UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 13 1982

Docket Nos: 50-329/330 OM, OL

MEMORANDUM FOR: Elinor G. Adensam, Chief
Licensing Branch No. 4, DL

FROM: Darl S. Hood, Project Manager
Licensing Branch No. 4, DL

SUBJECT: NOTICE OF MEETING - MIDLAND, UNITS 1 AND 2

DATE & TIME: April 16, 1982
10:00 AM - 4:30

MIDLAND
UNDERGROUND PIPING MEETING

LOCATION: Room P-110
Phillips Building
Bethesda, Maryland

PURPOSE: To discuss buried piping and applicant's related submittal of March 16, 1982.

PARTICIPANTS:

NRC

R. Bosnak, et al.
P. Chen (Consultant)
J. Kane
D. Hood

Consumers Power Company

D. Budzik, et al.
J. Mooney

Bechtel

D. Lewis, et al.

Ronald W. Herman For
Darl S. Hood, Project Manager
Licensing Branch No. 4
Division of Licensing

Enclosure:

cc: See next page

1/ Meetings between NRC technical staff and applicants for licenses are open for interested members of the public, petitioners, intervenors, or other parties to attend as observers pursuant to "Open Meeting and Statement of NRC Staff Policy", 43 Federal Register 28058, 6/28/78.

4/16/82
lot
J. Kane

Subject: Meeting w/ CPC

April 7, 1982 Conf. Call Identified Items
Item 1 Par. 6.2, 6.3

NRC Position Needed On:
- Measuring annular space during plant operation { CPC - may not be easy to be measured
- Requiring minimum annular space to be maintained

✓ CPC will measure ovality (in letter to be provided April 15) before & after rebedding 26"Φ pipe.

How to distribute 1½" of future settlement (Rebedded 30"Φ Pipe)
In analysis - Cantilevered distance of 30' (from Anchor Point)

CPC will provide details of excavating & rebedding the 26"Φ (not yet determined what backfill will be (structural backfill or soil-cement))
CPC need to address transitional end (leaving stiff backfill into the clay fill)
* Will be included in Stress Study @ both 30"Φ & 26"Φ rebedding operations. CPC commits to making stress analysis after setting transitional details if this is considered critical or necessary.

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* CPC will look @ each strain gage location. Will prepare table on each side of weld or on each side of fitting

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Check mar 16 submittal
Tech Spec - Establishing action & allowable limits
For settlement - 75% of 3" (est. max)
For strain - the 4% ovality
CPC to expand - what happens when threshold
Actions - Increase frequency - Engage pipe & measure ovality - Repair or Replace

Check program for surcharging BWST valve pit. ? Commitment to measure 18" pipe after surcharge removal

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* Only place where questionable 26-OHBC-15 line (At entrance to Auxil. Bldg.) Should settlement exceed 2.8" (@ 30') then contact could be made Will review - see if settlement less than 2.8" is likely because of actual soil conditions in this area

Will address soil conditions in immediate area & piping configuration as related to settlement

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* Check Stresses in submitted Bechtel Tables (Encl. 1 & 2)

Paul Chen to check seismic analysis package (not an action item)

OK Will provide accuracy of stream gages

J. Kane to provide comments on Mar. 16

Verify no other lines are Categ. 1 — Identified to Staff

Cross-sections that show limits of excavation for rebedding & replacing 36" ϕ & 26" ϕ pipes. Cross-sections should reflect all potentially affected structures (e.g. SWS, CWIS, duct banks, other utilities) within the zone of excavation. Backfill details should be shown on sections (types of materials, e.g. concrete, structural, non-ϕ fill etc.)

What documentation exists that indicates the minimum rattle space which will be required during years of plant operation? If none exists - how will this be checked?
Suggest Tech Spec w/ table indentifying wall penetration & minimum rattle space to be required (Min space could be established by taking seismic displacement estimate + 1" (margin)

Controls during years of plant operation that will prevent heavy loads being placed over Cat. I pipes

4/14/82
ltr
J Kane

Subject: Underground Piping
Outstanding issues in geotechnical engineering area
(Identified in ASLB hearing on Feb 18&19, 1982)

1. Appropriateness of soil input into seismic analysis for underground piping

Rec'd Mar. 10, 1982 2. Profiles with subsurface information for lines 8"-1HBC-81, 26"-OHBC-16, 26"-OHBC-56

3. Documentation supporting 3" max. future settlement estimate

Mar 16, 1982 Submittal 4. CPC monitoring plan for settlement & strains. Details to be provided. Check measurement @ anchor points - how does it compare to previously indicated plan - Frequency - Action levels; check testimony - pg. 9

5. Review of table on available rattle space.

Mar. 16, 1982 Submittal 6. Replacement activities for 36"ϕ pipe

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Other outstanding issues (not covered in ASLB hearing)

Mar. 16 Submittal 7. ~~6~~. Replacement activities for 26"ϕ pipes in front of CWIS.

Compare w/ CPC listing for ACRS meeting

4/15/82

Outstanding Issues - From Feb. 17, 1982 ASLB Transcripts

Pg. 7852 Settlement Monitoring Program - Details
- Location of settlement monuments
- Type of instruments
- Frequency of readings

Three additional Profiles — Pg. 7855 Include settlement profile, soil boring information w/blow counts, stratification, GWT, past loading

7853 Actual locations & details of strain monitoring
- Specified locations in testimony OK — anticipate need for additional locations

* 7856 ✓ Documentation that supports the 3-inch future settlement

* 7856 ✓ Questionable soil loading

* 7882 Details w/ loss of gauge still have to be worked out

* Response to ASLB questioning - what controls during plant operation will prevent heavy loads from being placed over Cat. I pipes

Discuss w/ MEB

NRC decision on combining stresses induced by settlement with other loadings (e.g. earthquake). What settlements (& how established) is CPC using?

Enclosure 1

ASME CODE CHECK - STRESS SUMMARY FOR BURIED SERVICE WATER PIPING[1]
(Stresses in psi)

Line Number	Description	Normal Eq 8[2]		Upset Eq 9[2]		Faulted Code Case 1606[2]		Thermal Eq 10[2]	
		Actual Stress	Allowable Stress	Actual Stress	Allowable Stress	Actual Stress	Allowable Stress	Actual Stress	Allowable Stress
36/26"-OHBC-15	SW Supply	10,442	17,500	14,060	21,000	20,536	42,000	5,214	26,250
36/26"-OHBC-16	SW Return	10,442	17,500	15,505	21,000	34,383	42,000	10,420	26,250
36/26"-OHBC-19	SW Supply	10,442	17,500	17,190	21,000	34,953	42,000	10,814	26,250
36/26"-OHBC-20	SW Return	10,442	17,500	17,190	21,000	35,232	42,000	21,613	26,250
26"-OHBC-53	SW Supply	5,842	17,500	9,538	21,000	21,478	42,000	12,513	26,250
26"-OHBC-54	SW Return	5,842	17,500	9,318	21,000	26,323	42,000	25,009	26,250

NOTES:

1. Actual stresses are based on calculations using 3/8-inch wall pipe

2. Piping stress summaries:

   a. Equation 8

      Stresses included = design pressure, weight and sustained loads (includes overburden)
      Allowable stress = $1.0S_h$ - in accordance with ASME NC-3652.1 and Section III, Division 1, Appendix I

   b. Equation 9

      Stresses included = peak pressure, weight and sustained loads (includes overburden), occasional load (OBE)
      Allowable stress = $1.2S_h$ - in accordance with ASME NC-3652.2 and Section III, Division 1, Appendix I

   c. Code Case 1606

      Stresses included = peak pressure, weight and sustained loads (includes overburden), occasional load (SSE)
      Allowable stress = $2.4S_h$ - in accordance with Code Case 1606 and Section III, Division 1, Appendix I

   d. Equation 10

      Stresses included = thermal expansion, anchor movement (OBE)
      Allowable stress = S_A - in accordance with ASME NC-3652.3 and Section III, Division 1, Appendix I

J. Kane Rec'd 4/16/82 in Meeting w/ CPC

Sheet 1
4/14/82

Enclosure 1

PRELIMINARY RESULTS OF WALL PENETRATION ANALYSIS

Line Number	Annulus at Wall Penetration (in) (A)	Seismic Disp.[1] at Wall Penetration (in) (B)	Disp. Due to[2] 1-1/2" Settlement 30' from Wall (in) (C)	Margin (in) A - (B + C)
36"-0HBC-15	2.625	0.1741	0.204	2.2469
36"-0HBC-16	2.625	0.1801	0.0705	2.3744
36"-0HBC-19	2.625	0.3361	0.204	2.0849
36"-0HBC-20	2.625	0.7220	0.1935	1.7095
26"-0HBC-53	2.0	0.163	0.2505	1.5865
26"-0HBC-54	2.0	0.163	0.2505	1.5865

NOTES:

(1) Seismic displacement was determined by combining the absolute values of the following four motions:

a. Building movement - lateral and vertical

b. Soil movement - lateral and vertical

c. Pipe in soil - lateral and vertical

d. Pipe in building - lateral and vertical

The lateral and vertical absolute sums were then combined by the square-root-of-the-sum-of-the-squares method.

(2) Settlement displacement is the pipe displacement at the penetration because of 1-1/2" of settlement 30 feet from the building.

Enclosure 1

PRELIMINARY RESULTS OF TERMINAL END ANALYSIS

Line Number	Allowable[1] Stress $3S_c$ (psi)	Maximum Stress for 1-1/2" Settlement 30' from Wall (psi)	Settlement at 30' for Stress to be $3S_c$ (in)
36"-OHBC-15	52,500	9,374	8.401
36"-OHBC-16	52,500	8,403	9.3717
36"-OHBC-19	52,500	9,374	8.401
36"-OHBC-20	52,500	8,403	9.3717

NOTE:

(1) ASME 1977 Edition, Subsection NC-3652.3, Equation 10a = $\frac{iM_D}{Z} \leq 3.0S_c$

Need to address transitional end (leaving stiff backfill into the clay fill) both for 36"ϕ & 26"ϕ pipes.
Will make stress analysis after resolving transitional details if considered to be critical or necessary.

Sheet 3
4/15/82

a) Settlement values not available

Compare w/ Encl. 1

Line No. 36"-OHBC-15

Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
86 (tee in line 36"-OHBC-15)	2442	2757	0	35390	a)	8234	0	48823
215 (90° elbow)	2442	630	0	2561		3948	0	14581
350	2442	306	0	1212		3015	0	6975
351 (outside face of SWPS)	2442	0	8000	2136		2132	0	14710
352	2442	0	8000	2625		2015	0	15082
353	2442	0	8000	2385		1923	0	14760
354	2442	0	8000	2025		1985	0	14452
355	2442	0	8000	1904		2374	0	14720
356 (tee for line 26"-OHBC-53)	2442	0	8000	8773		8257	0	27966
357 (36x26 reducer)	2442	0	8000	1037		3054	0	14533
358	2442	0	8000	1688		-	0	12130
359 (end of reinstalled line)	2442	0	4100	1372		2514	0	10428

Enclosure 2
Sheet 1

2) Data point is within 10 feet of assumed anchor imposed for terminal end analysis. The imposed restraints influence the stress value. This stress value is not valid due to end conditions.

Line No. 36"-OHBC-16

Data Point	Pressure	Stresses in psi: Weight	Over-burden	Thermal	Settlement	Seismic (SSE)	Hydraulic Transients	Total
847 (36" x 30" reducer to line 30-OHBC-34)	2442	786	0	2497	9890	606	0	16221
845	2442	1378	0	2893	11531	877	0	19121
830 (tee for line 36-OHBC-1)	2442	4749	0	11171	29332	2180	0	49874
836 (1st weld inside SWPS)	2442	878	0	696	9533	610	0	13149
834	2442	567	0	—	11772	598	0	15379
836 (outside face of SWPS)	2442	0	8000	497	13712	2079	0	25125
90 R	2442	0	8000	1207	17713	2858	0	32320
290 (tee for line 26-OHBC-54)	2442	0	8000	8866	66202	18914	0	
90 Q (36x26 reducer to line 26-OHBC-16	2442	0	8000	2792	37046	3876	0	54156
90 P	2442	0	8000	2088	7414	5035	0	24979
90 N	2442	0	8000	810	88665 2)	3422	0	102839 2)
(end of reinstalled line)								

Enclosure 2
Sheet 2

oj Settlement values not available

Line No. 36"-OHBC-19

Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
32 (tee + line 36"-OHBC-19)	2442	2150	0	8313	oj	8207	0	21112
200 (90° elbow)	2442	2012	0	9066		8728	0	22298
200A	2442	397	0	975		3555	0	7169
205 (90° elbow)	2442	2031	0	6370		8099	0	18942
700 (first weld point inside SCWRS)	2442	689	0	1166		4099	0	8346
701 (outside face of SCWRS)	2442	0	8000	1955		5326	0	17723
702	2442	0	8000	2292		5705	0	17839.
703	2442	0	8000	1909		4892	0	17233
704	2442	0	8000	1307		4662	0	16411
705	2442	0	8000	745		4444	0	15631
706	2442	0	8000	1418		4232	0	16092
707 (assumed anchor end of analysis)	2442	0	8000	4273		4032	0	18747
X (tee for line 26-OHBC-55)	2442	0	8000			1875.	0	29199

Enclosure 2
Sheet 3

a) Data point 807 from analysis for 36"-OHBC-1

b) Data point at, or within 10 feet of, assumed anchors imposed for terminal end analysis. The imposed restra influence the stress value. This stress value is not valid due to end conditions.

Line No. 36"-OHBC-20 Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
a) 807/886 (tee of line 36-OHBC-1 inside SWRS)	2442	1644	0	6407	16497	3362	0	30352
887 (90° elbow)	2442	1892	0	3324	12255	1722	0	22135
890	2442	615	0	636	2142	618	0	6453
892 (90° elbow)	2442	1463	0	4714	10615	3808	0	23042
894 (90° elbow)	2442	1411	0	2376	4507	2282	0	13024
896	2442	727	0	531	898	648	0	5246
897 (90° elbow)	2442	1693	0	5017	10647	1256	0	21055
898 (first weld inside SWRS)	2442	609	0	791	2838	816	0	7496
899 (outside face of SWRS)	2442	0	8000	734	3276	5536	0	19988
A99	2442	0	8000	717	4471	5536	0	21166
B99	2442	0	8000	655	2537	5492	0	19106
C99	2442	0	8000	596	22488 b)	5265	0	38791
D99	2442	0	8000	560	79101 b)	5058	0	95161
E99	2442	0	8000	-	0	4052	0	15294

Enclosure 2
Sheet 4

Line No 36"-OHBC-20 (con't) Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
F99	2442	0	8000	543	0	4650	0	15635
G99	2442	0	8000	588	0	4453	0	15483
H99	2442	0	8000	712	0	4270	0	15424
J99	2442	0	8000	905	0	4112	0	15459
A99	2442	0	8000	1081	0	4007	0	15530
L99	2442	0	8000	1058	0	4005	0	15505
M99	2442	0	8000	669	0	4209	0	15320
N99	2442	0	8000	1437	0	4815	0	16694
200	2442	0	8000	21613	0	18972	0	51027

(tee for line 26"-OHBC-58)

(end of reinstalled line)

Enclosure 2
Sheet 5

a) Due to low design temperature (105°F) thermal analysis not performed. Thermal stresses are lower than stresses Line No. 26"-OHBC-54.
b) Terminal end analysis not run on this line.

Line No. 26"-OHBC-53 Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
4C (tee of 36-OHBC-15)	1742	0	4100	a)	not available	20643	0	26485
4B	1742	0	4100		b)	5216	0	11058
3I (90° elbow)	1742	0	4100		0	263	0	6105
3B	1742	0	4100		0	723	0	6565
2I	1742	0	4100		0	361	0	6203
2C	1742	0	4100		0	744	0	6586
2B	1742	0	4100		0	622	0	6464
37I (90° elbow)	1742	0	4100		0	2064	0	7906
35B (45° elbow)	1742	0	4100		0	7168	0	13010
97I	1742	0	4100		0	2609	0	8451
97C	1742	0	4100		0	2078	0	7920
97B	1742	0	4100		0	2274	0	8116
96I	1742	0	4100		0	2654	0	8496
96C	1742	0	4100		0	2089	0	8931
96B	1742	0	4100		0	3533	0	9375
95I	1742	0	4100		0	3980	0	9822
95C	1742	0	4100		0	4424	0	10266
95B	1742	0	4100		0	4868	0	10710
94I	1742	0	4100		0	5311	0	11153
94C	1742	0	4100		0	5336	0	11378
94B	1742	0	4100		0	5336	0	11378
93I	1742	0	4100		0	5336	0	11378
92I	1742	0	4100		0	5336	0	11378

Line No. 26"-OHBC-53 (cont'd)

Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transients	Total
92C	1742	0	4100		0	5536	0	11378
92B	1742	0	4100		0	5536	0	11378
91I	1742	0	4100		0	5536	0	11378
91C	1742	0	4100		0	5536	0	11378
91B	1742	0	4100		0	5536	0	11378
90I	1742	0	4100		0	5536	0	11378
90C	1742	0	4100		0	5536	0	11378
90B	1742	0	4100		0	5536	0	11378
89I	1742	0	4100		0	5536	0	11378
89C	1742	0	4100		0	5536	0	11378
89B	1742	0	4100		0	5536	0	11378
88I	1742	0	4100		0	5536	0	11378
88C	1742	0	4100		0	5536	0	11378
88B	1742	0	4100		0	5536	0	11378
87I	1742	0	4100		0	5536	0	11378
87C	1742	0	4100		0	5536	0	11378
87B	1742	0	4100		0	5536	0	11378

Enclosure 2
Sheet 7

a) Data point 290 is from sheet for 36"-CHBC-16

b) Data point is within 10 feet of assumed anchor imposed for terminal end analysis of line 36-CHBC-16. The imposed restraints influence the stress value. This stress value is not valid due to end conditions.

c) Terminal end analysis not run on this line

Line No. 26"-CHBC-54

Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydrostatic Transient	Total
[a]290/48T (tee of 36"-CHBC-16)	1742	0	4100	12476	66202 [b]	26652	0	111172 [b]
45D (45° elbow)	1742	0	4100	1791	[c]	7488	0	15121
45C	1742	0	4100	3591	0	2088	0	11521
45B	1742	0	4100	1961	0	2279	0	10082
44I	1742	0	4100	603	0	2661	0	9106
44C	1742	0	4100	74	0	3090	0	9006
44B	1742	0	4100	172	0	3529	0	9543
43I	1742	0	4100	142	0	3969	0	9953
43C	1742	0	4100	95	0	4409	0	10346
43B	1742	0	4100	76	0	4849	0	10767
42I	1742	0	4100	73	0	5289	0	11204
42C	1742	0	4100	73	0	5536	0	11451
42B	1742	0	4100	73	0	5536	0	11451
41I	1742	0	4100	73	0	5536	0	11451
41C	1742	0	4100	73	0	5536	0	11451
41B	1742	0	4100	73	0	5536	0	11451
40I	1742	0	4100	73	0	5536	0	11451
40C	1742	0	4100	73	0	5536	0	11451
40B	1742	0	4100	73	0	5536	0	11451
39I	1742	0	4100	73	0	5536	0	11451
39C	1742	0	4100	73	0	5536	0	11451
39B	1742	0	4100	73	0	5536	0	11451
38I	1742	0	4100	73	0	5536	0	11451
38C	1742	0	4100	73	0	5536	0	11451
38B	1742	0	4100	73	0	5536	0	11451

Enclosure 2
Sheet 8

Line No. 26"-OHBC-54 (con't)

Stresses in psi

Data Point	Pressure	Weight	Over-burden	Thermal	Settle-ment	Seismic (SSE)	Hydraulic Transient	Total
37 I	1742	0	4100	73	0	5536	0	11451
37 B	1742	0	4100	73	0	5536	0	11451
36 I	1742	0	4100	73	0	5536	0	11451
36 C	1742	0	4100	73	0	5536	0	11451
36 B	1742	0	4100	73	0	5536	0	11451
35 I	1742	0	4100	73	0	5536	0	11451
35 C	1742	0	4100	73	0	5536	0	11451
35 B	1742	0	4100	73	0	5536	0	11451
(end of reinstalled line)								

Enclosure 2
Sheet 9

Enclosure 3

48-INCH DIAMETER SERVICE WATER LINE

TO

COOLING TOWER

(LINE 48"-0HBC-2/48"-0YJJ-1)

This line is used to route the returning service water to the cooling tower in lieu of discharge to the emergency cooling water reservoir. Inside the service water pump structure (SWPS), there are two Seismic Category I butterfly valves isolating this line from the normal routing to the cooling pond. Functionally, the class change is at the butterfly valves; however, design practice is to extend the pipe class to the first anchor point beyond the safety/non-safety isolation valves. This anchor point was the soil outside the structure. At the class change, the line also changes from carbon steel to concrete.

The routing of this line is shown in drawings:

M-183, Sh 1
M-183, Sh 2
M-184, Sh 1
M-184, Sh 2
M-618, Sh 1

The analysis of the piping system inside the SWPS included a terminal end analysis which continued to an assumed anchor at the change from steel pipe to concrete pipe.

J. Kane
Rec'd 4/16/82
from CPC Meeting
on Underground Piping

ENCLOSURE 4

TABLE 1.0
Monitoring Station Ovality and Corresponding Strain

Line: 26-OHBC 15
Reference: Figure 1

Allowable Strain = .48%

Station*	Measured Ovality (%) (From Submitted Graphs)	Meridional Strain (%) From Fig. 4
1	2.34	0.35
2	1.88	0.32
3	2.34	0.35
4	2.34	0.35
5	1.24	0.25

0.48 - 0.35 = 0.13% Strain Start off monitoring this will be allowable strain @ Sta-1
(this needs to go into Tech spec.

Line: 26-OHBC 16
Reference: Figure 2

What is accuracy of strain gage to be used

1	2.18	0.34
2	2.18	0.34
3	2.34	0.35
4	2.18	0.34
5	1.12	0.23

Line: 26-OHBC 53
Reference: Figure 3

1	1.40	0.27
2	2.96	0.40
3	2.18	0.34
4	2.18	0.34

0.48 - 0.40 = 0.08%

Line: 26-OHBC 54
Reference: Figure 4

1	2.50	0.36
2	2.50	0.36
3	2.18	0.34
4	2.03	0.32
5	2.50	0.36
6	2.03	0.32

Line: 26-OHBC 55
Reference: Figure 5

1	2.03	0.32
2	1.47	0.27
3	1.56	0.28
4	1.56	0.28

Station*	Measured Ovality (%)	Meridional Strain (%)
Line 26-OHBC 56 Reference: Figure 5		
1	1.09	0.22
2	1.87	0.31
3	0.90	0.21
4	2.49	0.36
Line 26-OHBC 19 Reference: Figure 6		
1	1.87	0.31
2	1.87	0.31
3	1.87	0.31
4	0.89	0.21
Line 26-OHBC 20 Reference: Figure 6		
1	1.87	0.31
2	1.87	0.31
3	1.87	0.31
4	1.79	0.30

*The station numbers are numbered from left to right from the given reference figure.

J. Kane
Rec'd 10/6/81

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 23 1981

Docket Nos. 50-329 OM, OL
and 50-330 OM, OL

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 & 2

SUBJECT: SUMMARY OF JANUARY 20, 1981 MEETING ON UNDERGROUND PIPING

On January 20, 1981, the NRC staff and its consultant, Energy Technology Engineering Center (ETEC), met in Bethesda, Maryland, with Consumers Power Company (the applicant) and Bechtel to discuss stresses in underground piping due to differential settlement at the Midland site. A summary of the applicant's stress calculations had previously been provided by cover-letter dated November 14, 1980.

The summary of the January 20, 1981 meeting, including identification of attendees and the agenda, is provided by Enclosure 1. Viewgraph slides used during the applicant's presentation are shown in Enclosure 2.

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Division of Licensing

Enclosures:
As stated

8110130129

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ENCLOSURE 1

To File: 0485.16

From CSKeeley, P14-113B

Date February 4, 1981

Subject MEETING WITH NRC AND ETEC ON UNDERGROUND PIPING
UFI: 00234(S) (71*01) SERIAL: 11372

Consumers Power Company

INTERNAL CORRESPONDENCE

cc Al Boos, Bechtel Ann Arbor
HWSlager, P14-304
TRThiruvengadam, P14-400
MMiller, IL&B
DMBudzik, P24-517A

On January 20, 1981 a meeting was held in Bethesda with the NRC staff and their consultants (ETEC). An agenda for the meeting is attached.

Personnel present at the meeting were:

Bechtel	CP Co	IL&B	NRC	ETEC
Al Boos	GCDoerr	MMiller	DHood	Chen, Brammer
Agit Patel	DMBudzik	Joann Bloom	Joe Kane	
John Legette	GSKeeley		Jim Brammer	
	HWSlager		A. Cappucci	
			D. Gupta	

During the initial part of the meetings there was a general discussion about the survey information which was fed to the stress engineers for calculations of piping stress for the underground piping. It was pointed out that the Bechtel project engineering does the analysis for Class II, III and B31.1. Class I piping stresses are calculated by the Bechtel staff group. It was pointed out that there is no Class I underground pipe.

Agenda Items:

A.1:

The staff and their consultant were updated on the status of responses to the 50.54F questions. Nine of the pipes shown in Table 17-2 are pipes which had new profile data taken in September 1979 after removal of the surcharge areas. The other four pipes were in the areas of the surcharge. In Amendment 85 we provided data taken from the September 1979 profile and in our recent letter to them dated November 14, 1980, we gave them some of the results and commented on the new stress calculations.

A.2 a:

There was a discussion of the two techniques used for taking profile data. A manometer was used by consultant on the invert of the pipe to provide this profile information. For piping 21" and larger, a man was placed in the pipe. Information from the consultant indicates that the reading device was accurate to ± 1/4", not including any error on placing the device on the invert. On some of the lines (borated water and service water), an optical check was made. Piping not in the

surcharge area was profiled only once, while those in the area of the surcharge were profiled prior to and after the surcharge. Only one pipe in each set was profiled since they were in close proximity. "Close proximity" was defined as 10' to 20'. It was agreed to provide the staff a percentage of the pipes profiled as well as a copy of the drawings of all piping in the area. We responded negatively to their question on whether we compared soil conditions to which piping runs should be provided and whether we compared profiles of two pipes in the same trench.

A.2 b:

We informed them that we had fitted the survey data by computer to a smoothed curve which was forced to be within 1/4" of actual survey data taken. It was believed that this was better than using actual data. ETEC was worried whether the criterion of 1/4" is good enough and whether the interval being used was short enough in smoothing curve to the actual survey data. It was agreed that we will update and submit new stress calculations for the September 1979 data with the model discussed above and will then add to this stress assuming maximum possible settlements obtained from GeoTech for lifetime settlement of soils. Two of these have been run so far and one is over the limit of 3 S_c. It appeared that the initial position of ETEC was that they would consider that there were not problems if 3 S_c was the criteria and if "standard" methods are used. It is still debatable on what is considered "standard."

A.2 a and b:

During the profiling of this 8" line there was confusing data obtained since there was water in the line and the TV was fouled up as a result of this. Since this line was only two feet from the surface when the tie rods from the diesel generator building to the turbine building were removed, the line was dug up and the indicated 6" dip was not there. The line was rebedded. We will correct the data on this line in the next submittal.

A.3:

There was a lengthy discussion on the results of the calculations to date and new curves on pipe positions were shown to them. It was indicated by Brammer (NRC Staff) that nonlinear analysis had been accepted on North Anna and it is agreeable to the staff to sharpen the pencil to demonstrate that the piping is okay; however, there must be adequate substantiation of the philosophy for doing this. It was agreed that the curve of the 260HBC-54 pipe was not in the package sent to them and will be provided to them.

B:

Method of calculations:

a. The reason for the different allowables was given to them (ETEC) including the specs used for the different size pipes.

b. Same as Item a.

c. There was a discussion on the connection detail; however, we agreed to provide a more detailed drawing of the connection. 36" to 26"

d. With respect to profiling, it was agreed that we would provide them a clear table of profile readings of all lines both before and after surcharge and an index of which lines in the survey are representative of other lines and why we consider these representative. It was agreed that this information would be provided in approximately a month and a half.

e. It was explained to them that the reason for the change in the profiles was because the reference point is different on Figure 19-1 from September to June profiles and that this could be due to the fact that an optical profile was taken in September 1979. We will check and let them know the reason for this as well as why 100BC27 shows a rise after the surcharge.

f. The new curves were reviewed and there was still a disagreement on how frequently the stresses should be calculated and whether it should be based upon the smoothing technique.

g. There was disagreement on how much rotational flexibility should be permitted and it was pointed out that we consider ETEC as being over conservative; however, we will have to some how reach agreement between the more conservative and less conservative end points for calculations during surcharge. The calculation of end point stress during settlement over the lifetime of the plant will have to take into account the actual end point conditions and will also have to address branch connections. We are to provide an indication of which pipes were free to move during the surcharge and Table 17-2 will indicate the highest stress points and where piping was cut loose. The NRC seems to have a problem that we do not have data on how the pipe was originally installed. We agreed to plot data on 8-1HBC-81 prior to cutting the line. On Unit 2 condensate line, it was agreed that it will have to be handled in the same method as Unit 1 condensate line, which has been shown to be over stressed just south of the diesel generator building.

C:

There was then a discussion on possible other methods of analysis which could be used to show that there is no problem with the lines. This included using non-linear stress strain relationships. The staff seemed to be receptive to this, but has no acceptance criteria. They also indicated that seismic loading has to be addressed.

saa

DISCUSSION TOPICS

NRC-ETEC-BECHTEL
MEETING JANUARY 20, 1981
BETHESDA, MARYLAND

A. Status Update

1. 50.54f Questions and Responses

2. Survey Data

   a. 8-1ZBC-81 Re-bedded Condition

   b. Purpose of Re-bedding

3. Calculations

   a. Results

   b. Affect on Previous Information

B. Method of Calculations

1. ETEC Telecon Questions of 1/14/81

   a. Reason for Different Allowables

   b. Basis for Allowables

   c. Connection Detail 36" to 26" Service Water

   d. Two Profiles of 26-OHBC-54

   e. Reason for Change in Profiles Rev 2 to Rev 10

   f. High Stress Levels

   g. End Support Assumptions, Fixed or Hinged

ENCLOSURE 2

VIEW-GRAPH SLIDES USED DURING
JANAURY 20, 1981 MEETING

H. Sleger

ETEC BENDING ANALYSIS

Elastic Stress = 212.2 ksi

Young's Modulus = 29×10^3 ksi

Equivalent Strain = 0.0073 in/in.

MATERIAL PROPERTIES

ASME SA 155 KC70

(Fine Grain Killed Carbon Steel)

Pipe is Fabricated From ASTM A516 Grade 70 Material

Specified Properties:

UTS :	**70-90ksi**
Yield Strength :	**38ksi min.**
Elongation in 8 in :	**17% min.**
Elongation in 2 in:	**21% min.**

Stress limits : $3S_c$ = 52.5 ksi

Per equation 10_a of NC-3652.3(b)

CODE LIMIT ELASTIC STRAINS

Code Stress Limit: 52,5 ksi

Youngs Modulus: 29 x 10^3 ksi

Elastic Strain : 0.0018 in/in

CODE LIMIT PLASTIC STRAINS

$\sigma = K \epsilon^{n}$

Assume : n = 0.23

For a Plastic Strain of e= 0.002 the Stress is 38 ksi

(from the definition of Yield Stress)

K can be calculated to be : 159 ksi

Plastic Strains Can be Plotted on a Log-Log Plot

Plastic Strain for 52.5 ksi is 0.0084

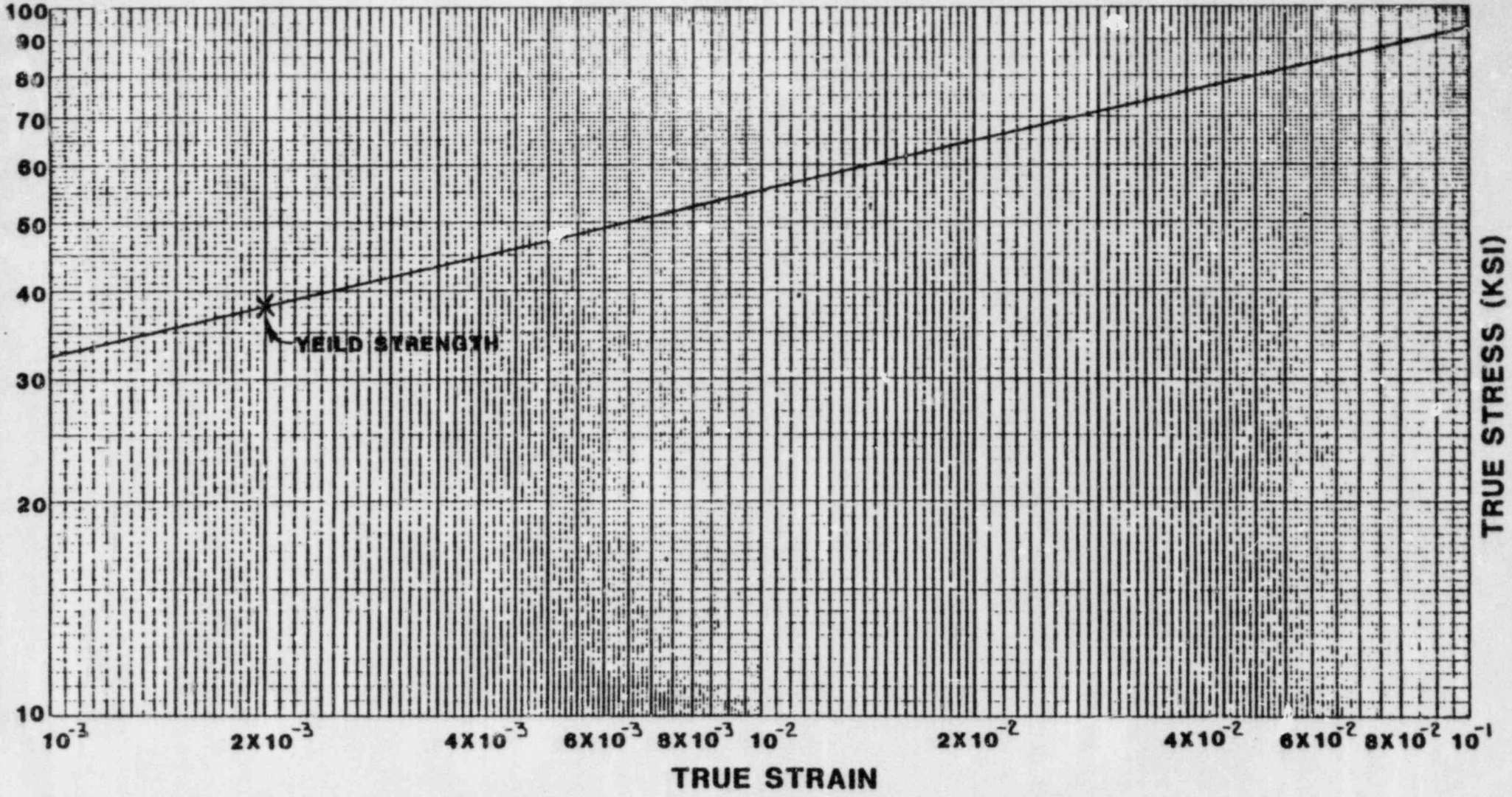


FIGURE 1

RELATIONSHIP BETWEEN TRUE STRESS & TRUE STRAIN

TOTAL STRAINS

Elastic strain = 0.0018 in/in

Plastic Strain = 0.0084 in/in

Total Strain = 0.0102 in/in

Strain Equivalent to 212.2 ksi

Elastic Strain 0.0073 in/in

Therefore Pipe Strain And Stress

is Lower Than Code Limit Stress

TABLE 17-2

SETTLEMENT STRESSES OF PROFILED SYSTEMS

CATION OF AX. STRESS STATION)	Line	Seismic Category I	Location Shown in Figure	Profile Shown in Figure	Stress(1) (ksi)		Code Allowable(2) (ksi)	DATE OF READING DATA
	Service water lines							
3+30	26"/36"-OHBC-16	Yes ✓	17-1	17-2	(14.8)	15.2	52.5	APRIL 79
0140	26"/36"-OHBC-18	Yes ✓	17-1	17-2				
1+00	26"-OHBC-54	Yes ✓	17-1 & ~~19-1~~	17-2 & ~~19-1~~	22.8		52.5	JUNE 79
0167	26"-OHBC-55	Yes ✓	17-1 & ~~19-1~~	17-2 & ~~19-1~~	22.8		52.5	APRIL 79
0+50	10"-OHBC-27	Yes ✓	19-1	19-1	(27.0)	27.9	52.5	APRIL 79
0+10	8"-1HBC-81	Yes ✓	19-1	19-1	(14.4)	15.3	45.0	SEPT 79
0+15	8"-1HBC-82 8"-2HBC-82	Yes ✓	19-1	19-1	(17.2)	17.2	45.0	SEPT 79
0+25	8"-1HBC-311	Yes ✓	19-1	19-1	(11.9)	14.3	45.0	SEPT 79
0+30	26"-1JBD-2	No ✓	19-1	19-1	(21.1)	24.0	45.0	SEPT 79
0+08	26"-2JBD-1	No ✓	19-1	19-1	(11.0)	13.1	47.1	SEPT 79
					(16.1)	63.2	47.1	SEPT 79
	Condensate water line							
1+60	20"-1NCD-169	No ✓	17-1 & ~~19-1~~	17-2 & ~~19-1~~	(22.8)	187.0	47.7	SEPT 79

(1) Analytical values generated from settlement gage data. Rounding in excess of the accuracy of the gage was necessary in several zones. These zones will be subjected to further investigation.

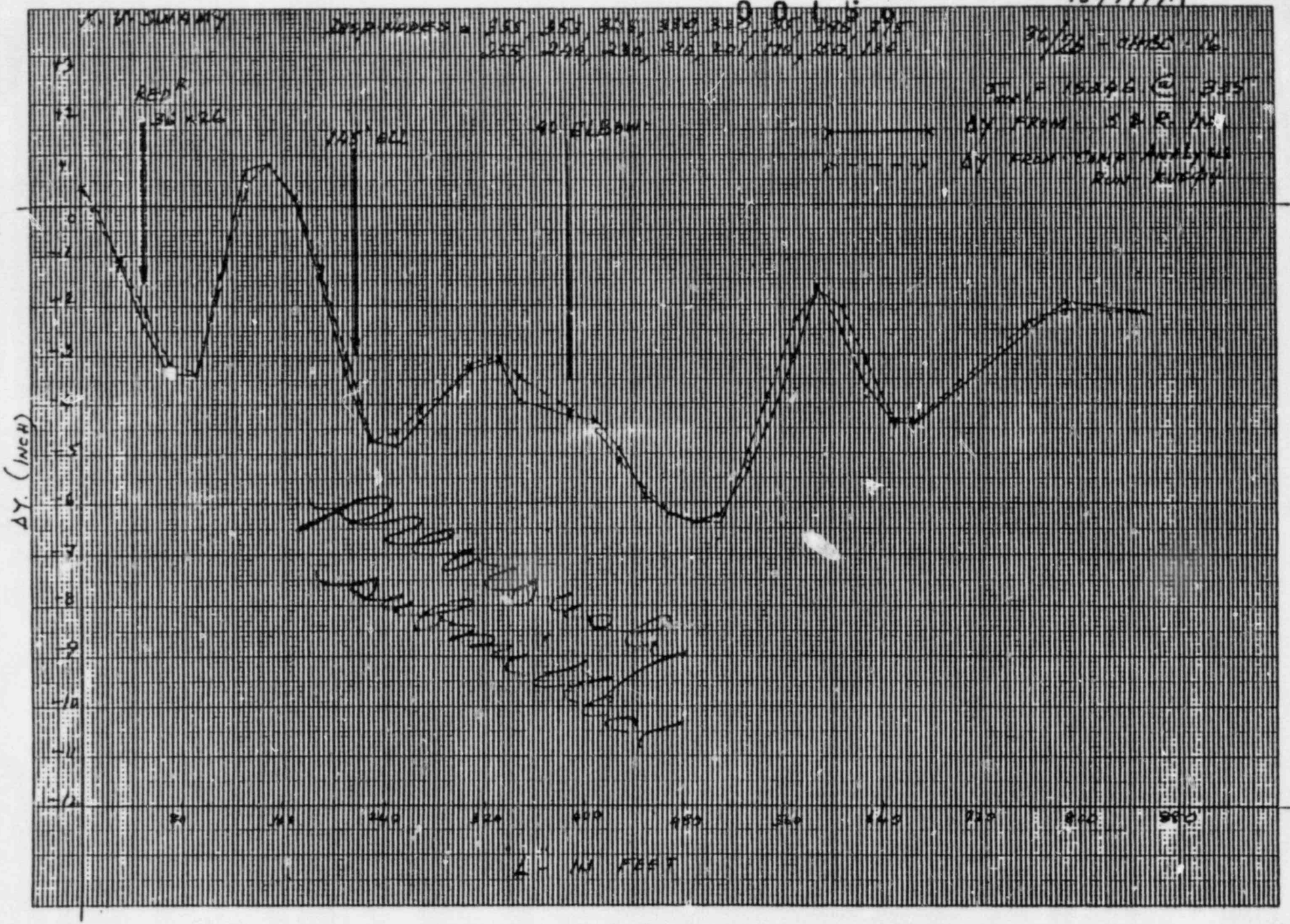
(2) Equation 10a, ASME Section III, Division 1, Subsection NC

	SERVICE WATER LINES						
1+38	26"-OHBC-54	YES ✓	19-1	19-1	23.2	52.5	SEPT. 79
0112	26"-OHBC-55	YES ✓	19-1	19-1	18.6	52.5	SEPT. 79

A4

Revision 8) 4.
9/79 1/81

8/7/79.



K·E 10 X 10 TO THE CENTIMETER 16 X 25 CM KEUFFEL & ESSER CO. MADE IN U.S.A.

0 0 4 6 0 5 1 2 9

BY : S. KANNAN (FOR S.N.ACHARY)
CHKD :

36/12C-DNBC-19

FIELD DATA

JAC 14 T_1 = 42000 AT ANC
JAN 14 T_2 = 37000 AT TAC (50)

ANC TAC

45° ELBOW

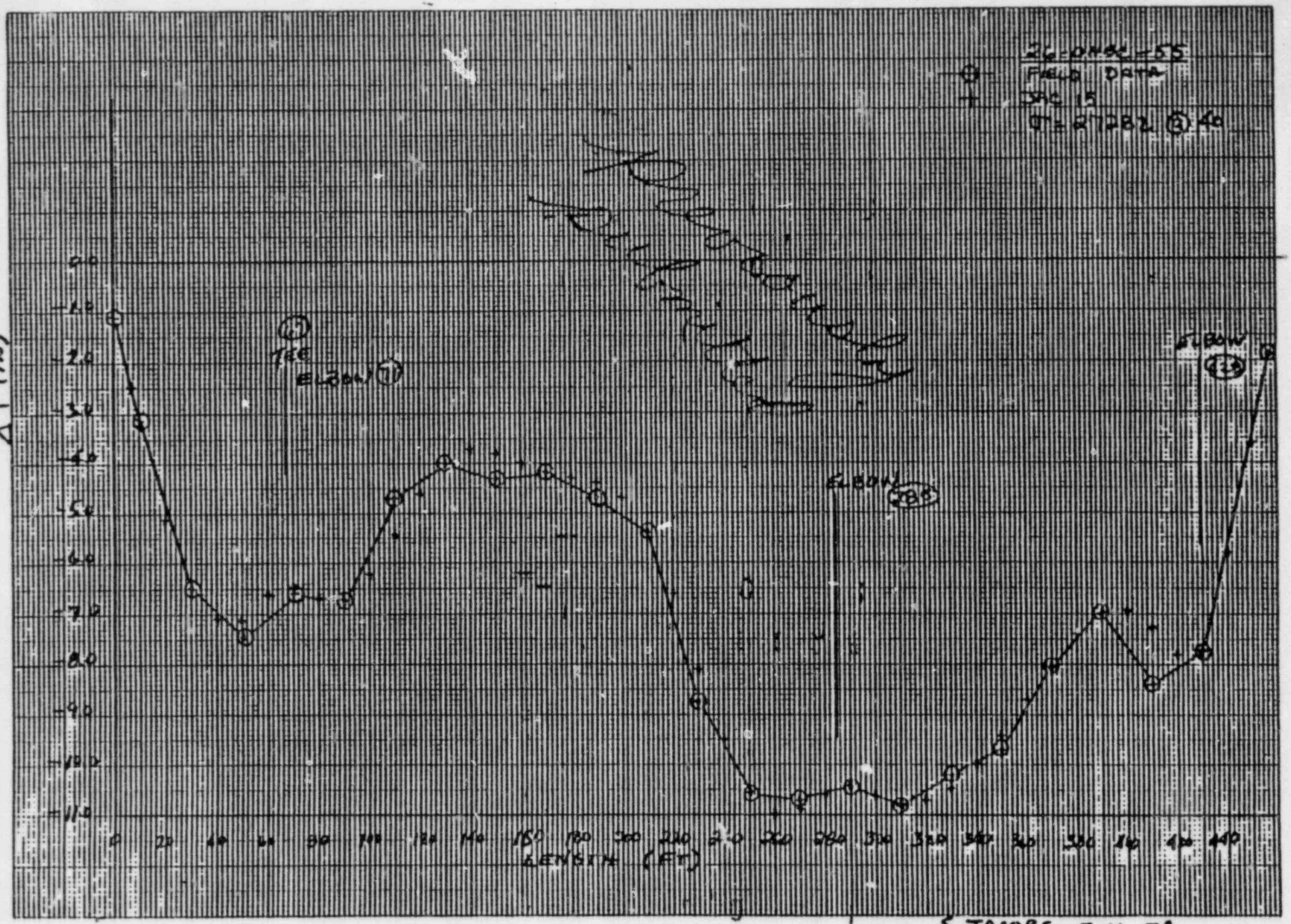
90° ELBOW

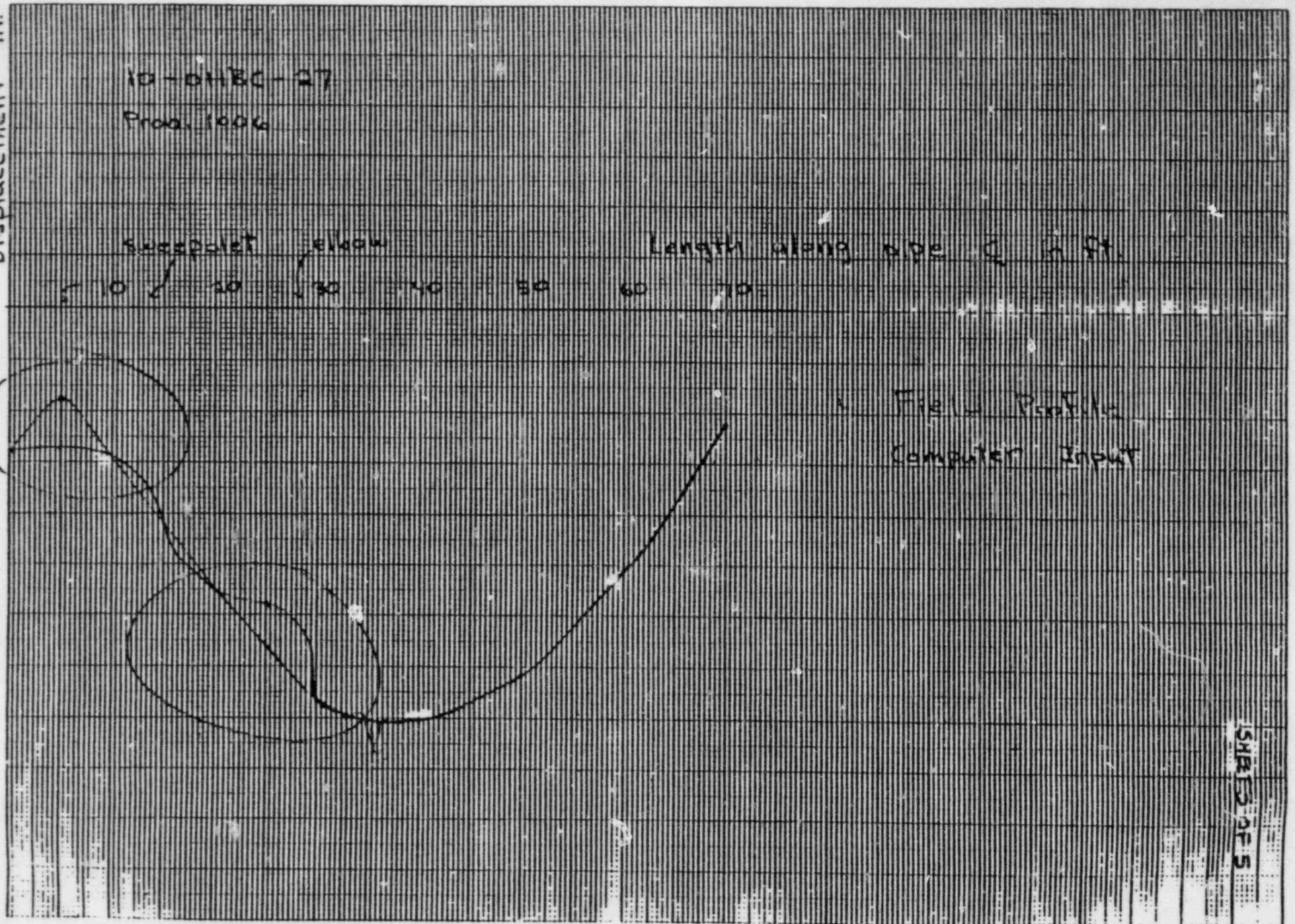
ΔY (IN)

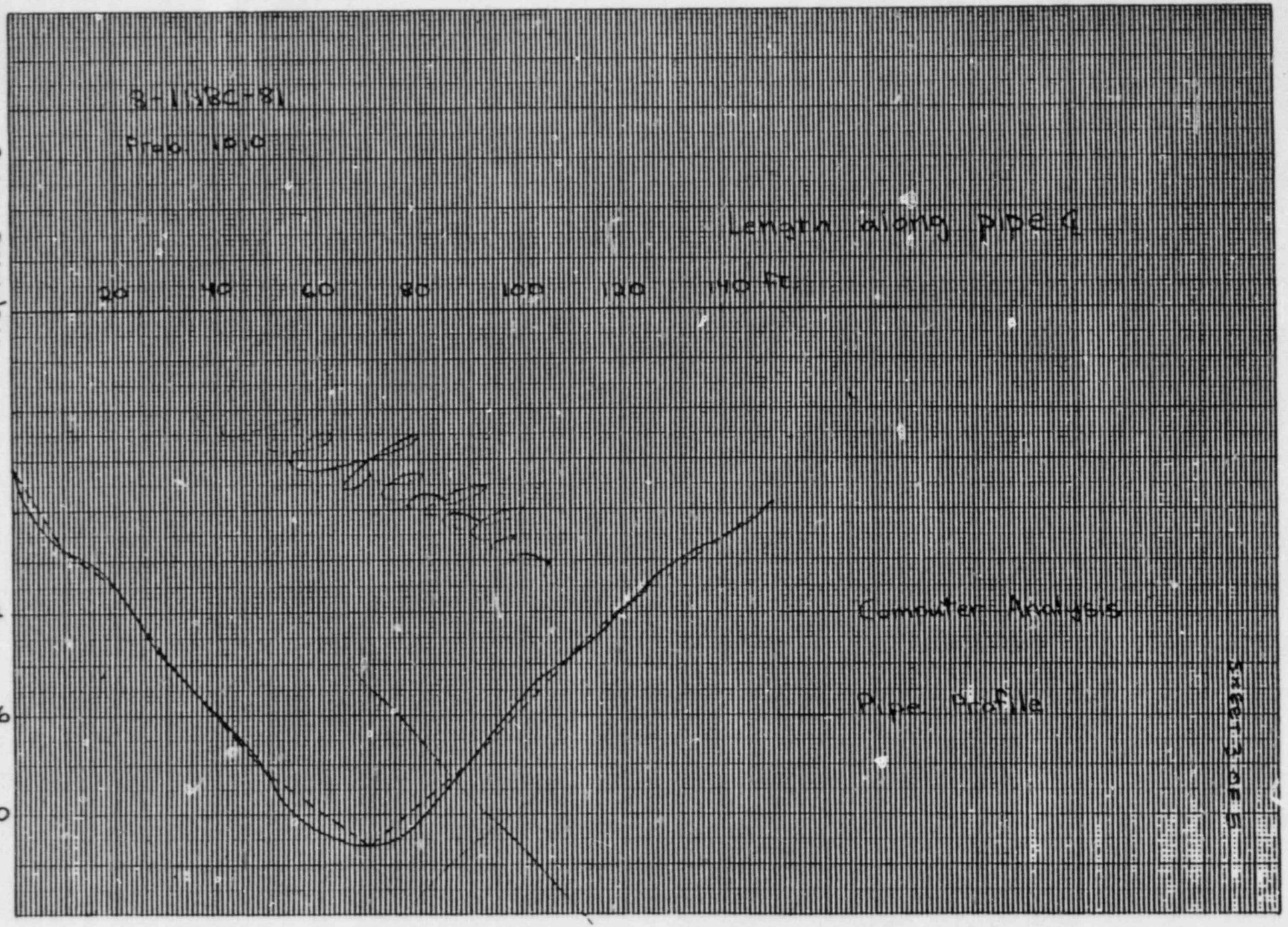
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100

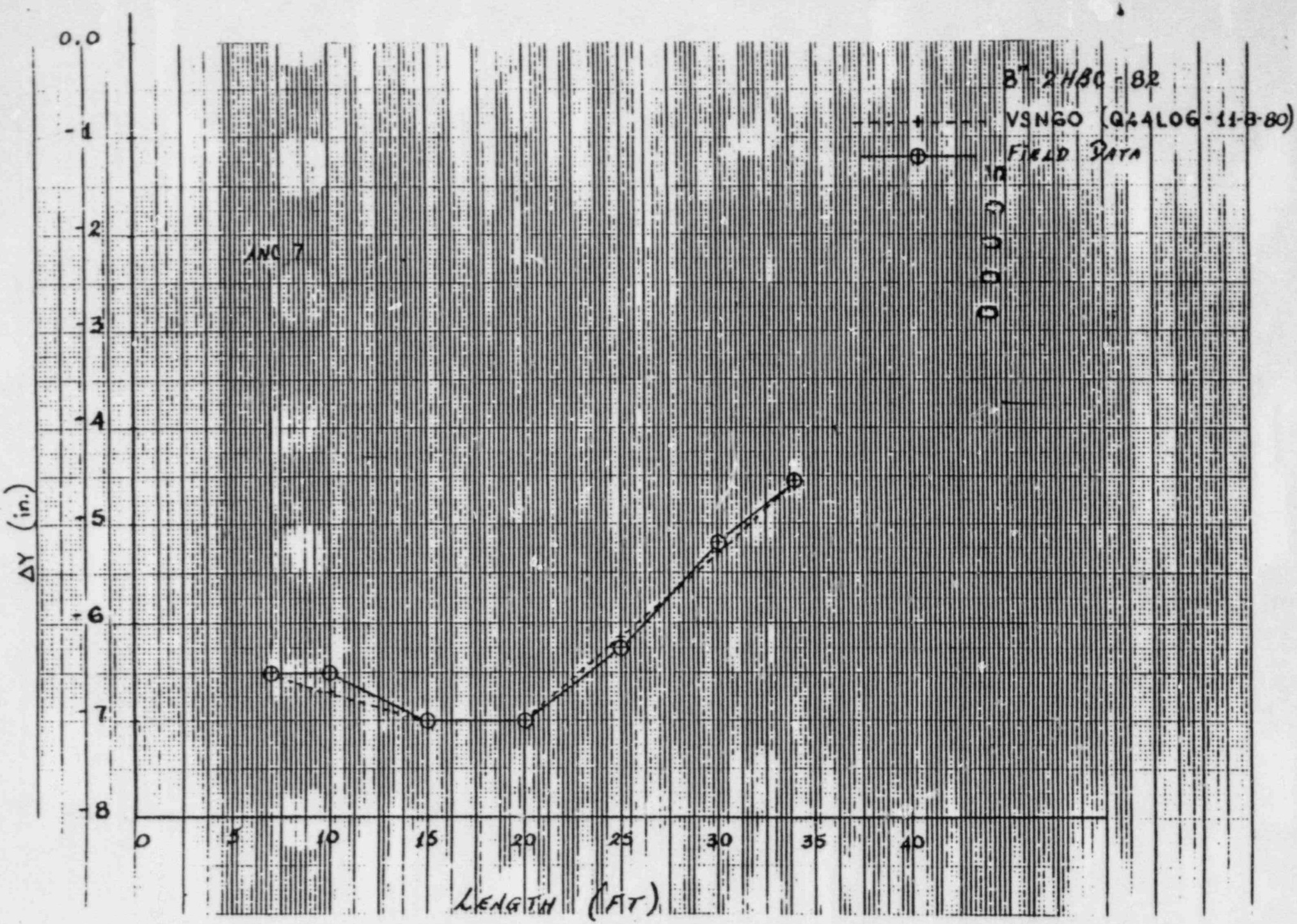
0 40 80 120 160 200 240 280 320 360 400 440 480 520 560 600 640

LENGTH (FT)


ΔY (IN)
LENGTH (FT)
TEE
ELBOW (51)
ELBOW (55)
ELBOW (33)
S. JACOBS 7-16-79






0.0
-1
-2
-3
-4
-5
-6
-7
-8
ΔY (in.)
0
5
10
15
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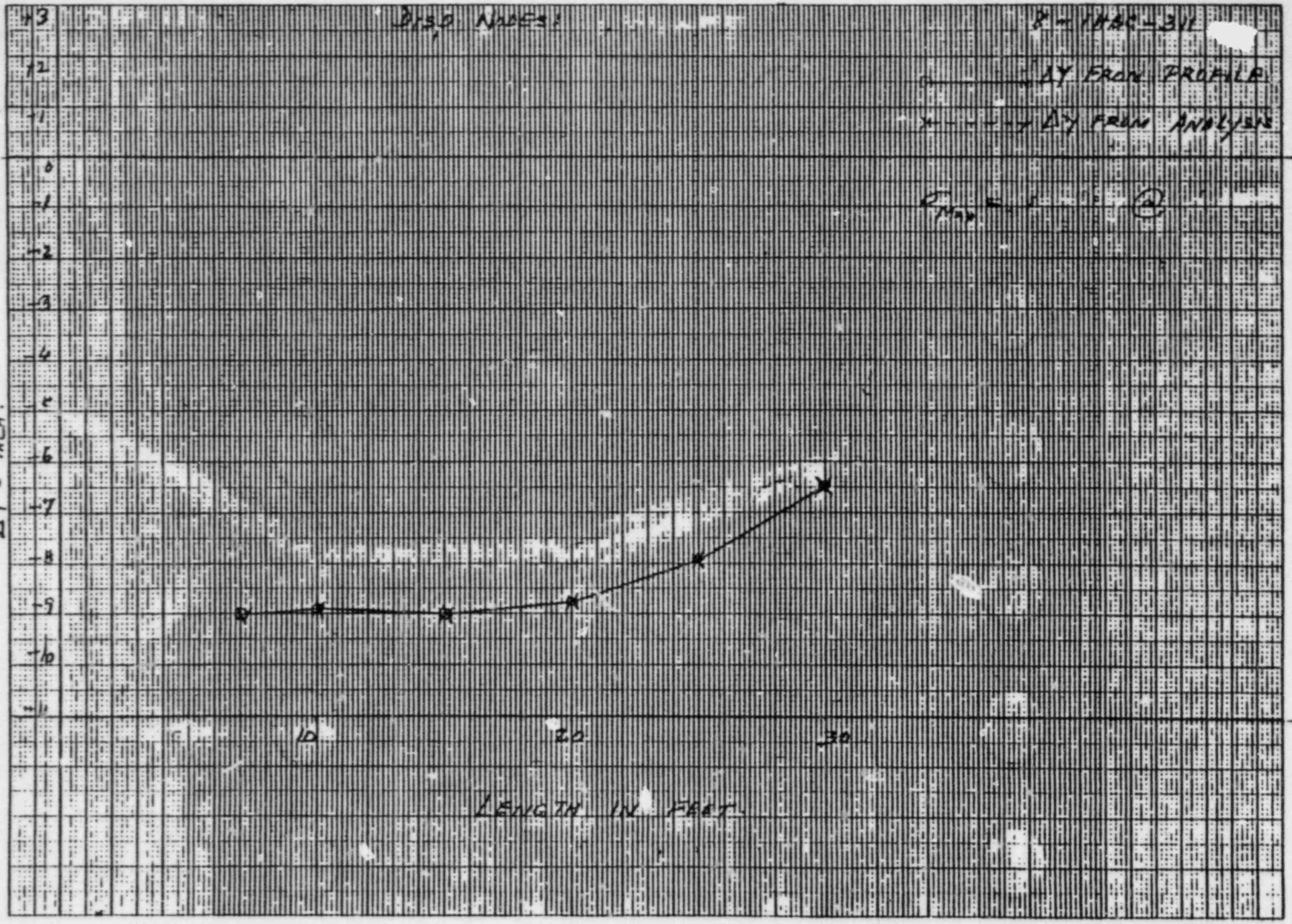
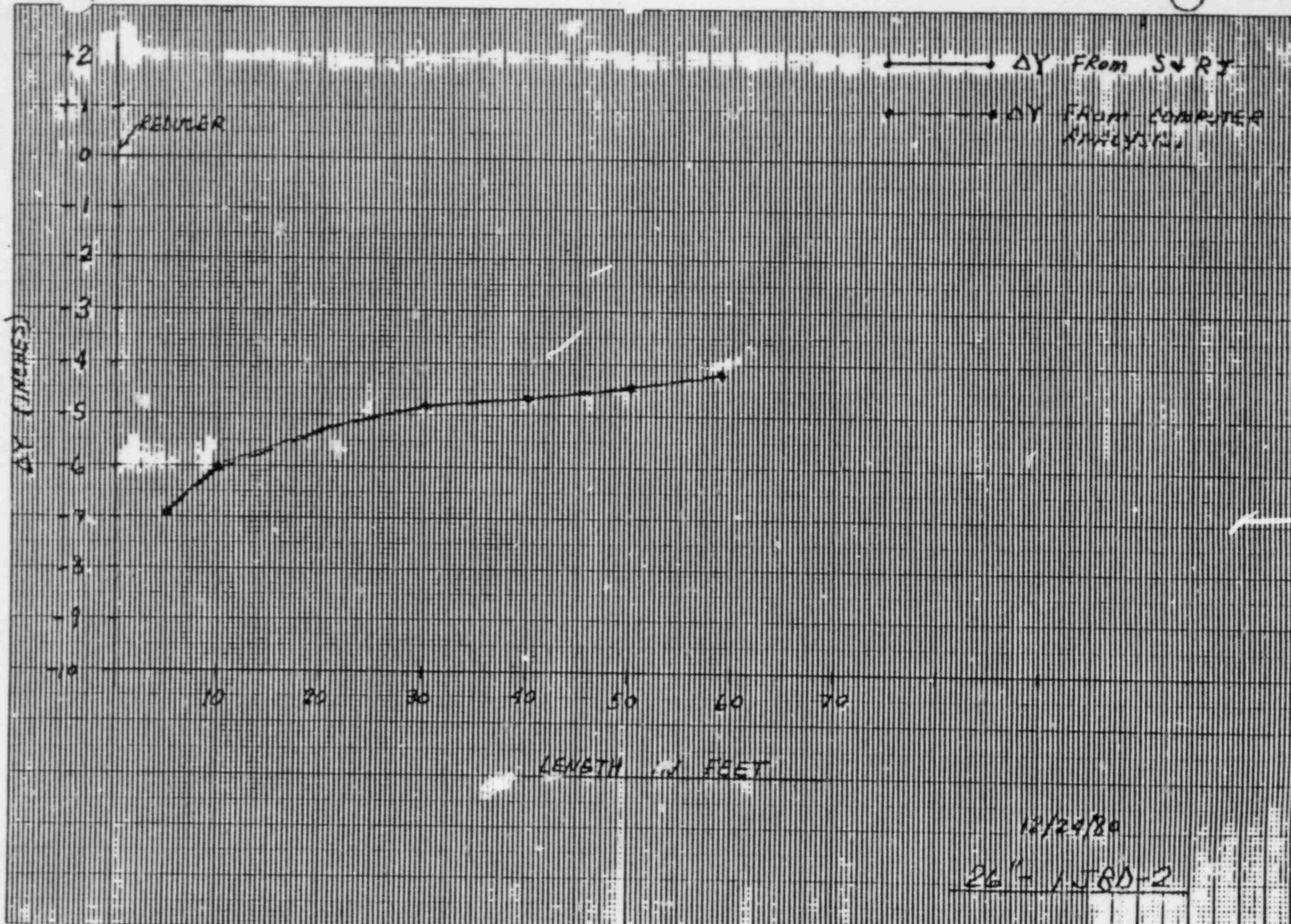
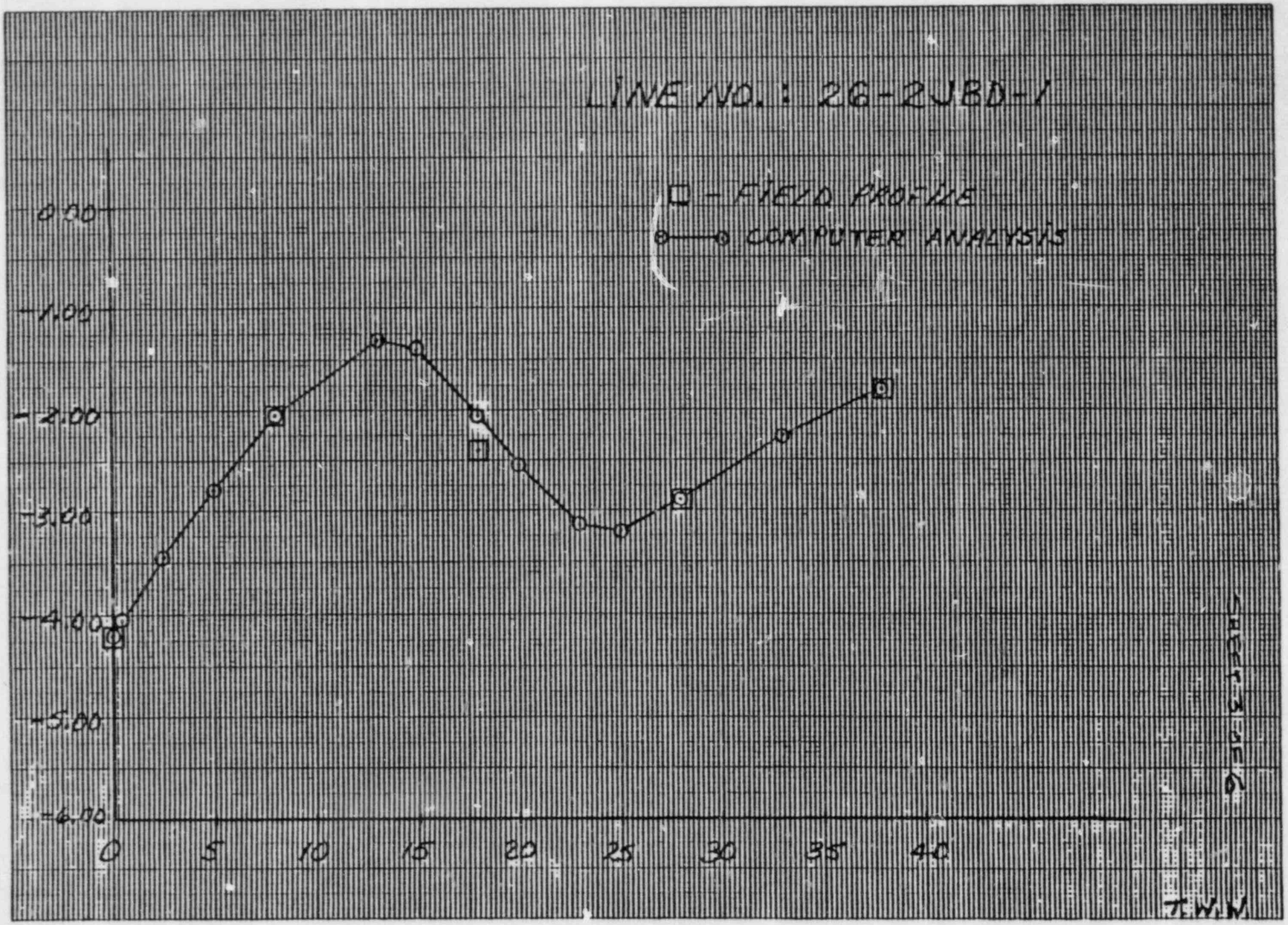
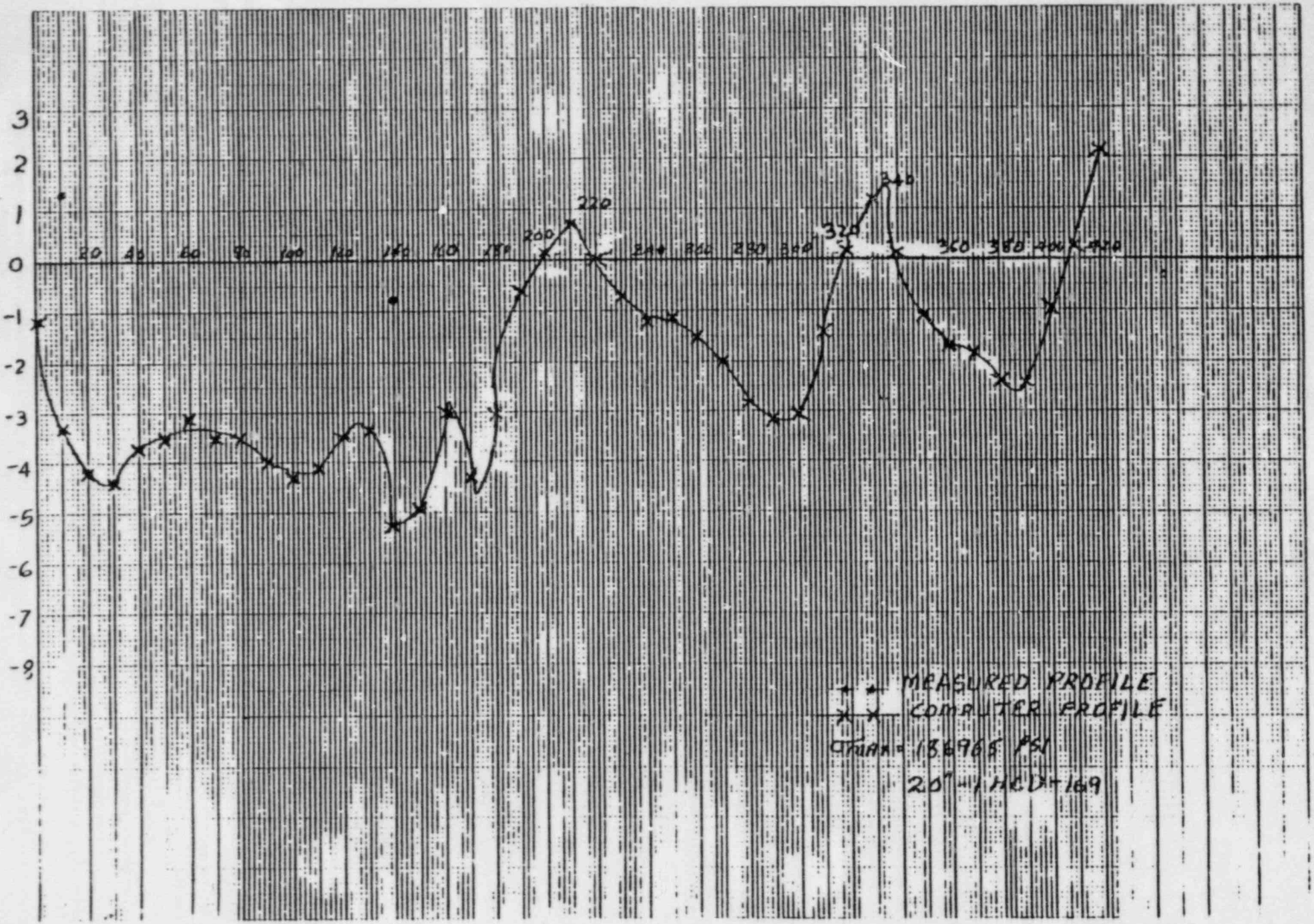
25
30
35
40
LENGTH (FT)
ANC 7
B"-2HBC-82
VSNGO (Q44LOG-11-8-80)
FIELD DATA
DEFLECTION








3
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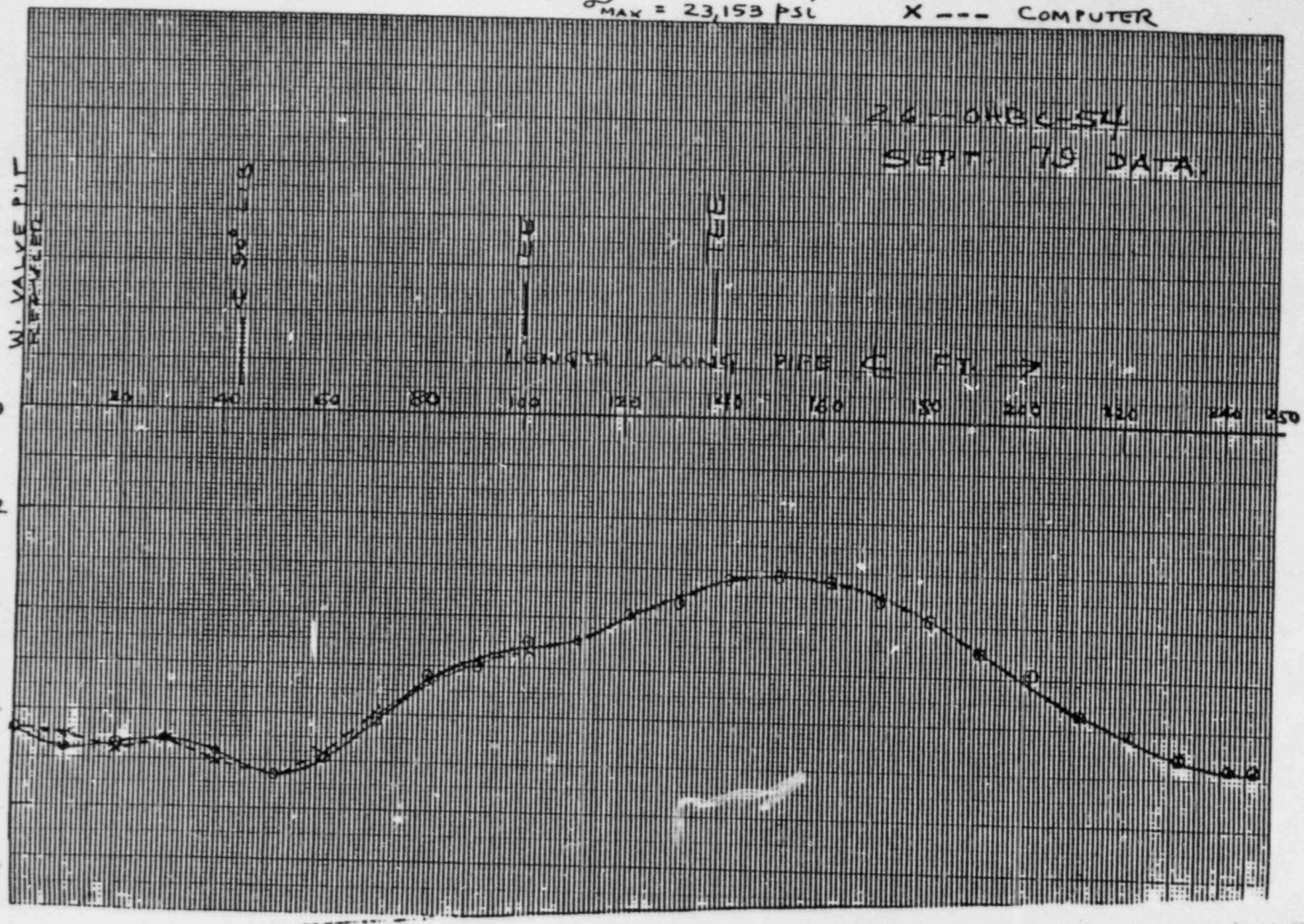
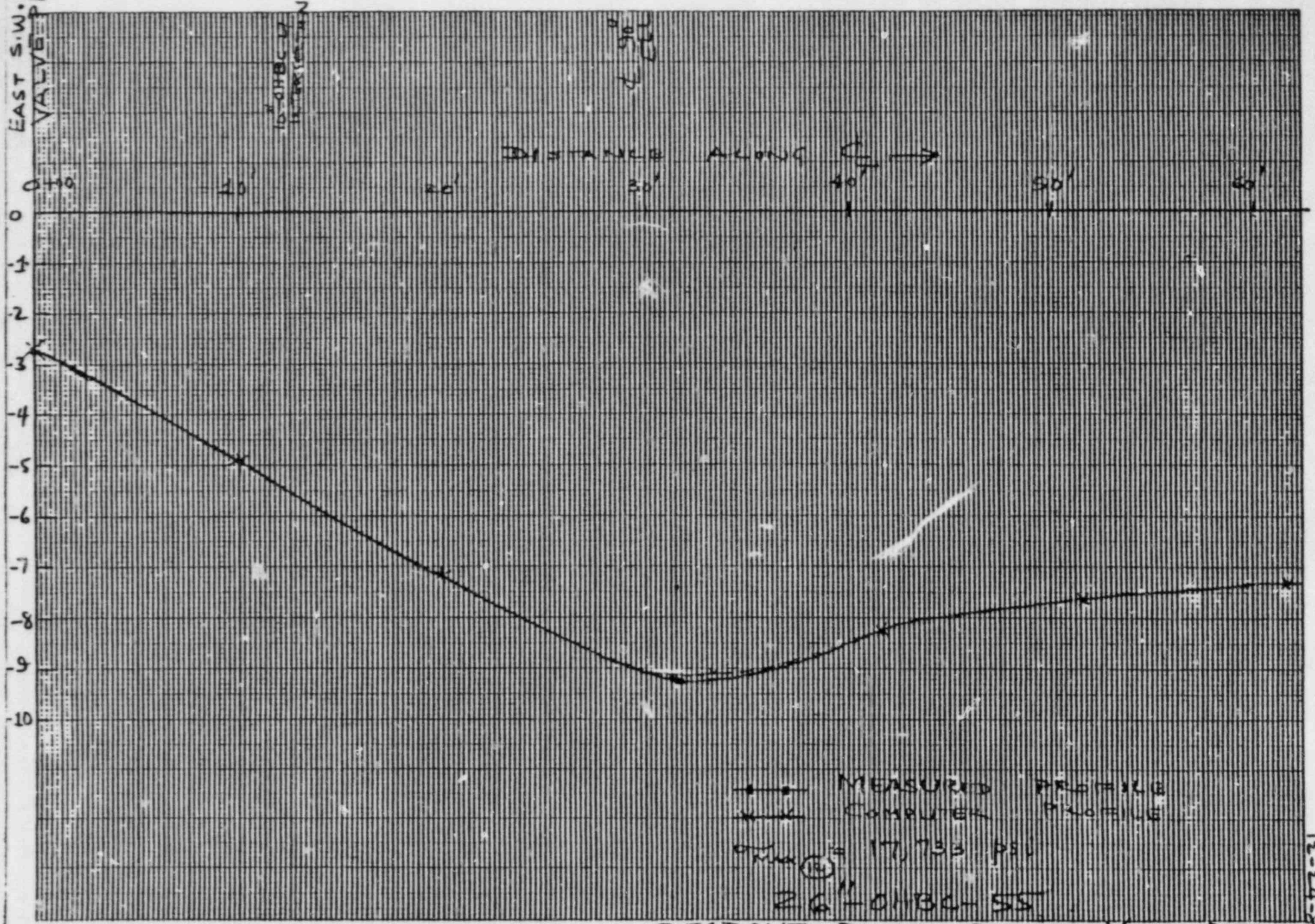
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
MEASURED PROFILE
COMPUTER PROFILE
σTRAX = 18696 PSI
20" - HCV = 169

46 1512





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12-14-50