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SUBJECT: Forwards facility reactor bldg tendon surveillance rept submitted to fulfill requirements of Tech Specs 4.4.2 re tendon inservice insp.

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March 28, 1988

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Oconee Nuclear Station, Unit 1
Docket No. 50-269
Tendon Surveillance Report

Gentlemen:

Pursuant to Oconee Nuclear Station Technical Specification 6.6.3.g please find attached the Oconee Unit 1 Reactor Building Tendon Surveillance Report. This report is submitted to fulfill the requirements of Technical Specification 4.4.2 regarding tendon inservice inspections.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

PJN/312/jgc

Attachment

xc: Dr. J. Nelson Grace, Regional Administrator
U.S. Nuclear Regulatory Commission
Region II
101 Marietta St., NW, Suite 2900
Atlanta, Georgia 30323

Ms. Helen Pastis
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. P.H. Skinner
NRC Resident Inspector
Oconee Nuclear Station

A047
1/1

OCONEE NUCLEAR STATION
UNIT 1 CONTAINMENT BUILDING
TENDON SURVEILLANCE

SUMMARY

Containment Building tendon surveillance was performed on Oconee Unit 1 during the period September, 1987 through December, 1987 in accordance with Technical Specification 4.4.2. This was the fifth inspection for the unit, and all tendons inspected have remained in satisfactory condition. Tendon 2D28 had a crack on opposite edges of the stressing washer on one end. This crack or peeling back of the metal on the outside edge of the stressing washer, was apparently caused during a previous inspection when the tendon was seated when one of the shims was out of position. E. H. Murphy from Duke Power's design Engineering Department examined the damaged stressing washer. It was his opinion, and I concur, that the damage was not significant enough to prevent the stressing washer from supporting the load of the tendon. Pictures were taken of the stressing washer and it will be examined during the next Unit 1 tendon surveillance.

DISCUSSION

Nine surveillance tendons were inspected for anchorage condition and post-tensioning force and, of these, one tendon in each surveillance group was detensioned for wire removal, for wire condition inspection and destructive examination. These tendons were then re-stressed to the as-found configuration.

1) Lift-off forces remain within the acceptable range for all tendons. The average lift-off force per wire is given on Table 1. Force-time trends are shown on Figures 1 through 9.

2) All tendons and components remain in satisfactory condition. Grease coverage of components was adequate. No moisture was detected. No change in grease coloring or condition was noted. No significant change in corrosion level of anchorage components or wires was found. Anchorage and wire conditions are detailed in Table 2.

3) Tensile testing was performed on wire samples removed from the designated tendons. A large percentage of the samples broke outside the gage marks and 'percent elongation' could not be determined. Based on the consistency of the ultimate strength results on the wire samples the wires would appear to meet the requirements of ASTM A421 to which the tendons were manufactured. Test results are attached.

CONCLUSION

Based on the results of this surveillance, the Unit 1 Containment Building post-tensioning system is in satisfactory condition and is capable of continuing to perform its intended function.

TABLE 1

AVERAGE LIST-OFF FORCE PER WIRE

(KIPS)

TENDON	1971	1972	1974	1977	1984	1987
1D28	8.53	7.80/7.98	7.89	7.69	7.84	7.86/7.72
2D28	8.40	7.98	7.94/8.33	8.02	7.95	8.14
3D28	8.46	7.85	7.87	7.84/8.26	8.41/8.24	8.40
23V14	8.40	7.57/7.75	7.59	7.70	7.56	7.75/7.93
45V16	8.27	7.34	7.37/8.49	7.75	8.17	8.40
61V16	8.46	7.60	7.33	7.49/8.29	8.05/8.57	8.34
31H9	8.40	7.30/7.80	7.87	7.90	7.58	8.00
53H10	8.49	7.48	7.66	7.55/8.33	8.08	7.82
15H9	8.33	7.44	7.42/8.29	7.95	8.09/7.95	7.84/7.86

NOTES:

1. Double entries are, respectively, the as-found and as-left values for re-tensioned tendons.
2. 1971 values are for initial installation.
3. All values are the average of the values obtained at each end of the tendon.
4. Tendon 45V16 has a special anchorage at the lower end. Lift-off readings were obtained from the top end only.

TABLE 2

TENDON COMPONENT CONDITION

TENDON	WIRES	BUTTONHEADS	WASHERS	SHIMS	BEARING PLATE
1D28	A	A	B	B	B
2D29	N/A	A	B	B	B
3D28	N/A	A	B	B	B
13H9	N/A	A	A	A	A
51H9	A	A	B	B	B
53H10	N/A	A	B	B	B
23V14	A	A	B	B	B
45V16	N/A	A	B	B	B
61V16	N/A	A	B	B	B

CORROSION LEVELS

A	Bright metal, no visible oxidation
B	Reddish brown color, no pitting
C	$0 \leq$ Pitting $\leq .003"$
D	$.003" \leq$ Pitting $\leq .006"$
E	$.006" \leq$ Pitting $\leq .010"$

DUKE POWER COMPANY

APPLIED SCIENCE CENTER

Metallurgical Analysis Report

Sample No: 594 **Station:** Oconee **Unit:** 1
Requestor/Dept.: F. W. Linsley, CMD-SD/Maint.
Principal Investigator: G. O. Hite
Submitted to: F. W. Linsley **Date:** 2-11-88
cc: C. W. Hendrix

Equipment Description:

Tensile testing of ONS Unit 1 Surveillance tendons 1D28, 23V14, 51H9

Background Information:

Original samples were sectioned in half creating Sample A and B for each tendon, except for 23V14 series and 51H9-East for which there was only 1 sample each.

Description/Macro-Examination: N/A

Metallography: N/A

Fractography: N/A

Chemistry/Mechanical Testing: See Attachment 1

Conclusions:

The as received samples appeared to contain a greater amount of permanent curvature than has been noticed in previously tested samples.

This condition creates a bending moment which is thought to contribute to the inordinate number of specimens breaking outside the gage marks.

Tensile tester calibration sheets are included for your inspection.

If the Metallurgy Lab can be of further assistance, please call.

Approvals: J. B. Weigle Date: 2/24/88.
G. O. Hite 2/24/88

2MET8146

ATTACHMENT 1

Tensile Data:
Cal. Date: 10/08/87

Test Date: 2-11-88
Tested By: GH/CK

ID/Location	Diameter	% Elongation (101N. Gage)	Maximum Load (lbs)	Ultimate Strength (PSI)
1D28-East	.2502"	4.36	12,440	253,900
1D28-East	.2498"	9.00	12,410	253,300
1D28-Middle	.2496"	5.59	12,420	253,500
1D28-Middle	.2493"	(1)	12,460	254,300
1D28-West	.2498"	4.77	12,470	254,500
1D28-West	.2496"	9.74	12,440	253,900
23V14-Top	.2496"	(1)	12,740	260,000
23V14-Middle	.2497"	4.42	12,740	260,000
23V14-End	.2500"	4.10	12,620	257,600
51 H9-East	.2498"	(1)	12,570	256,500
51 H9-Middle	.2495"	(1)	12,590	256,900
51 H9-Middle	.2497"	(1)	12,540	255,900
51 H9-West	.2495"	(1)	12,500	255,100
51 H9-West	.2494"	5.44	12,550	256,100

(1) Specimen broke outside of gage marks.

Southern Calibration & Service, Inc.
460 PLASAMOUR DRIVE / P.O. BOX 13308 ATLANTA, GEORGIA 30324-0308

Certificate of Calibration

CERTIFICATE NUMBER: 871567
This is to certify that the following described machine has been calibrated in accordance with ASTM-E4 and found to be within a tolerance of 1.0%

DUKE POWER CO.
ROUTE 4, BOX 531
HIGHWAY 73
HUNTERSVILLE, N.C.

MACHINE (MODEL) TINIUS OLSEN SUPER "L" PT
(SER. NO.) 137315
COMPRESSION TEST

MACHINE RANGE 6,000 THRU 60,000 lbs.

MACHINE READING	RING READING	MACHINE ERROR lbs.	%	RING CODE
6,000.00	6,023.20	-23.20	.39	C
12,000.00	12,059.00	-59.00	.49	D
24,000.00	24,043.00	-43.00	.18	D
36,000.00	36,044.00	-44.00	.12	D
48,000.00	48,035.00	-35.00	.07	D
60,000.00	60,094.00	-94.00	.16	D

MACHINE RANGE 2,400 THRU 24,000 lbs.

MACHINE READING	RING READING	MACHINE ERROR lbs.	%	RING CODE
2,400.00	2,406.10	-6.10	.25	C
4,800.00	4,807.70	-7.70	.16	C
9,600.00	9,599.30	.70	.01	C
14,400.00	14,409.00	-9.00	.06	D
19,200.00	19,275.00	-75.00	.39	D
24,000.00	24,056.00	-56.00	.23	D

MACHINE RANGE 600 THRU 6,000 lbs.

MACHINE READING	RING READING	MACHINE ERROR lbs.	%	RING CODE
600.00	598.30	1.70	.28	B
1,200.00	1,203.70	-3.70	.31	B
2,400.00	2,400.30	-.30	.01	C
3,600.00	3,595.90	4.10	.11	C
4,800.00	4,795.20	4.80	.10	C
6,000.00	6,002.60	-2.60	.04	C

(continued)

Southern Calibration & Service, Inc.
460 PLASAMOUR DRIVE / P.O. BOX 13308 ATLANTA, GEORGIA 30324-0308

Certificate of Calibration

CERTIFICATE NUMBER: 871567 (continued)
This is to certify that the following described machine has been calibrated in accordance with ASTM-E4 and found to be within a tolerance of 1.0%

DUKE POWER CO.
ROUTE 4, BOX 531
HIGHWAY 73
HUNTERSVILLE, N.C.

MACHINE (MODEL) TINIUS OLSEN SUPER "L" PT
(SER. NO.) 137315
COMPRESSION TEST

MACHINE RANGE 120 THRU 1,200 lbs.

MACHINE READING	RING READING	MACHINE ERROR lbs.	%	RING CODE
120.00	119.62	.38	.32	A
240.00	239.31	.69	.29	A
480.00	479.85	.15	.03	A
720.00	720.09	-.09	.01	B
960.00	959.21	.79	.08	B
1,200.00	1,201.30	-1.30	.11	B

CALIBRATION APPARATUS

PR	SER.#	CAP.	CALIBRATION LAB	CLASS "A" VERIF.	CAL. DTE	MANUF.
A	1806	500	NAT STDS TEST LAB	43.60 LB.F.	10/11/85	MOREHOUSE
B	3947G	2000	NAT STDS TEST LAB	172.0 LB.F.	04/20/87	MOREHOUSE
C	3753N	10000	NAT STDS TEST LAB	904.0 LB.F.	08/07/86	MOREHOUSE
D	3764C	60000	NAT STDS TEST LAB	7200 LB.F.	10/08/86	MOREHOUSE

VERIFICATION METHOD USED: ELASTIC CALIBRATION DEVICE

LOAD VALUES CORRECTED FOR TEMP OF 74° RING TEMP 73 °F

Method of verification and pertinent data is in accordance with ASTM specification E4. The testing device(s) used for this calibration have been verified per ASTM specification E74 and are directly traceable to the U.S. Bureau of Standards.

DATE OF CALIBRATION: 10/08/87 BY: KEVIN D. SMITH

SERVICE REPRESENTATIVE

Kevin D. Smith

Figure 1

AVERAGE LIFT-OFF FORCE PER WIRE

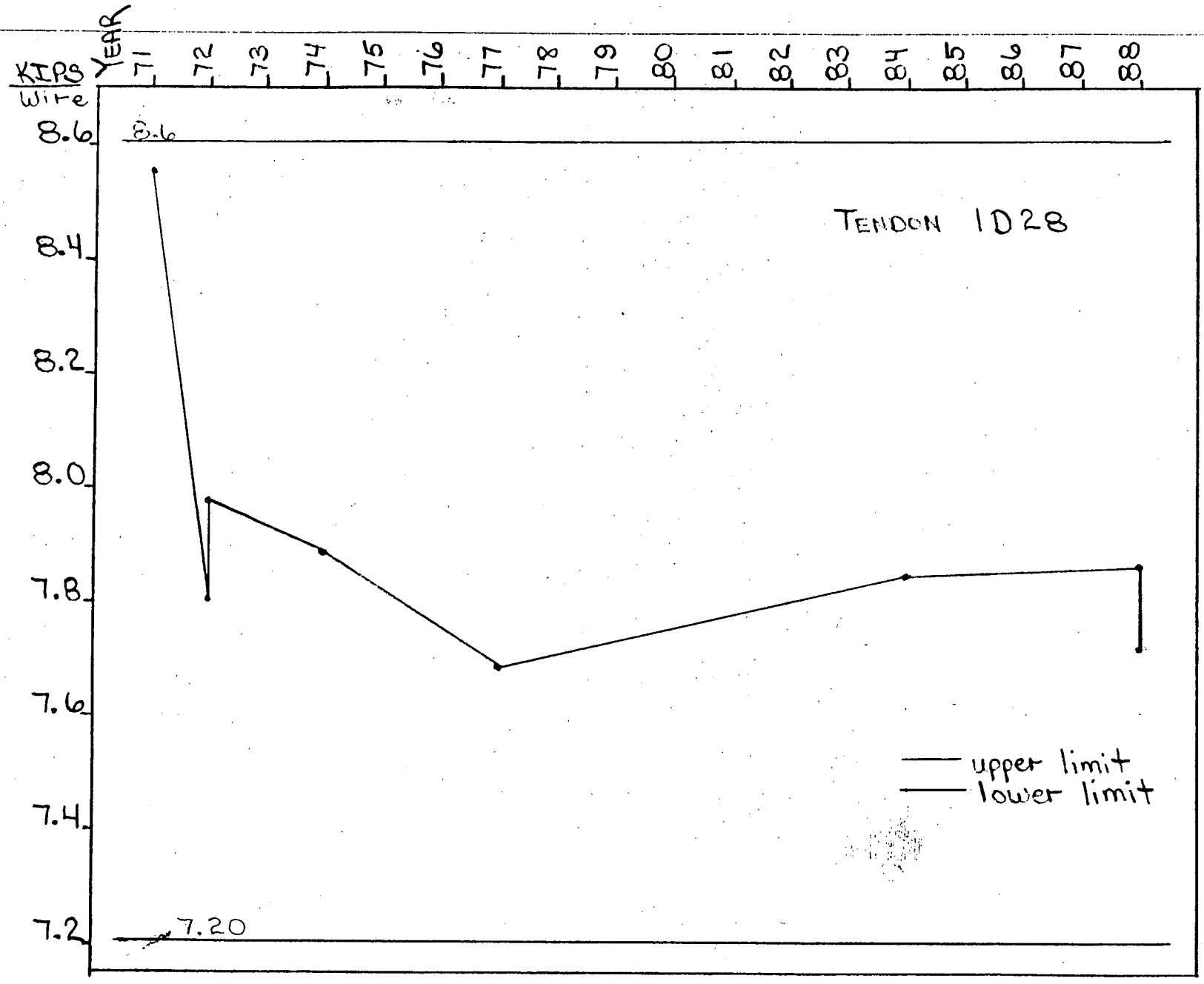


figure 2

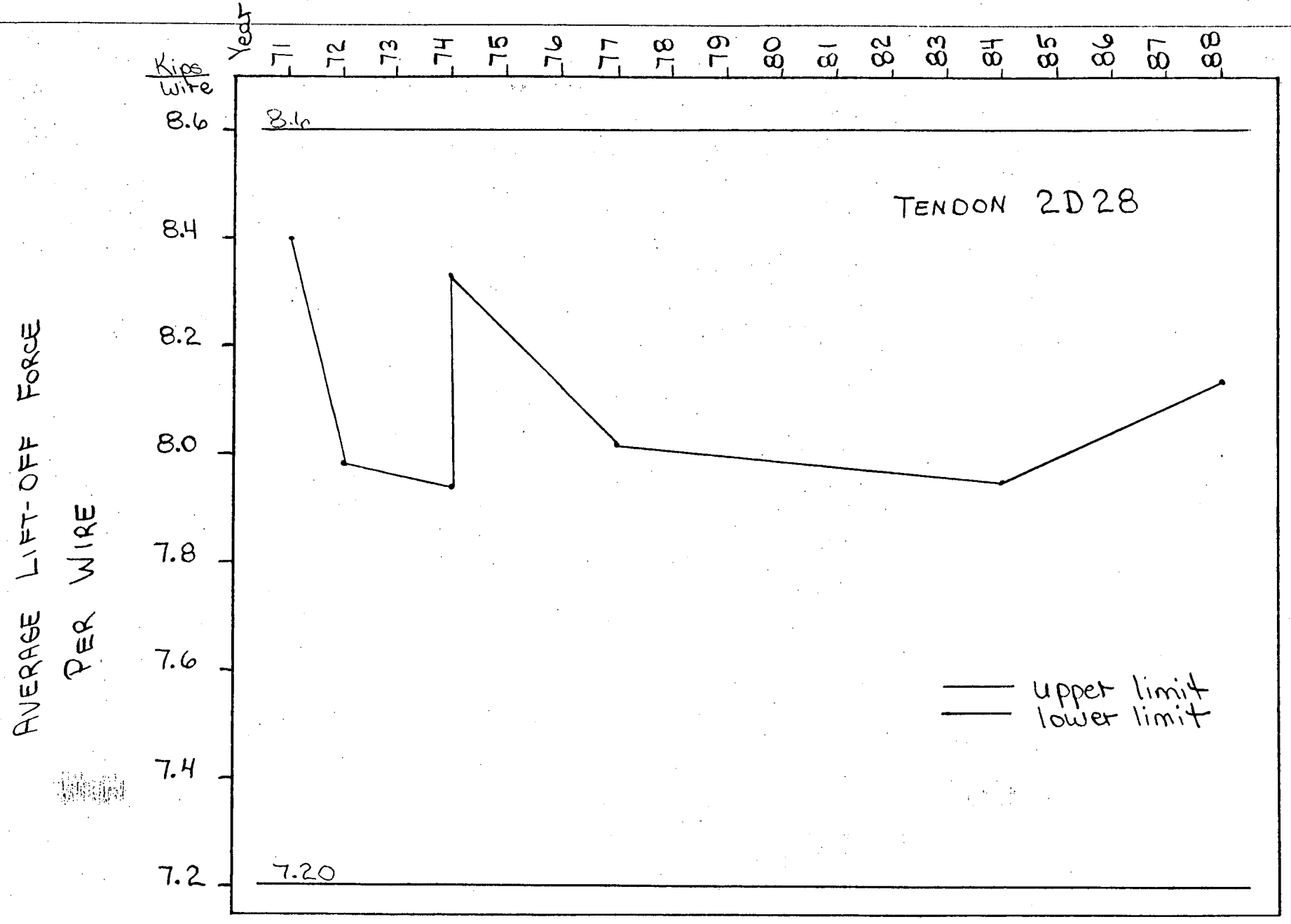
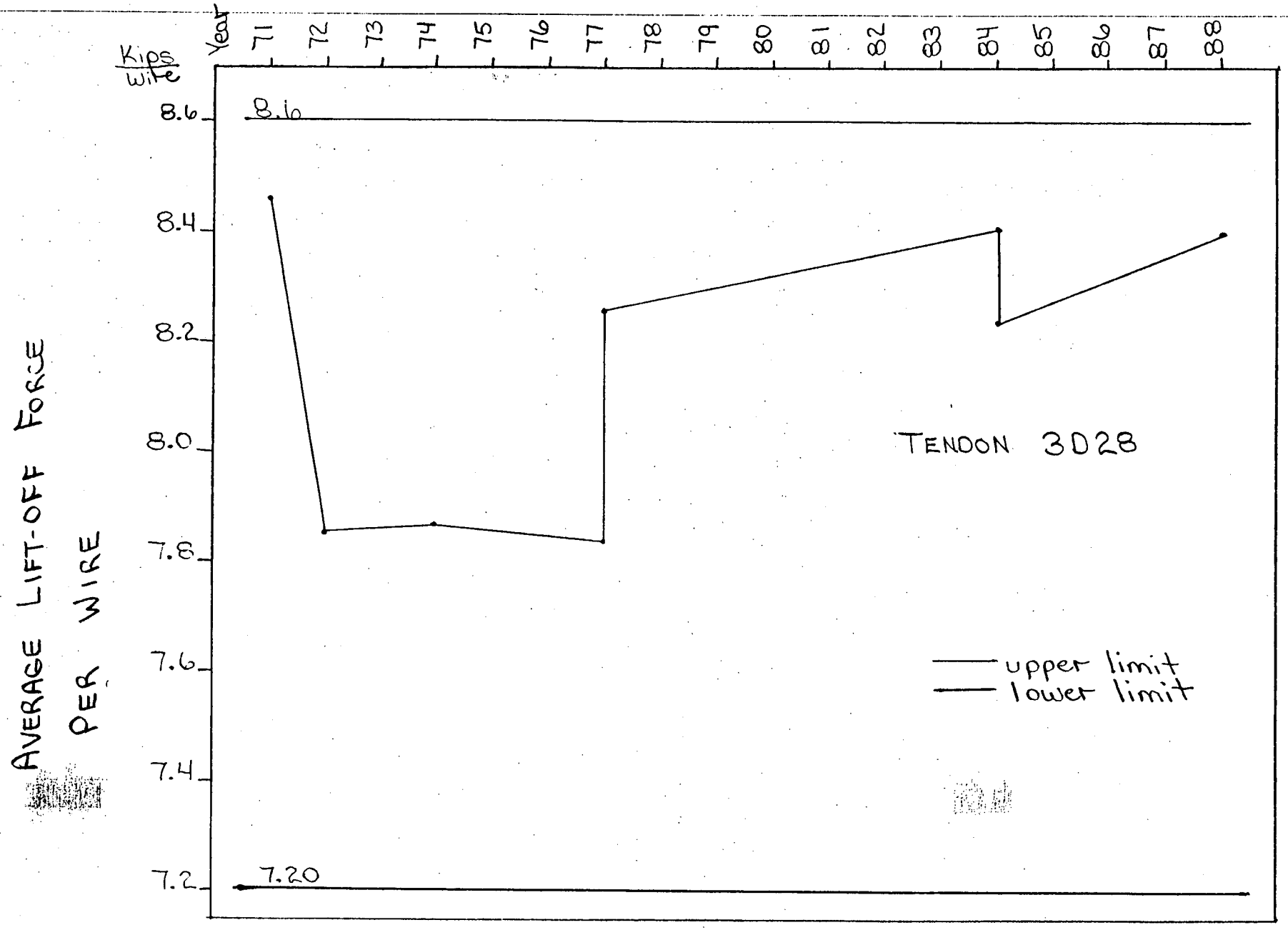

AVERAGE LIFT-OFF FORCE PER WIRE
Kips/wire
Year
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.16
7.20
TENDON 2D28
upper limit
lower limit

Figure 3


AVERAGE LIFT-OFF FORCE PER WIRE
Kips/Wire
Year
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.16
7.20
TENDON 3028
upper limit
lower limit

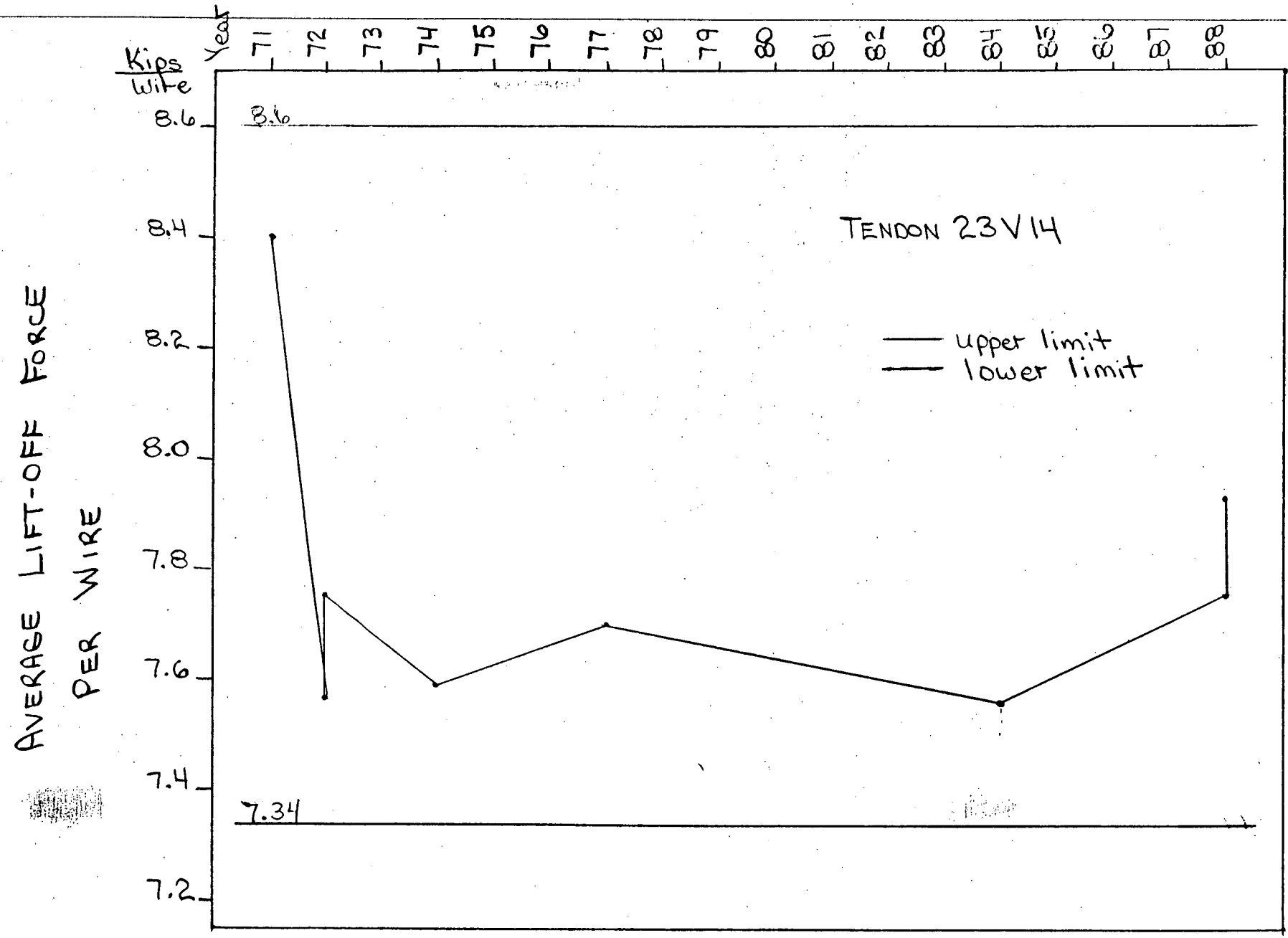

Kips / Wire
Year
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
7.34
TENDON 23V14
upper limit
lower limit
AVERAGE LIFT-OFF FORCE PER WIRE

Figure 4

figure 5

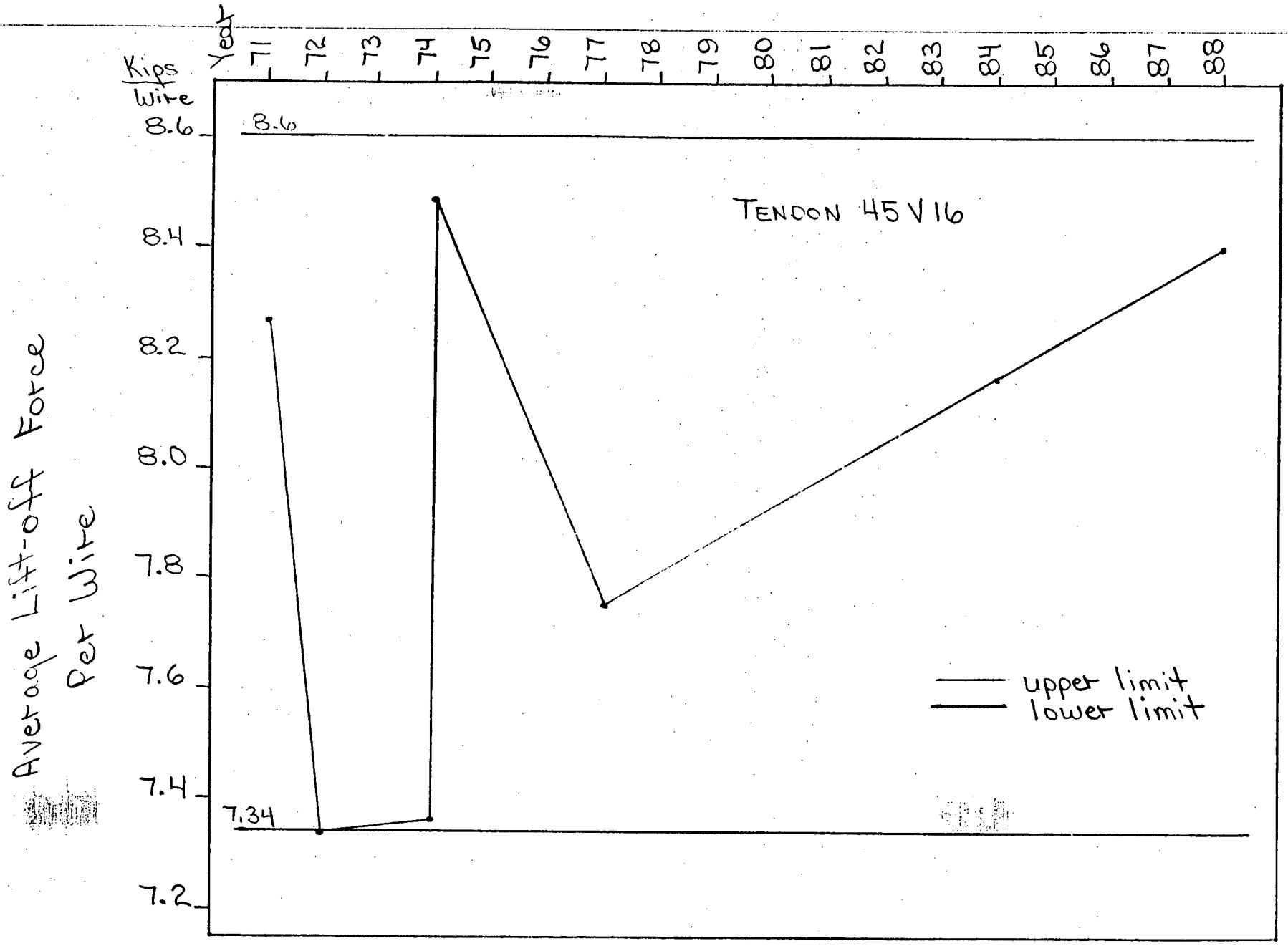

Average Lift-off Force Per Wire
Kips / Wire
Year
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
7.34
TENDON 45 V 16
upper limit
lower limit

figure 6

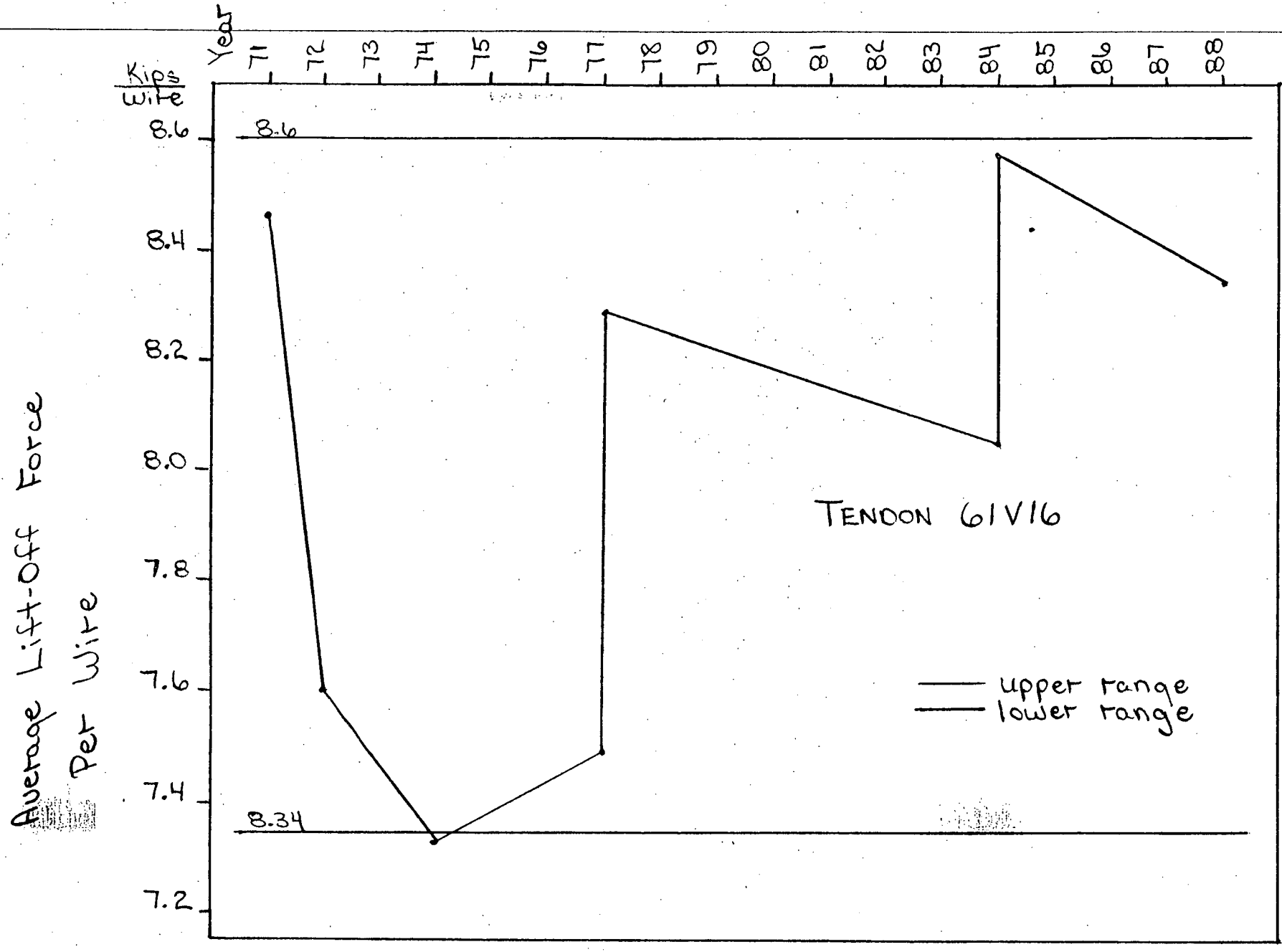

Average Lift-Off Force Per Wire
Kips/Wire
Year
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
8.34
TENDON 61V16
upper range
lower range

Figure 7

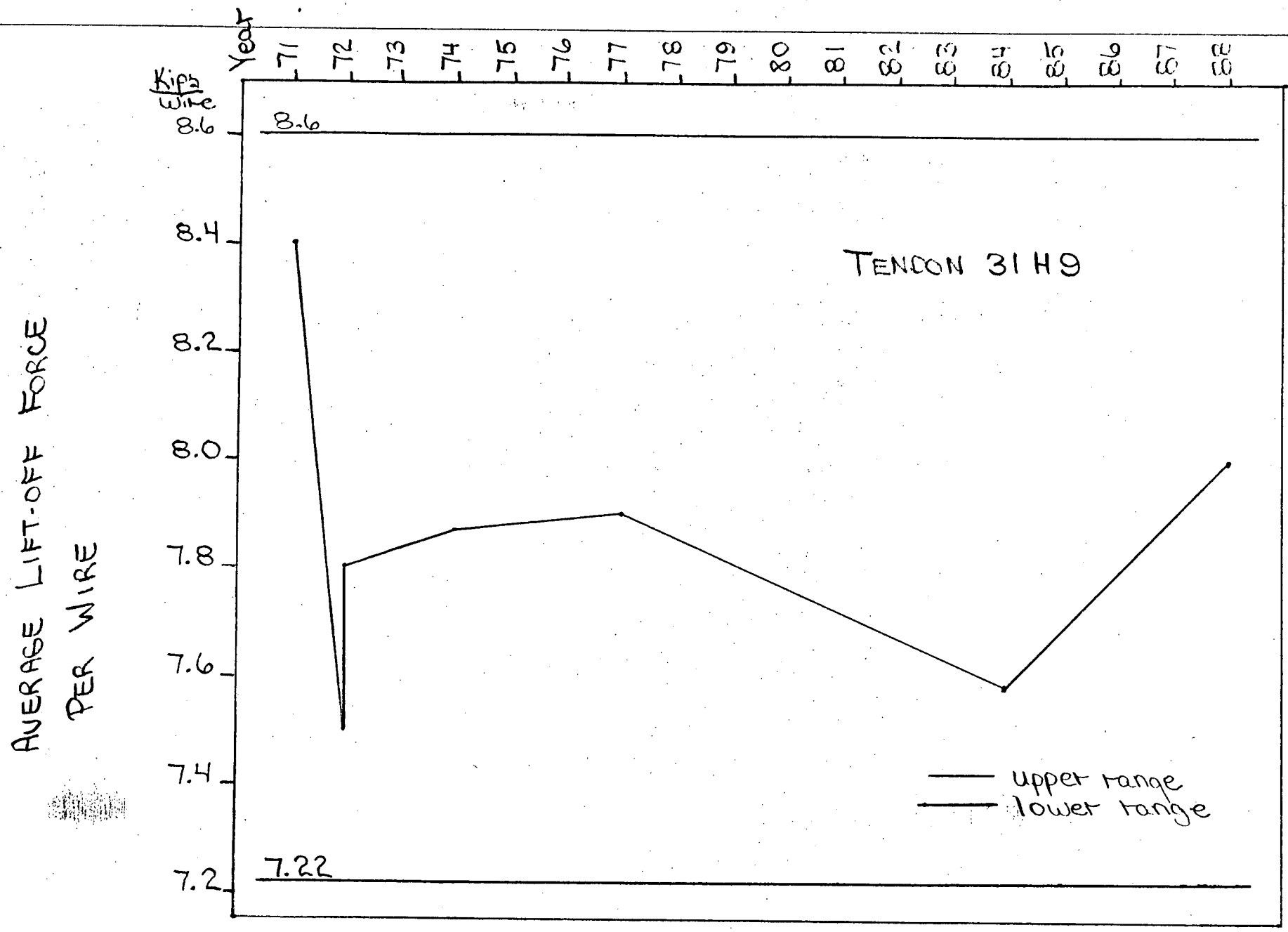
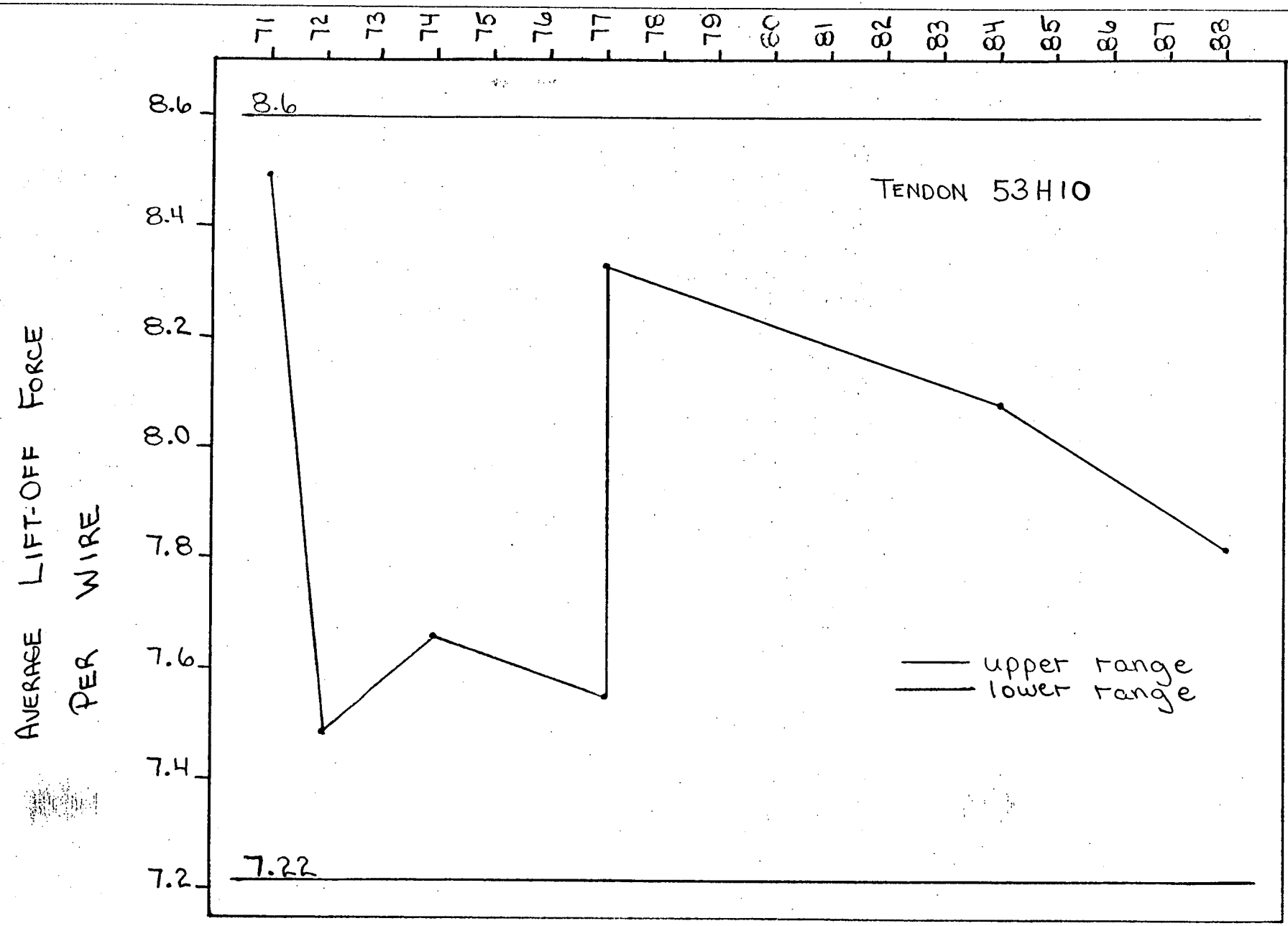

AVERAGE LIFT-OFF FORCE PER WIRE
Kips/Wire
Year
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
7.22
TENCON 31 H9
upper range
lower range

Figure 8


71
72
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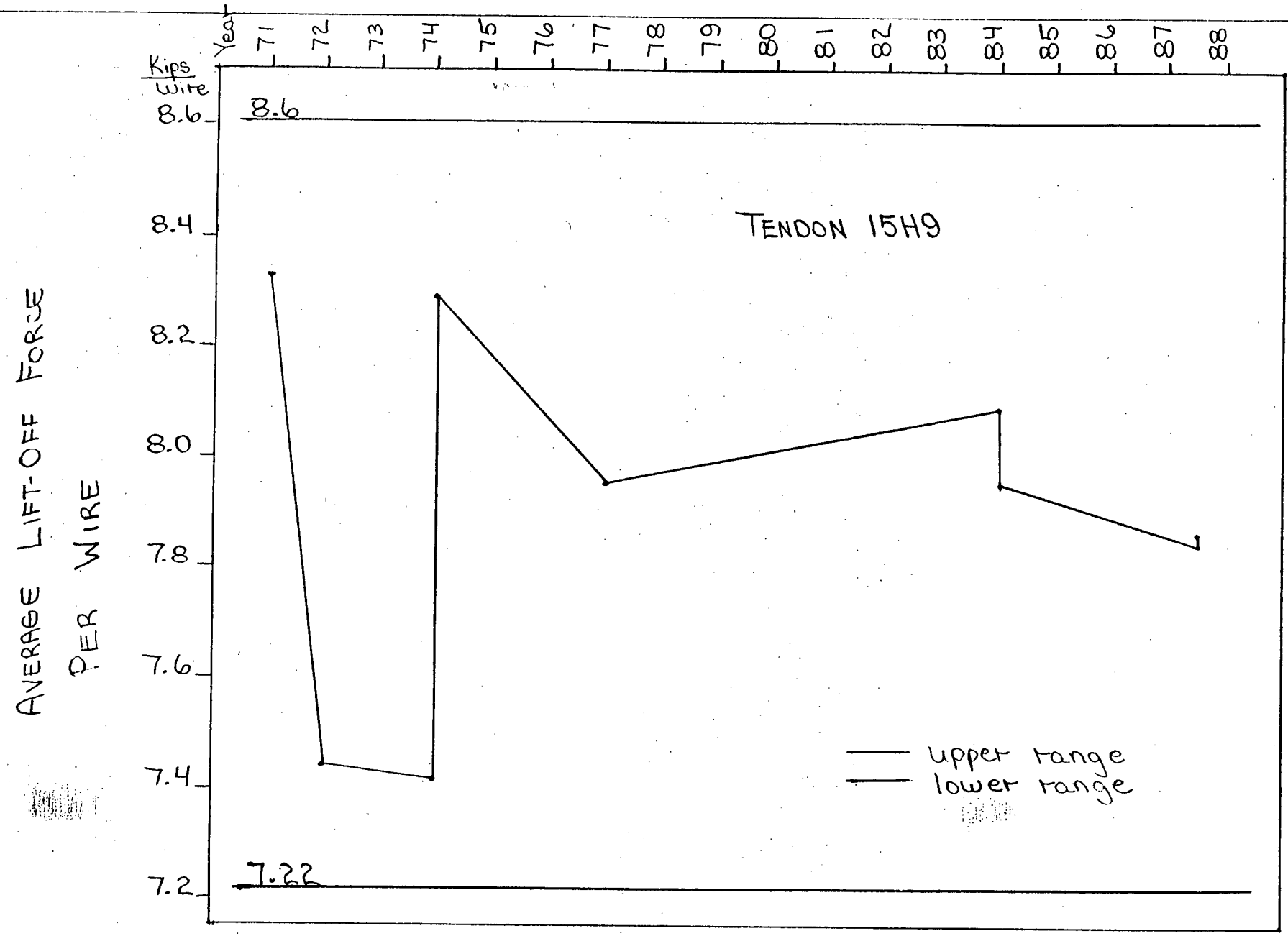
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
7.22
TENDON 53H10
upper range
lower range
AVERAGE LIFT-OFF FORCE PER WIRE

Figure 9


AVERAGE LIFT-OFF FORCE PER WIRE
Kips/Wire
Year
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
8.6
7.22
TENDON 15H9
upper range
lower range