GAI REPORT NO. 2512
JANUARY, 1984

ROBERT E. GINNA NUCLEAR POWER STATION
CONTAINMENT VESSEL TENDONS
1983 SURVEILLANCE
FINAL REPORT

PREPARED FOR:

ROCHESTER GAS AND ELECTRIC COMPANY

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PREFACE

The second tendon surveillance after tendon retensioning of the R. E. Ginna Nuclear Power Plant containment structure was performed during July and November of 1983. The report contained herein constitutes the final report for that surveillance.

1.0 INTRODUCTION

The 1983 surveillance of containment vessel tendons for the R. E. Ginna Nuclear Power Station was performed during July and November. This was the second surveillance performed after 123 of the tendons (out of a total of 160 tendons) had been retensioned in June 1980. A representative sample of 18 tendons was selected. The list of selected tendons, and the reasons for their selection, is included as Table 1. The procedure used for the surveillance is included in Appendix A.

During the surveillance it was found that the stressing rod coupler would not thread onto tendon #133, so tendon #76 was selected as a substitute. The reasons for its selection were the availability of an existing force prediction calculation and force-vs-time curve, and the fact that it is adjacent to tendon #75 which was damaged following its surveillance inspection.

2.0 TENDON FORCES

2.1 Lift Off Forces

The forces obtained from two calibrated measurement systems are reported in Appendix B. One system uses the gauge pressures of the stressing ram as input into the calibration equation.

$$\text{Force (kips)} = 0.896 + 0.1274 \times \text{Gauge Pressure(psig)}$$

This equation resulted from a linear regression fit of the force-gauge pressure data obtained during the calibration of the pressure gauge and stressing ram as one unit.

The second measurement system consists of the calibrated strain gaged stressing rod, which measures the force in the tendon directly. The calibration equation for this system is

Force (kips) = 0.2004 x Strain (micro-inches/inch)

The above equation was used during July 1983 prior to the accident involving tendon #75. That accident also damaged the stressing rod, requiring the fabrication and calibration of a new rod. The calibration formula for the new rod, used for all tendon testing performed in November 1983 is

Force (kips) = .1997 x Strain (micro-inches/inch)

The Data Sheets for each tendon (see Appendix C) indicate which constant was used for that tendon.

From the completed data records in Appendix C (Data Sheet 1), both measurement systems obtained tendon forces that were generally in good agreement at all increasing and decreasing pressure levels indicating that confirming force data was obtained. At lift off, the agreement in forces was excellent. The official tendon forces are considered to be the lift off values measured just prior to applying the 6% force increment and using the strain gaged stressing rod results. These forces are presented in column (1) of Table 2.

2.2 Average Tendon Force

From column (1) of Table 2, the average force for the 18 tendon sample is 709 kips. The sample includes four tendons (35, 36, 116 and 120) that were retensioned in May of 1969, as part of a 23 tendon group. These tendons were not retensioned in June 1980 with the remaining 137 tendons in the containment. As expected, the lift off forces for 35, 36, 116 and 120 were lower than the

remaining sample tendons. Therefore, to make use of the forces from the 18 sample tendons in order to obtain the expected average tendon force for all 160 tendons in the containment, a weighted average should be constructed. This was done, resulting in the expected average tendon force of 713 kips reported in Table 2.

The formula for calculating the weighted average is:

$$\text{Weighted Ave.} = \frac{137\ (F_1\text{ave}) + 23\ (F_2\text{ave})}{160}$$

where: F_1ave = average force of 14 tendons from June 1980 retensioning

F_2ave = average force of 4 tendons from May 1969 retensioning

160 = total tendons in Ginna containment structure

Following surveillance inspection of tendon #75, an accident occurred causing shims to be dislodged and some tendon wires to be broken. The tendon was repaired by, first, detensioning, removing the broken wires, and then retensioning. The result of the repair is that tendon #75 was restored with a tendon force of 531 kips. An additional weighted average of 711 kips has been provided in Table 2 to reflect the "as left" force in tendon #75.

The formula for calculating this additional weighted average is:

$$\text{Weighted Ave.} = \frac{136\ (F_1\text{ave}) + 23\ (F_2\text{ave}) + F_{75}}{160}$$

where: F_1ave = average force of 13 tendons from June 1980 retensioning

F_2ave = average force of 4 tendons from May 1969 retensioning

F_{75} = force in tendon #75 after repair

160 = total number of tendons

2.3 Acceptance Criteria

In the Ginna Technical Specification, Section 4.4.4.2 provides the acceptance criterion for the lift off forces. The criterion requires that the average stress of the sample tendons not be less than 144,000 psi, which is equivalent to 636 kips. The 636 kip value represents the minimum required average tendon force for the tendons. Actually, considering that in this surveillance (or possibly any surveillance) the tendon sample includes tendons that were not retensioned in June 1980, the weighted average of the sample forces (rather than the absolute average) should be compared to the 636 kip requirement. The "as-found" weighted average of 713 kips exceeds the minimum requirement of 636 kips by 12.1%. The "as-left" (after Tendon #75 repair) weighted average of 711 kips exceeds the minimum requirement by 11.8%.

2.4 Comparison with Predicted Forces

In order to determine if the tendons are experiencing an abnormal rate of force loss with time, the measured lift off force for each sample tendon is compared with the force predicted for the tendon. The predicted forces were provided to RG&E prior to the start of the surveillance in References 1 and 2. This information included force-versus-time history curves for all sample tendons involved in the surveillance, along with a table containing the forces from these curves which apply for this specific surveillance. These predicted forces are shown in column (2) and column (3) of Table 2. Also, for each of the 18 surveillance tendons, the force-versus-time history curve that was included in References 1 and 2 are provided herein in Appendix D.

Two sets of predicted forces are presented, which are denoted as ESR WITH RT and 16% RELAX. WITH RT. The difference in the two sets of forces is due to different stress relaxation properties used for the tendon wires. These properties result from the

evaluation of the stress relaxation testing performed at Lehigh University. The method for establishing the stress relaxation values is summarized below. A detailed report on this work has been issued (3).

In one case, the individual Effective Stress Relaxation (ESR) values of the tendons determined from the June 1980 lift off tests were used. These are the values of stress relaxation which individual tendons had to exhibit in order for the predicted and measured forces to be equal in June 1980, after deducting other known losses. The ESR values were then reduced by the factors developed from the Lehigh restressed wire tests to take into account the fact that the tendons were retensioned in June 1980. These factors significantly reduce the ESR values and, consequently, result in higher values of predicted tendon force. This effect can be seen from the figures in Appendix D where, for information, curves noted as ESR WITHOUT RT have been included in some figures. These curves are comparable with the curves marked ESR WITH RT, the only difference being whether the retensioning effect on stress relaxation has been included.

In the second case, a stress relaxation curve developed from the Lehigh tests on both the unrestressed and the restressed wires was used. The basis for this curve is the following. From the test results of the sample wires (prior to restressing) for Tendon 76 (heat #30091) and Tendon 51 (heat #19477), 90° F stress relaxation curves were constructed by linear interpolation between the 68° F and 104° F test curves. The 90° F temperature was selected as an average value for the 85° F to 95° F range which the tendons are expected to have experienced during most of their existence in the containment. This resulted in one curve for heat #30091, with a 16.7% stress relaxation value at 100,000 hours, and one curve for heat #19477, with a 14.2% stress relaxation value at 100,000 hours. The time of 100,000 hours was selected since the June 1980 lift off tests occurred at approximately 100,000 after

original tensioning in 1969. In these tests, the average ESR value was approximately 15% for each of the three heats tested. Therefore, since this value was within the 14.2% and 16.7% values described above, 15% at 100,000 hours was selected to establish the one stress relaxation curve to be used for all the tendons for future force predictions. This curve was determined by scaling the 16.7% curve for heat #30091 to 15% at 100,000 hours. The 16.7% curve was selected over the 14.2% curve to establish the shape of the 15% curve because the 16.7% curve was based on longer-time data; consequently, its shape was established more accurately out to 40 years. The resulting curve with 15% at 100,000 hours exhibits a 40 year relaxation of 15.9%; therefore, it is referred to as the 16% RELAXATION case in Table 2 and in the figures in Appendix D. Finally, the same factors discussed above to account for the retensioning effect (to reduce relaxation) were applied to the 16% curve, and this is noted as 16% RELAX. WITH RT in the table and figures.

The two relaxation cases described above were in effect for the July 1983 surveillance as part of the task to determine if one curve, namely 16% RELAX. WITH RT, could be used for all the tendons to predict forces which would be in reasonable agreement with those measured.

The measured lift off forces appearing in column (1) of Table 2 are also indicated on the curves in Appendix D by a circled dot. A comparison of the lift off forces with the two predicted curves, denoted as (1) and (2), generally shows good agreement. The actual percent differences for the surveillance tendons are shown in columns (4) and (5) of Table 2. From these results, the forces for 9 of the 18 tendons exceed the predicted values. For all but one of the remaining 9 tendons, the amounts by which the measured forces are less than predicted are small and well within the 5% tolerance allowed, indicating that no abnormal force losses have occurred. The one exception is tendon #125 which is 5.3% below

the prediction based on Effective Stress Relaxation. However, a review of the force prediction calculations indicated that the Effective Stress Relaxation for this tendon was much lower than for other tendons, resulting in a high predicted force using this method. Consequently, the force prediction for tendon #125 based on 16% RELAX. is believed to be more realistic, and the measured force is only 2.0% below this value. Considering all the tendons involved in the surveillance, a comparison of the results between column (4) and column (5) indicates that the 16% RELAXATION case generally agrees better with the measured forces than does the ESR case. Therefore, there appears to be sufficient justification to restrict future surveillance tendon force predictions to the case of 16% relaxation, accounting for the retensioning effect.

2.5 Future Need for Tendon Retensioning

In order to determine the need for future tendon retensioning, it is necessary to compare the stress relaxation experienced at the 1983 surveillance with that predicted in Figure 5 of Reference 3. This comparison has been done for the tendons retensioned in May 1969 where the 11% actual stress relaxation compares favorably with the 11.2% stress relaxation read from the 1000 hour curve in Figure 5 at 124,000 hours. For the tendons retensioned in June 1980, the 5.4% actual stress relaxation also compares favorably with the 6.2% stress relaxation read from the 11 year curve in Figure 5 at 27,000 hours.

From the 1000 hour curve in Figure 5 of Reference 3, the average stress relaxation for the group of 23 tendons which were retensioned in May 1969 (1000 hours after original tensioning) is 12.7% at 350,000 hours (estimated plant life of 40 years). Applying this relaxation percentage loss to the average tendon force of 758^{k} for these 23 tendons at retensioning produces an estimated average tendon force of 662^{k} at the assumed plant life of 40 years.

The average stress relaxation for the group of 137 tendons retensioned in June 1980 can be read from the 11 year curve in Figure 5 (above) as 10.3% at 253,000 hours (approx. 29 years after retensioning). The average tendon force for this group at retensioning was 760^k. Applying the stress relaxation percentage loss to the average retensioning force produces an estimated average tendon force of 682^k at the 40 year plant life.

In order to account for Tendon #75, which was restored to a tendon force of 531^k following the accident mentioned in Section 2.2, a value for stress relaxation of 10% has been read from the 11 year curve in Figure 5 at 233,000 hours (approx. 25.5 years after retensioning). The effect of this stress relaxation would be to reduce the estimated tendon force for this tendon to 478^k at the 40 year plant life.

In order to compare the above tendon forces with the design requirements, a weighted average tendon force at the anticipated plant life of 40 years has been constructed as follows:

$$\text{Ave. tendon force @ 40 years} = \frac{23(662) + 136(682) + 478}{160} = 678^k$$

The Ginna Technical Specification, Section 4.4.4.2 requires that the average stress in the containment vessel tendons be not less than 144,000 psi, which equates to an average tendon force of 636^k.

Since the predicted average tendon force of 678^k at 40 year plant life exceeds the required minimum average tendon force of 636^k by 42^k (6.6%) it can be concluded that no additional tendon retensioning will be required for the remainder of the life of the plant.

3.0 CONCLUSIONS

The results of the completed tendon surveillance, in which 18 sample tendons have been lift off tested, indicate that the forces in the tendons are being maintained at the levels expected, and no abnormal force losses have occurred. In fact, the agreement between the actual and predicted tendon forces is better than that which is generally experienced on other containments.

Based on the forces measured in the sample tendons, the average force level of the tendons in the containment is 711 kips, and this exceeds the minimum required value of 636 kips appearing in the Ginna Technical Specification by 11.8%.

Based on the results of this surveillance, it is recommended for future surveillances that the predicted tendon force calculations be based on a 40 year wire relaxation of 16%, applicable to all tendons, and multiplied by factors to account for the retensioning effect. The information necessary to implement this recommendation is in Reference 3.

From the results of this surveillance and a comparison of actual stress relaxation with that predicted, no future retensioning of tendons should be required for the remainder of the expected plant life.

4.0 REFERENCES

1. Letter: J. F. Fulton (G/C) to C. A. Forbes (RG&E), dated July 18, 1983. (13N1-GR-T4289)

2. Letter: J. F. Fulton (G/C) to C. A. Forbes (RG&E), dated July 20, 1983. (13N1-GR-T4295)

3. GAI Report No. 2499, "Stress Relaxation Properties of Retensioned Wires", December, 1983.

GINNA

TENDONS FOR 1983 SURVEILLANCE

Tendon #	Heat #	Reason for Selection
From July 1981 Surveillance		
13	19477 (51)	Load Cell
36	10355 (150) 39377	Retensioned at 1000 hours (Largest Percent Loss)
51	19477 (51)	Third Largest Percent Loss
53	19477 (51)	Load Cell
62	21504	Second Largest Percent Loss
93	39377	Load Cell
116	Unspecified	Retensioned at 1000 hours (Smallest Percent Loss)
125	30091 (76)	Largest Percent Loss
133	39377	Load Cell
155	19477 (51)	Smallest Percent Loss
Remaining Tendons		
18	30091 (76)	Largest ESR from this heat
35	10355 (150)	Retensioned at 1000 hours
40	30091 (76)	Arbitrary from Heat 30091
60	21504	Arbitrary from Heat 21504
75	30091 (76)	16% ESR from this heat
120	Unspecified	Retensioned at 1000 hours
128	30091 (76)	Smallest ESR from this heat
160	19477 (51)	Arbitrary from Heat 19477

ESR = Effective Stress Relaxation as of June 1980 (prior to retensioning)
( ) = Tendon # of wire for relaxation tests

Summary by Heat #:

5 tendons from 19477 (51)
5 tendons from 30091 (76)
2 tendons from 10355 (150)
2 tendons from 21504
2 tendons from 39377
2 tendons from unspecified heat

TABLE 1 TENDON SELECTION FOR 1983 SURVEILLANCE

Gilbert/Commonwealth

TENDON NO.	LIFT OFF FORCES (KIPS) MEASURED	PREDICTED ESR WITH RT	PREDICTED 16% RELAX. WITH RT	MEAS-PRED / PRED (%) ESR WITH RT	MEAS-PRED / PRED (%) 16% RELAX. WITH RT
	(1)	(2)	(3)	(4)	(5)
13	730	693	711	5.3	2.7
18	727	703	721	3.4	0.8
35*	662	661	650	0.2	1.8
36*	664	686	661	-3.2	0.5
40	731	714	711	2.4	2.8
51	709	718	712	-1.3	-0.4
53	731	697	711	4.8	2.8
60	711	712	707	-0.1	0.6
62	715	723	720	-1.1	-0.7
75	723	705	709	2.5	2.0
76	700	695	704	0.7	-0.6
93	706	702	711	0.6	-0.7
116*	693	660	656	5.0	5.6
120*	680	693	661	-1.9	2.9
125	702	741	716	-5.3	-2.0
128	709	716	703	-1.0	0.9
155	745	709	703	5.1	6.0
160	721	711	709	1.4	1.7
Ave.	709	702	699	2.5(3)	2.0(3)
Wt. Ave.(1)	713				
Wt. Ave.(2)	711				

*Retensioned in May 1969
(1) Weighted average using inspection value of 723K for Tendon #75.
(2) Weighted average using value of 531K for Tendon #75 as repaired.
(3) Average of the absolute values.

TABLE 2 MEASURED AND PREDICTED TENDON FORCES

APPENDIX A

TENDON SURVEILLANCE PROGRAM

GINNA STATI
UNIT #1
COMPLETE

DATE :-

TIME :-

ROCHESTER GAS AND ELECTRIC CORPORATION

GINNA STATION

CONTROLLED COPY NUMBER 4

"MASTER COPY"

PROCEDURE NO. PT-27.2 REV. NO. 4

TENDON SURVEILLANCE PROGRAM FOLLOWING RE-TENSIONING

TECHNICAL REVIEW

PORC REVIEW DATE 9-14-83

QC REVIEW

PLANT SUPERINTENDENT

SEP 19 1983
EFFECTIVE DATE

QA X NON-QA _____ CATEGORY 1.0

REVIEWED BY: _____

THIS PROCEDURE CONTAINS 10 PAGES

PT-27.2

TENDON SURVEILLANCE PROGRAM FOLLOWING RE-TENSIONING

1.0 PURPOSE:

1.1 To provide the instructions necessary to perform a tendon lift-off surveillance after the re-tensioning program has been completed to verify that the tendon forces are within Technical Specification limits.

1.2 To obtain data needed to continue the investigation into the larger than predicted tendon losses.

2.0 TEST REQUIREMENTS:

2.1 To measure lift-off forces in eighteen (18) selected tendons including the four (4) tendons with load cells.

2.2 To compare lift-off forces with those predicted by applying factors developed from the retensioned wire tests at Lehigh University, to retensioned wire stress relaxation property curves.

2.3 To compare the two force measuring systems:

2.3.1 Strain gaged stressing rod.

2.3.2 Pressure gauge and effective ram area.

2.4 To test the 6% overstress effect.

2.5 ACCEPTANCE CRITERIA:

2.5.1 The measured lift-off force of each tendon will be evaluated in accordance with the present "Ginna Technical Specifications".

2.5.2 Any tendon having a lift-off force less than 0.6 GUTS (636 kips) will be considered not acceptable.

2.5.3 Tendons on each side of all unacceptable tendons will be surveyed according to the procedures of 2.5.4 and 2.5.5. They shall be sequenced next after the unacceptable tendon with the lowest numbered tendon being first.

2.5.4 If both adjacent tendons have lift off forces greater than 0.6 GUTS (636 kips) and the average is greater than 636 kips, the group will be considered as meeting the specifications (comments will be included in the surveillance report on this tendon).

2.5.5 If only one adjacent tendon has a lift off force greater than Ø.6 GUTS (636 kips) but the average of all three is greater than 636 kips the group will be considered as meeting the specifications.

2.5.6 If both adjacent tendons have lift off forces less than Ø.6 GUTS (636 kips) or either average in 2.5.4 or 2.5.5 is less than 636 kips, the group will be considered to not meet the specifications.

2.5.7 All tendons evaluated as unacceptable will be retensioned to Ø.7 GUTS at the end of the surveillance.

2.6 The tendon selection process will:

2.6.1 Verify that tendon force losses have stabilized.

2.6.2 Survey enough tendons to extend present data base.

2.6.3 Include all four tendons with load cells.

2.6.4 Include four (4) tendons retensioned at 1ØØØ hours after initial stressing, two (2) from the July 1981 Surveillance and two (2) additional tendons.

2.6.5 Include ten (1Ø) tendons from the July 1981 Surveillance and two (2) additional tendons.

2.6.6 Include eight (8) tendons that were not tested during the July 1981 Surveillance, which are from representative wire heats and had displayed a wide range of percent force loss at the June 198Ø Retensioning Program.

3.Ø <u>REFERENCES</u>:

3.1 Gilbert Associates Inc. (GAI) June, 1981 Tendon Surveillance Program (Rev. 1).

3.2 Ginna Technical Specifications - Section 4.4.4.

4.Ø <u>INITIAL CONDITIONS</u>:

4.1 Plant may be in any phase of operation. C.A.F.

4.2 Pressure gauges have been calibrated. C.A.F.

4.3 Hydraulic ram area has been calculated. C.A.F.

4.4 Hydraulic pump and ram are functional and ready for operation. C.a.F.

4.5 Stressing rod and strain indicator have been calibrated. C.a.F.

4.6 Load cells have been calibrated. C.a.F.

4.7 All tendons to be stressed will be inspected for broken wires and corrosion prior to lift off. C.a.F.

4.8 Containment structure has been inspected for cracks, spalling, etc. C.a.F.

4.9 Test personnel have been qualified in accordance with A-1102. C.a.F.

4.10 Notify QC for assignment of inspection personnel. C.a.F.

4.11 Test personnel shall be present during all phases of tendon surveillance and related set-up/take-down activities. C.a.F.

5.0 PRECAUTIONS:

5.1 Observe all RG&E safety rules and regulations.

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

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

5.4 Do not extend ram more than 8 inches.

6.0 INSTRUCTIONS:

NOTE: The tendon surveillance sequence is presented in attached Table 2.

6.1 Fill in line 1-4 on the data sheet (sample attached) and record comments from the visual inspection on line 5.

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

6.2.1 Carefully thread stressing adaptor onto tendon anchor head.

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

6.2.2 Place jack assembly on tendon base plate.

6.2.3 Center jack chair carefully over tendon head and thread stressing rod into stressing adaptor ensuring full engagement.

NOTE: Leave a maximum of thread on stressing rod exposed above the top edge of the stressing adaptor.

6.2.4 Inspect for approximately equal circumferential clearance between stressing rod and jack assembly.

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

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

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

6.4.1 Set valves to pump position. Discharge Valve "OPEN". Vent Valve "OPEN".

6.4.2 Start pump and Gauge Valve "OPEN" at the same time depress the ball valve.

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

6.4.4 Release ball valve and start pumping again. Continue pumping; hose will become stiff; gauge pressure will rise rapidly to approximately 2000 psig and then hold constant.

6.5 Reduce pressure to "0" psig and connect hoses to jack, suction hose to top of ram and discharge hose to bottom of ram.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6.10.5 Calculate and record force values.

6.11 Stress each tendon an additional 6% over recorded lift-off pressure.

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

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

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

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

6.11.5 Calculate and record force values on data sheet.

6.11.6 Ensure permanently installed shims are properly aligned under tendon head as pressure is reduced.

6.12 Decrease pressure to approximately 4,000 psi.

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

6.12.2 Calculate and record force values on data sheet.

6.13 Decrease pressure to approximately 2,000 psi.

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

6.13.2 Calculate and record force values on the data sheet.

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

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

6.14.2 Re-check alignment of permanently installed shims. If shims need adjustment, re-perform liftoff, as determined in step 6.11.5, or until shims can be moved easily by hand, then repeat steps 6.12 through 6.14.2.

NOTE: Do not exceed 6560 PSI.

6.15 Remove jack assembly from tendon.

6.15.1 Disconnect strain gage equipment.

6.15.2 Unthread stressing rod from coupler.

6.15.3 Remove jack chair and stressing rod assembly.

6.15.4 Remove adapter from tendon head.

6.16 Record any comments concerning lift-off on the data sheet.

6.17 Move to next tendon.

COMPLETED BY: Clyde Faber

DATE COMPLETED: 11-21-83

SHIFT SUPERVISOR: _____

RESULTS & TEST REVIEW: _____ DATE _____

ATTACHMENT 1

INDIVIDUAL LOAD CELL FACTORS

#13) Force = 722.4 - Ø.15137 (/\ Load Cell Reading)

#53) Force = 51.6 - Ø.1561 (Load Cell Reading)

#93) Force = 4Ø.6 - Ø.1495 (Load Cell Reading)

#133) Force = 2Ø.9 - Ø.1413 (Load Cell Reading)

TABLE 1

TENDON SELECTION

Tendon #	Heat #	Reason for Selection
From July 1981 Surveillance		
13	19477 (51)	Load Cell
36	10355, 39377 (150)	Retensioned at 1000 hours — (Largest Percent Loss)
51	19477 (51)	Third Largest Percent Loss
53	19477 (51)	Load Cell
62	21504	Second Largest Percent Loss
93	39377	Load Cell
116	Unspecified	Retensioned at 1000 hours — (Smallest Percent Loss)
125	30091 (76)	Largest Percent Loss
133	39377	Load Cell
155	19477 (51)	Smallest Percent Loss
Remaining Tendons		
18	30091 (76)	Largest ESR from this heat
128	30091 (76)	Smallest ESR from this heat
75	30091 (76)	16% ESR from this heat
35	10355 (150)	Retensioned at 1000 hours —
120	Unspecified	Retensioned at 1000 hours —
40	30091 (76)	Arbitrary from Heat 30091
60	21504	Arbitrary from Heat 21504
160	19477 (51)	Arbitrary from Heat 19477

ESR = Effective Stress Relaxation as of June 1980 (prior to retensioning)

( ) = Tendon # of wire for relaxation tests

TABLE 2

TENDON SURVEILLANCE SEQUENCE

Sequence Number	Tendon Number
1	155
2	160
3	13*
4	18
5	35
6	36
7	40
8	51
9	53*
10	60
11	62
12	75
13	93*
14	116
15	120
16	125
17	128
18	133*

*Load Cell Tendon

APPENDIX B

EQUIPMENT CALIBRATION

1983 Tendon Surveillance
(Ginna Station)

Linear Regression Calibration Equations

Tension Rod

Force (Kips) = 0.2004 x Strain

Stressing Ram

Force (Kips) = 0.896 + 0.1274 x Gage Pressure

Load Cells

No. 13: Force (Kips) = 4.94 + 0.15125 x Strain

No. 53: Force (Kips) = -1.95 + 0.1525 x Strain

No. 93: Force (Kips) = 3.12 + 0.15105 x Strain

No. 133: Force (Kips) = 3.42 + 0.15155 x Strain

FRITZ ENGINEERING LABORATORY

Lehigh University

File 200.83.783.1

Sheet 1 of 1

Subject Calibration of Tension Link Load Cell

Date 7/12/83

Party C.H.
R.S.

Rochester Gas & Electric Corporation
89 East Avenue
Rochester, NY 14644

Attn: C. B. Forbes P.O. 352-44

Approved Roger D. Slutter
Director-Operations

Indicator # 035074
Switch Box # 034917 (connected)
Gage Factor = 2.00
Shield Connected to Ground on Indicator

Load (kips)	First Run (μ")	Second Run (μ")	Average Run (μ")
0	0	0	0
50	+ 248	+ 244	+ 246
100	+ 494	+ 495	+ 495
150	+ 746	+ 746	+ 746
200	+ 994	+ 994	+ 994
250	+ 1246	+ 1242	+ 1244
300	+ 1492	+ 1492	+ 1492
350	+ 1748	+ 1744	+ 1746
400	+ 1990	+ 1990	+ 1990
450	+ 2242	+ 2238	+ 2240
500	+ 2490	+ 2488	+ 2489
550	+ 2746	+ 2746	+ 2746
600	+ 2988	+ 2990	+ 2989
650	+ 3238	+ 3244	+ 3241
700	+ 3490	+ 3490	+ 3490
750	+ 3738	+ 3741	+ 3740
400	+ 2000	+ 1998	+ 1999
0	0	0	0

CERTIFICATE of CALIBRATION

INSTRUMENT VISHAY P-350A STRAIN INDICATOR DATE 7/6/83

SERIAL NUMBER 035074 DUE 7/5/84

STANDARD USED BLH 1.25 INITIALS SDT

As-Is Calibration		Corrective Action Calibration	
Standard	Inst. Output	Standard mV/V	Inst. Output uin/in
		0	0
		.2	+398
		.4	+800
		.6	+1196
		.8	+1597
		1.0	+1995
		1.2	+2396
		1.4	+2795
		1.6	+3197
		1.8	+3599
		2.0	+4000
		0	0

Calibration Procedure Used: STANDARD 10 POINT LAB CALIBRATION

REMARKS: - VISHAY P-350A CALIBRATED THROUGH VISHAY SWITCH AND BALANCE UNIT MODEL SB-2 S/N 034917

- THE AS FOUND CALIBRATION WAS APPROXIMATELY 1/2 % LOWER THAN TRUE READING

REFERENCES:

1200 BLH Model Manual Pages 5-15 to 5-16, Paragraph 5-65, Subparagraphs 1 to 43.
P-350A Instruction Manual, Pages 3-6.
Section 2.0 SPECIFICATIONS, Paragraphs 2.1 to 2.16.
Operating and Service Manual - 625 Precision Calibrator, Page 3-1, Section III, Paragraphs 3-1 through 3-20.

Jerome F. Wallace

ROCHESTER GAS AND ELECTRIC CORPORATION

42.13

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 13

SYSTEM CALIBRATION (STRESSING RAM)

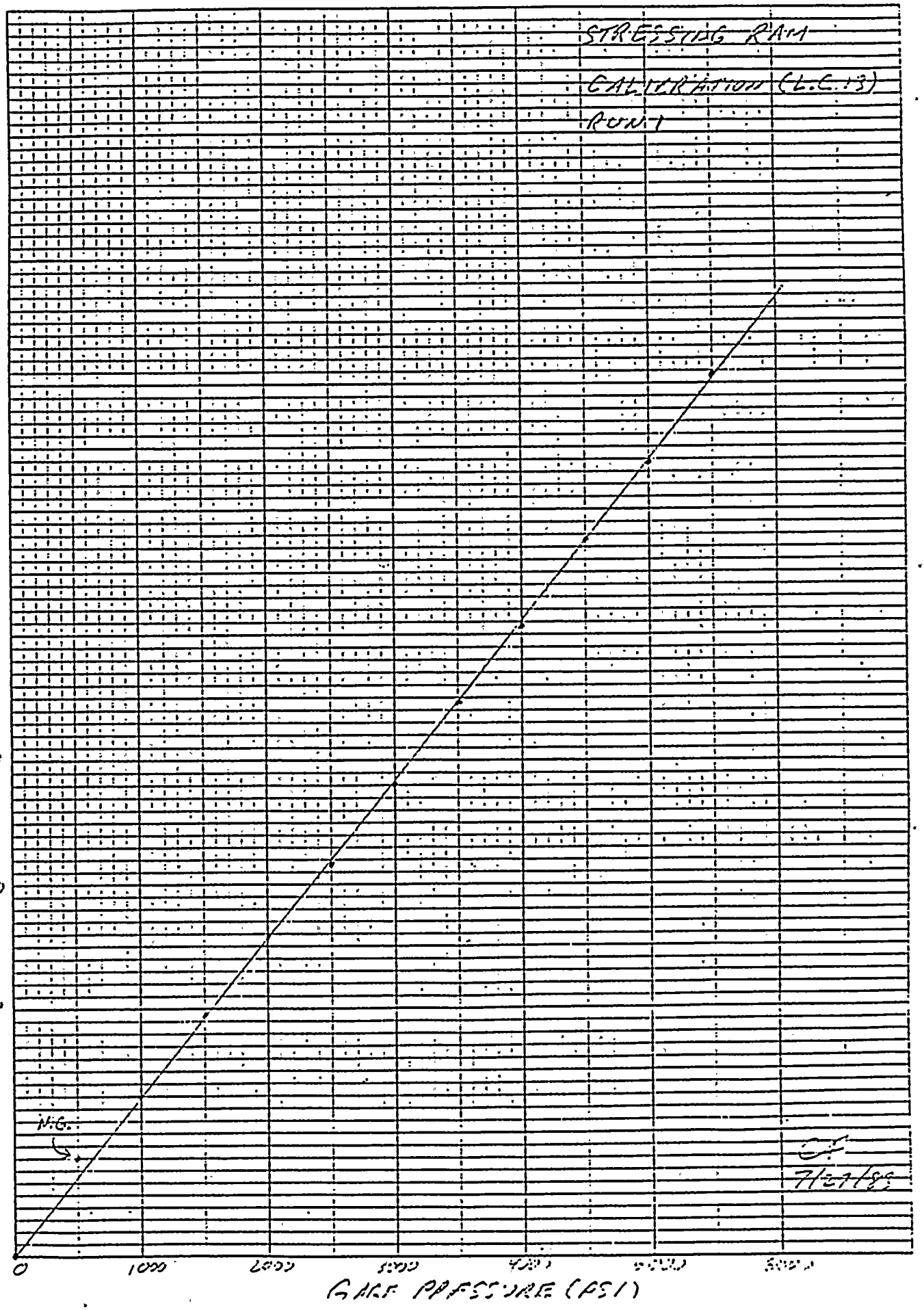
GAGE PRESS (PSI)	LOAD CELL Strain (μin/in)	Tension Rod Strain (μin/in)	Force (Kips)	Calc Force Lin Regr (Kips)	% Δ (Calc-Meas)/Meas
(X)			RUN 1 (Y)		
0			0	0.7	—
500			80.4 X	—	—
1000			130.9	128.3	-1.9
1500			194.6	192.1	-1.3
2000			258.5	255.9	-1.0
2500			315.4	319.7	1.4
3000			380.8	383.5	0.7
3500			446.9	447.3	0.1
4000			506.2	511.1	0.9
4500			576.9	574.9	-0.3
5000			638.3	638.7	0.1
5500			706.6	702.5	-0.6

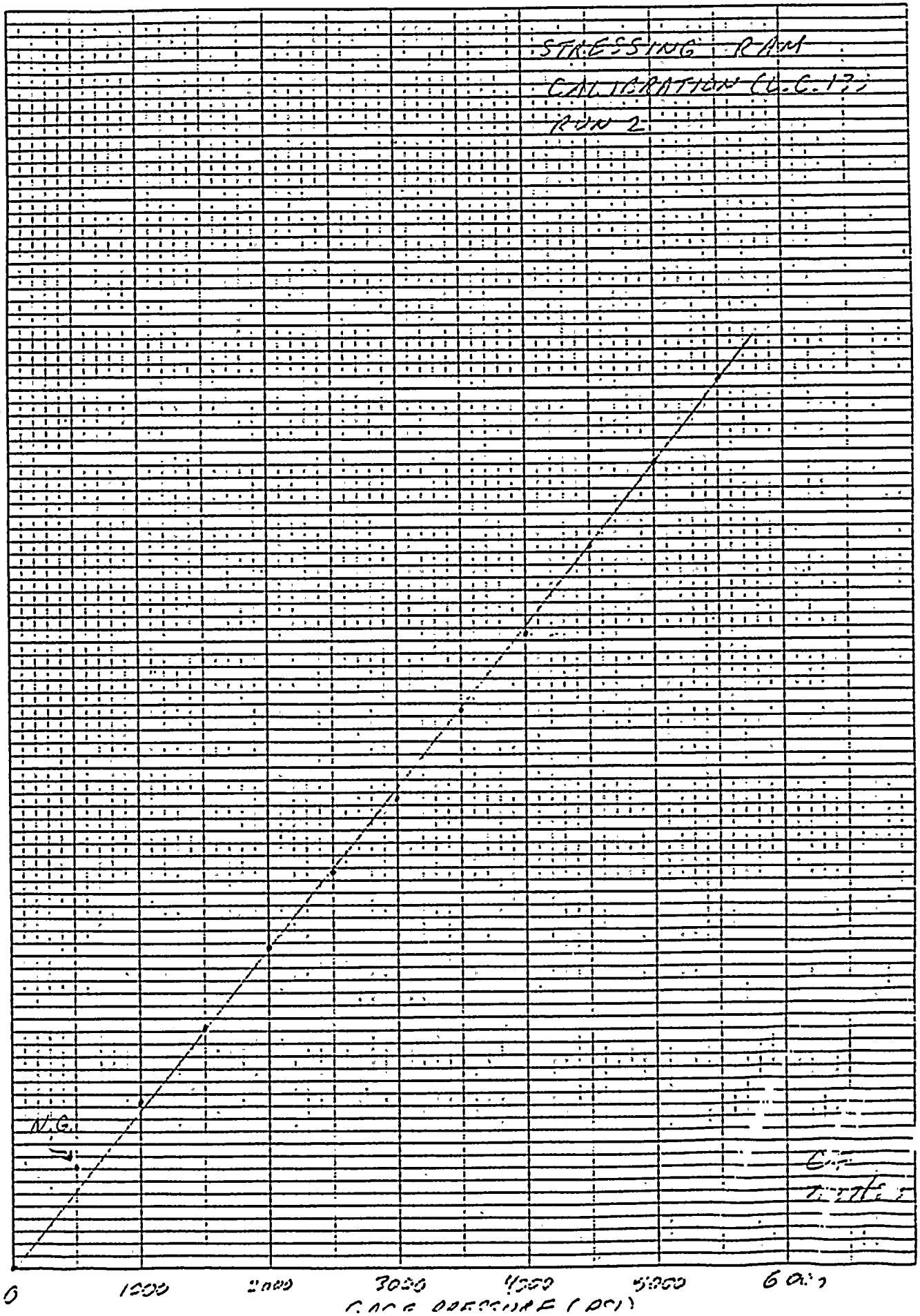
[Y = 0.729 + 0.1276 X]

(X)			RUN 2 (Y)		
0			0	1.1	—
500			81.8 X	—	—
1000			133.9	128.4	-4.1
1500			193.2	192.0	-0.6
2000			252.1	255.7	-0.9
2500			318.2	319.3	0.3
3000			374.9	382.9	2.1
3500			444.9	446.6	0.4
4000			505.4	510.3	0.9
4500			574.9	573.9	-0.2
5000			639.5	637.6	-0.3
5500			706.0	701.2	-0.7

[Y = 1.062 + 0.1273 X]

AVG. [Y = 0.896 + 0.1274X]


STRESSING RAM
CALIBRATION (L.C. 13)
RUN 1
ROD FORCE (KIPS)
300
700
400
200
100
0
1000
GAGE PRESSURE (PSI)
N.G.
46 0782
10 X 10 TO THE INCH • 2 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.


STRESSING RAM
CALIBRATION C.C.I.T.
ROD 2
800
700
600
500
400
300
200
100
0
ROD FORCE (KIPS)
0
1000
3000
5000
N.G.
10 X 10 TO THE INCH • 2 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

ROCHESTER GAS AND ELECTRIC CORPORATION

42.13

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 13

SYSTEM CALIBRATION (LOAD CELL No. 13)

GAGE PRESS (PSI)	Load Cell Strain (μin/in) Reading	Load Cell Strain (μin/in) Actual	Tension Rod Strain (μin/in) Reading	Tension Rod Strain (μin/in) Actual	Tension Rod Force (Kips) (.2004 x STRAIN)
RUN 1					
0	-4936	0	0	SAME	0
500	-4420	516	401		80.4
1000	-4103	833	653		130.9
1500	-3682	1254	971		194.6
2000	-3270	1666	1290		258.5
2500	-2896	2040	1574		315.4
3000	-2477	2459	1900		380.8
3500	-2031	2905	2230		446.9
4000	-1643	3293	2526		506.2
4500	-1158	3778	2879		576.9
5000	-740	4196	3185		638.3
5500	-247	4689	3526		706.6
RUN 2					
0	-4930	0	0	SAME	0
500	-4410	520	408		81.8
1000	-4076	854	668		133.9
1500	-3692	1238	964		193.2
2000	-3264	1666	1288		258.1
2500	-2876	2054	1588		318.2
3000	-2508	2422	1871		374.9
3500	-2050	2880	2220		444.9
4000	-1646	3284	2522		505.4
4500	-1178	3752	2869		574.9
5000	-724	4206	3191		639.5
5500	-238	4692	3523		706.0

ZERO BALANCE: Rod - 92 μin/in

FINAL ZERO:
PULL ROD: 0
LOAD CELL -4928 μin/in

ROCHESTER GAS AND ELECTRIC CORPORATION

42-33

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 13

SYSTEM CALIBRATION (LOAD CELL No. 13)

GAGE PRESS (PSI)	LOAD CELL Strain (μin/in)	Tension Rod Strain (μin/in)	Force (Kips)	Calc Force Lin Regr (Kips)	% Δ (Calc-Meas)/Meas
	(X)	RUN 1	(Y)°		
0	0	0	0	4.7	—
500	516	401	80.4	82.8	2.9
1000	833	653	130.9	130.7	-0.2
1500	1254	971	194.6	194.4	-0.1
2000	1666	1290	258.5	256.8	-0.7
2500	2040	1574	315.4	313.3	-0.7
3000	2459	1900	380.8	376.7	-1.1
3500	2905	2270	446.9	444.2	-0.6
4000	3293	2576	506.2	502.9	-0.7
4500	3778	2879	576.9	576.3	-0.1
5000	4196	3185	638.3	639.5	0.2
5500	4689	3526	706.6	714.1	1.1

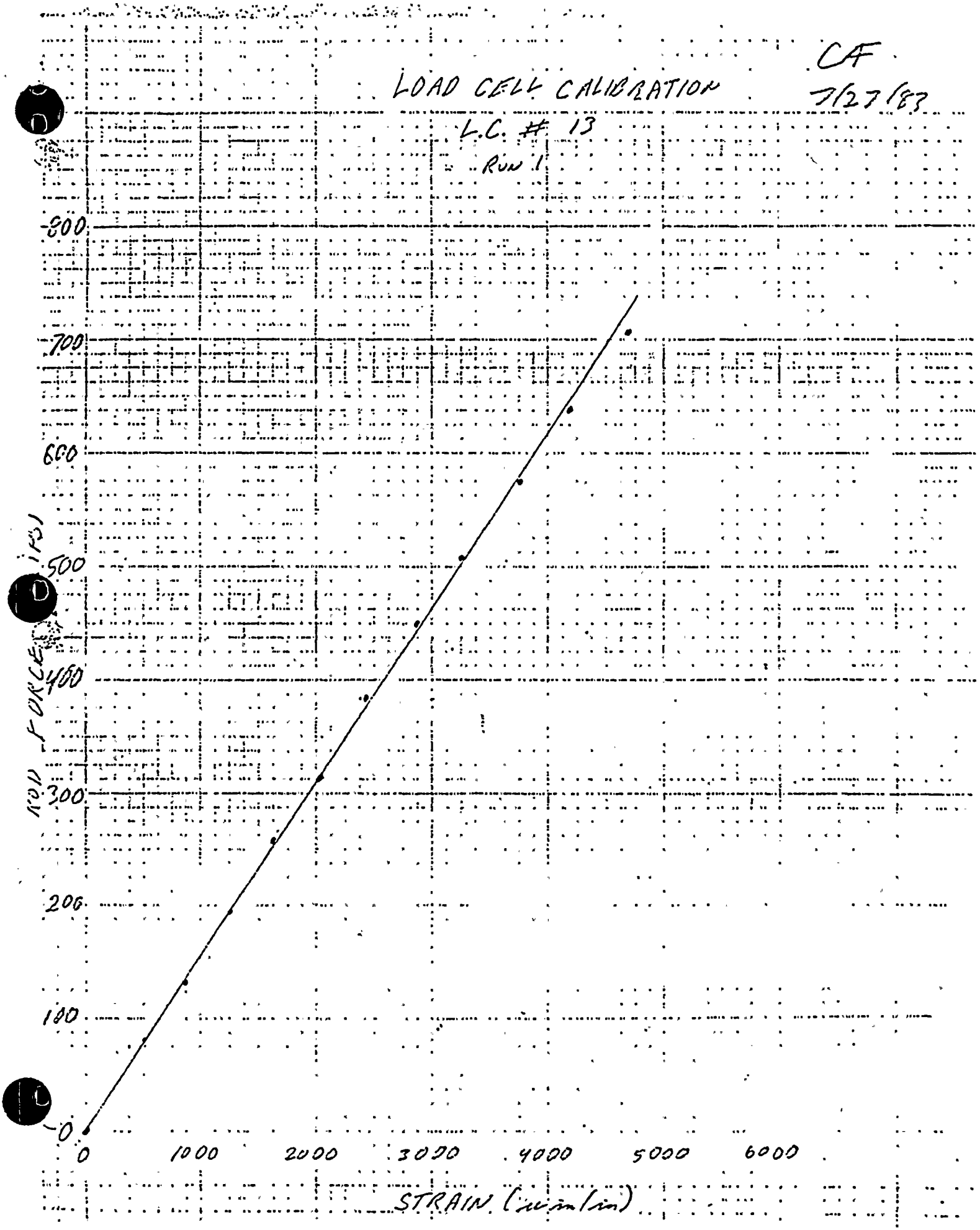
FORCE (KIPS) = 4.69 + 0.1513 (STRAIN)
X Y

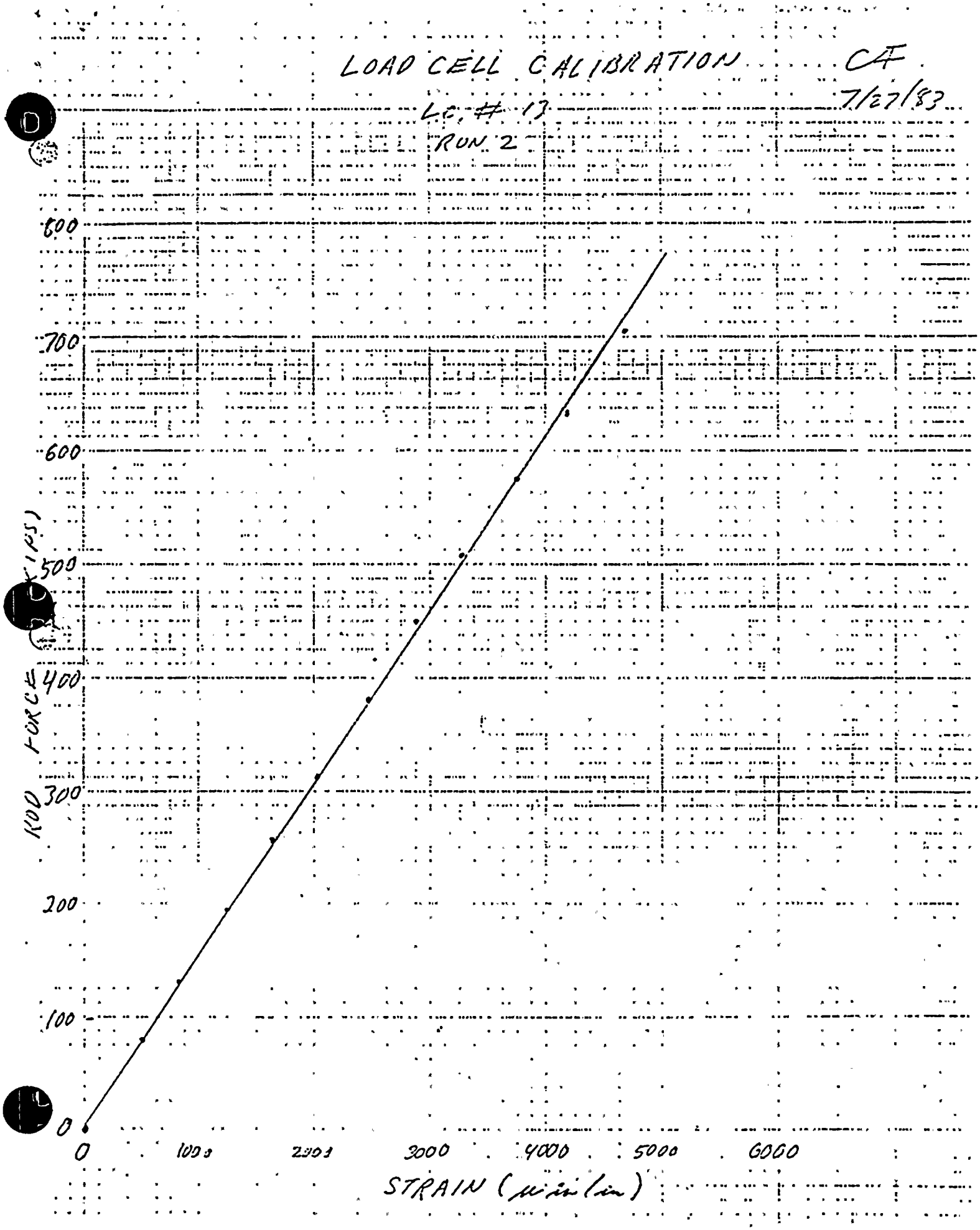
① Y = .2004(X)

	(X)	RUN 2	(Y)°		
0	0	0	0	5.2	—
500	520	408	81.8	83.8	2.4
1000	854	668	133.9	134.3	0.3
1500	1238	964	193.2	192.4	-0.4
2000	1666	1288	258.1	257.1	-0.4
2500	2054	1588	318.2	315.7	-0.8
3000	2422	1871	374.9	371.4	-0.9
3500	2880	2220	444.9	440.6	-0.9
4000	3284	2522	505.4	501.7	-0.7
4500	3752	2869	574.9	572.5	-0.4
5000	4206	3191	639.5	641.1	0.2
5500	4692	3523	706.0	714.6	1.2

FORCE (KIPS) = 5.18 + 0.1512 (STRAIN)
X Y

② : Average (X)
Force = 4.94 + 0.15125 (STRAIN)


LOAD CELL CALIBRATION
L.C. # 13
RUN 1
CF
7/27/87
800
700
600
500
400
300
200
100
0
LOAD FORCE (lbs)
0
1000
2000
3000
4000
5000
6000
STRAIN (in/in)


LOAD CELL CALIBRATION
CF
7/27/83
LC, # 17
RUN 2
600
700
600
500
400
300
200
100
0
FORCE (KIPS)
0
1000
2000
3000
4000
5000
6000
STRAIN (micro in/in)

ROCHESTER GAS AND ELECTRIC CORPORATION

42-93

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 53

SYSTEM CALIBRATION (LOAD CELL No. 53)

GAGE PRESS (PSI)	Load Cell Strain (μin/in) Reading	Load Cell Strain (μin/in) Actual	Tension Rod Strain (μin/in) Reading	Tension Rod Strain (μin/in) Actual	Tension Rod Force (Kips) (.2004 X STRAIN)

RUN 1

0	-4830	0	0	SAME		0
500	-4315	515	380			76.2
1000	-3970	860	640			128.3
1500	-3600	1230	928			185.9
2000	-3205	1625	1216			243.7
2500	-2800	2030	1538			308.2
3000	-2405	2425	1838			368.3
3500	-1966	2864	2173			435.5
4000	-1570	3260	2468			494.6
4500	-1122	3708	2807			562.5
5000	-716	4114	3119			625.0
5500	-258	4572	3482			697.8

RUN 2

0	-4835	0	0	SAME		0
500	-4307	533	387			77.6
1000	-4016	819	610			122.2
1500	-3610	1225	922			184.8
2000	-3170	1665	1252			250.9
2500	-2800	2035	1540			308.6
3000	-2438	2397	1812			363.1
3500	-1990	2845	2160			432.9
4000	-1602	3233	2455			491.9
4500	-1130	3705	2812			563.5
5000	-684	4151	3147			630.7
5500	-263	4572	3460			693.4

ZERO CHLANCE:
PULL ROD · 48 μin/in

FINAL ZERO:
PULL ROD 0
LOAD CELL -4841 μin/in

ROCHESTER GAS AND ELECTRIC CORPORATION

42-33

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 53

SYSTEM CALIBRATION (LOAD CELL No. 53)

GAGE PRESS (PSI)	LOAD CELL Strain (μin/in)	Tension Rod Strain (μin/in)	Force (Kips)	Calc Force Lin Regr (Kips)	% Δ (Calc-Meas)/Meas
	(X)	RUN 1 (Y)°			
0	0	0	0	-2.1	-
500	515	380	76.2	76.5	0.4
1000	860	640	128.3	129.2	0.7
1500	1230	928	185.9	185.6	-0.2
2000	1625	1216	243.7	245.9	0.9
2500	2030	1538	308.2	307.7	-0.2
3000	2425	1838	368.3	368.0	-0.1
3500	2864	2173	435.5	434.9	-0.1
4000	3260	2468	494.6	495.4	0.2
4500	3708	2807	562.5	563.2	0.1
5000	4114	3119	625.0	625.7	0.1
5500	4572	3482	697.8	695.6	-0.3

FORCE(KIPS) = -2.05 + 0.1526 (STRAIN)
(X) ① Y = .2004 (X)

		RUN 2 (Y)°			
0	0	0	0	-1.9	-
500	533	387	77.6	79.4	2.3
1000	919	610	122.2	122.9	0.6
1500	1225	922	184.8	184.8	0
2000	1665	1252	250.9	251.9	0.4
2500	2035	1540	308.6	308.3	-0.1
3000	2397	1812	363.1	363.5	0.1
3500	2845	2160	432.9	431.7	-0.3
4000	3233	2455	491.9	490.9	0.2
4500	3705	2812	563.5	562.8	-0.1
5000	4151	3147	630.7	630.8	0
5500	4572	3460	693.4	694.9	0.2

FORCE(KIPS) = -1.85 + 0.1524 (STRAIN)
X Y

Average Force = 7.95 + 0.1525 (STRAIN)

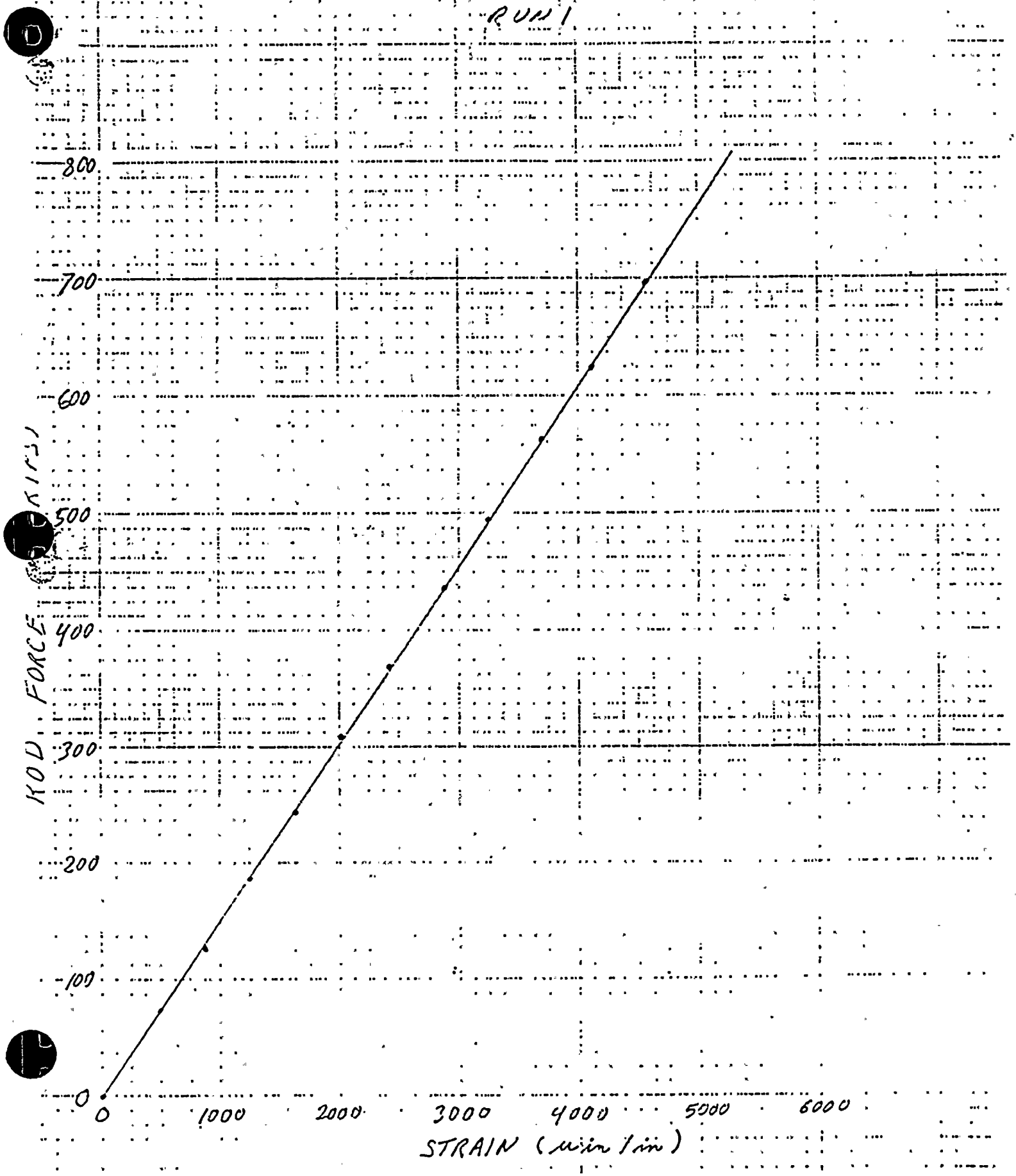
LOAD CELL CALIBRATION

L.C. # 53

RUN 1

CF

7/27/83

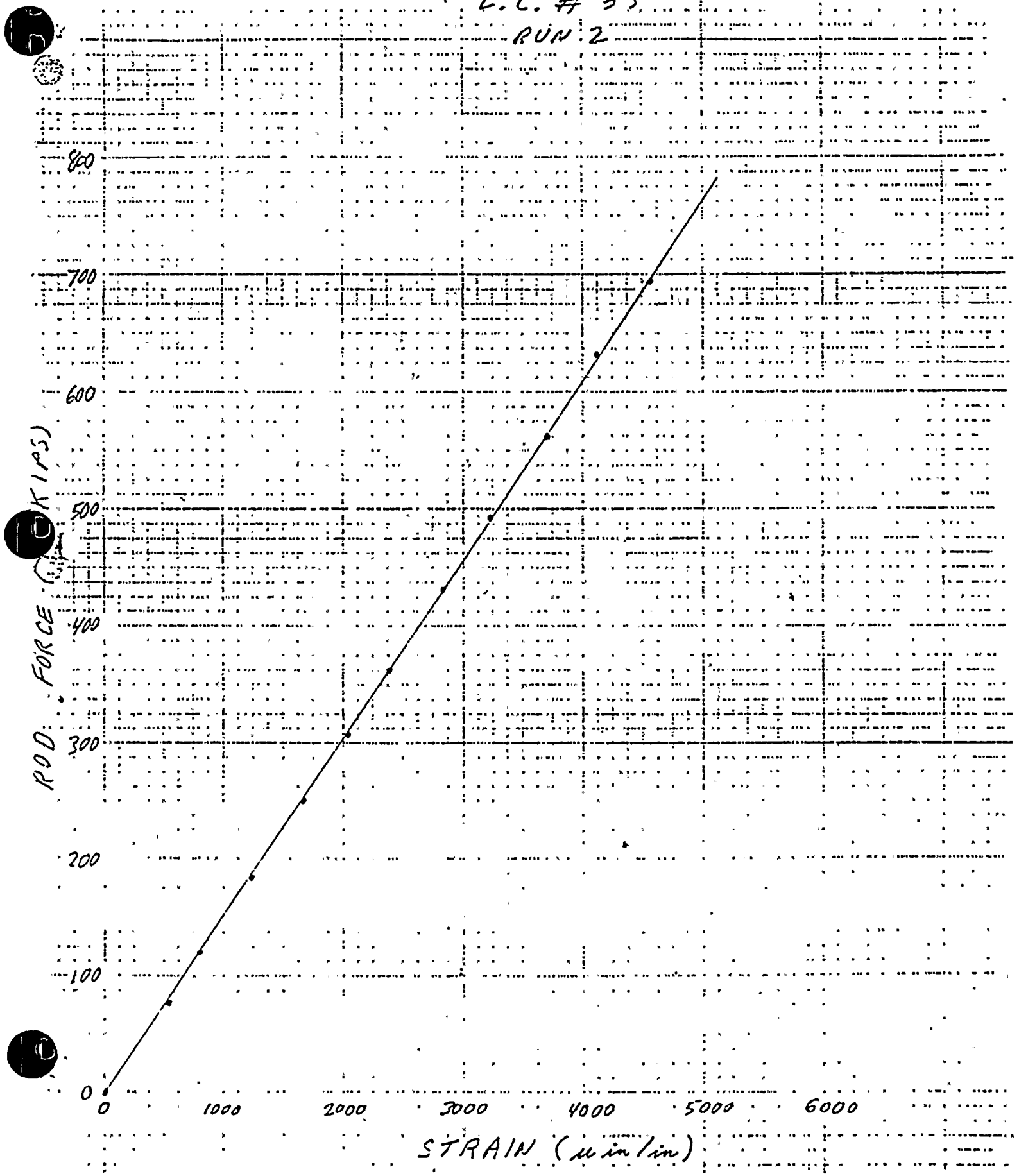


CF
7/27/82

LOAD CELL CALIBRATION

L.C. # 53

RUN 2



ROCHESTER GAS AND ELECTRIC CORPORATION

42.33

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 93

SYSTEM CALIBRATION (LOAD CELL No. 93)

RUN 1

GAGE PRESS (PSI)	Load Cell Strain (μin/in) Reading	Load Cell Strain (μin/in) Actual	Tension Rod Strain (μin/in) Reading	Tension Rod Strain (μin/in) Actual	Tension Rod Force (Kips) (.2004 x STRAIN)
0	-4912	0	0	SAME	0
500	-4292	620	480		96.2
1000	-4060	852	658		131.9
1500	-3648	1264	972		194.8
2000	-3276	1636	1251		250.7
2500	-2871	2041	1566		313.8
3000	-2472	2440	1865		373.7
3500	-2024	2888	2205		441.9
4000	-1603	3309	2520		505.0
4500	-1160	3752	2850		571.1
5000	-738	4174	3156		632.5
5500	-262	4650	3500		701.4

RUN 2

0	-4912	0	0	SAME	0
500	-4313	599	462		92.6
1000	-4074	838	646		129.5
1500	-3666	1246	955		191.4
2000	-3274	1638	1249		250.3
2500	-2956	2056	1573		315.2
3000	-2448	2464	1891		376.9
3500	-2034	2878	2195		439.9
4000	-1629	3284	2500		501.0
4500	-1188	3724	2827		566.5
5000	-730	4182	3158		632.9
5500	-262	4650	3499		701.2

ZERO CALANCE:
PULL ROD 43 μin/in

FINAL ZERO:
PULL ROD 0
LOAD CELL -4913 μin/in

ROCHESTER GAS AND ELECTRIC CORPORATION

42-33

ENG. DEPT.	STATION: GINNA	DATE: 9/6/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORBES	CK: L.C. 93

SYSTEM CALIBRATION (LOAD CELL No.93)

GAGE PRESS (PSI)	LOAD CELL Strain (μin/in)	Tension Rod Strain (μin/in)	Force (Kips)	Calc Force Lin Regr (Kips)	% Δ (Calc-Meas)/Meas
	(X)	RUN 1	(Y)①		
0	0	0	0	3.3	—
500	620	480	96.2	97.0	0.8
1000	852	658	131.9	132.1	0.2
1500	1264	977	194.8	194.3	0.3
2000	1636	1251	250.7	250.5	0.1
2500	2041	1566	313.8	311.7	-0.7
3000	2440	1865	373.7	372.0	-0.5
3500	2888	2205	441.9	439.7	-0.5
4000	3309	2520	505.0	503.3	-0.3
4500	3752	2850	571.1	570.2	-0.2
5000	4174	3156	632.5	634.0	0.2
5500	4650	3500	701.4	705.9	0.6

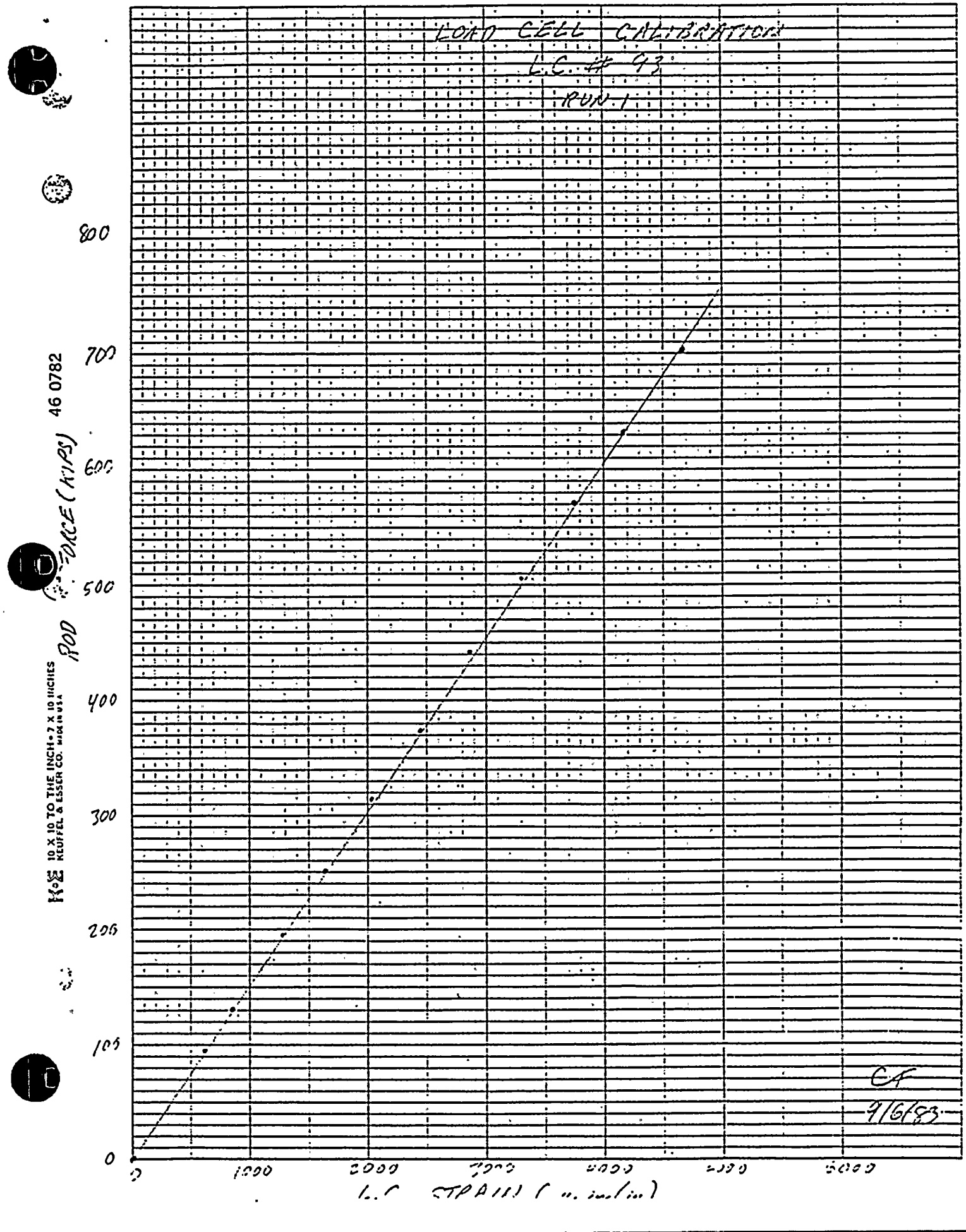
FORCE (KIPS) = 3.32 + 0.1511 (STRAIN)
X

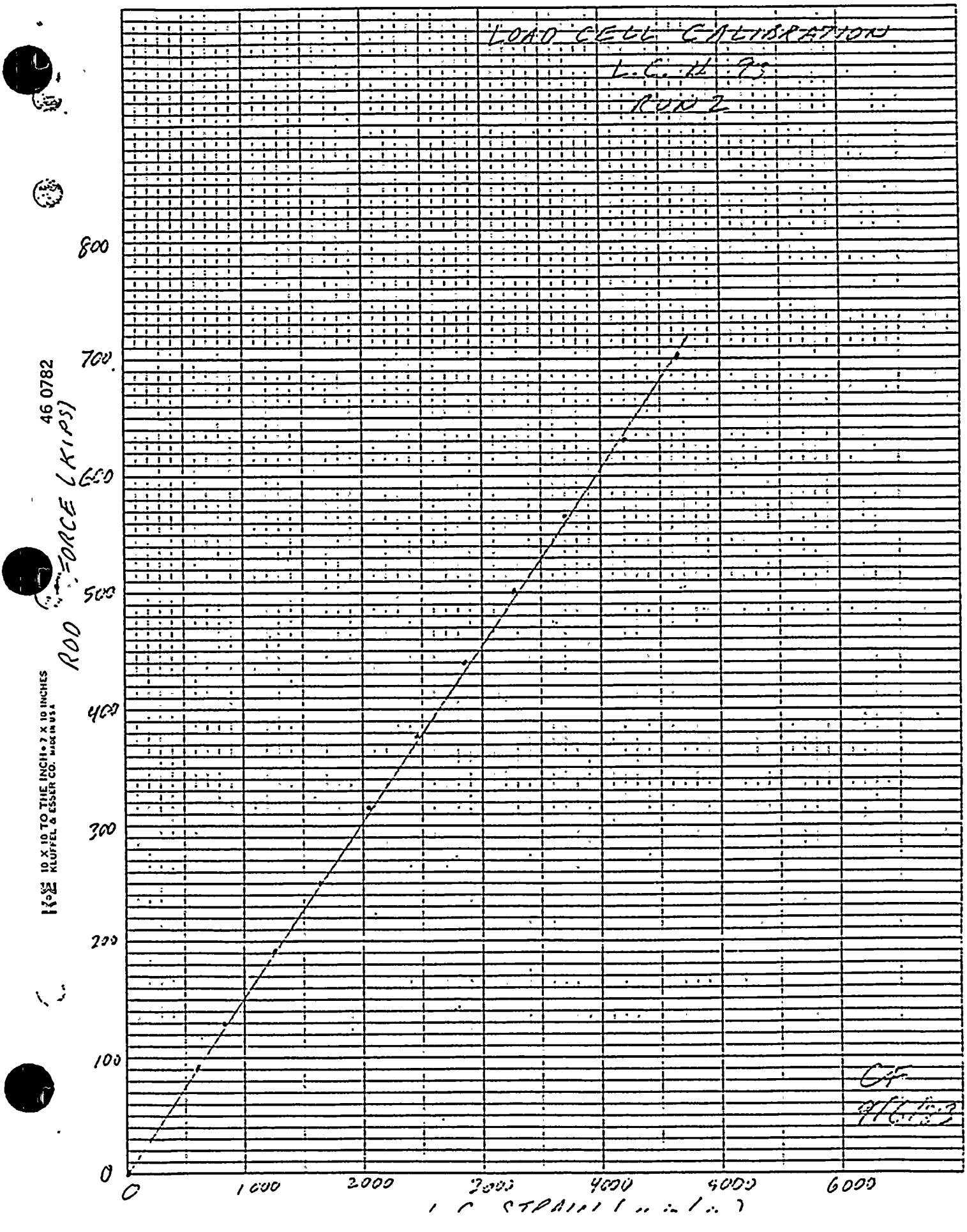
① Y = .2004(X)

	(X)	RUN 2	(Y)①		
0	0	0	0	2.9	—
500	599	462	92.6	93.4	0.9
1000	838	646	129.5	129.5	0
1500	1246	965	191.4	191.1	-0.2
2000	1638	1249	250.3	250.3	0
2500	2056	1573	315.2	313.4	-0.6
3000	2464	1881	376.9	374.9	-0.5
3500	2878	2195	439.9	437.5	-0.5
4000	3284	2500	501.0	498.8	-0.4
4500	3724	2827	566.5	565.2	-0.2
5000	4182	3158	632.9	634.4	0.2
5500	4650	3499	701.2	705.1	0.6

FORCE (KIPS) = 2.92 + 0.1510 (STRAIN)
X Y

Average FORCE = 3.12 + 0.15105 (STRAIN)


LOAD CELL CALIBRATION
L.C. # 93
RUN 1
800
700
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
ROD FORCE (KIPS)
L.C. STRAIN (μ in/in)
46 0782
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
CF
9/6/83


LOAD CELL CALIBRATION
L.C. # 93
ROD 2
ROD FORCE (KIPS)
800
700
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
46 0782
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

ROCHESTER GAS AND ELECTRIC CORPORATION

ENG. DEPT.	STATION: GINNA	DATE: 7/27/83	PAGE 1 OF 1
JOB: Tendon Surveillance - 1983		MADE BY: C.A. FORNES	CK: L.C. 137

SYSTEM CALIBRATION (LOAD CELL No. 133)

GAGE PRESS (PSI)	Load Cell Strain (μin/in) Reading	Load Cell Strain (μin/in) Actual	Tension Rod Strain (μin/in) Reading	Tension Rod Strain (μin/in) Actual	Tension Rod Force (Kips) (.2004 X STRAIN)
RUN 1					
0	-5154	0	0	SAME	0
500	-4549	605	473		94.8
1000	-4308	846	663		132.9
1500	-3932	1222	946		189.6
2000	-3530	1624	1256		251.7
2500	-3103	2051	1578		316.2
3000	-2700	2454	1888		378.4
3500	-2243	2911	2226		446.1
4000	-1846	3308	2531		507.2
4500	-1395	3769	2870		575.1
5000	-951	4203	3188		638.9
5500	-486	4668	3520		705.4
RUN 2					
0	-5147	0	0	SAME	0
500	-4537	610	450		90.2
1000	-4284	864	672		134.7
1500	-3900	1248	966		193.6
2000	-3520	1628	1257		251.9
2500	-3086	2062	1574		315.4
3000	-2718	2430	1876		375.9
3500	-2250	2898	2225		445.9
4000	-1838	3309	2532		507.4
4500	-1379	3769	2876		576.4
5000	-952	4196	3184		638.1
5500	-482	4666	3525		706.4

ZERO CALANCE
PULL ROD 40 μin/in

FINAL ZERO:
PULL ROD 0
LOAD CELL -5146 μin/in

ROCHESTER GAS AND ELECTRIC CORPORATION

42-33

ENG. DEPT.	STATION: GINNA	DATE: 9/6/83	PAGE 1 OF 1
JOB: Tendon Surveillance -- 1983		MADE BY: C. A. FORBES	CK: L.C. 133

SYSTEM CALIBRATION (LOAD CELL No. 133)

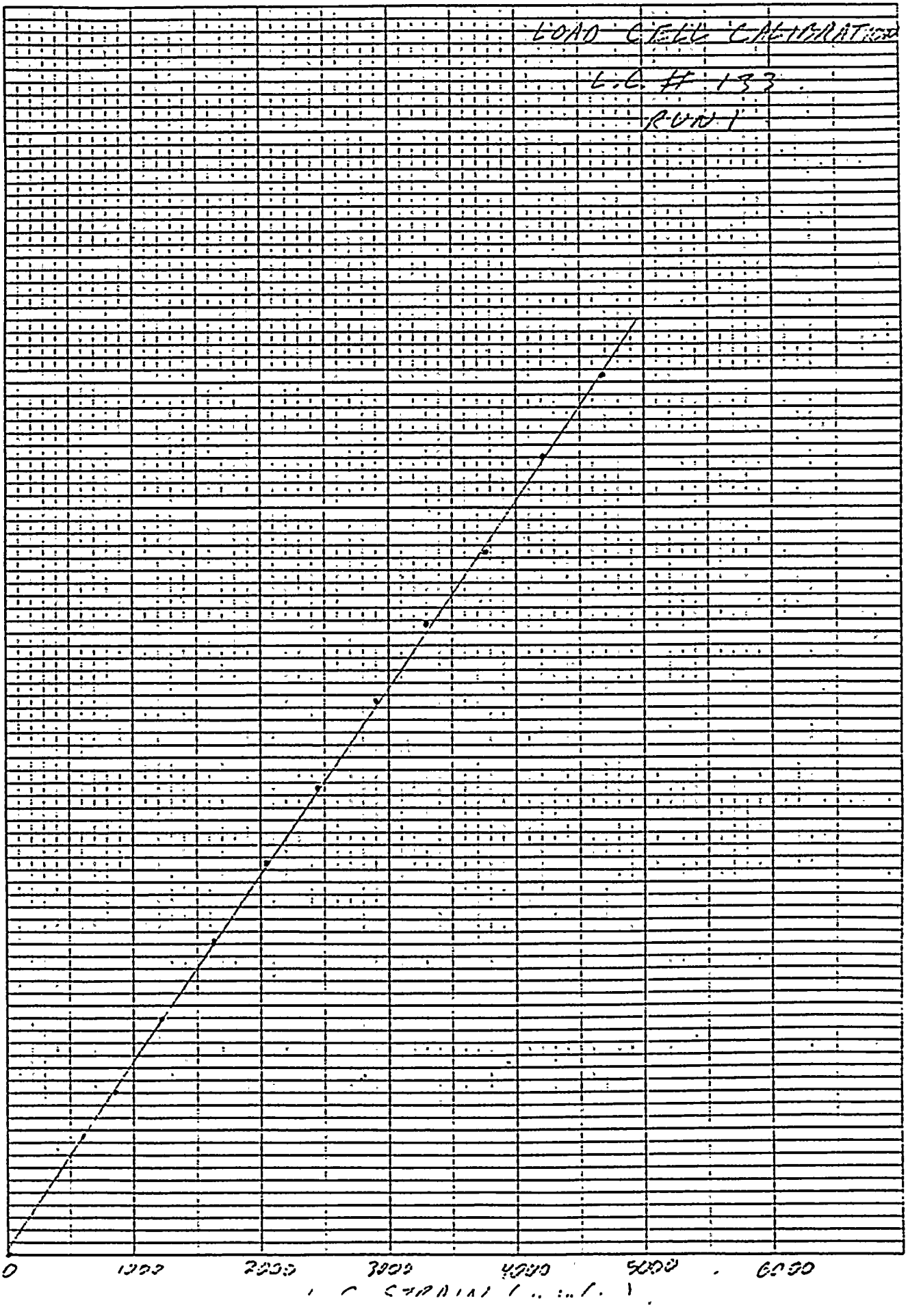
GAGE PRESS (PSI)	LOAD CELL Strain (μin/in)	Tension Rod Strain (μin/in)	Force (Kips)	Calc Force - Lin Regr (Kips)	% Δ (Calc-Meas)/Meas
	(X)	RUN 1	(Y)		
0	0	0	0	4.4	—
500	605	473	94.8	95.9	1.2
1000	846	663	132.9	132.3	-0.5
1500	1222	946	189.6	189.2	-0.2
2000	1624	1256	251.7	249.9	-0.7
2500	2051	1578	316.2	314.5	-0.5
3000	2454	1888	378.4	375.4	-0.8
3500	2911	2226	446.1	444.5	-0.4
4000	3308	2531	507.2	504.6	-0.5
4500	3769	2870	575.1	574.3	-0.1
5000	4203	3188	638.9	639.9	0.2
5500	4668	3520	705.4	710.2	0.7

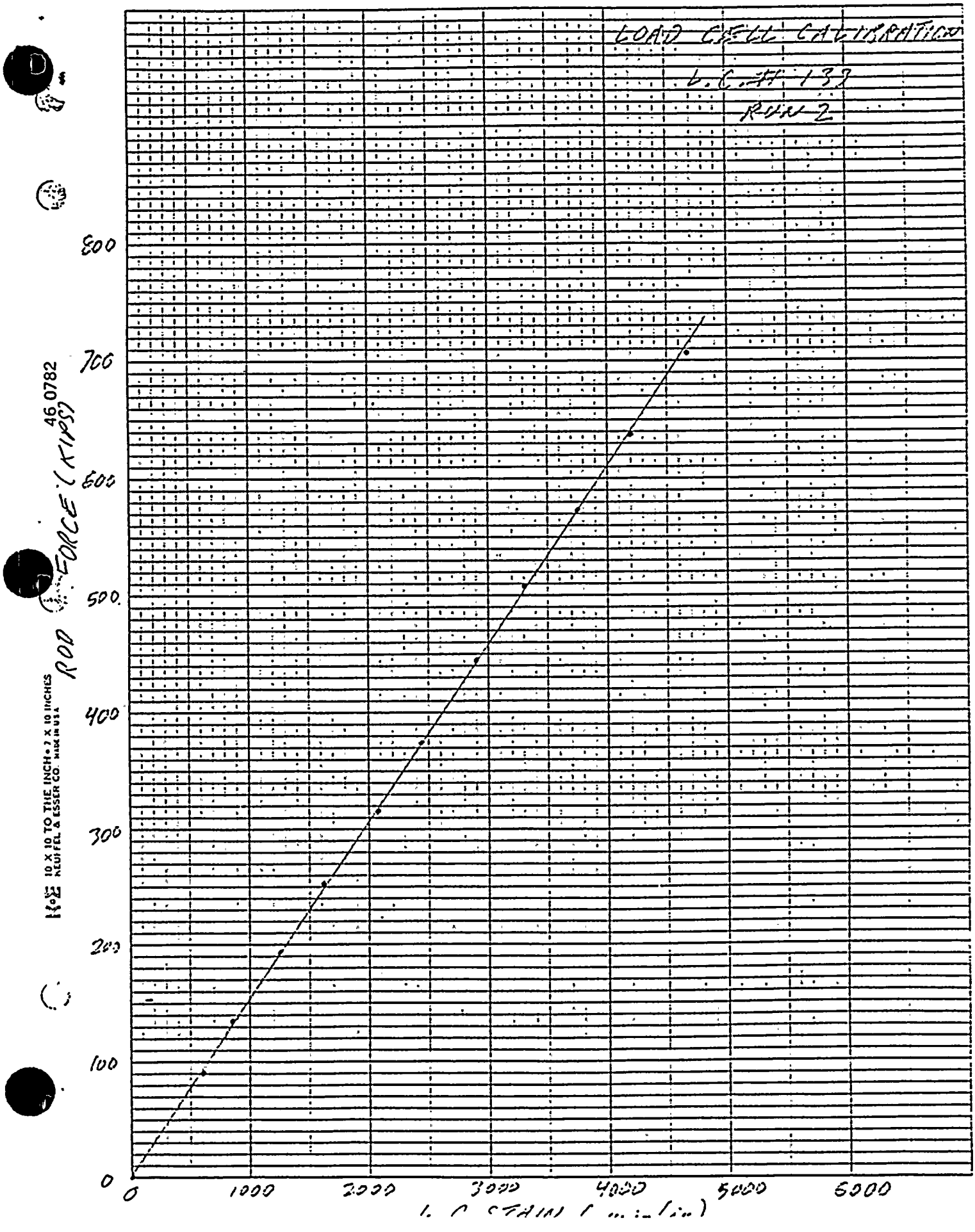
FORCE (KIPS) = 4.40 + 0.1512 (STRAIN)
X

	(X)	RUN 2	(Y)		
0	0	0	0	2.5	—
500	610	450	90.2	95.1	5.4
1000	864	672	134.7	133.7	-0.7
1500	1248	966	193.6	192.0	-0.8
2000	1628	1257	251.9	249.7	-0.9
2500	2062	1574	315.4	315.7	0.1
3000	2430	1876	375.9	371.6	-1.1
3500	2898	2225	445.9	442.7	-0.7
4000	3309	2532	507.4	505.1	-0.5
4500	3769	2876	576.4	574.9	-0.3
5000	4196	3194	638.1	639.8	0.3
5500	4666	3525	706.4	711.2	0.7

FORCE (KIPS) = 2.45 + 0.1519 (STRAIN)
X Y

Average
FORCE = 3.42 + 0.15155 (STRAIN)


LOAD CELL CALIBRATION
L.C. # 133
RUN 1
800
700
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
ROD FORCE (KIPS)
46 0782
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.


LOAD CELL CALIBRATION
L.C. # 133
RUN 2
ROD FORCE (KIPS)
800
700
600
500
400
300
200
100
0
0
1000
2000
3000
4000
5000
6000
46 0782
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

January 24, 1984

Gilbert Associates, Inc.
P.O. Box 1498
Reading, Pennsylvania 19603

Attention: Mr. J. F. Fulton

RE: 1983 Tendon Surveillance

Dear Jim:

Attached herewith is one (1) copy of the calibration data and material certification reports for the new stressing rod. During our telephone conversation yesterday, I stated that the calculated "stressing rod gage factor" is 0.1997. This value was used to determine the stressing rod force for the tendons tested subsequent to the accident involving tendon 75. The calibration equation for the pressure gauge system was assumed to remain constant.

If you have any questions, please contact me.

Very truly yours,

Clyde A. Forbes

Clyde A. Forbes
Structural Engineering

CAF:mkv
Enclosure

xc: R. E. Smith
T. R. Weis
D. R. Campbell (GAI)
File/EWR #1900

13N1-RG-L0624

WHEELOCK, LOVEJOY - METALSOURCE

LABORATORY CERTIFICATION REPORT

CUSTOMER Teledyne Engineering Services

DATE 10/6/83

ADDRESS 130 Second Ave.
Waltham, Ma. 02254

ORDER NO. E2806

GRADE 4150 F HT RT

INVOICE NO. 17288

SPECIFICATION

MILL SOURCE Standard Steel

SIZE	HEAT NO.	C.	MN.	P.	S.	SIL.	NI.	CR.	MO.
10-1/2" Rd.	LVB5681	.47	1.00	.019	.08	.22		.72	.16

SIZE	TENSILE STRENGTH	ELASTIC LIMIT	% ELONG IN	RED. OF AREA	HARDNESS
					311

WHEELOCK, LOVEJOY - METALSOURCE

BY Carol Goblaskas

Carol Goblaskas

STATE OF Mass.
COUNTY OF Middlesex } SS.

SWORN TO AND SUBSCRIBED BEFORE ME, A NOTARY PUBLIC, THIS _____ DAY OF

_____ 19___

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES _____

WHEELOCK, LOVEJOY - METALSOURCE

LABORATORY CERTIFICATION REPORT

CUSTOMER TELEDYNE ENGINEERING SERVICES

DATE September 28, 1983

ADDRESS 130 Second Street
Waltham, MA 02254

ORDER NO. E2806 Part 1 of 2

GRADE 4140 HR HT ER

INVOICE NO. 00-17287

SPECIFICATION

MILL SOURCE Republic

SIZE	HEAT NO.	C.	MN.	P.	S.	SIL.	NI.	CR.	MO.
5-1/4 RD	6071414	.43	.82	.007	.024	.20	.22	.92	.26

SIZE	TENSILE STRENGTH	ELASTIC LIMIT	% ELONG IN	RED. OF AREA	HARDNESS
5-1/4 RD	126,500	98,000	18.0	58.1	285

WHEELOCK, LOVEJOY - METALSOURCE

BY Carolyn M. Sharon

Carolyn M. Sharon

STATE OF Mass.
COUNTY OF Middlesex } SS.

SWORN TO AND SUBSCRIBED BEFORE ME, A NOTARY PUBLIC, THIS _____ DAY OF

_____ 19___

_____
NOTARY PUBLIC

MY COMMISSION EXPIRES _____

FRITZ ENGINEERING LABORATORY

Lehigh University

File 200.83.783.1

Sheet 1 of 2

Subject Calibration of Tension Link Load Cell

Date 11 - 9 - 83

Party E.M.

C.H.

Approved Director-Operations

Rochester Gas & Electric Corporation
89 East Avenue
Rochester, NY 14644

Attn: Mr. C. B. Forbes P.O. BZ-36613

Indicator # 035074
Gage Factor = 2.00

Load (kips)	First Run (μ")	Second Run (μ")	Average Run (μ")
0	0	0	0
50	+ 244	+ 248	+ 246
100	+ 496	+ 494	+ 495
150	+ 746	+ 760	+ 753
200	+ 988	+ 990	+ 989
250	+ 1236	+ 1240	+ 1238
300	+ 1488	+ 1498	+ 1493
350	+ 1746	+ 1742	+ 1744
400	+ 2000	+ 1994	+ 1997
450	+ 2240	+ 2246	+ 2243
500	+ 2500	+ 2494	+ 2497
550	+ 2748	+ 2750	+ 2749
600	+ 2996	+ 2994	+ 2995
650	+ 3248	+ 3250	+ 3249
700	+ 3500	+ 3498	+ 3499
750	+ 3750	+ 3762	+ 3756
400	+ 1990	+ 2000	+ 1995
0	0	0	0

Note: Switch box used on previous calibration was not available

FRITZ ENGINEERING LABORATORY

Lehigh University

File 200.83.783.1

Sheet 2 of 2

Subject Calibration of Tension Link Load Cell

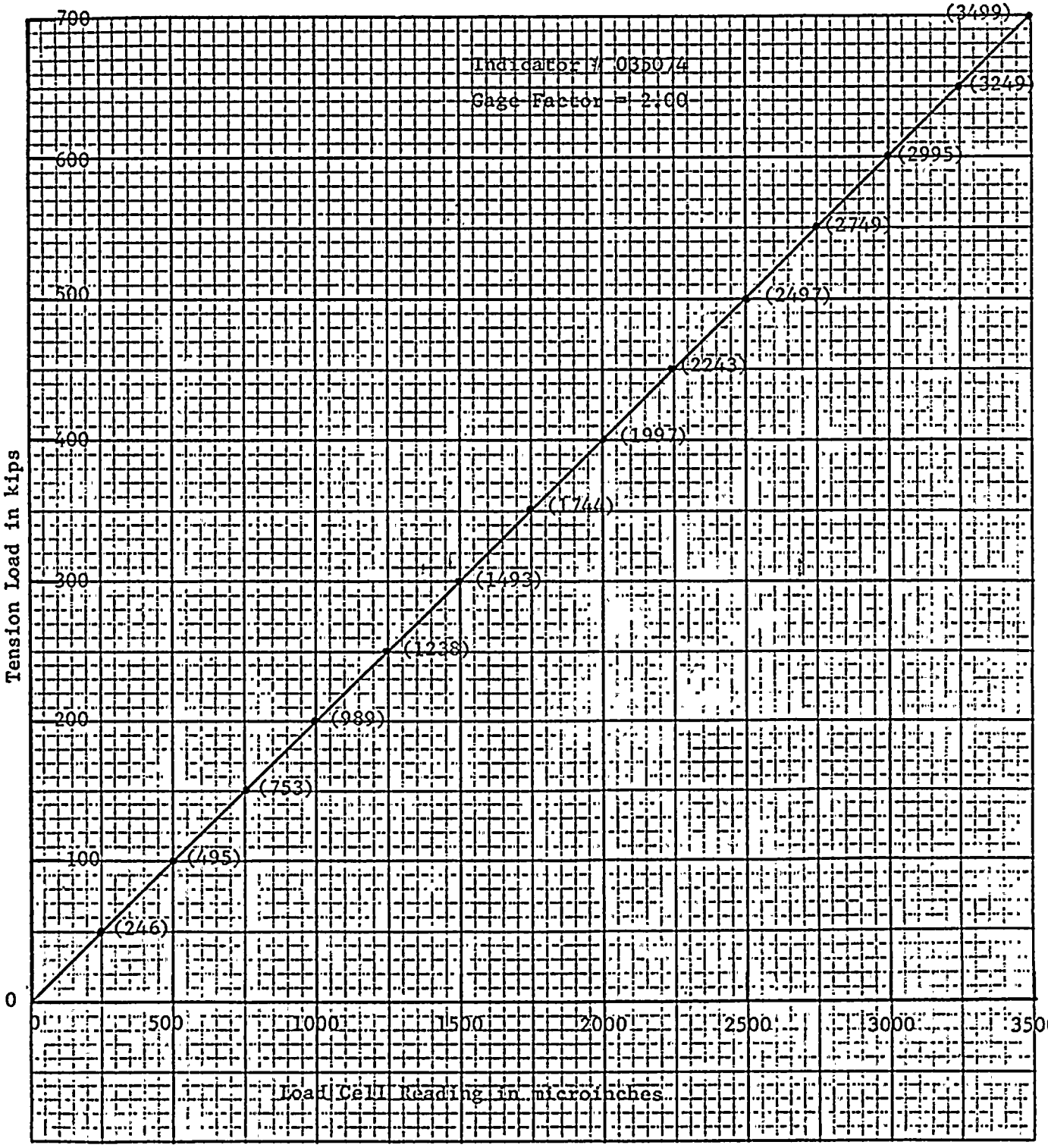
Date 11 - 9 - 83

Party E. M.
C. H.

Rochester Gas & Electric Corporation
89 East Avenue
Rochester, NY 14644

Attn: Mr. C. B. Forbes P. O. BZ-36613

Approved Roger D. Shuttle
Director-Operations



APPENDIX C

DATA SHEET 1

SURVEILLANCE FORCE DATA

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/25/83 TENDON NO.: 13 SHIM STACK THICKNESS: 10-5/8" (TOT) Load Cell - 8"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797 KRTA MM 1904 PRESSURE GAUGE NO.: 0090 (NEW INSTALLATION)

4) LOAD CELL FACTOR**: — STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) (b) Force* (lbs)X1000	(3) STRESSING ROD (a) ① Strain (u in/in)	(3) (b) Force** (lbs)X1000	(4) LOAD CELL (a) ② Strain (u in/in)	(4) (b) Force** (lbs)X1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Balance)	0	0	0 (50)	0	4887	744.1	1-7/8"	
INCREASING:	2000	255.7	1291	258.7	3221	492.1	1-15/16"	
INCREASING:	4000	510.5	2553/2562 AVG 2558	512.6 ④ /1547		234.1 ~~238.9~~	2-0"	④ N.R.L
LIFTOFF:	5710	728.4	3644	730.3	70	15.5	2-1/8"	
LIFTOFF +6%	6052	771.9	3837	768.9	70	15.5	2-9/16"	
LIFTOFF:	5710	728.4	3631	727.6	73	15.9	2-1/8"	
DECREASING:	4000	510.5	2506/2548 AVG 2527	506.4	1632/~~1576~~ AVG 1599 1566	246.8	2-0"	
DECREASING:	2000	255.7	1269	254.3	3249	496.4	1-15/16"	
DECREASING:	0	0	0	0	4887	744.1	1-7/8"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 8/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/25/83 TENDON NO.: 18 SHIM STACK THICKNESS: 11-1/16"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797 KRTA / MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire visible.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero DaCance)	0	0	0 (38)	0	N/A		2-1/2"	
INCREASING:	2000	255.7	1278	256.1	N/A		2-"1/16"	
INCREASING:	4000	510.5	2522	505.4	N/A		2-"1/16"	
LIFTOFF: Shim 1 / Shim 2	5650 / 5750 AVG 5700	727.1	3600 / 3655 AVG 3627.5	(726.9)	N/A		2-7/8"	
LIFTOFF +6%	6050	771.7	3832	767.9	N/A		3-1/8"	
LIFTOFF: Shim 1 / Shim 2	5550 / 5725 AVG 5637.5	719.1	3525 / 3643 AVG 3584	718.2	N/A		2-"13/16"	
DECREASING:	4000	510.5	2600	521.0	N/A		2-3/4"	
DECREASING:	2000	255.7	1309	262.3	N/A		2-"1/16"	
DECREASING:	0	0	0	0	N/A		2-1/2"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/25/83 TENDON NO.: 35 SHIM STACK THICKNESS: 9-1/2"

2) HYDRAULIC JACK NO.: RJ500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797KRTA MM1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire visible

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: ZERO BALANCE	0	0	0 (61)	0	N/A		10/16"	
INCREASING:	2000	255.7	1272	254.9	N/A		3/4"	
INCREASING:	4000	510.5	2537	508.4	N/A		13/16"	
LIFTOFF:	5170	659.6	3302	661.7	N/A		7/8"	
LIFTOFF +6%	5480	699.0	3491	699.6	N/A		1-0"	
LIFTOFF: SHM1 / SHM2	5150 / 5150	657.0	32887 / 32923329	659.3	N/A		7/8"	
DECREASING:	4000	510.5	2588	518.6	N/A		13/16"	
DECREASING:	2000	255.7	1288	258.1	N/A		3/4"	
DECREASING:	0	0	0	0	N/A		10/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/25/83 TENDON NO.: 36 SHIM STACK THICKNESS: 9-3/4"

2) HYDRAULIC JACK NO.: RJ500-12 RAM AREA: A

3) HYDRAULIC PUMP NO.: 797 KRTA MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition.

No surveillance wire visible through collar. Outer edge bent on upper 1/4" shim

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BALANCE)	0	0	0 (146)	0	N/A		" = 1-0"	
INCREASING:	2000	255.7	1273	255.1	N/A		1-1/16"	
INCREASING:	4000	510.5	2530	507.0	N/A		1-1/8"	
LIFTOFF: AVG 5212.5 (1) ~~5190~~ 5200 (2) 5225		664.9	~~3700~~ ~~5251~~ / AVG 3312 3324	663.7	N/A		1-3/16"	
LIFTOFF +6%	5525	704.8	3511	703.6	N/A		1-3/8"	
LIFTOFF: AVG 5150 (1) 5150 (2) 5210		660.8	32807 3318 AVG 3299	661.1	N/A		1-3/16"	
DECREASING:	4000	510.5	2528	506.6	N/A		1-1/8"	
DECREASING:	2000	255.7	1250	250.5	N/A		1-1/16"	
DECREASING:	0	0	0	0	N/A		15/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Fulton DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: 40 SHIM STACK THICKNESS: 12-9/16"

2) HYDRAULIC JACK NO.: RD-500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797 KATA MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: 7/25 - Tendon Acad in good condition Surveillance Wire Button head resting on top of collar

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Balance)	0	0	0 (-32)	0	N/A		3-3/4"	
INCREASING:	2000	255.7	1282	256.9	N/A		3-7/8"	
INCREASING:	4000	510.5	2545	510.0	N/A		3-15/16"	
LIFTOFF:	5740	732.2	3648	731.1	N/A		4-0"	
LIFTOFF +6%	6080	775.5	3861	773.7	N/A		4-1/2"	
LIFTOFF:	5730	730.9	3648	731.1	N/A		4-0"	
DECREASING:	4000	510.5	2532	507.4	N/A		3-15/16"	
DECREASING:	2000	255.7	1257	251.9	N/A		3-7/8"	
DECREASING:	0	0	0	0	N/A		3-3/4"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + .1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: 51 SHIM STACK THICKNESS: 11-13/16"

2) HYDRAULIC JACK NO.: RJ500-12 RAM AREA: X

3) HYDRAULIC PUMP NO.: 797 KATA PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: MM 1904 N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire present

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Balance)	0	0	0 (0)	0	N/A		3-1/4"	
INCREASING:	2000	255.7	1290	258.5	N/A		3-5/16"	
INCREASING:	4000	510.5	2549	510.8	N/A		3-3/8"	
LIFTOFF:	5575	711.2	3538	709.0	N/A		3-7/16"	
LIFTOFF +6%	5910	753.8	3730	747.5	N/A		3-15/16"	
LIFTOFF:	5575	711.2	3538	709.0	N/A		3-1/2"	
DECREASING:	4000	510.5	2526	506.2	N/A		3-3/8"	
DECREASING:	2000	255.7	1250	250.5	N/A		3-5/16"	
DECREASING:	0	0	0	0	N/A		3-1/4"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Foster DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: 53 SHIM STACK THICKNESS: 11-7/8" Load Cell - 8"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797 KRTA MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: — STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire visible through collar. Load Cell Present

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)X1000	(3) STRESSING ROD (a) ① Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)X1000	(4) LOAD CELL (a) ② Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)X1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BALANCE)	0	0	0 (-42)	0	-4972	758.3	2-3/4"	Channel ② Not Balanced
INCREASING:	2000	255.7	1265	253.5	-3314	503.4	2-13/16"	
INCREASING:	4000	510.5	2526	506.2	-1643	248.6	2-7/8"	
LIFTOFF:	5725	730.3	3647	(730.8)	-212	30.4	3-0"	
LIFTOFF +6%	6070	774.2	3862	773.9	-212	30.4	3-1/2"	
LIFTOFF:	5715	728.9	3641	729.7	-213	30.5	3-0"	
DECREASING:	4000	510.5	2537	508.4	-1663	251.7	2-7/8"	
DECREASING:	2000	255.7	1267	253.9	-3313	503.3	2-13/16"	
DECREASING:	0	0	2	0	-4956	753.8	2-3/4"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Farby DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: 60 SHIM STACK THICKNESS: 11-9/16"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797 KRIA PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: MM 1904 N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire present.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BALANCE)	0	0	0 (-48)	0	N/A		2-1/16"	
INCREASING:	2000	255.7	1295	259.5	N/A		2-3/16" 3/4"	
INCREASING:	4000	510.5	2570	515.0	N/A		2-13/16"	
LIFTOFF:	5550	707.9	3548	711.0	N/A		2-15/16"	
LIFTOFF +6%	5880	750.0	3748	751.1	N/A		3-3/8"	
LIFTOFF: SHM 1 / SHM 2	5600 / 5550	714.8 / 707.9	7581 / 3572	717.6 / 715.8	N/A		3-0"	
DECREASING:	4000	510.5	2554	511.8	N/A		2-7/8"	
DECREASING:	2000	255.7	1248	250.1	N/A		2-13/16"	
DECREASING:	0	0	0	0	N/A		2-3/4	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Fowler DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: G2 SHIM STACK THICKNESS: 11-5/8"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797 KRIA MM 1904 . PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition.
Surveillance wire button head resting on top of collar.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BALANCE)	0	0	0 (-50)	0	N/A		2-15/16"	
INCREASING:	2000	255.7	1277	255.9	N/A		3-0"	
INCREASING:	4000	510.5	2549	510.8	N/A		3-1/16"	
LIFTOFF:	5575	711.2	1) 3565 2) 3572 AVG 3568.5	714.4 715.8 AVG (715.1)	N/A		3-1/8"	
LIFTOFF +6#	5910	753.8	3773	756.1	N/A		3-9/16"	
LIFTOFF: SHM 1) SHM 2)	5550 5590 AVG 5570	707.9 713.1 AVG 710.5	1) 3564 2) 3578 AVG 3571	714.2 717.0 AVG 715.6	N/A		3-1/8"	
DECREASING:	4000	510.5	2538	508.6	N/A		3-1/16	
DECREASING:	2000	255.7	1283	257.1	N/A		3-0"	
DECREASING:	0	0	0	0	N/A		2-15/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Fuller DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/27/83 TENDON NO.: 75 SHIM STACK THICKNESS: 10-9/16"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: A

3) HYDRAULIC PUMP NO.: 797KRTA MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition.

Surveillance wire sunk inside collar

Data sheet no longer valid. Tendon damage resulted from accident on July 28, 1983
C.A. Faber (11/21/83)

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) (b) Force* (lbs)X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) (b) Force** (lbs)X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BALANCE)	0	0	0 (-50)	0	N/A		1-9/16"	
INCREASING:	2000	255.7	1284	257.3	N/A		1-3/4"	
INCREASING:	4000	510.5	2566	514.2	N/A		1-13/16"	
LIFTOFF:	SHM 1) 5610 SHM 2) 5720 AVG 5665	715.6 729.6 AVG 722.6	3578 3636 AVG 3607	717.0 728.6	AVG 722.8	N/A	(*)	(*) No Reading Taken
LIFTOFF +6%	6000	765.3	3812	763.9	N/A		2-0"	
LIFTOFF:	SHM 1) 5610 SHM 2) 5760 AVG 5685	715.6 734.7 AVG 725.2	3580 3637 AVG 3608.5	717.4 728.8 AVG 723.1	N/A		1-15/16"	
DECREASING:	4000	510.5	2543	509.6	N/A		1-3/4"	
DECREASING:	2000	255.7	1271	254.7	N/A		1-11/16"	
DECREASING:	0	0	0	0	N/A		1-9/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+01274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-17-83 TENDON NO.: 75 SHIM STACK THICKNESS: INITIAL: 8-3/4"
FINAL: 10-3/4"

2) HYDRAULIC JACK NO.: RJ-500-12 797KRTA RAM AREA: ☆

3) HYDRAULIC PUMP NO.: MM1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: N/A

5) TENDON INSPECTION COMMENTS: Tendon head remains in same condition as left after repair work was completed.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL:	0	0					2-3/4"	
	1000	128.3	N/A		N/A		2-7/4"	
INCREASING:	2000	255.7	N/A		N/A		2-1 1/16"	
INCREASING:	4000	—	N/A		N/A		—	Not reached, Lift-off occured first.
LIFTOFF:	1) 2940 AVG 2955	377.4	N/A		N/A		2-7/8"	Added 1-1/4" to Shim Stack
LIFTOFF ~~#63~~	1) 3360 AVG 3360	428.9	N/A		N/A		—	Shim height 9-1/2" Added 1" to Shim Stack
LIFTOFF:	1) 4200 AVG 4200	535.9	N/A		N/A		—	Shim height 10-1/2" Added 1/4" to Shim Stack
~~DECREASING:~~ LIFTOFF:	~~4000~~ 1) 3560 AVG 3860 2) 4160	530.9	N/A		N/A		5"	Shim height 10-3/4" 1st shim inserted on side of missing wires; therefore, Lift-off applies to 2nd Shim
~~DECREASING:~~ LIFTOFF:	~~2000~~ 1) 3660 2) 4170	532.2	N/A		N/A		5"	
DECREASING:	2000	255.7	N/A		N/A		4-1 1/16"	(Max pressure Achieved 4500 psi)
	0	0					2-13/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Fisher DATE: 11/21/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-17-83 TENDON NO.: 76 SHIM STACK THICKNESS: 12 - 7/8"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: A

3) HYDRAULIC PUMP NO.: 797KRTA MM1704 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire present.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL:	0	0	0	0	N/A		3-7/8"	
INCREASING:	2000	255.7	1253	250.2	N/A		3-7/8"	
INCREASING:	4000	510.5	2542	507.6	N/A		4	
LIFTOFF: 1)	5500 AVG		3496 AVG	699.6				
2)	5525 5512	703.1	3510 3503	700.7	N/A		4-1/8"	
LIFTOFF +6#	—	—	—	—	N/A			Step not performed due to lack of clearance betw Coupler & Jac
LIFTOFF: 1)	5500		3498					
2)	"	701.6	"	698.6	N/A		4-1/16"	
DECREASING:	4000	510.5	2560	511.2	N/A		3-15/16"	
DECREASING:	2000	255.7	1285	256.6	N/A		3-7/8"	
DECREASING:	0	0	0	0	N/A		3-7/8"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1.

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

COMPLETED BY: Clyde Foster DATE: 11/21/83

PT-27.2:10

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-16-83 TENDON NO.: 93 SHIM STACK THICKNESS: L.C. - 8" 11 3/8" Total
Shims - 3-3/4"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797 KRTA MM 1404 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: — STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. Surveillance wire buttonhead resting atop collar. ALL other buttonheads in good condition.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)x1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO GAL)	0	0	(215) 0	0	(5095)	772.7	3"	
INCREASING:	2000	255.7	1314	262.4	3380	513.7	3-1/16"	
INCREASING:	4000	510.5	2576	514.4	1705	260.7	3-1/8"	
LIFTOFF: 1)	5460 AVG 5480	699.0	3526 AVG 3533	705.5	— ①	59.9	3-1/4"	① No Reading Taken
2)	5500		3540		376			
LIFTOFF +6%	5800	739.8	3708	740.5	378	60.2	3-5/8"	
LIFTOFF: 1)	5440 AVG 5470	697.8	3512 AVG 3530	704.9	— ①	60.2	3-1/4"	① No Reading Taken
2)	5500		3548		378			
DECREASING:	4000	510.5	2596	518.4	1675	256.1	3-1/8"	
DECREASING:	2000	255.7	1295	258.6	3396	516.1	3-1/16"	
DECREASING:	0	0	0	0	5098	773.2	3"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Farber DATE: 11-21-83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-16-83 TENDON NO.: 116 SHIM STACK THICKNESS: 10-3/4"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797KRTA MM1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. Surveillance wire sunken inside collar. All other button heads in good condition.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)x1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Ref.)	0	0	(214)	0	N/A		2-3/4"	
INCREASING:	2000	255.7	1318	263.2	N/A		2-7/8"	
INCREASING:	4000	510.5	2588	516.8	N/A		2-15/16"	
LIFTOFF: 1)	5360	686.3	3458	3469 AVG	(692.8)		3"	
2)	5400 5380 AVG		3480		N/A			
LIFTOFF +6%	5700	727.1	3650	728.9	N/A		3-3/16"	
LIFTOFF: 1)	5340	683.8	3452	3460 AVG	690.9		3"	
2)	5380 5360 AVG		3467		N/A			
DECREASING:	4000	510.5	2578	514.8	N/A		2-7/8"	
DECREASING:	2000	255.7	1284	256.4	N/A		2-7/8"	
DECREASING:	0	0	0	0	N/A		2-3/4"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+0.1274X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Forbes DATE: 11-21-83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-16-83 TENDON NO.: 120 SHIM STACK THICKNESS: 11"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797 KRTA MM1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. Surveillance wire sunken inside collar which is split. All other button heads in good condition.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)x1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (ZERO BAL)	0	0	0 (200)	0	N/A		2 - 15/16"	
INCREASING:	2000	255.7	1286	256.8	N/A		3"	
INCREASING:	4000	510.5	2570	513.2	N/A		3 - 4/16"	
LIFTOFF: 1)	5310		3406					
2)	"	677.4	"	(680.2)	N/A		3 - 2/16"	
LIFTOFF +6%	5630	718.2	3582	715.3	N/A		3 - 5/16"	
LIFTOFF: 1)	5290		3391					
2)	5290	673.6	"	677.2	N/A		3 - 3/16	
DECREASING:	4000	510.5	2576	514.4	N/A		3 - 4/16"	
DECREASING:	2000	255.7	1291	257.8	N/A		3"	
DECREASING:	0	0	0	0	N/A		2 - 15/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 11-21-83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-16-83 TENDON NO.: 125 SHIM STACK THICKNESS: 11-3/4"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: *

3) HYDRAULIC PUMP NO.: 797 KKTA PRESSURE GAUGE NO.: 0090
MM 1904

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon Head in good condition. Surveillance wire sunken inside collar. All other button heads in good condition

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)x1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Calj	0	0	0 (200)	0	N/A		3-9/16"	
INCREASING:	2000	255.7	1267	253.0.	N/A		3-11/16"	
INCREASING:	4000	510.5	2557	510.6	N/A		3-11/16"	
LIFTOFF: 1)	5460 AVG		3510 AVG					
2)	5490 5475	698.4	3524 3517	(702.3)	N/A		3-13/16"	
LIFTOFF +6%	5800	739.8	3697	738.3	N/A		3-14/16"	
LIFTOFF: 1)	5390 AVG		3466 AVG					
2)	5480 5435	693.3	3520 3493	697.6	N/A		3-13/16"	
DECREASING:	4000	510.5	2544	508.0.	N/A		3-11/16"	
DECREASING:	2000	255.7	1266	252.8	N/A		3-5/8"	
DECREASING:	0	0	0	0	N/A		3-9/16"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 11-21-83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-17-83 TENDON NO.: 128 SHIM STACK THICKNESS: 11-15/16"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: X

3) HYDRAULIC PUMP NO.: 747 KRTA MM 1904 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon Head in good condition. Surveillance wire buttonhead sunken inside collar. All other buttonheads in good condition.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)X1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Adj)	0	0	0 (200)	0	N/A		3-5/8"	
INCREASING:	2000	255.7	1308	261.2	N/A		3-3/4"	
INCREASING:	4000	510.5	2591	517.4	N/A		3-13/16"	
LIFTOFF: 1) 2)	5450	695.2	3550	708.9	N/A		3-7/8"	
LIFTOFF +6%	5780	737.3	3728	744.5	N/A		3-15/16"	
LIFTOFF: 1) 2)	5420	691.4	3532	705.3	N/A		3-13/16"	
DECREASING:	4000	510.5	2600	519.2	N/A		3-7/4"	
DECREASING:	2000	255.7	1328	265.2	N/A		3-1/16"	
DECREASING:	0	0	0	0	N/A		3-5/8"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 11-21-83

PT-27.2:10

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 11-17-83 TENDON NO.: 133 SHIM STACK THICKNESS: L.C. - 8" 12-1/4" Tot
Shims - 4 1/4"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: *
797 KETA

3) HYDRAULIC PUMP NO.: MM 1404 PRESSURE GAUGE NO.: 0090

4) LOAD CELL FACTOR**: — STRESSING ROD GAGE FACTOR***: 0.1997

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. All buttonheads in good condition

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs)x1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs)x1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)x1000	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Bal)	0							Stressing not performed due to inability of stressing rod to be threaded over tendon head.
INCREASING:	2000							
INCREASING:	4000							
LIFTOFF:								
LIFTOFF +6%								Load Cell Strain (at rest) = -5345 μin/in
LIFTOFF:								
DECREASING:	4000							
DECREASING:	2000							
DECREASING:	0							

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896+0.1274 X [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 11-21-83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/25/83 TENDON NO.: 155 SHIM STACK THICKNESS: 11-7/8"

2) HYDRAULIC JACK NO.: RJ 500-12 RAM AREA: A

3) HYDRAULIC PUMP NO.: 797KRTA / M M 1904 PRESSURE GAUGE NO.: ST-2

4) LOAD CELL FACTOR**: N/A STRESSING ROD GAGE FACTOR***: 0.2004 x STRAIN

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. Surveillance wire button head resting on top of collar.

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) X1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Gilbert - P.R. 35 min Lw)	0	0	0	0	N/A		~~3-1/16~~ 3-1/8"	
INCREASING:	2000	255.7	1263 ~~400~~	253.1	N/A		3-3/16"	
INCREASING:	4000	510.5	2502 / 2522	503.4	N/A		3-1/4"	
LIFTOFF: SHM1 / SHM2	5800 / 5825 AVG 5812.5	741.4	3711 / 3722 3716.5	744.8	N/A		3-3/8"	
LIFTOFF +6%	6200	790.8	3939	789.4	N/A		3-13/16"	
LIFTOFF: SHM1 / SHM2	5800 / 5820 AVG 5810	741.1	3713 / 3722 3717.5	744.9	N/A		3-3/8"	
DECREASING:	4000	510.5	2504	501.8	N/A		3-1/4"	
DECREASING:	2000	255.7	1286	257.7	N/A		3-3/16"	
DECREASING:	0	0	0	0	N/A		3-1/8"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = .896+0.1274 x [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Faber DATE: 7/27/83

DATA SHEET 1 - JULY 1983 TENDON SURVEILLANCE

1) DATE: 7/26/83 TENDON NO.: 160 SHIM STACK THICKNESS: 11 9/16"

2) HYDRAULIC JACK NO.: RJ-500-12 RAM AREA: ☆

3) HYDRAULIC PUMP NO.: 797 KRTA PRESSURE GAUGE NO.: ST-2

4) LOAD CELL FACTOR**: MM 1904 N/A STRESSING ROD GAGE FACTOR***: 0.2004

5) TENDON INSPECTION COMMENTS: Tendon head in good condition. No surveillance wire showing

(1) CONDITION	(2) PRESSURE GAUGE (a) Pressure (psi)	(2) PRESSURE GAUGE (b) Force* (lbs) X1000	(3) STRESSING ROD (a) Strain (u in/in)	(3) STRESSING ROD (b) Force** (lbs) /1000	(4) LOAD CELL (a) Strain (u in/in)	(4) LOAD CELL (b) Force** (lbs)	(5) RAM POSITION inches	(6) COMMENTS
INITIAL: (Zero Balance-P.R. 50 psi Lock-up)	0	0	0	0	N/A		2-9/16"	
INCREASING:	2000	255.7	1270	254.5	N/A		2-11/16"	
INCREASING:	4000	510.5	2526	506.2	N/A		2-3/4"	
LIFTOFF: Shim 1 / Shim 2	5620 / 5640 } 5630	718.2	3593 / 3605 } 3599	721.2	N/A		2-7/8"	
LIFTOFF +6%	☆ 5970/5990	764.0	☆ 3779/3792	759.9	N/A		☆ 2-13/16 / 3-5/16"	☆ Press Gage Needle Stuck
LIFTOFF:	5650	720.7	3598	721.0	N/A		2-13/16	
DECREASING:	4000	510.5	2562	513.4	N/A		2-3/4"	
DECREASING:	2000	255.7	1275	255.5	N/A		2-11/16"	
DECREASING:	0	0	0	0	N/A		2-5/8"	

NOTES: (*) Ram area to be used to calculate ram force in column 2b: Force = 0.896 + 0.1274 x [Gage Pressure (PSIG)]

(**) Load Cell Factor to be used to calculate force in column 4b: See Attachment 1

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

COMPLETED BY: Clyde Fulton DATE: 7/27/83

APPENDIX D

FORCE VS TIME CURVES

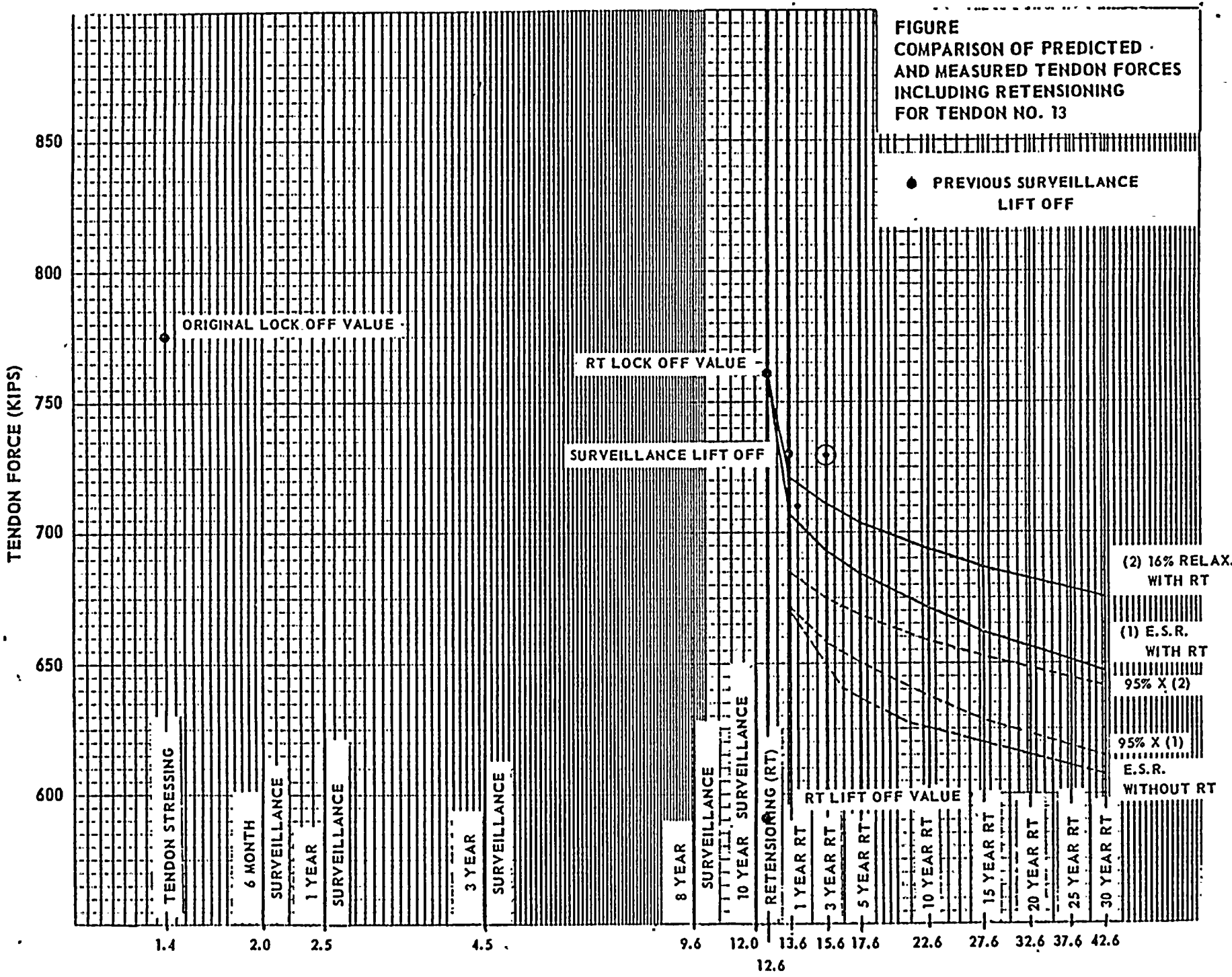


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 13
PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
E.S.R. WITHOUT RT
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
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17.6
22.6
27.6
32.6
37.6
42.6

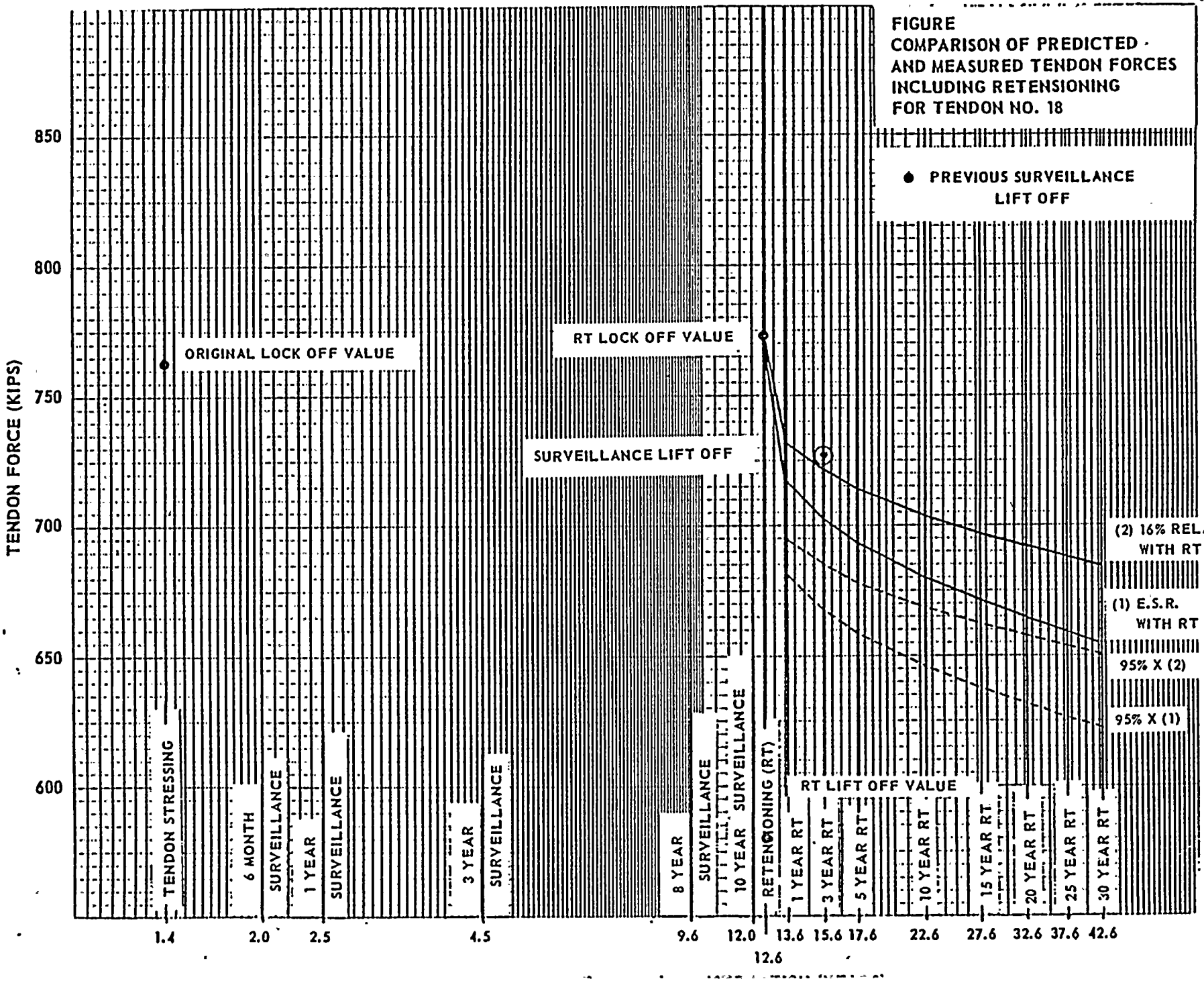


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 18
PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6

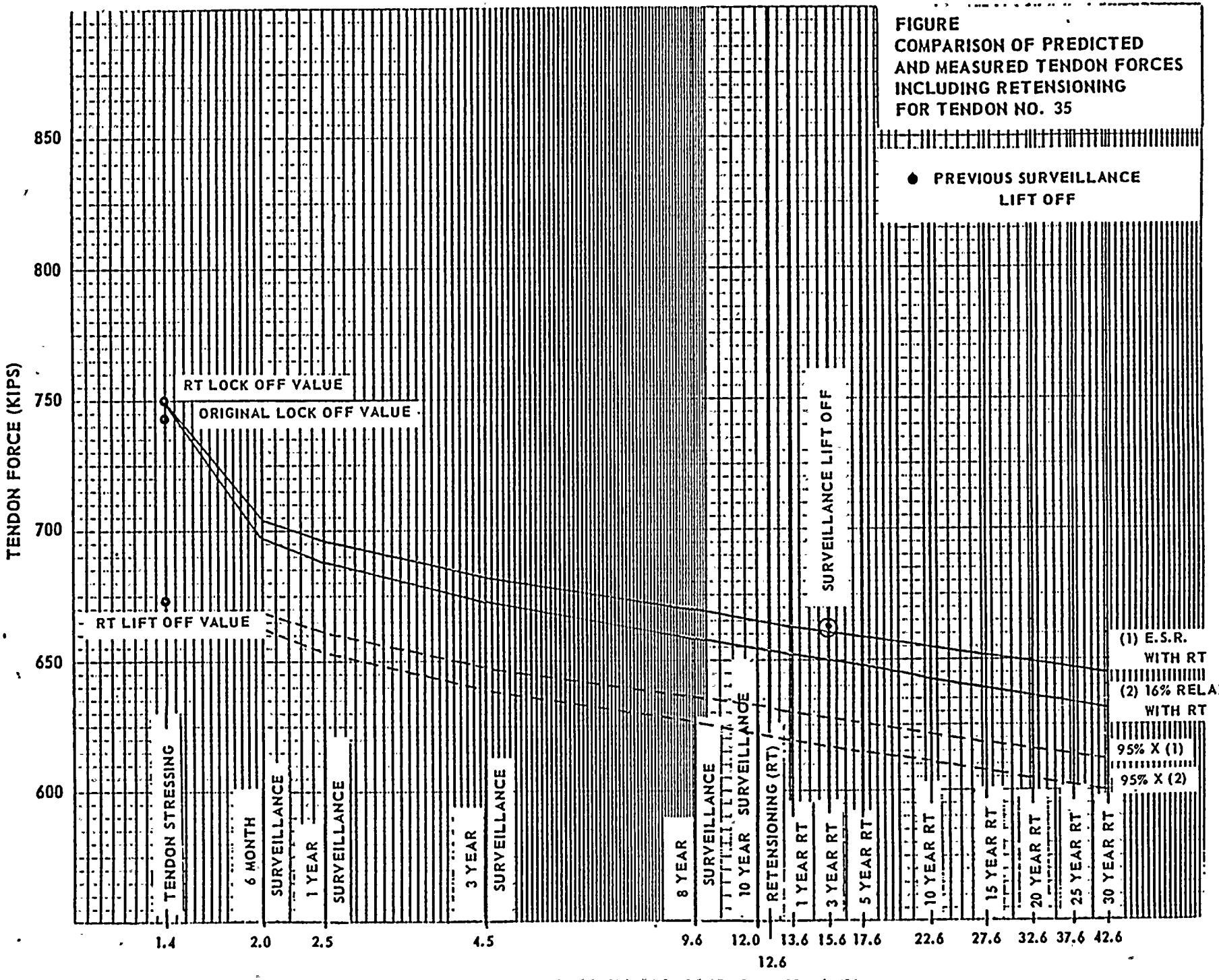


FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 35
● PREVIOUS SURVEILLANCE
LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
RT LOCK OFF VALUE
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
SURVEILLANCE LIFT OFF
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
(1) E.S.R.
WITH RT
(2) 16% RELAX.
WITH RT
95% X (1)
95% X (2)
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6

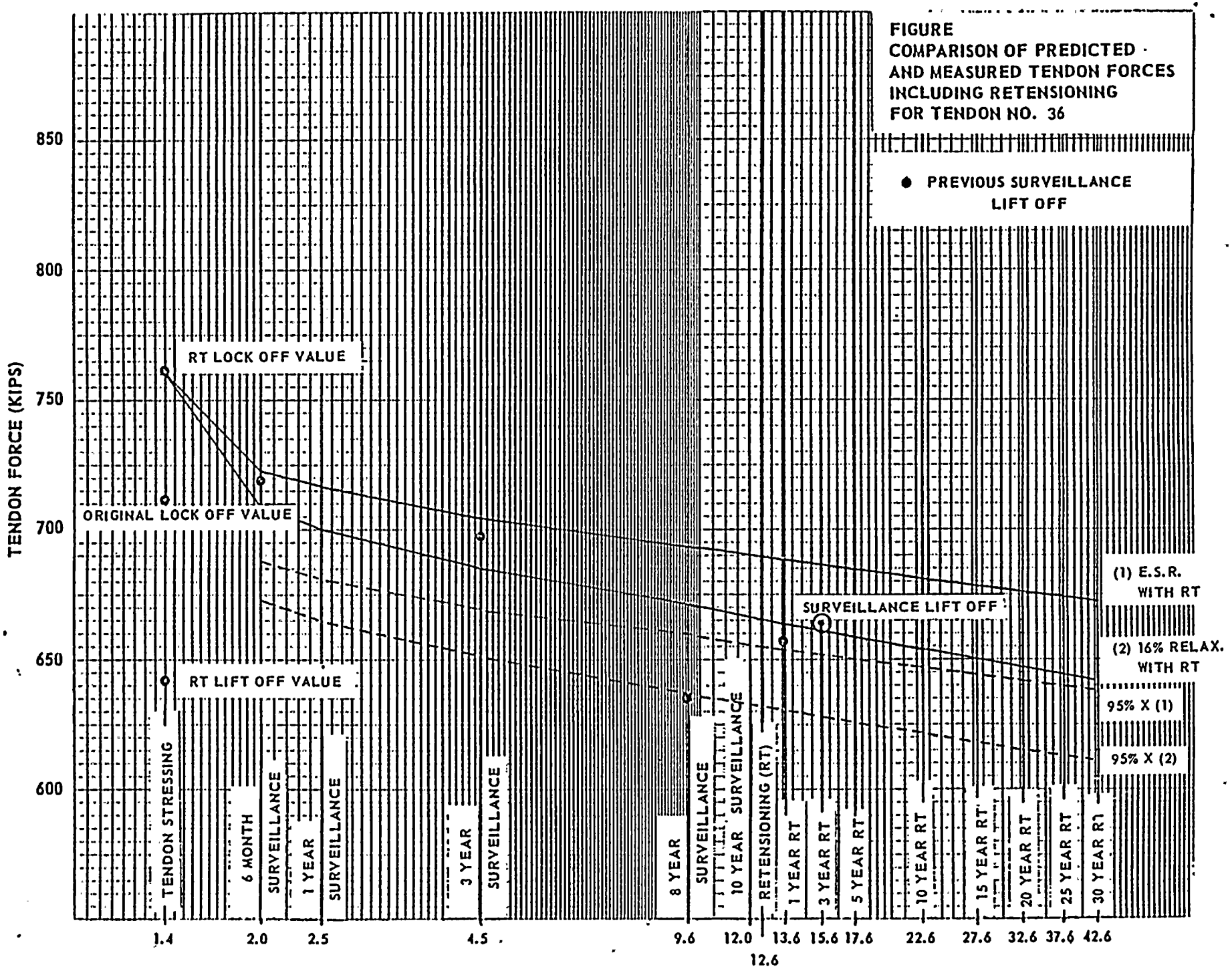


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 36
● PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
RT LOCK OFF VALUE
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
(1) E.S.R. WITH RT
(2) 16% RELAX. WITH RT
95% X (1)
95% X (2)
SURVEILLANCE LIFT OFF
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6

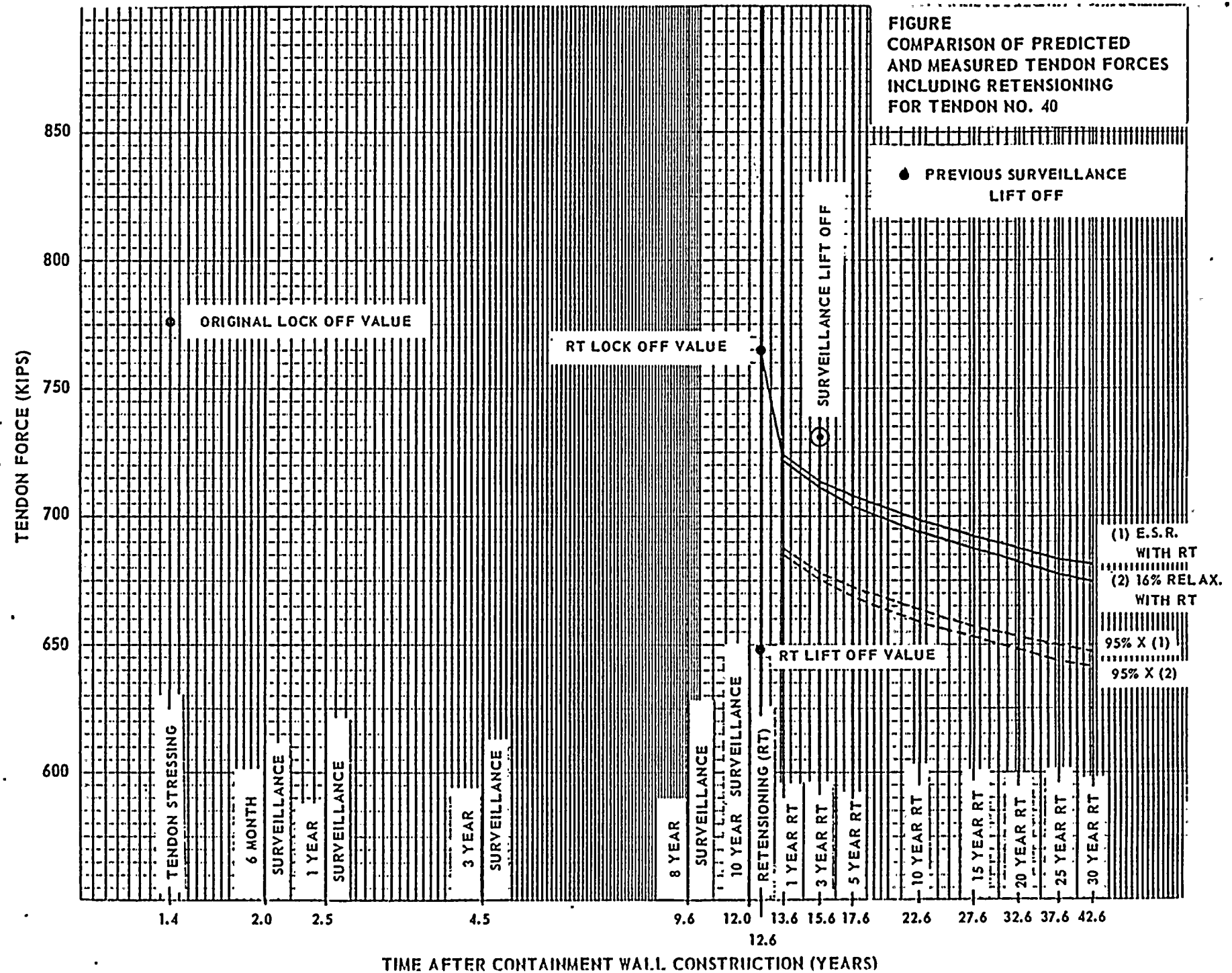


FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 40
PREVIOUS SURVEILLANCE
LIFT OFF
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(1) E.S.R.
WITH RT
(2) 16% RELAX.
WITH RT
95% X (1)
95% X (2)
TENDON FORCE (KIPS)
850
800
750
700
650
600
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

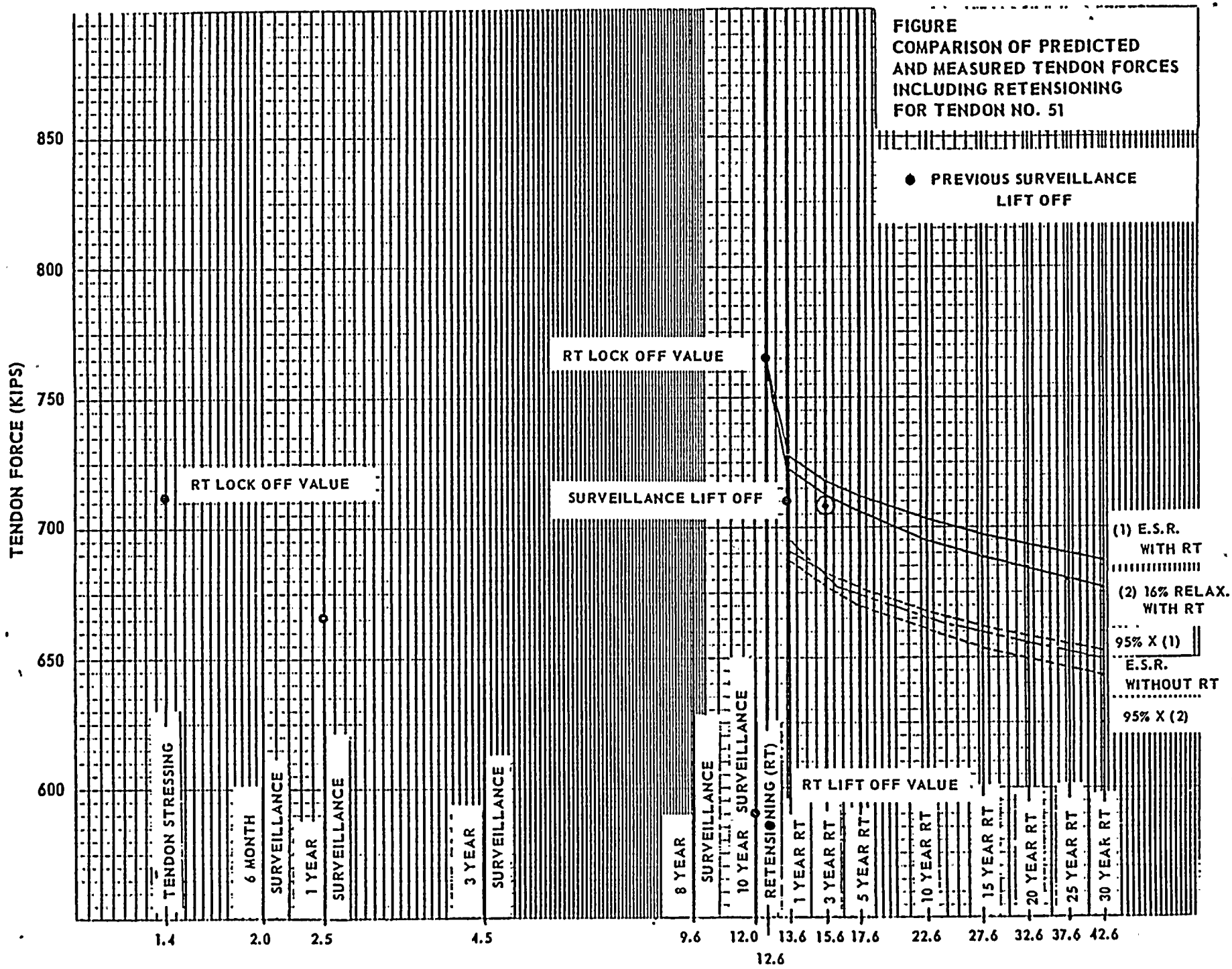


FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 51
● PREVIOUS SURVEILLANCE
LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LOCK OFF VALUE
RT LIFT OFF VALUE
(1) E.S.R.
WITH RT
(2) 16% RELAX.
WITH RT
95% X (1)
E.S.R.
WITHOUT RT
95% X (2)
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6

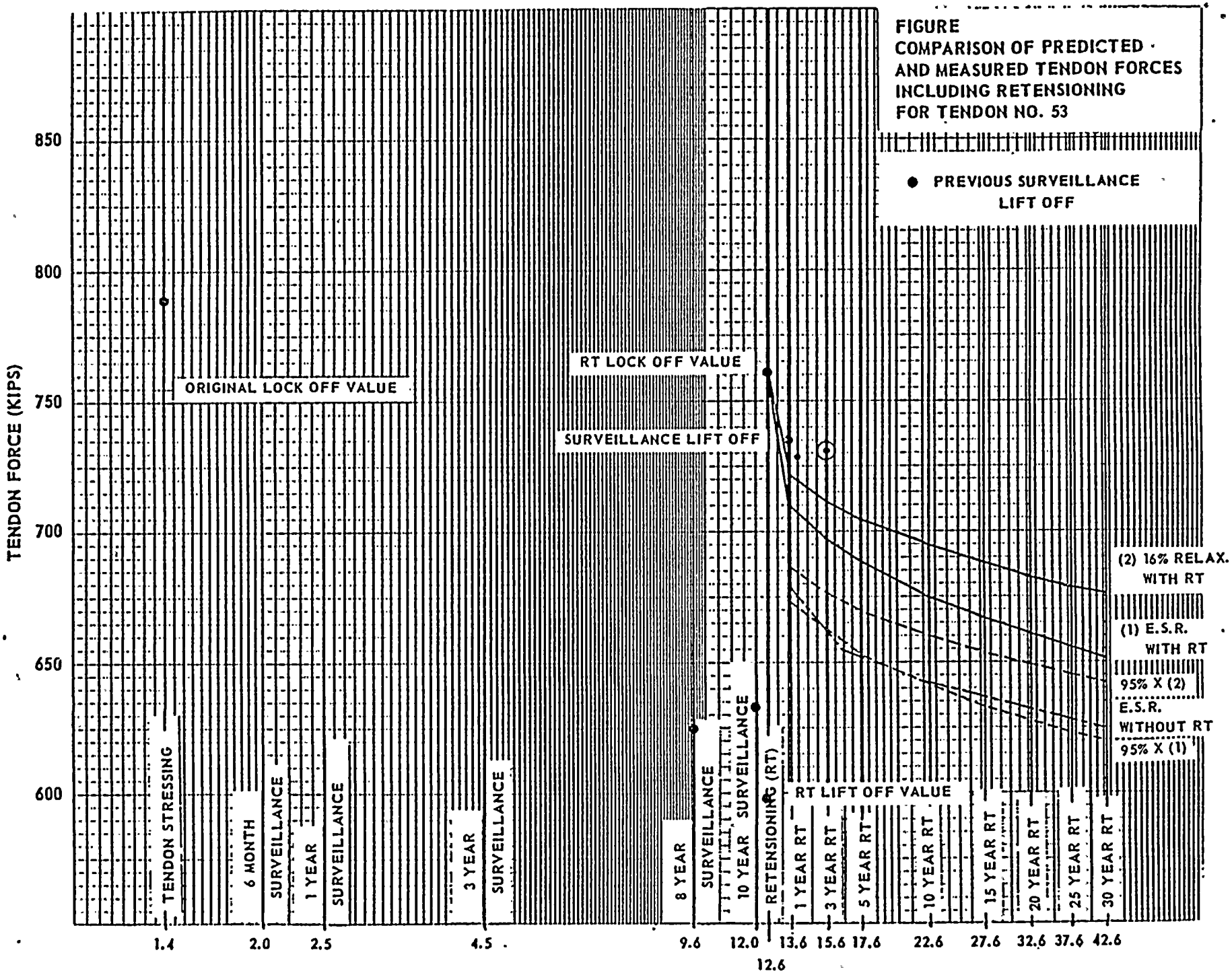
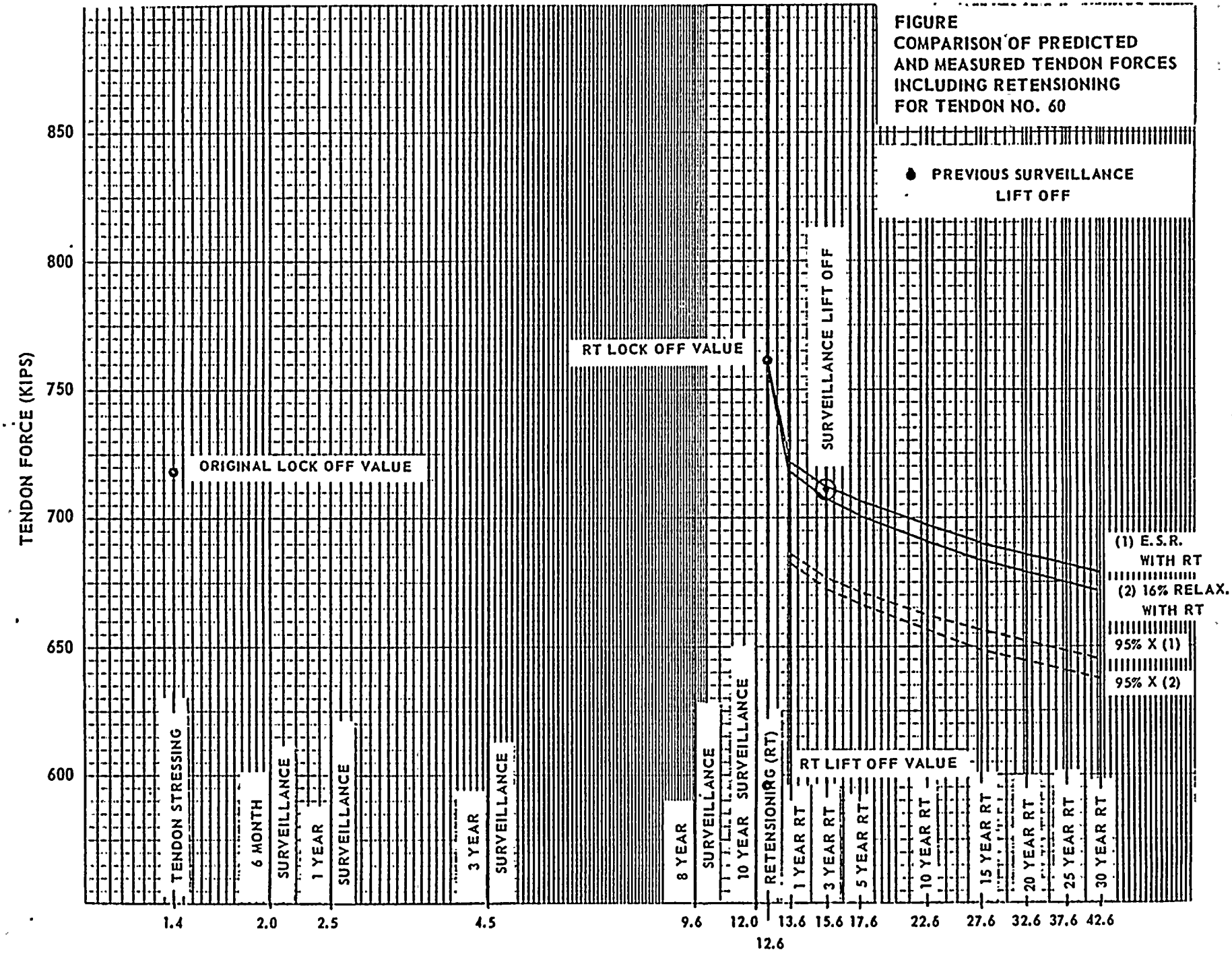


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 53
● PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
E.S.R. WITHOUT RT
95% X (1)

FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 60



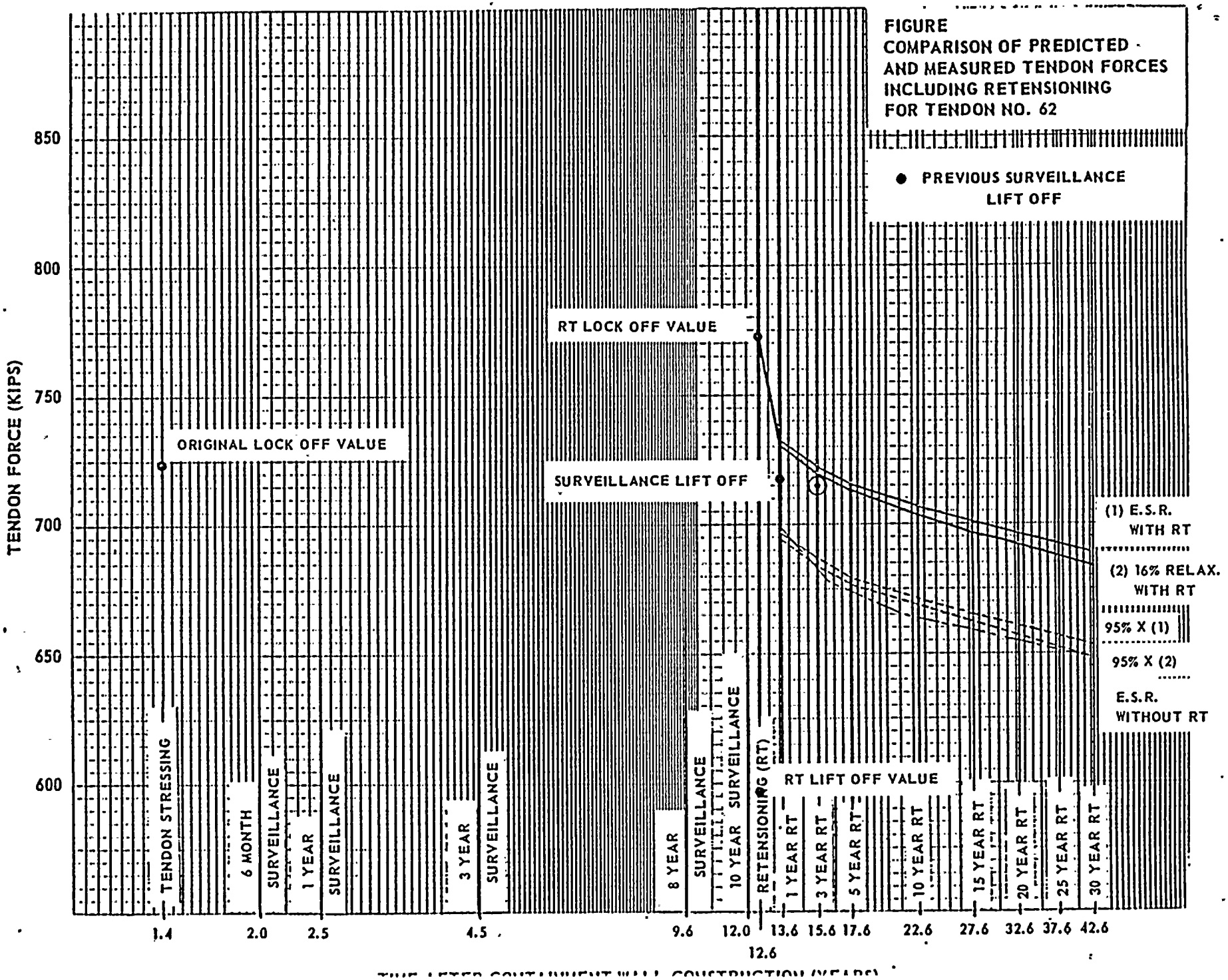


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 62
● PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
(1) E.S.R. WITH RT
(2) 16% RELAX. WITH RT
95% X (1)
95% X (2)
E.S.R. WITHOUT RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
THE LATER CONTAINMENT WALL CONSTRUCTION (YEARS)

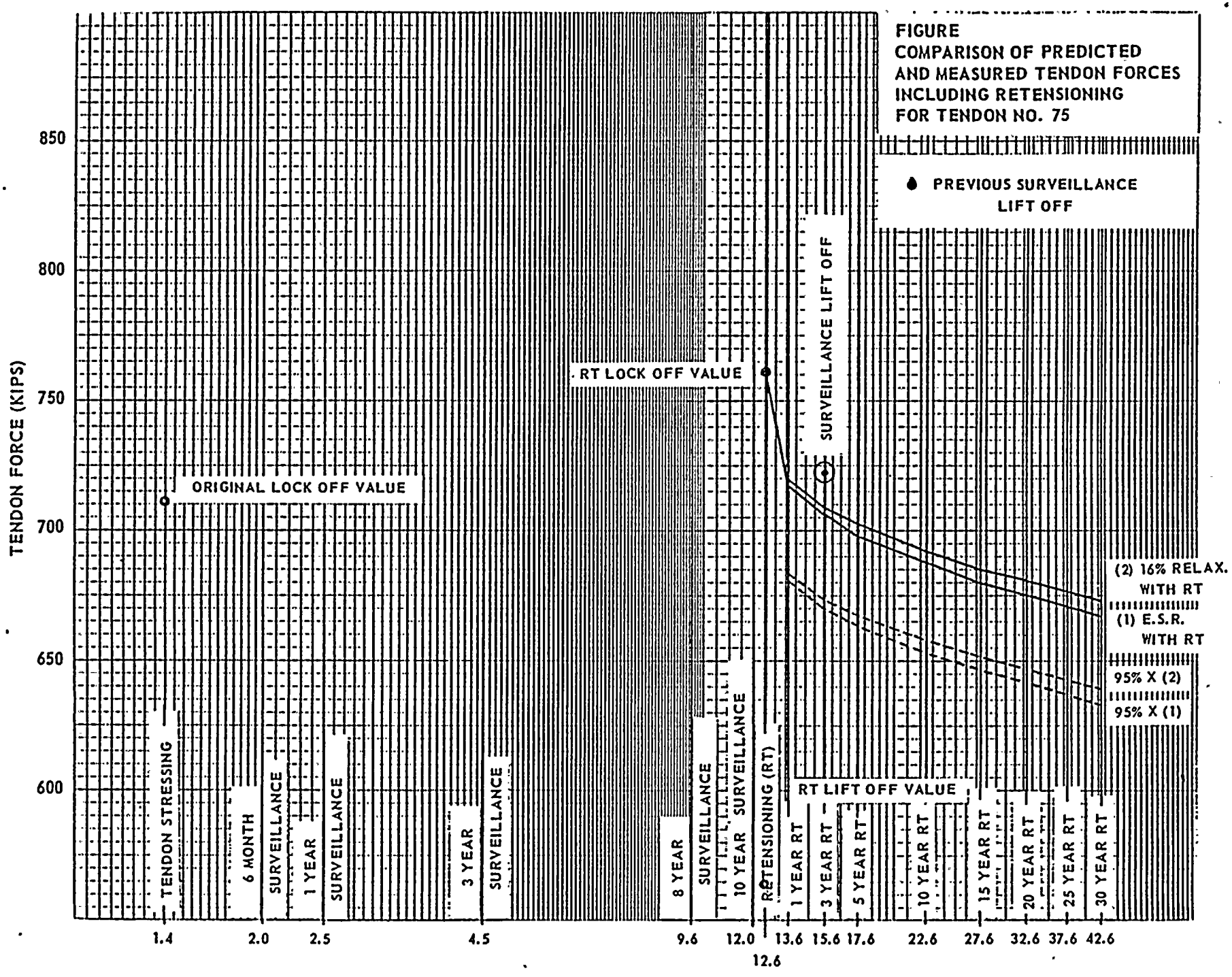


FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 75
PREVIOUS SURVEILLANCE
LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
(2) 16% RELAX.
WITH RT
(1) E.S.R.
WITH RT
95% X (2)
95% X (1)
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

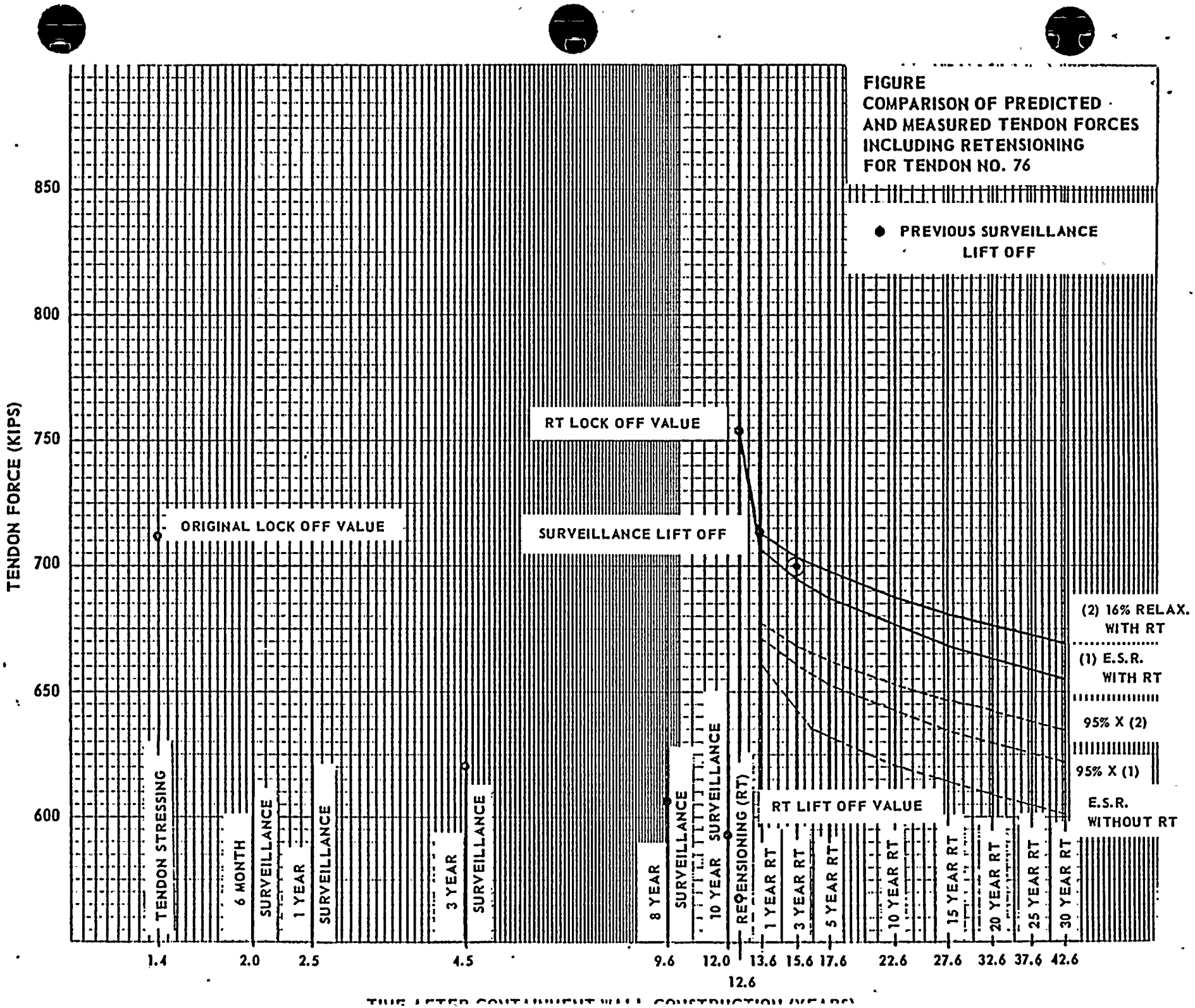


FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 76
PREVIOUS SURVEILLANCE LIFT OFF
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
E.S.R. WITHOUT RT
TENDON FORCE (KIPS)
850
800
750
700
650
600
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
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17.6
22.6
27.6
32.6
37.6
42.6

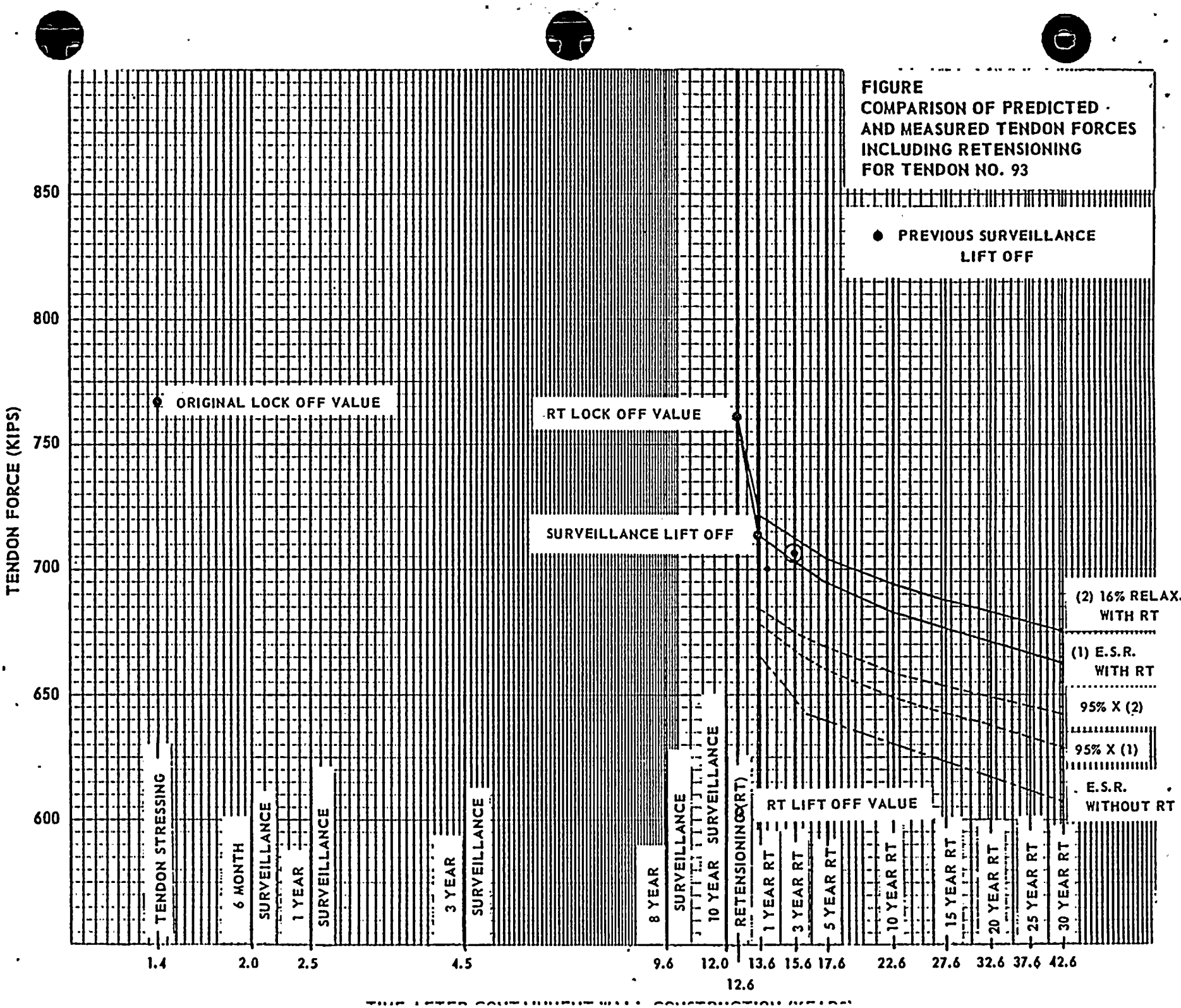
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 93
PREVIOUS SURVEILLANCE LIFT OFF
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
E.S.R. WITHOUT RT
TENDON FORCE (KIPS)
850
800
750
700
650
600
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
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15.6
17.6
22.6
27.6
32.6
37.6
42.6

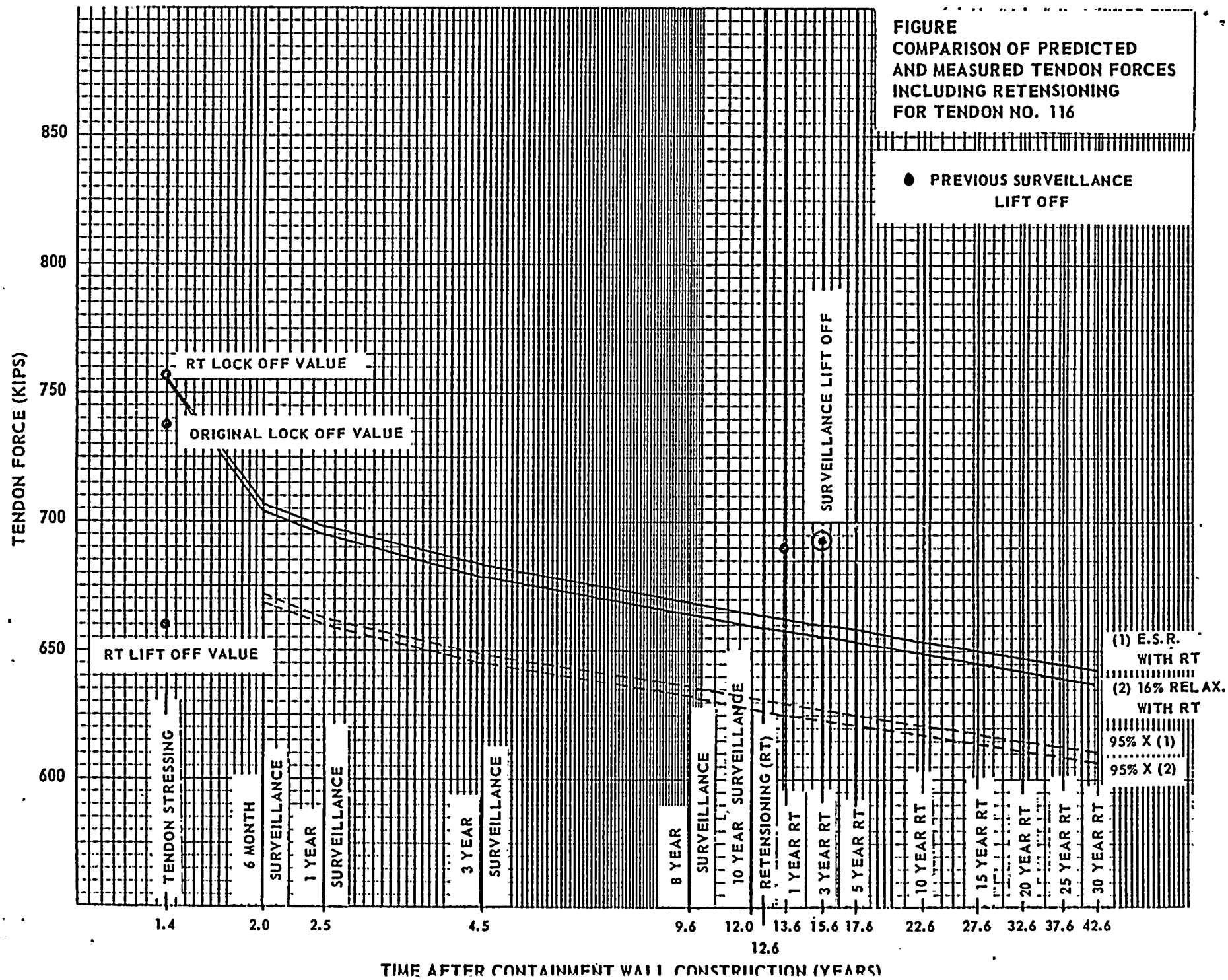
FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 116
PREVIOUS SURVEILLANCE
LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
RT LOCK OFF VALUE
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
SURVEILLANCE LIFT OFF
TENDON STRESSING
6 MONTH
SURVEILLANCE
1 YEAR
SURVEILLANCE
3 YEAR
SURVEILLANCE
8 YEAR
SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
(1) E.S.R.
WITH RT
(2) 16% RELAX.
WITH RT
95% X (1)
95% X (2)
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

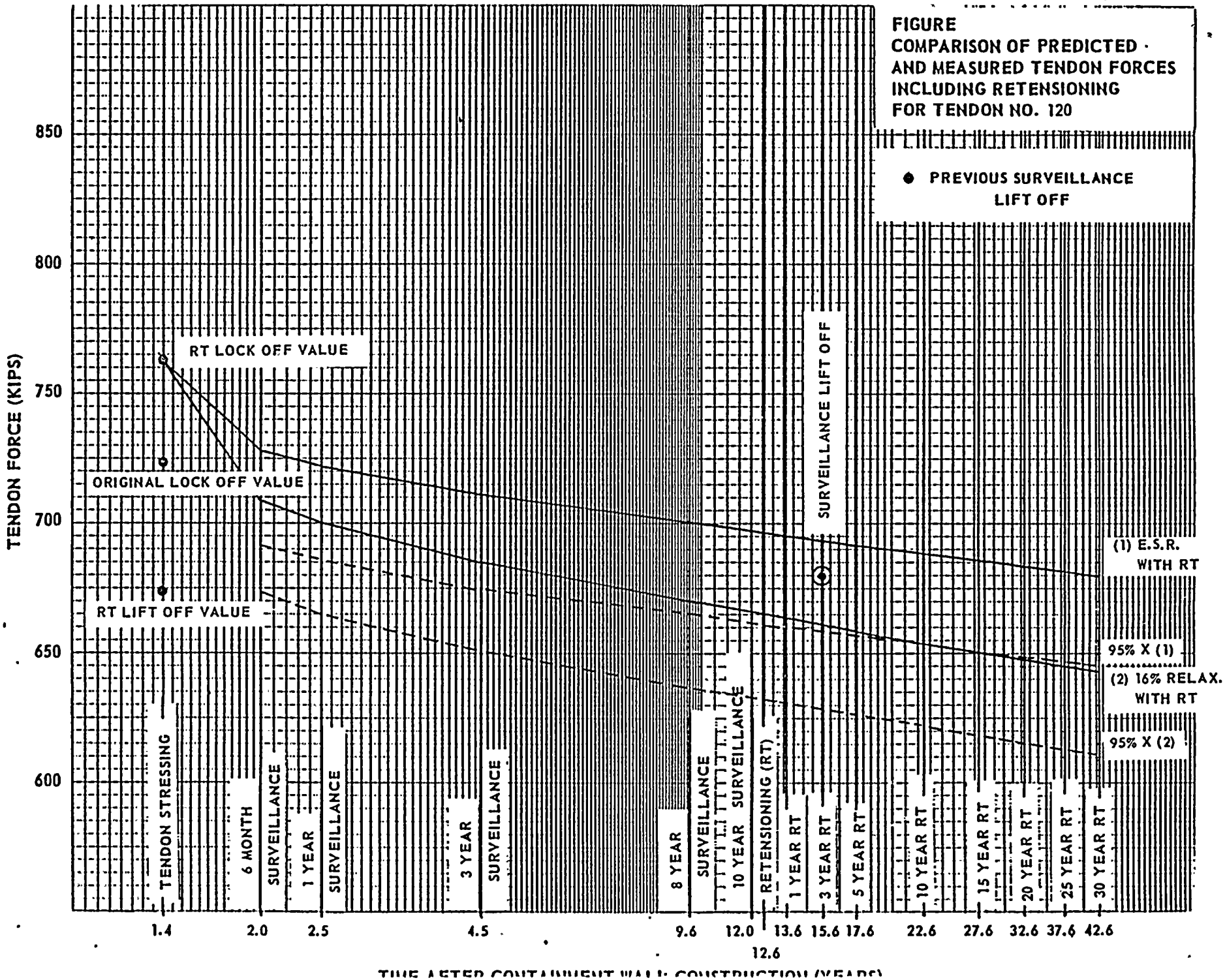
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 120
PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
RT LOCK OFF VALUE
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
SURVEILLANCE LIFT OFF
(1) E.S.R. WITH RT
95% X (1)
(2) 16% RELAX. WITH RT
95% X (2)
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

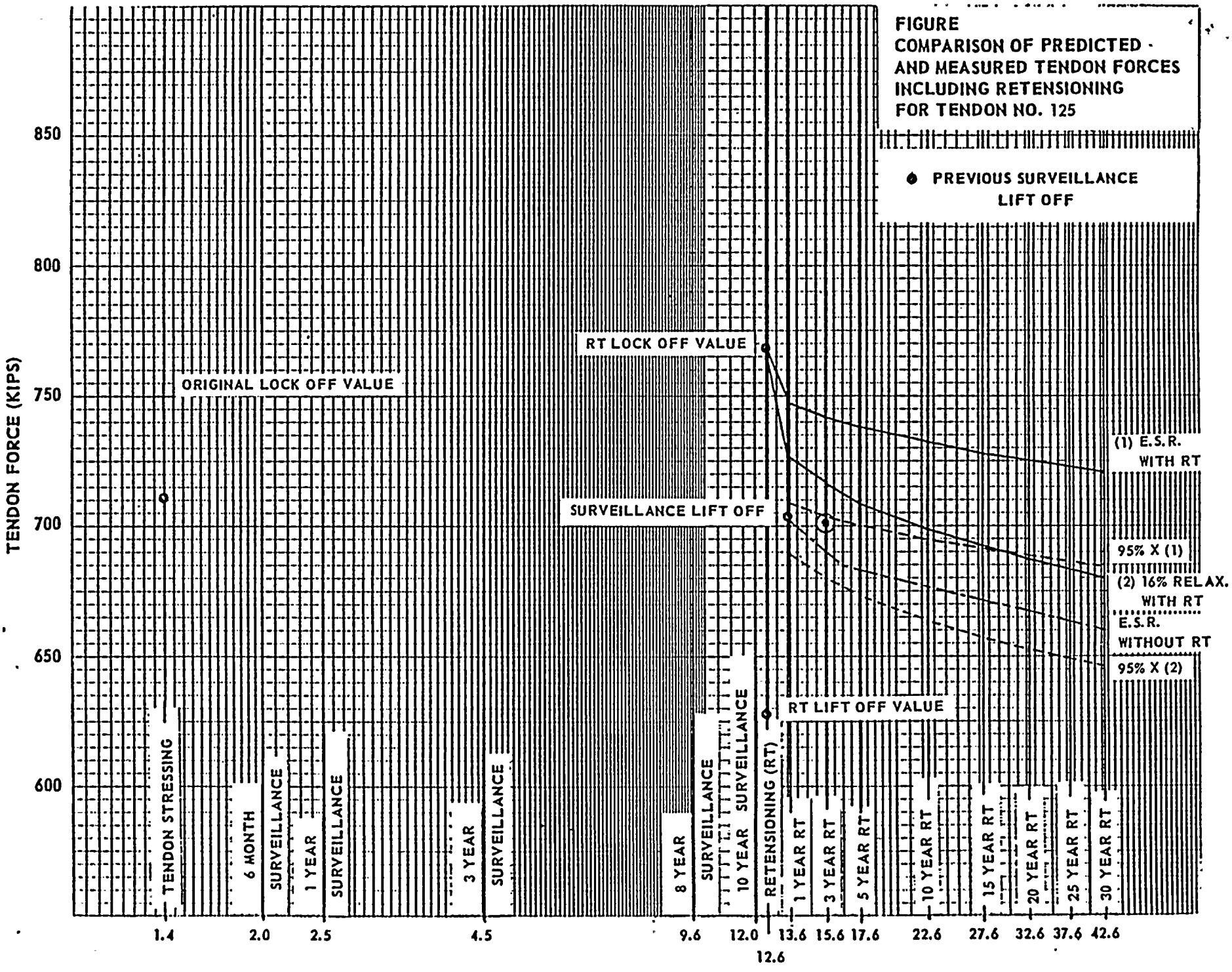
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 125
PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(1) E.S.R. WITH RT
95% X (1)
(2) 16% RELAX. WITH RT
E.S.R. WITHOUT RT
95% X (2)
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6

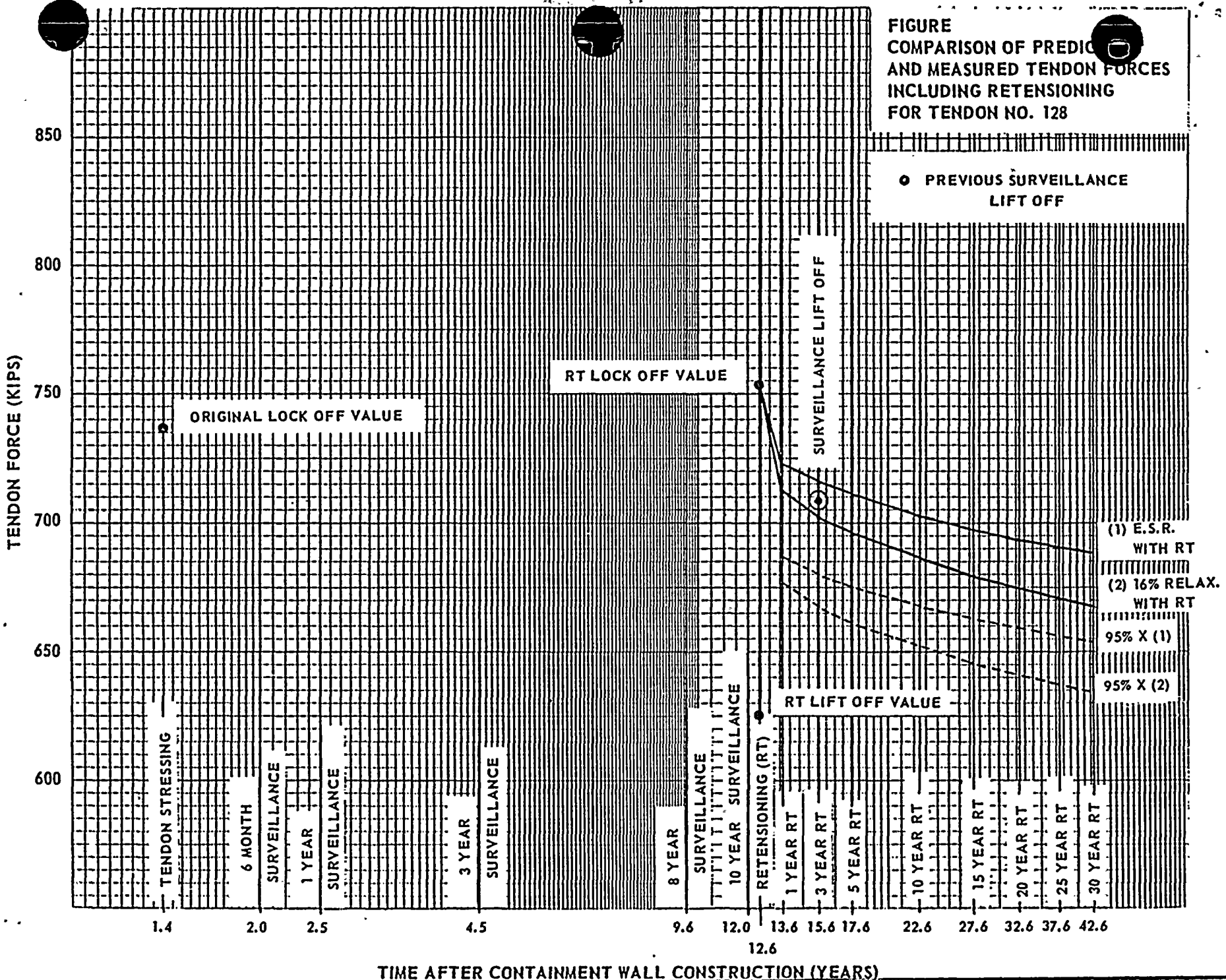
FIGURE
COMPARISON OF PREDIC
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 128
PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(1) E.S.R. WITH RT
(2) 16% RELAX. WITH RT
95% X (1)
95% X (2)
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

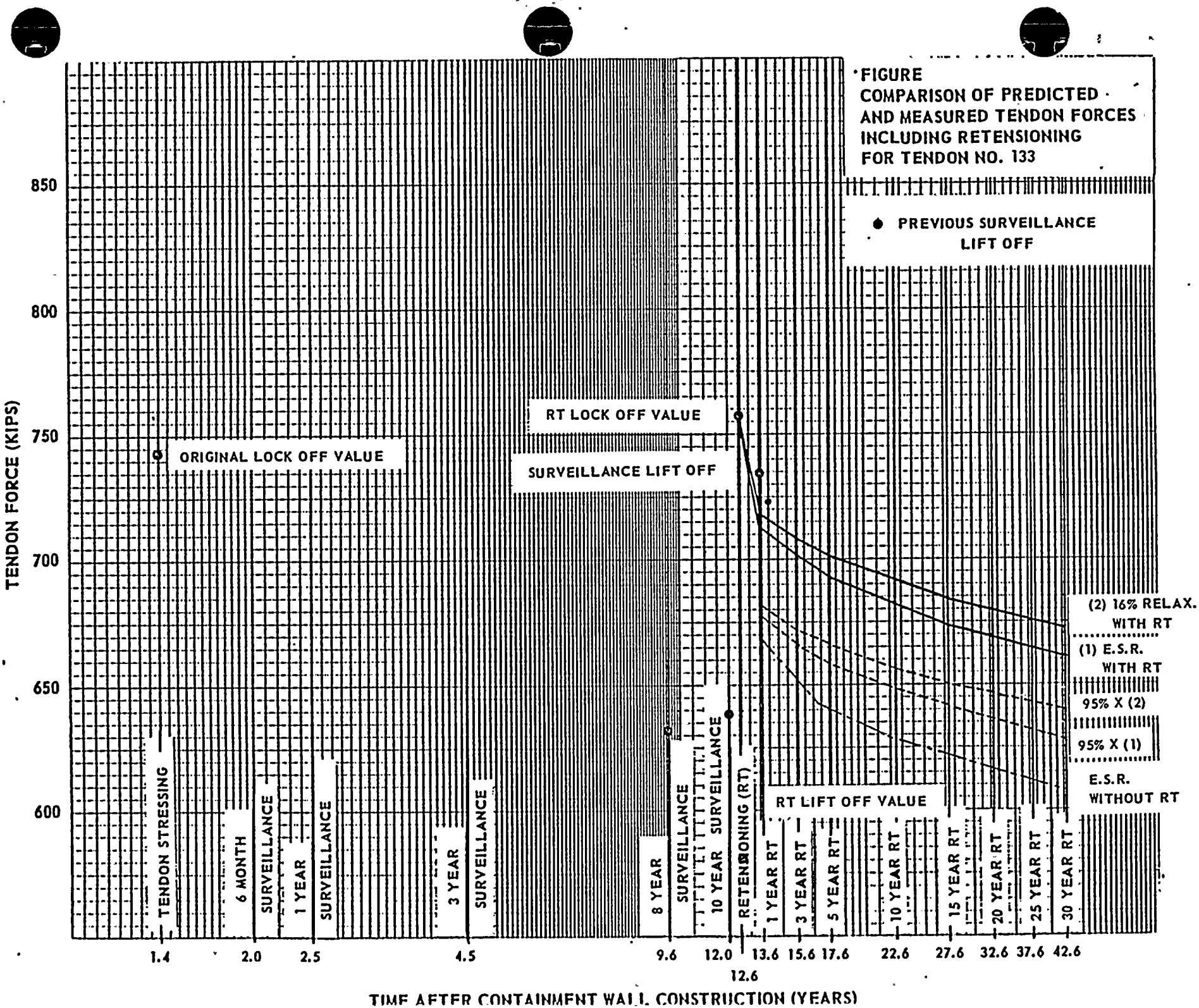
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 133
PREVIOUS SURVEILLANCE LIFT OFF
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
E.S.R. WITHOUT RT
TENDON FORCE (KIPS)
850
800
750
700
650
600
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

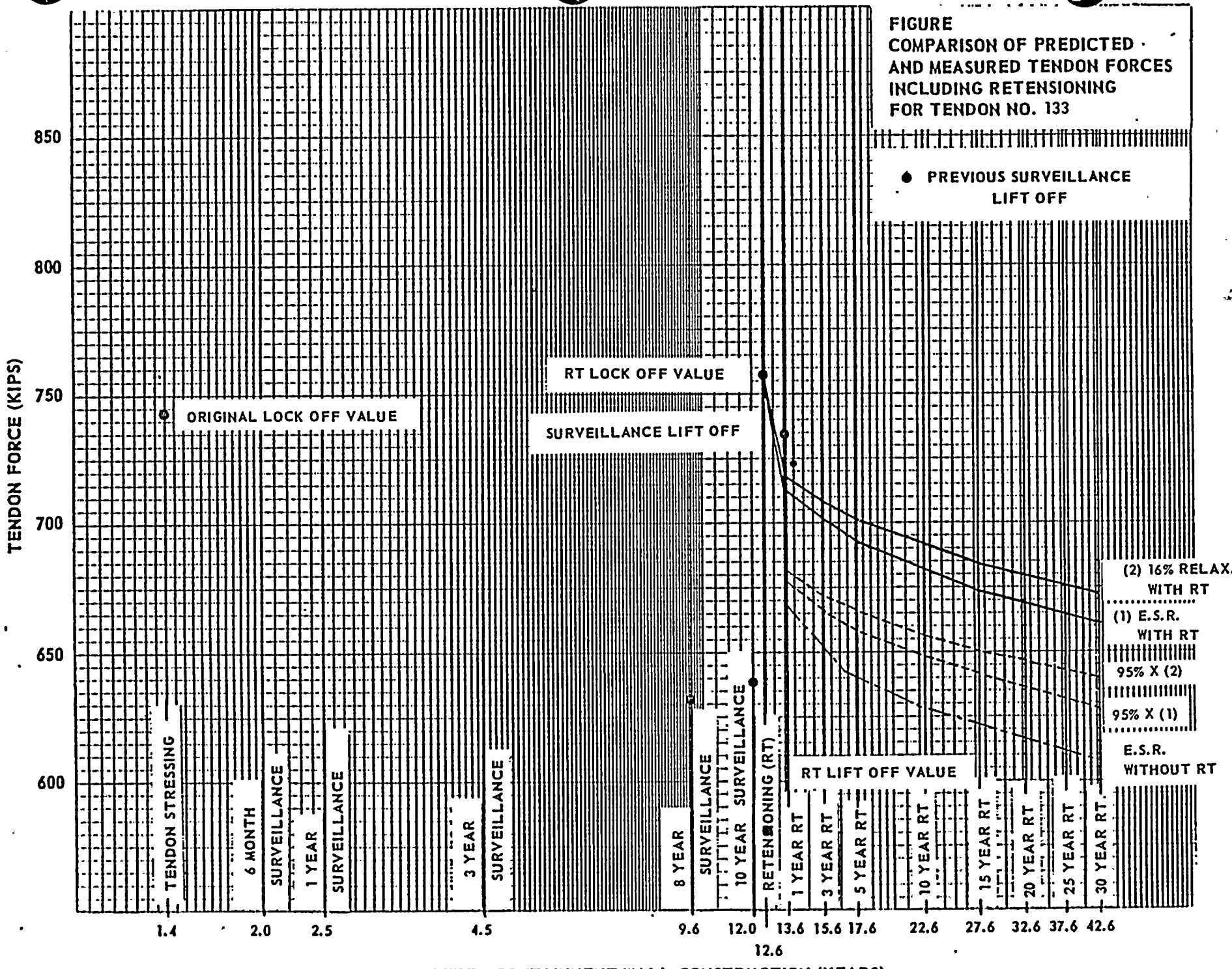
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 133
PREVIOUS SURVEILLANCE LIFT OFF
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
ORIGINAL LOCK OFF VALUE
RT LIFT OFF VALUE
(2) 16% RELAX. WITH RT
(1) E.S.R. WITH RT
95% X (2)
95% X (1)
E.S.R. WITHOUT RT
TENDON FORCE (KIPS)
850
800
750
700
650
600
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

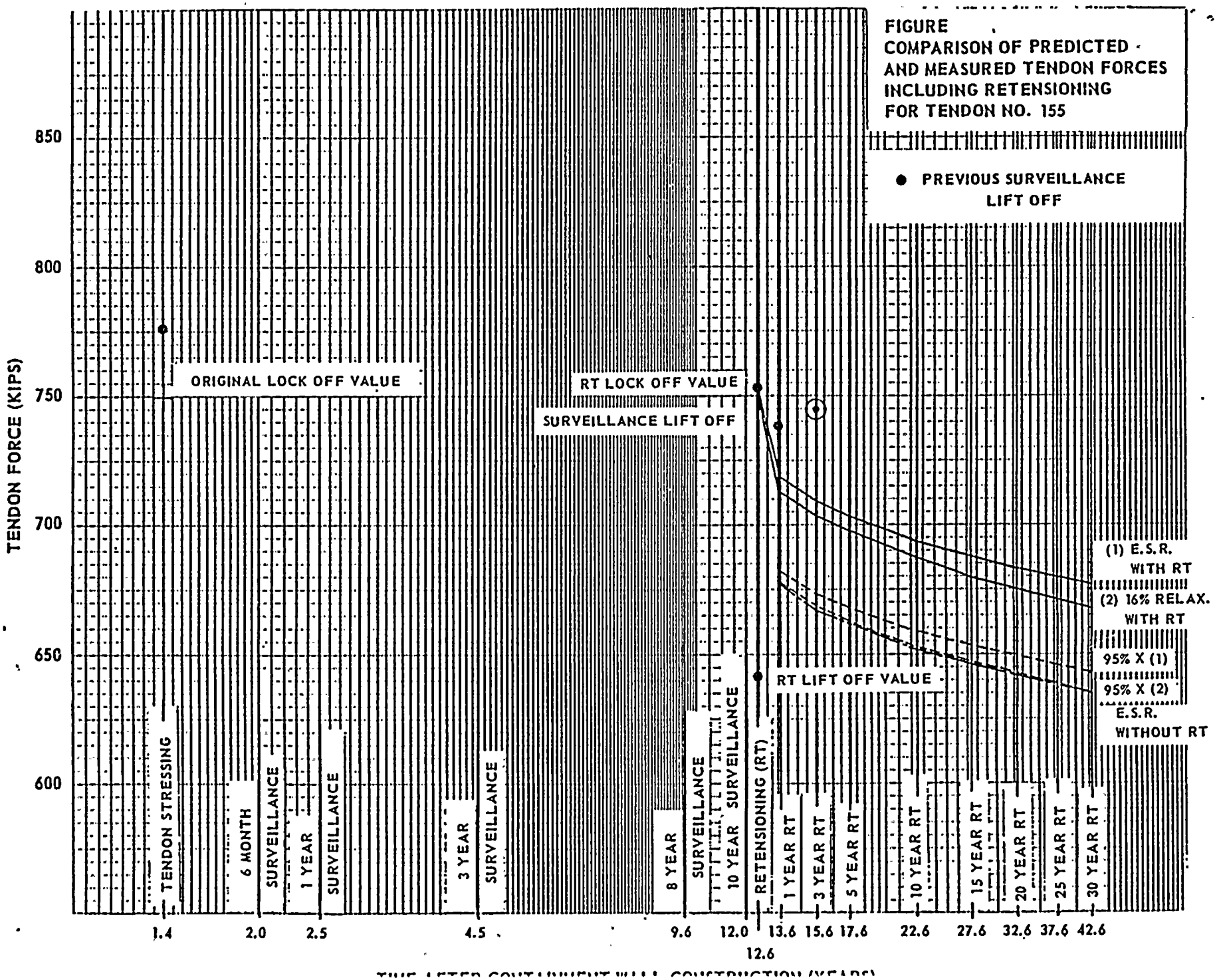
FIGURE
COMPARISON OF PREDICTED AND MEASURED TENDON FORCES INCLUDING RETENSIONING FOR TENDON NO. 155
● PREVIOUS SURVEILLANCE LIFT OFF
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
(1) E.S.R. WITH RT
(2) 16% RELAX. WITH RT
95% X (1)
95% X (2)
E.S.R. WITHOUT RT
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

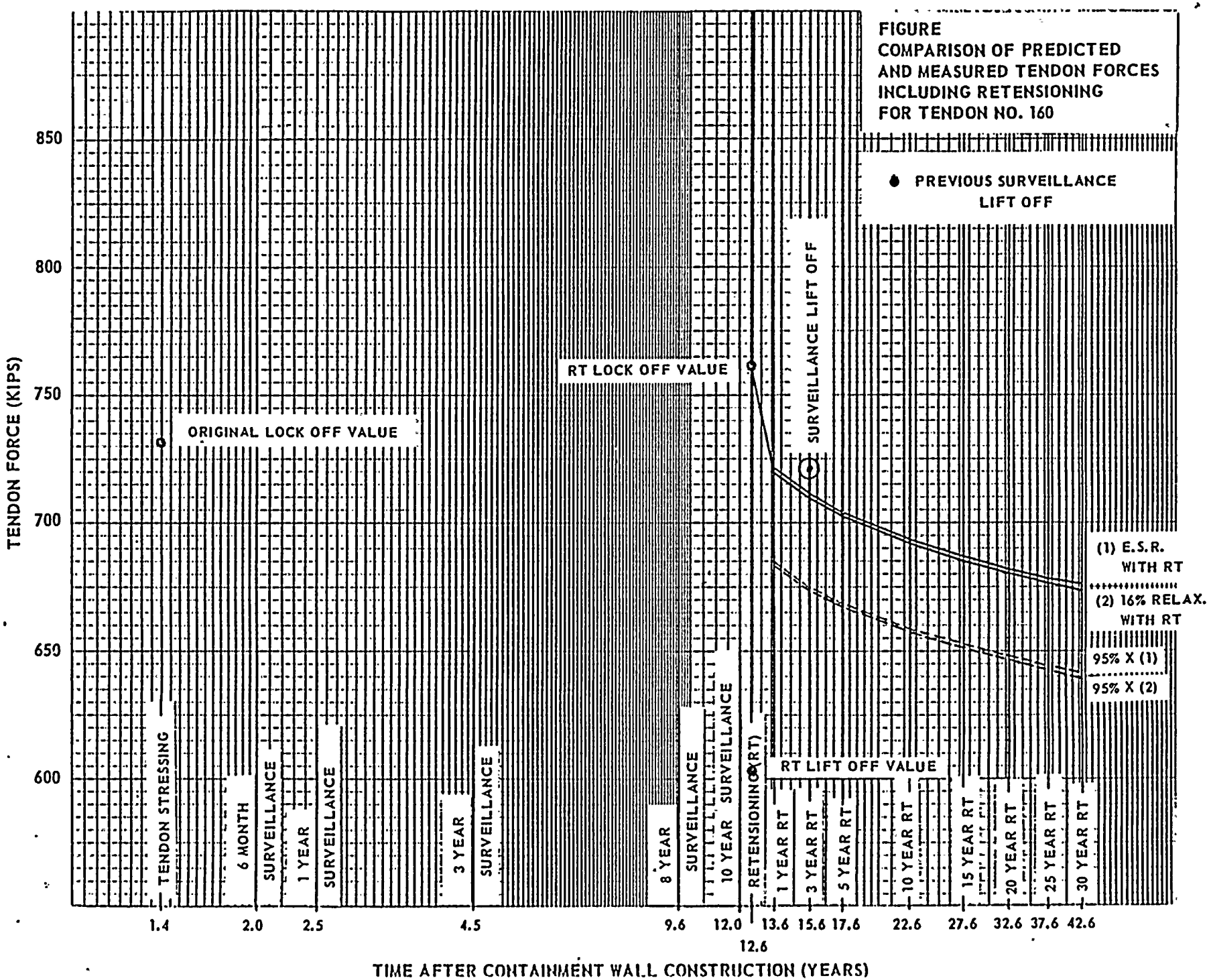
FIGURE
COMPARISON OF PREDICTED
AND MEASURED TENDON FORCES
INCLUDING RETENSIONING
FOR TENDON NO. 160
PREVIOUS SURVEILLANCE
LIFT OFF
(1) E.S.R.
WITH RT
(2) 16% RELAX.
WITH RT
95% X (1)
95% X (2)
TENDON FORCE (KIPS)
850
800
750
700
650
600
ORIGINAL LOCK OFF VALUE
RT LOCK OFF VALUE
SURVEILLANCE LIFT OFF
RT LIFT OFF VALUE
TENDON STRESSING
6 MONTH SURVEILLANCE
1 YEAR SURVEILLANCE
3 YEAR SURVEILLANCE
8 YEAR SURVEILLANCE
10 YEAR SURVEILLANCE
RETENSIONING (RT)
1 YEAR RT
3 YEAR RT
5 YEAR RT
10 YEAR RT
15 YEAR RT
20 YEAR RT
25 YEAR RT
30 YEAR RT
1.4
2.0
2.5
4.5
9.6
12.0
12.6
13.6
15.6
17.6
22.6
27.6
32.6
37.6
42.6
TIME AFTER CONTAINMENT WALL CONSTRUCTION (YEARS)

Attachment B