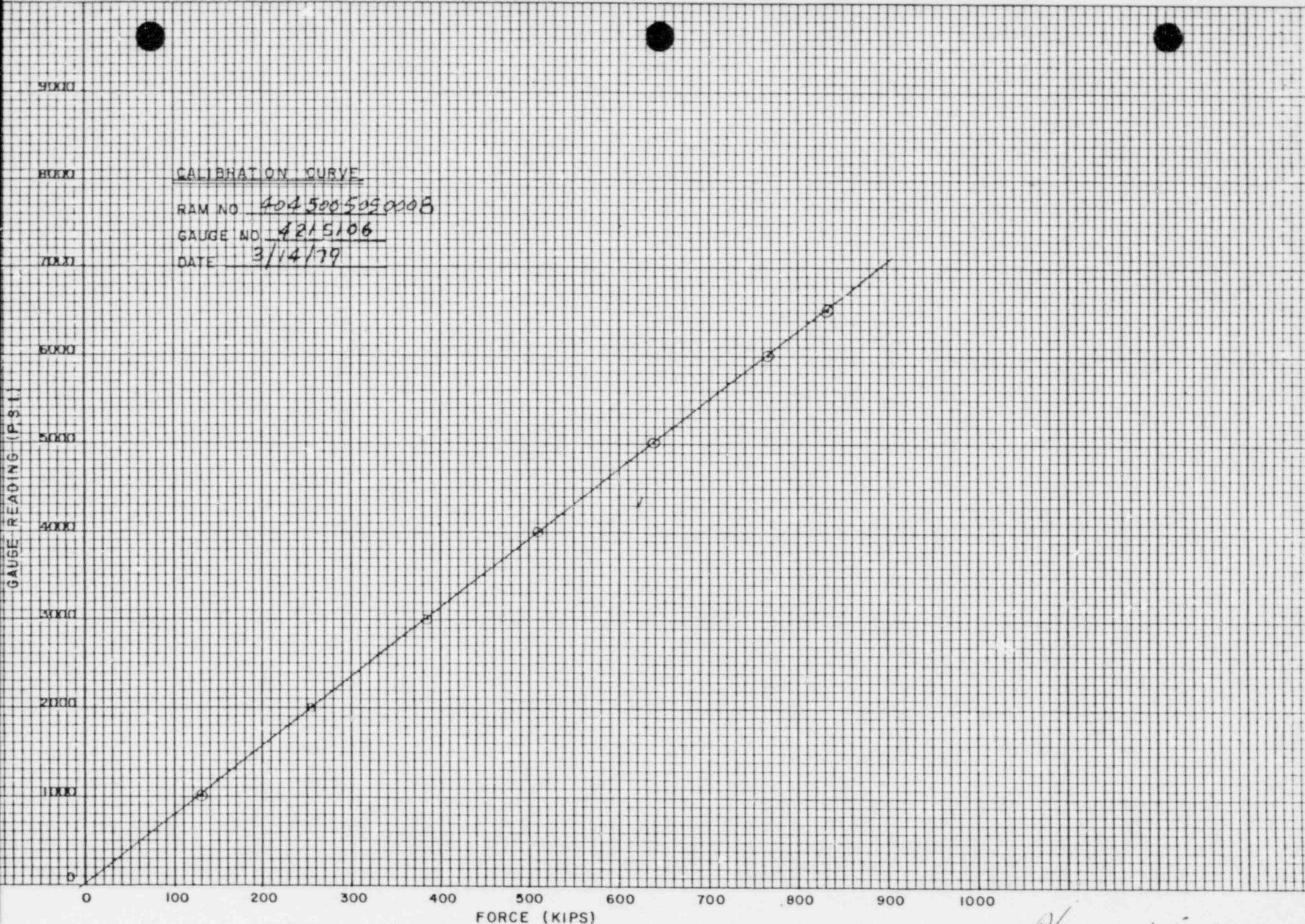
STRESSING RAM - Pressure Gauge Combinations

Ram: 4045005050008

Gauges: 4215006A
4215106



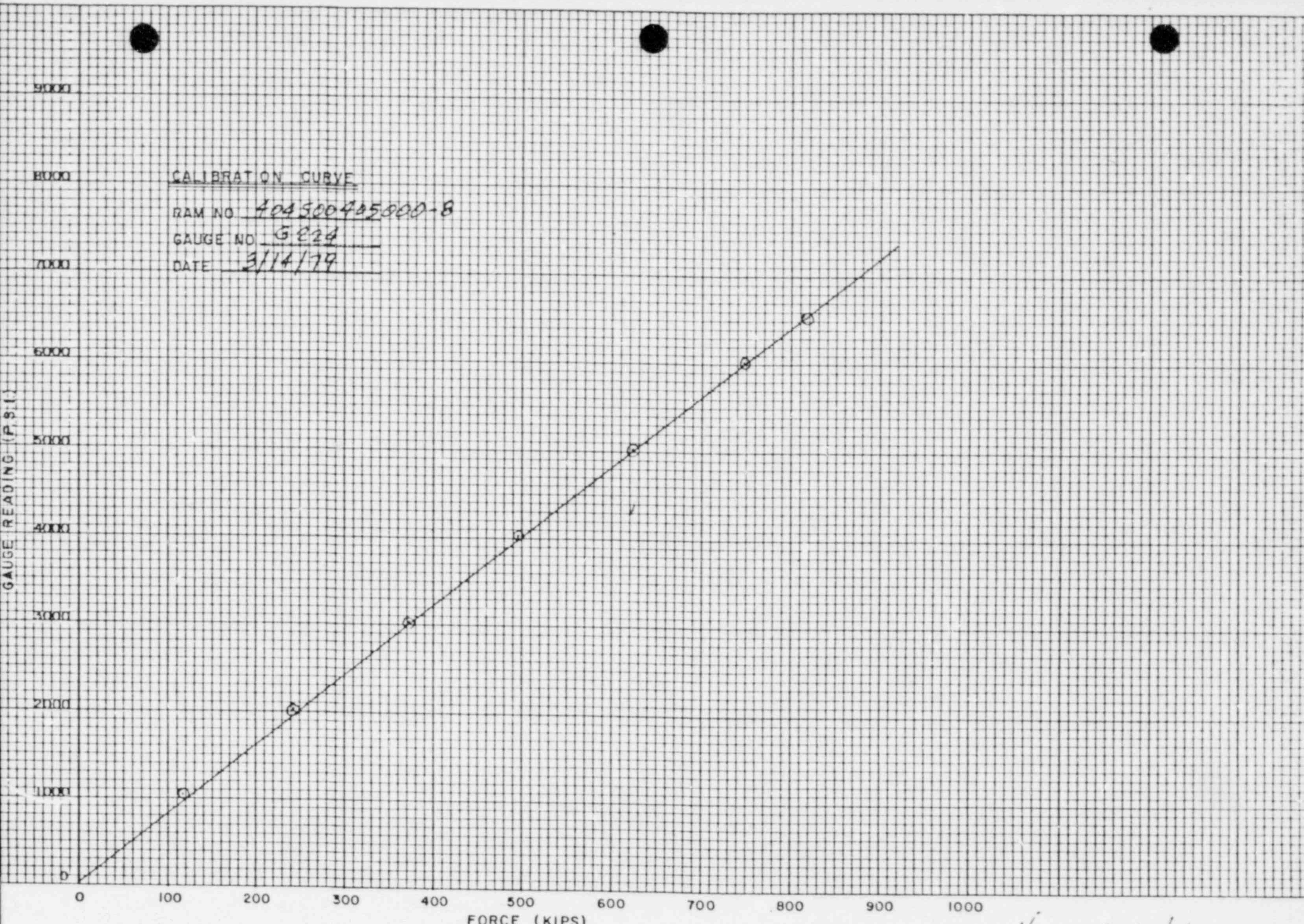
Thomas A. Castellaw
Thomas A. Castellaw, P.E.



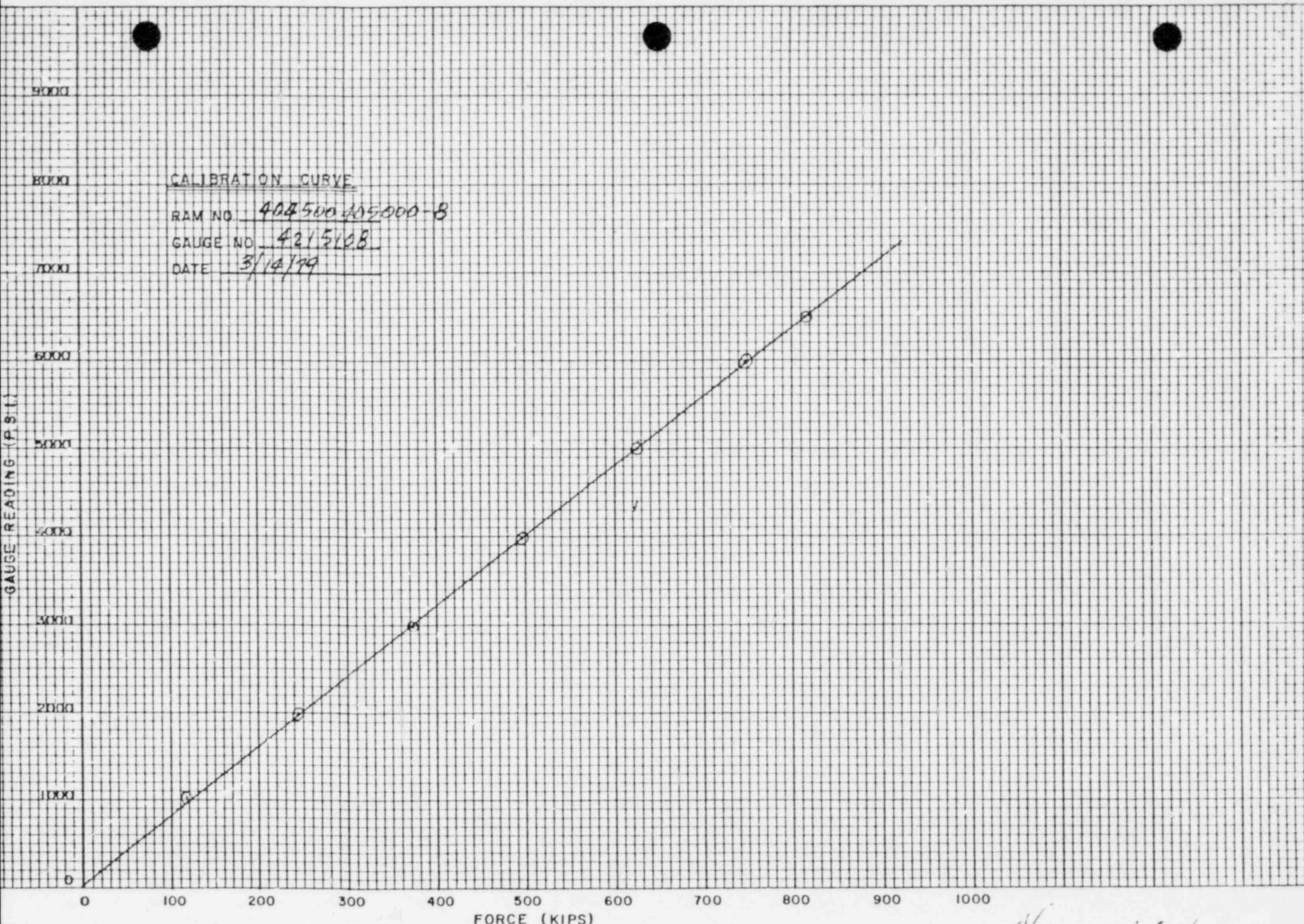
Thomas A. Castellaw, P.E.

STRESSING RAM - Pressure Gauge Combinations

Ram:	4045004050008
Gauges:	E 224 4215108



Thomas A. Castellaw, P.E.

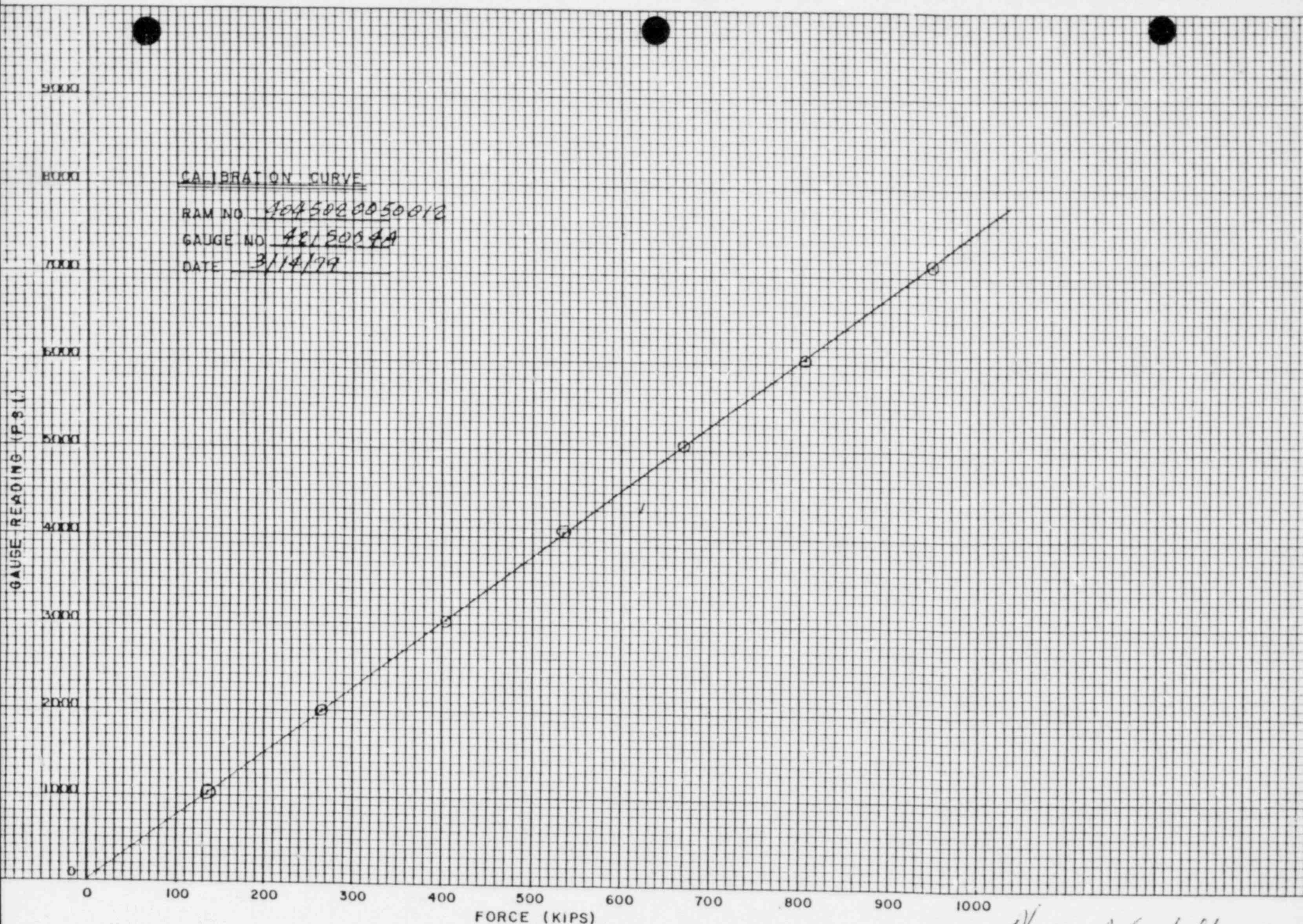


Thomas A. Castellaw, P.E.

STRESSING RAM - PRESSURE GAUGE COMBINATIONS

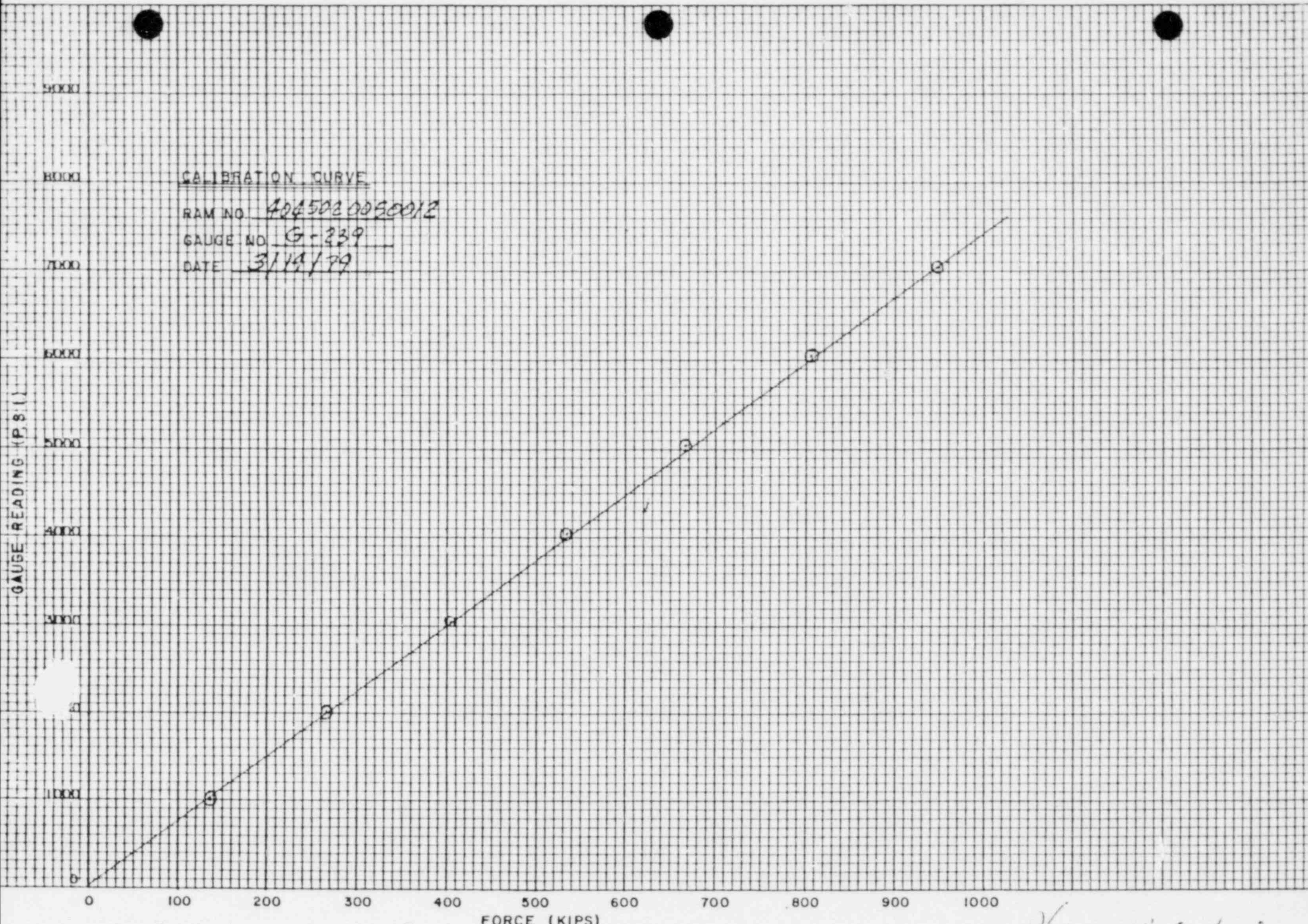
Ram: 4045020050012

Gauges: 4215004A
G-239



Thomas A. Castellaw

Thomas A. Castellaw, P.E.



Thomas A. Castellaw, P.E.

CALIBRATION CERTIFICATE

Loadcell No PCL 78L57

March 23, 1979

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050
214 – 262-3008

Certificate of Verification

This is to certify that *the following described testing machine has been calibrated by this company. The loading range shown below has been found to be within a tolerance of* .5 *%.*

Machine Load Cell S/N 4387 Indicator
Budd S/N 1565 Vishay 21932
(Make & type of)
(Serial No.)

Location Prescon Corporation
San Antonio, Texas

Date of Verification Month 3 *Day* 23 *Year* 79

Machine Range	*Loading Range*
0-1,500,000	100,000-1,500,000

Method of Verification and pertinent data are in accordance with A.S.T.M. Specification E4-74 and TEXAS CALIBRATION. "Procedure for Calibrating Tension and Compression Testing Machines" dated 1-2-71.

Attest:

Name ______________________

Title ______________________

Company ______________________
(Company Representative)

TEXAS CALIBRATION

By W. W. Stroud
Field Representative

FORM 71

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050

214 – 262-3008

Capacity	Serial No.	Date	Order No.
1,500,000 Lb.	4387	3-23-79	

Location

Prescon Corporation

San Antonio, Texas

Machine Reading Lb	Proving Ring Reading Lb.	Machine Error Lb.	Machine Error %	Remarks
100,000	99,850.00			
200,000	200,250.00			
400,000	400,510.00			
600,000	600,420.00			
800,000	800,180.00			
1,000.000	1,000,275.00			
1,250,000	1,250,340.00			
1,500,000	1,500,175.00			

Calibrated using Budd Indicator
S/N 1565 Vishay 21932
Budd REadings X30 Indicate
Ture Load In Lbs.

Gauge Factor Set At .15

Calibration
60K Resitor
Gives a reading of 38560
Black P1, Red S2
or 1,156,800 #

N.B.S. #213. 09/216746

BY FIELD REPRESENTATIVE W. M. Stroud

FORM 73

CALIBRATION CERTIFICATE

Loadcell No. PCL 78L57

February 22, 1978

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050

214 – 262-3008

Certificate of Verification

This is to certify that the following described testing machine has been calibrated by this company. The loading range shown below has been found to be within a tolerance of .5 %.

Machine LOAD CELL S/N 4387 INDICATOR
(Make & type of)
BUDD S/N 1585
(Serial No.)

Location PRESCON CORPORATION
SAN ANTONIO, TEXAS

Date of Verification Month 2 Day 22 Year 78

Machine Range	Loading Range
0-1,500,000	100,000-1,500,000

Method of Verification and pertinent data are in accordance with A.S.T.M. Specification E4-74 and TEXAS CALIBRATION. "Procedure for Calibrating Tension and Compression Testing Machines" dated 1-2-71.

Attest:

Name ______

Title ______

Company ______
(Company Representative)

TEXAS CALIBRATION

By A W Strand
Field Representative

FORM 71

TEXAS CALIBRATION

P. O. BOX 189, GRAND PRAIRIE, TEXAS 75050

214 – 262-3008

Capacity	Serial No.	Date	Order No.
1,500,000 Lb.	4387	2-22-78	

Location

PRESCON CORPORATION

SAN ANTONIO, TEXAS

Machine Reading Lb.	~~Proving Ring Reading~~ Lb. LOAD CELL	Machine Error Lb.	Machine Error %	Remarks
100,000	99,850.00			
200,000	200,250.00			
400,000	400,510.00			
600,000	600,420.00			
800,000	800,180.00			
1,000,000	1,000,275.00			
1,250,000	1,250,340.00			
1,500,000	1,500,175.00			

Calibrated using Budd Indicator

S/N 1565

Budd Readings X30 Indicate

True Load In Lbs.

Gauge Factor Set AT.15-

Calibration

60K Resistor

Gives a readign of 38560

Black P1, Red S2

or 1,156,800 #

N.B.S. #213.09/216746

BY FIELD REPRESENTATIVE [illegible signature]

DR. WM. B. D. PENNIMAN
1866-1938
DR. ARTHUR LEE BROWNE
1867-1933
EXECUTIVE STAFF
PHILIP M. AIDT
ALLEN W. THOMPSON
DANTE G. BERETTA
J. ADRIAN BUTT
DONALD W. SMITH

PENNIMAN & BROWNE, INC.

CHEMISTS-ENGINEERS-INSPECTORS
6252 FALLS ROAD
BALTIMORE, MARYLAND 21209

ESTABLISHED
1896
CABLE ADDRESS
"BALTEST"
TELEPHONE
825-4131
AREA CODE 301

ANALYTICAL DIVISION

REPORT OF ANALYSIS

Attn: Mr. B. C. Rudell April 3, 1979
P.O. 40586-MX

No. 790619

Sample of Tendon Greases

From Baltimore Gas & Electric Co.

Marked For Analysis

Sample Identification	Chlorides ppm	Nitrates ppm	Sulfides ppm	Water %	Neutralization No. MgKOH/g
64H 40-4	*0.1	0.40	*0.10	*0.1	0.087
31H 1-3	*0.1	0.82	*0.10	0.6	0.123
26H 4-2	*0.1	0.14	0.11	0.1	0.467
51H 45-2	*0.1	0.89	0.15	0.7	0.415
24H 55-4	*0.1	0.84	*0.10	0.1	0.188
62H 70-2	*0.1	0.57	*0.10	0.5	0.123
35H 4-5	0.1	0.56	*0.10	0.2	0.222
2D 21-L	*0.1	0.11	*0.10	0.1	0.197
2D 45-5	*0.1	0.77	0.20	0.1	0.067
31H 50-3	*0.1	0.19	*0.10	0.1	0.110
35H 65-3 (31H 65-3)	0.1	0.12	*0.10	*0.1	0.205
1D 40L (1040-1)	*0.1	0.14	*0.10	*0.1	0.210
3D 43-5 (2D43-5)	*0.1	0.30	*0.10	0.1	0.268
3D 14-5	*0.1	0.12	*0.10	*0.1	0.189
1D 24-5	*0.1	0.41	*0.10	0.3	0.303
45V14-B	*0.1	0.28	*0.10	0.4	0.416
61V1-T	*0.1	0.67	*0.10	0.4	0.138
34V8-B	*0.1	0.19	*0.10	0.7	0.221
56V28-T	0.1	0.61	0.15	0.3	0.519
42H37-2	*0.1	0.14	*0.10	0.2	0.345
12V31-B	*0.1	0.09	*0.10	0.1	0.043
23V9-B	*0.1	0.74	*0.10	1.2	0.117
31H2-1	*0.1	0.53	*0.10	1.9	0.265

*less than

Nitrates - ASTM D992; Chlorides - ASTM D-512; Sulfides - APHA; Waters ASTM D95; and Neutralization - ASTM D664.

PENNIMAN & BROWNE, INC.

Philip M. Aidt

spl

FORM 24-B L/B. INC.

(M-2374)-1B 16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 4-4-79

BY: Bernard C. Rudell

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL ☑ CONFERENCE ☐

WITH: Mr. Bernie Welch 921-2121

COMPANY: Pressure & Vacuum Measurments Div. NBS

SUBJECT: Tendon Stressing Ram Calibration Accuracy

NOTES: I described the procedure which was used to calibrate the stressing rams and the method used to determine the accuracy of the system relative to the calibrations by the NBS. Mr. Welch said that this approach was the method in which the NBS would use given such data. Taking the square-root of the sum of the squares of the rated accuracies of the equipment used to calibrate a system would result in the working accuracy of the system.

I told Mr. Welch that the dead weight tester had a rated accuracy of ± 1% and that the gauge calibration to this tester had a variation of ±0.5% (this was determined by taking the difference of the dead weight tester and the gauge being calibrated and dividing by the dead weight tester pressure reading). By combining the dead weight tester

COPIES TO:

11-5 Yr. Tendon Surveillance

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 4-4-79

BY: Bernard C. Rudell

PURCHASE ORDER NO.

REQN. NO.

SOR NO.

TELEPHONE CALL ☑ CONFERENCE ☐

WITH: Mr Welch, B.

COMPANY: Pressure & Vacuum Measurments Div. NBS

SUBJECT: Tendon Stressing Ram Calibration Accuracy

NOTES: (cont.)

and the gauge accuracies I obtained an accuracy of the gauge to the NBS of 1.118% of which Mr. Welch agreed. I explained that the load cell had an accuracy of ±0.5% to the NBS and that the gauge and load cell readings were plotted to get a calibration curve of the stressing ram. By combining the gauge and load cell accuracies using the square-root of the sum of the squares, the overall accuracy of the stressing ram system is 1.22%. Mr. Welch agreed with the method and the value obtained for the accuracy of the stressing ram system to the NBS system.

Bernard C Rudell 4/4/79

COPIES TO:

U1-5 Yr. Tendon Surveillance

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE 3/5/79

BY: Bernard C. Rudell

PURCHASE ORDER NO.

REQN. NO.

TELEPHONE CALL ☑ CONFERENCE ☐

SOR NO.

WITH: Mr. Keyser (301) 921-2401

COMPANY: Office of Measurements Services NBS

SUBJECT: Calibration Accuracy of Stressing Rams

NOTES: Described the calibration procedure of the Stressing Rams used for tendon surveillance. Discussed the square-root of the sum of the squares method that I used to determine the accuracy of ± 1.22% of the Stressing Ram system to the NBS system. Mr. Keyser said that the method I used is an acceptable and recognized method to the NBS. Mr. Keyser recommended that I talk to Mr. Welch. I told Mr. Keyser that I already had and he suggested I talk to Mr. Peterson.

Bernard C Rudell 4/5/79

COPIES TO:

U1-5 Yr Tendon Surveillance

(M-2374)-1B-16

BALTIMORE GAS & ELECTRIC COMPANY

TELEPHONE AND CONFERENCE MEMORANDUM

DATE: 4/5/79

BY: Bernard C. Rudell

PURCHASE ORDER NO.

REQN. NO.

TELEPHONE CALL ☑ CONFERENCE ☐

SOR NO.

WITH: Mr. Peterson (301) 921-2577

COMPANY: Force Measurements Division NBS

SUBJECT: Calibration Accuracy of Stressing Rams

NOTES: Described the method of which the rams were calibrated and the manner in which I reached an accuracy of ± 1.22% of the stressing Ram calibration curve to the NBS system. Mr. Peterson said that given the data I have he would have used the same method. He said that for this component he believed this accuracy to be a conservative estimate. He said he could not see how anyone could argue this method of determining these accuracies.

Bernard C Rudell 4/5/79

COPIES TO:

U1- 5 yr Tendon Surveillance

April 5, 1979

TO: Mr. D. T. Ward

FROM: B. C. Rudell

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit No. 1
Containment Structure Post - Tensioning System
Five - Year Surveillance

During the Unit No. 1 five-year tendon surveillance high average lift-offs were obtained on vertical and dome tendons. After review of all the data a comparison of average lift-offs for the five-year surveillance to the two previous surveillances revealed a 0.6 kip per wire bias above the values expected. At this point a poor initial calibration was suspected. It was decided to send the stressing equipment back to Prescon Corp. along with a witness to have the ram-gauge combinations recalibrated. Data from the recalibration collected on March 14, 1979, for the twelve inch stroke ram shows the initial data being incorrect as much as 2.8% high (20 kip higher at the 700 kip force reading). Data collected from the two eight inch stroke rams during recalibration was within the inaccuracies of the calibration (± 1.2%).

Three rams were used in the surveillance. The twelve inch stroke ram was first calibrated July 19, 1978. Two eight inch stroke rams were calibrated July 20, 1978. The twelve inch stroke ram was required on every dome and vertical tendon surveillance which explains the higher than expected averages for those groups of tendons when the initial calibration data was used. A comparison of the slopes of the various initial calibration data points taken using the twelve inch stroke ram shows that inaccurate zeroing of the strain gauge may be the cause of the poor initial calibration.

Determinations using the recalibration data for the twelve inch stroke ram shows the vertical tendon in the sample population previously suspected of having a high lift-off to be within our present and proposed specifications. Three tendons suspected of being reseated above our specification show, with the recalibration, to be reseated within Calvert Cliffs specifications.

There is no evidence of abnormal degradation of the containment structure. All tendons checked for lift-off force during this surveillance, using the recalibration data for the twelve inch stroke ram, have a lift-off force between 6760 (minimum) and 8700 (maximum) pounds per tendon wire. All tendon wires removed are free of corrosion and demonstrated to have a tensile strength greater than the guaranteed ultimate strength of the wire (240 Ksi.). No apparent changes have occurred in the visual appearance of the end anchorages. Chemical analysis of the sheathing filler shows concentrations of chlorides, nitrates, and sulfides to be less than ten parts per million. The sheathing filler contained less than ten percent water.

Bernard C Rusell

Surveillance Test Engineer
Electric Production Department

BCR/moj

cc: Messrs. L. B. Russell
R. F. Ash
R. C. L. Olson
D. W. Latham

April 10, 1979

To: Mr. B. C. Rudell

From: Mr. J. B. Lyon, II

Subject: Broken Tendon Wires (23V3)
Calvert Cliffs Unit No. 1

Two tendon wires which failed in service were sent to the Metallurgical Laboratory at Westport for evaluation. Both of the tendon wires failed by the same fracture mode, see Figure 1.

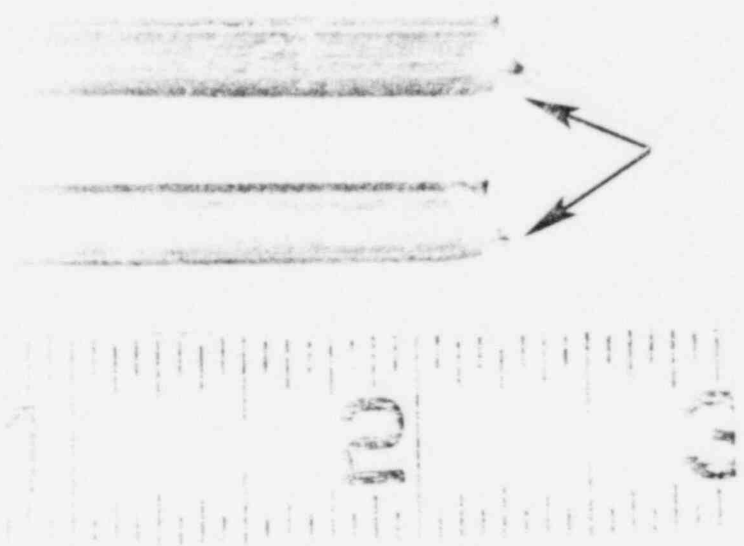


Figure 1 Failed Tendon Wires with 1/16" Deep Notch in 1/4" Wire

It is believed by Metallurgical Laboratory personnel that the notches which are seen on both failures are the stress risers which initiated the fractures. It appears that the tendon wires were pinched when they were clamped at a location 3-3/4 inches from the wires' ends. When the tendons were loaded after this pinching, they failed by what appears to be a tensile overload.

J. B. Lyon, II
Metallurgical Laboratory

Approved L. Erik Titland
L. Erik Titland
Principal Metallurgist

JBL/paw

BAI (81-262)

BALTIMORE GAS AND ELECTRIC COMPANY

TO Mr. J. Pence

FROM Bernie Rudell ext. 7938

SUBJECT Broken Tendon Wires DATE 2-22-79

MESSAGE

Inclosed is the broken sections of two tendon wires. The wires broke just beneath the stressing washers which are 3½" thick. The wires were under a tensile load of ~8.7 Kips when they failed sometime during the past five years. It is my belief that the wires were mashed during seating and failed at a latter date. Any information you can give concerning these breaks will be appreciated.

SIGNED B.C. Rudell

REPLY

Account Number 4973-5112

SIGNED DATE

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