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This report serves as the Interim Construction Report for Experimental Project 84-01.

16. Abstract
A thin-bonded overlay on the south Loop 610 in Houston was constructed in July and August of 1983. The objective of this project is to continue periodic monitoring of the thin-bonded overlay project. The project contained five experimental sections consisting of two and three-inch depths, non-reinforced with both chopped wire and wire mesh enforcement. Bonding included surface preparation with a cold mill, sand blasting, and grout over a dry surface.

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INTERIM CONSTRUCTION REPORT

"EXPERIMENTAL THIN-BONDED CONCRETE OVERLAY
PAVEMENT IN HOUSTON, TEXAS"

Project 561-2 Interim
(DTFH71-83-3952-TX-15)

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March, 1986

DISCLAIMER STATEMENT

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INTERIM CONSTRUCTION REPORT
EXPERIMENTAL THIN-BONDED CONCRETE OVERLAY PAVEMENT
IN HOUSTON, TEXAS

Visual Evaluation of the Overlay

The thin-bonded overlay on the south Loop 610 in Houston was constructed in July and August, 1983.

Maps of cracks and spalls for the test section, before and after construction of the thin-bonded overlay, appear in Figures 1-8. The black lines represent cracks observed in the original CRCP pavement in May, 1983. The purple lines represent cracks observed in the thin-bonded overlay in February, 1984, and the red and green lines represent cracks in the overlay observed in November, 1984. Spalls are indicated on the maps by the letter 'm' for minor spall and letter 's' for severe spall. Maps of cracks and spalls for the test sections in May, 1985, appear in Figures 9-16.

Longitudinal and transverse cracking by date, section and lane appear in Tables 1.1 and 1.2.[1] As can be seen, a significant decrease in the amount of both types of cracking was noted in the February, 1984 data, six months after overlay placement (during the harshest winter in the recent past in Houston). This was followed by a tremendous increase for the November, 1984 data, and finally, a sudden decrease in the May, 1984 data. The history of cracking is as would normally be expected, except for the last change. The recorded decrease in the amount of cracking is best explained by a combination of factors, but most importantly a change in survey team. In addition, weather condition (the tightly closed cracks in a CRCP are best seen shortly after a light to medium rain when the pavement is still wet) and seasonal effect (e.g., pavement temperature at the time of the condition survey) may have influenced the visual condition survey. However, the trend in Table 1.1 still indicates that the fiber sections exhibit the best performance with respect to cracking, and the 3-inch steel reinforced section the worst.[1]

Table 2 presents the number of spalled cracks by section for before and after overlay conditions. Virtually no spall has occurred after almost 2 years of thin-bonded concrete overlay placement.[1]

Tests and Samples

Dynaflect test points were located approximately on the centerline of each lane, at cracks and at midspans within each section. Mean deflections for May, 1983, to May, 1985, are shown in Tables 3.1 to 3.10. Although the stated objective was to test ten points per design section for crack condition and ten more points for midspan condition, a drift occurred during actual testing. However, since this drift resulted in the loss of observations in some cells of the experimental design in an essentially random manner, analysis by unweighted means can be conducted.[1]

Note that because interior loading was used and Dynaflect testing was usually finished before the hottest part of the day (i.e., the pavement still curled upward or was at full contact with the subbase in the center), no temperature correction was used in the analysis of the Dynaflect data. Further, since relative comparisons were the primarily goal and temperature correction would not necessarily provide more accurate results, raw data was used throughout.[1]

The following analysis of deflection data is from reference 1 (Thin-Bonded Concrete Overlay Pavement, Bagate, et al):

A univariate analysis of variance revealed that the effects of lane and section were significant at a 5 percent confidence level. The interaction lane by section was also significant. The remaining main effect cracking indicator for the base CRCP and all other two-way interactions were not significant for all four Dynaflect data sets corresponding to testing dates May 1985, November 1984, September 1983, and May 1984.

The February, 1984 data set was found ill-conditioned and probably in error. Rather than attempt to reorder the data (by increasing the order of magnitude corresponding to the sensor layout) or other such manipulation, this data set was removed from further analysis.

The multiple classification analysis allowed for ordering of lane and section effects for a given survey date.

Before overlay, the 2"F (fiber) section had the lowest mean deflection and the 2"R (reinforced) the highest. Lane 1 had the lowest mean deflection and Lane 3 the highest.

Immediately after overlay, the differences between the mean lane deflections were negligible (about one-tenth their initial values) and differences between mean section deflections varied depending on the sensor number.

After overlay, the 3"F (fiber) section had the lowest mean deflection and the 2"NR (non-reinforced) the highest. The difference between the mean lane deflection varied depending on the sensor number.

The before minus the after Dynaflect data allowed for an assessment of the structural benefit of the five TBCO design sections. This immediate effect was analyzed using univariate analysis of variance, multiple classification analysis, and multivariate analysis of variance. It was found that significant effects were lane, section and their interaction. The cracking indicator was significant for sensor 1 and sensor 2 only. The grand difference means decreased from sensor 1 to sensor 5. This may mean that the deflection measurement itself is a function of the magnitude of the load, which would tend to support the assertion that heavier loads are required to test thicker pavements for improved accuracy.

Again, it was found that the 3"R (reinforced) section induced the greatest reduction in pavement deflection. Lane 3, the lane with the worst deflection characteristics, showed the largest improvement after overlay. In fact, the order in lane deflection characteristics improvement remained unchanged (i.e., 2nd worst, 2nd largest improvement, etc.).

In the multivariate analysis of variance, three effects were studied: survey date effect, section effects for each survey date, and immediate section effect after TBCO construction. The analysis of the date effect revealed that even if the before overlay data set is not considered, the data sets after overlay were significantly different; thus, these data sets could be studied on a date basis.

The section effect study showed that all other sections had significantly different deflection basins from the 3"R, the section which had the largest reduction in deflection after overlay, on all survey dates but May, 1985 and November, 1984, when the 3"R and the 2"R had statistically the same deflection characteristics. Therefore, the thickness effect varied by survey date (i.e., there is a date by thickness interaction).

The immediate section effect study revealed that thickness effect is significant for a high level and intensity of traffic and that this effect appears sooner for the fiber sections than for the steel reinforced sections.

For a low level of traffic the fibers were more effective in reducing the deflection of overlaid CRCP, and for a high level of traffic the steel mats were more effective.

Concrete cores were taken in Lane 4, the outermost lane on August 14, 1985. Two cores were taken from each of the five design sections. The 4-inch cores were encased in a rubber sheath for testing - unlike the cores which were tested a month after the overlay was placed.[2]

The results of the direct shear at the interface TBCO-CRCP are reported in Table 4. As can be seen, the range of bond/shear strength is 138 to 254 psi. The mean interface shear strength is 211 psi with a standard deviation of 56 psi.[2]

Measurements

Road profile measurements in all four lanes were made with a GMR profilometer. The data gathered from the two trailing wheels of the profilometer were digitized, then processed with the "VERTAC" computer program to arrive at estimates of Serviceability Index. SI Values by date are given in Table 5.[1]

References

1. Bagate, Moussa, B. Frank McCullough, D. W. Fowler, and M. Muhtu, Center for Transportation Research, The University of Texas at Austin, Research Report 357-2F, Preliminary Review Copy, November, 1985.

2. McCullough, Frank, Technical Memo 457-2, Houston Bonded Concrete Overlay Project, January 8, 1986.

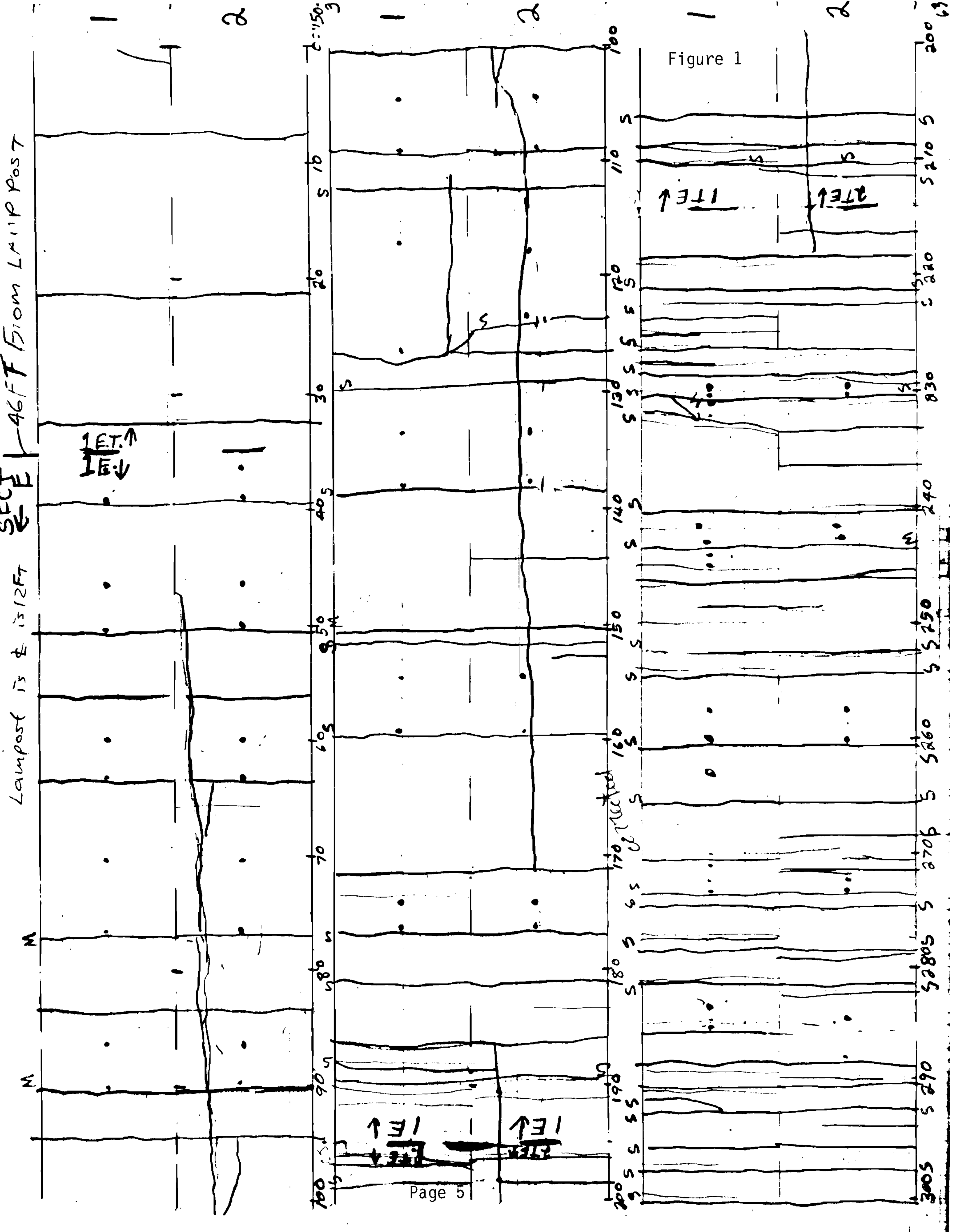
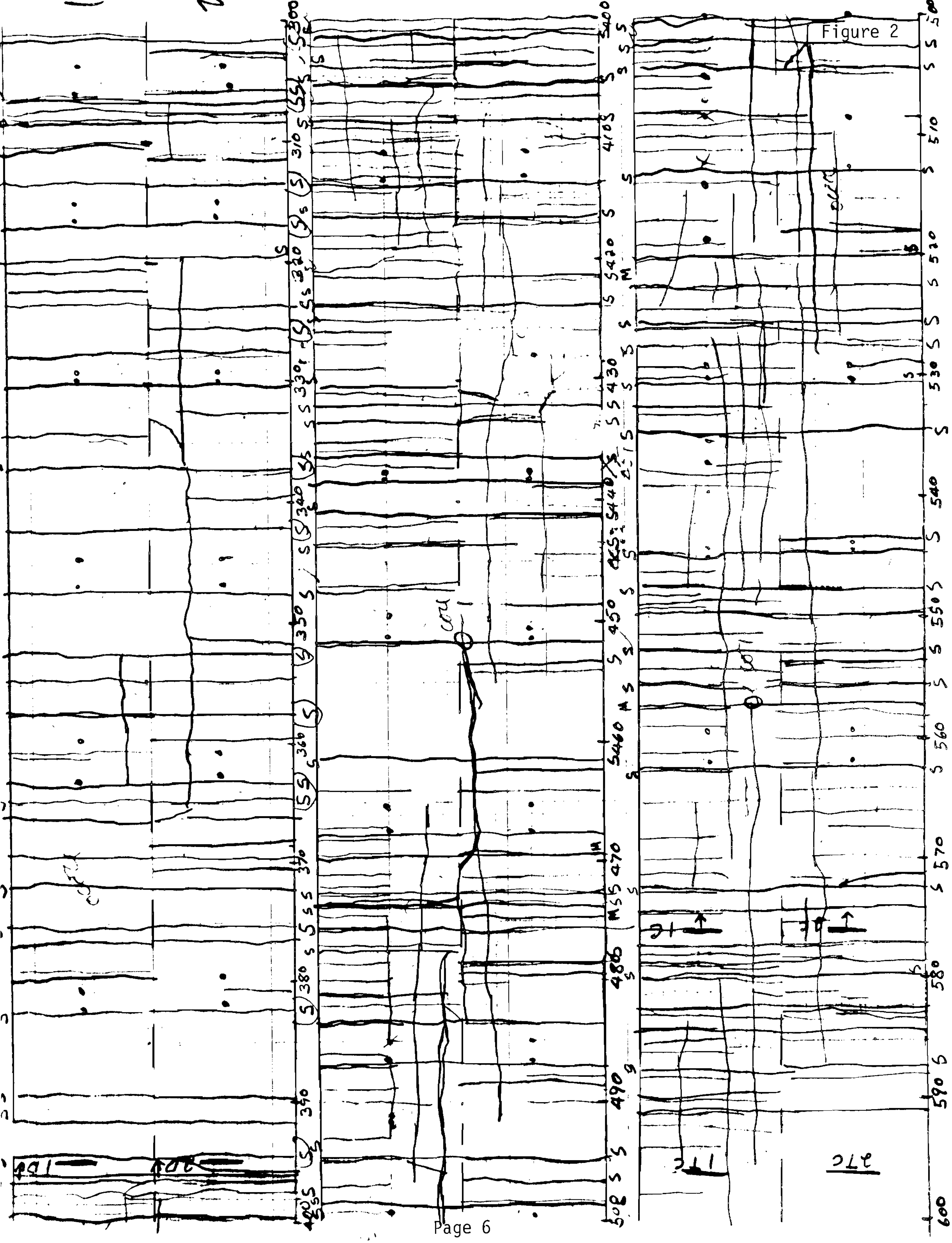


Figure 1



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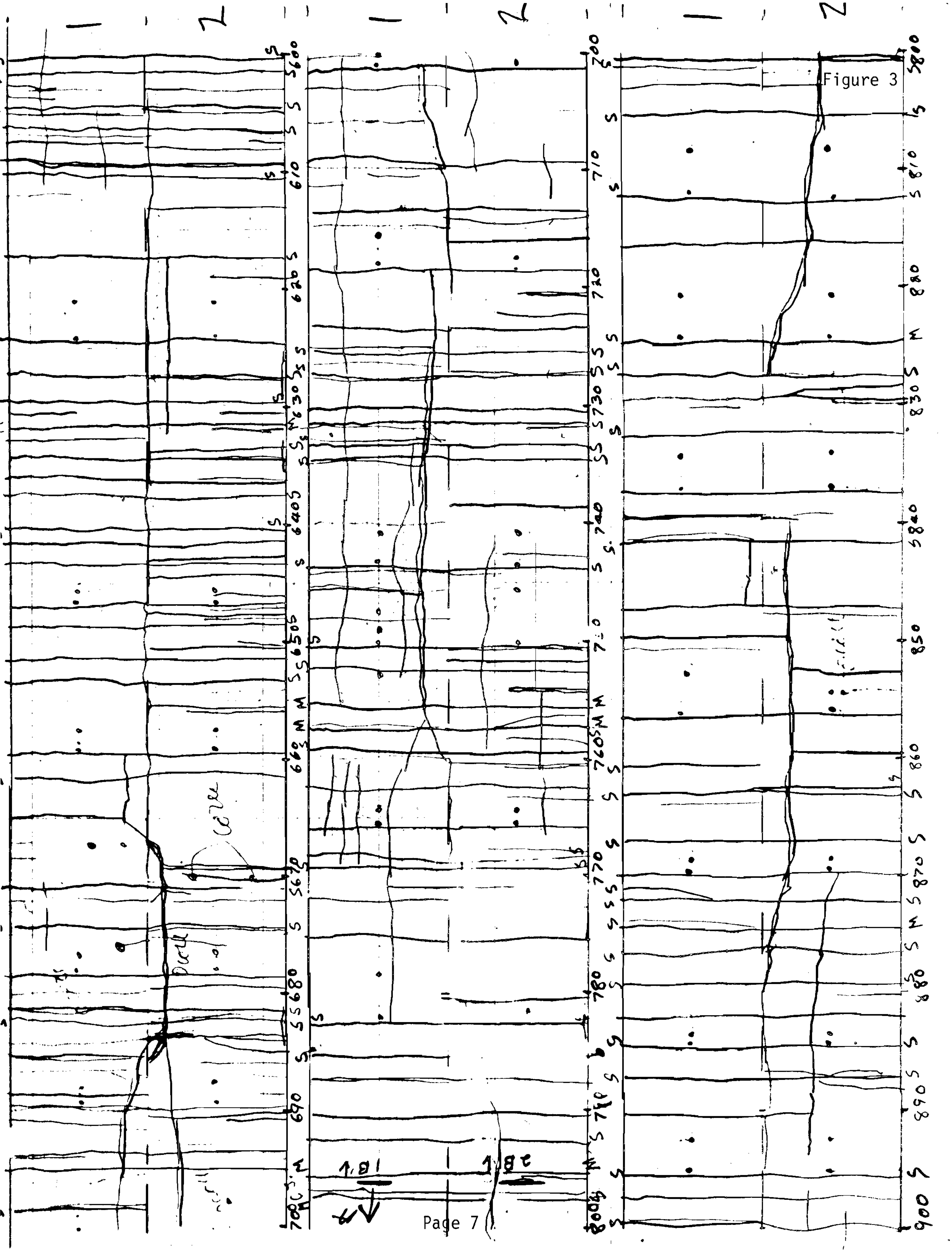

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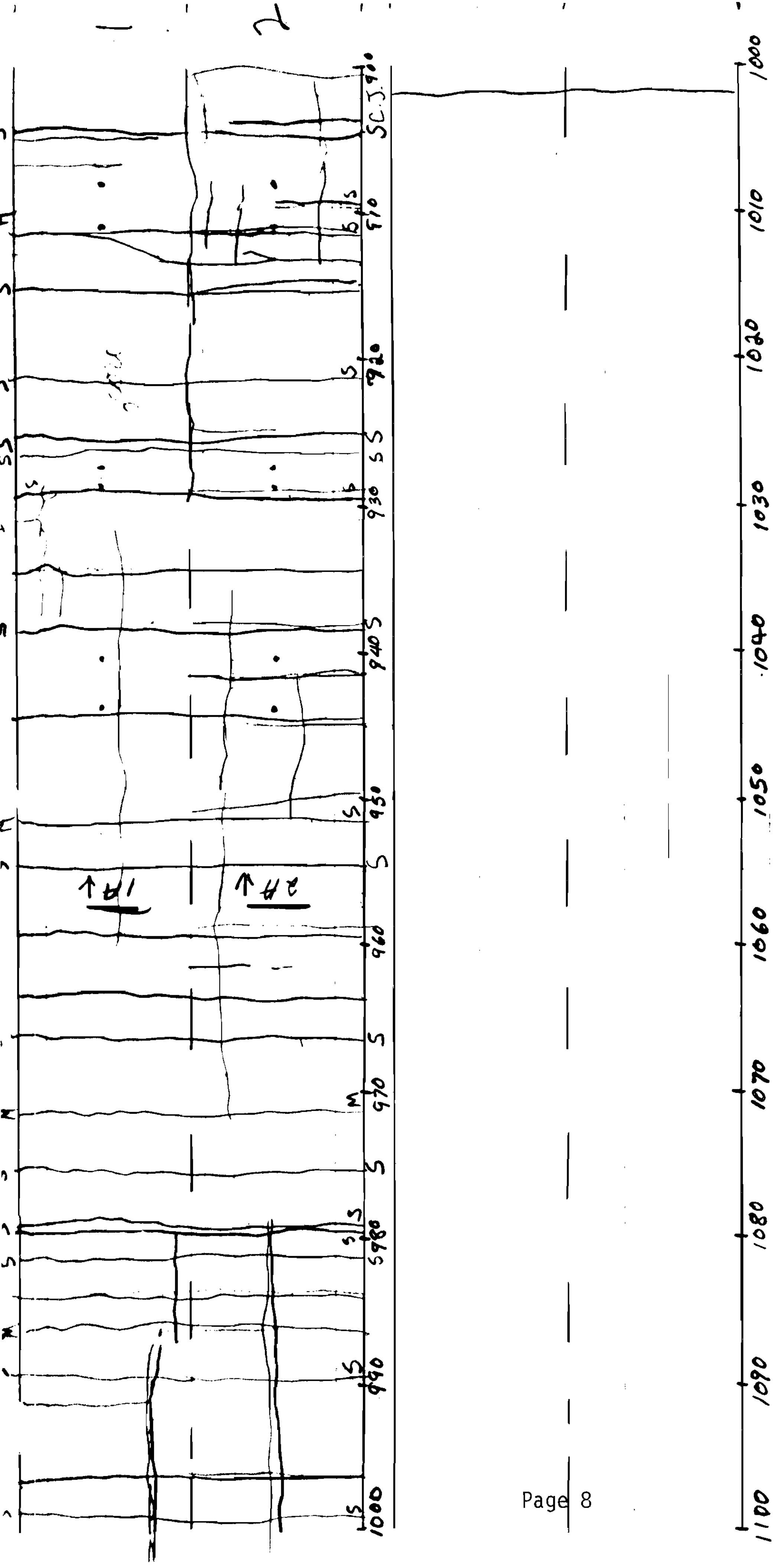
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Figure 5

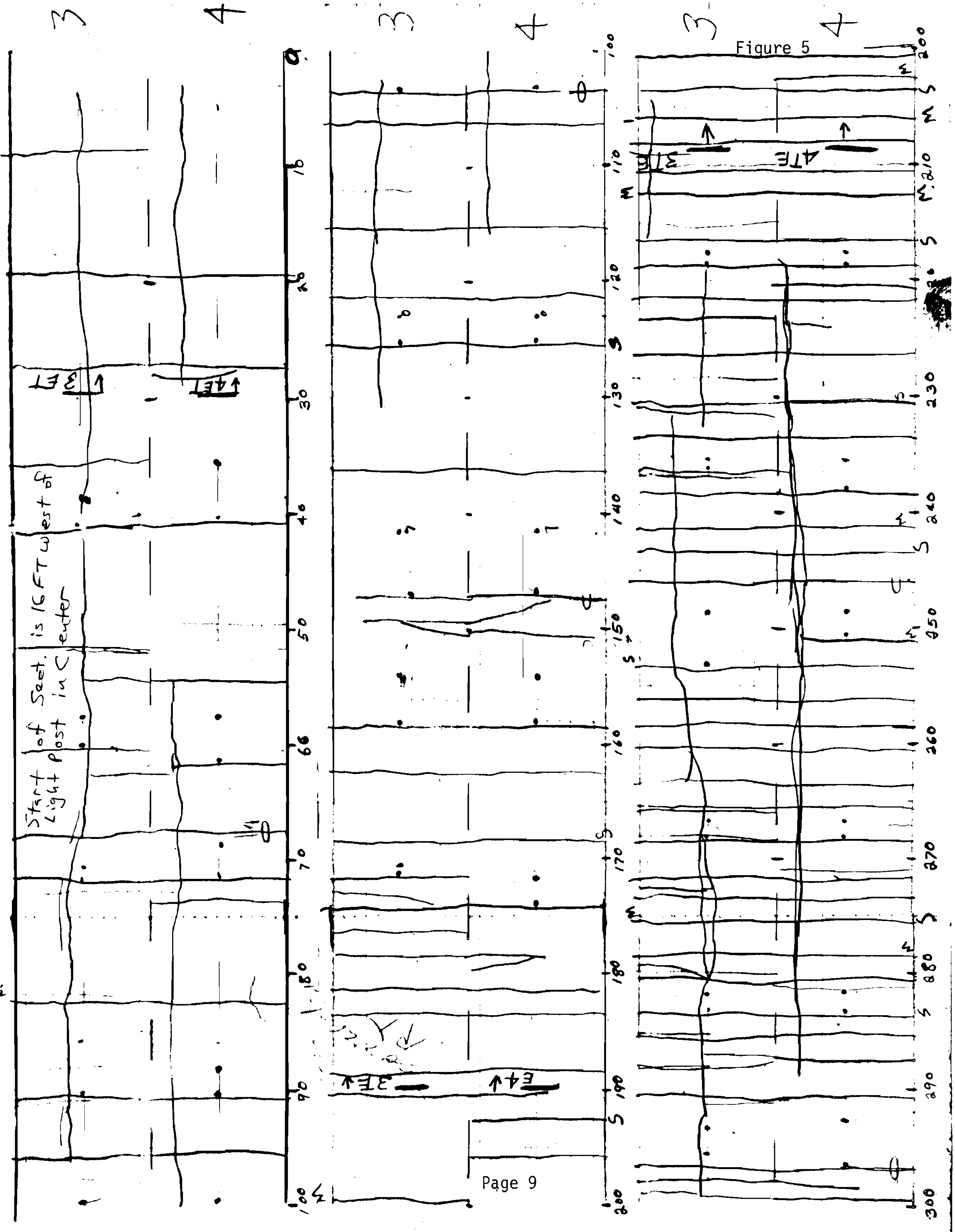

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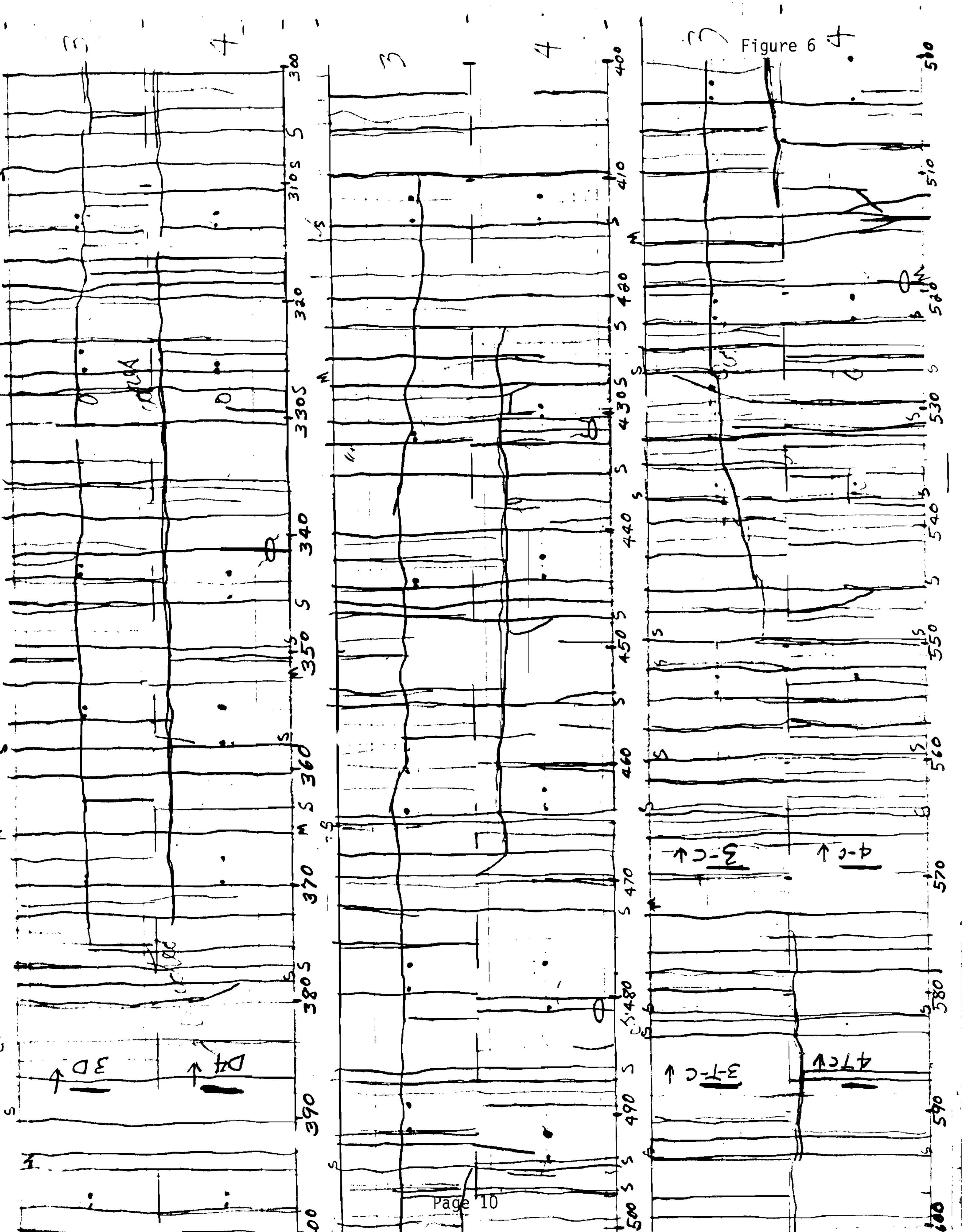
Figure 6



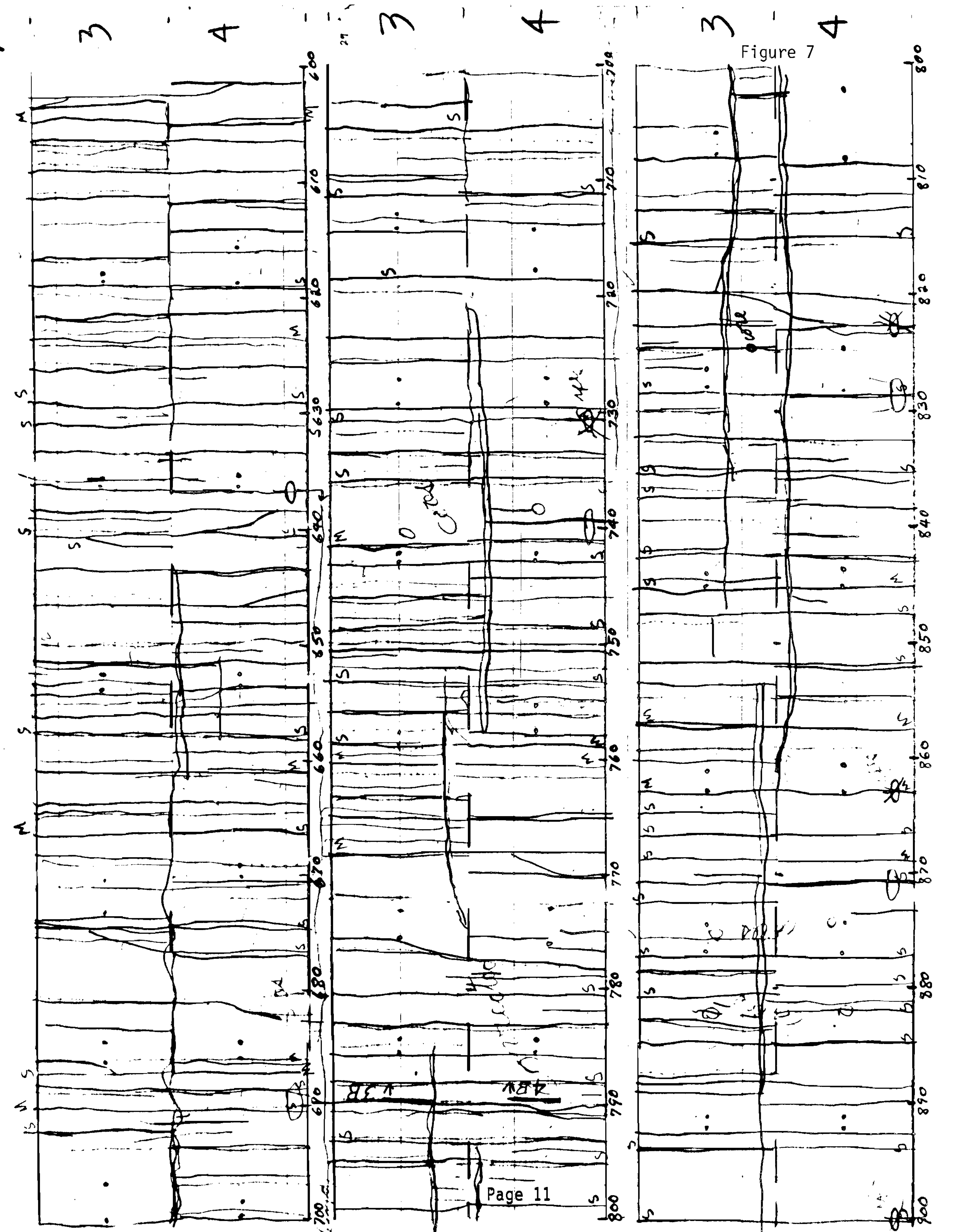

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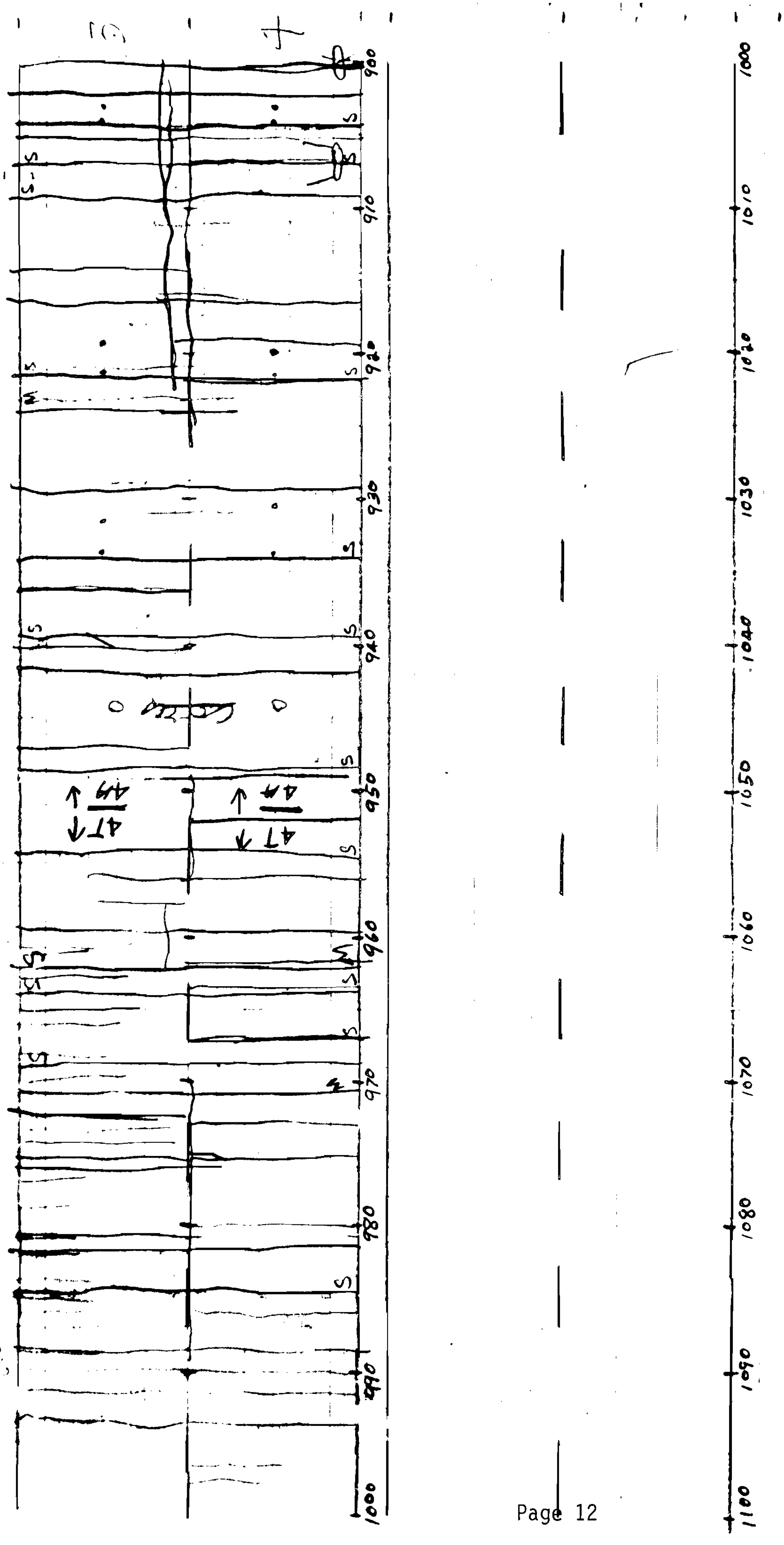
Figure 7

Figure 8



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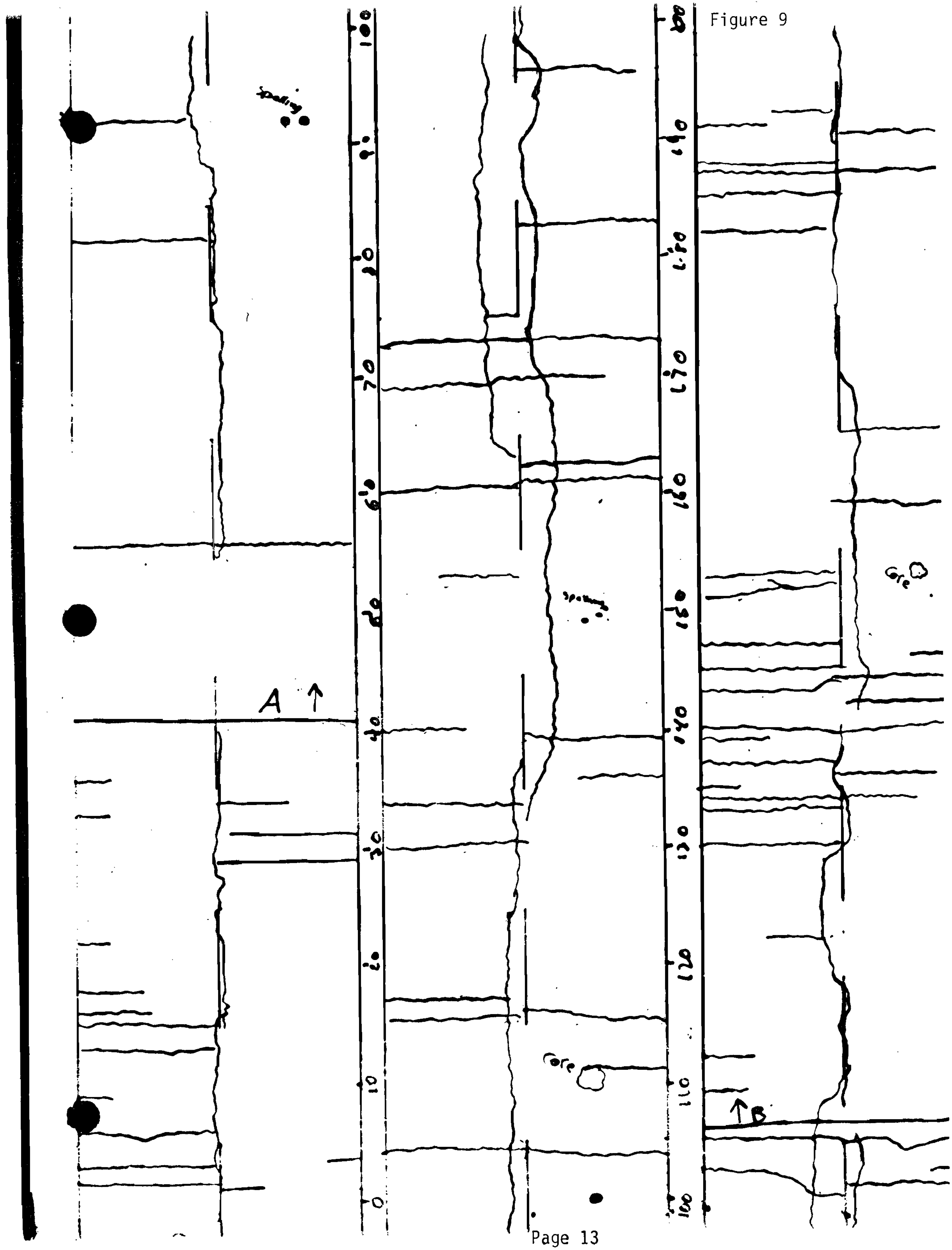

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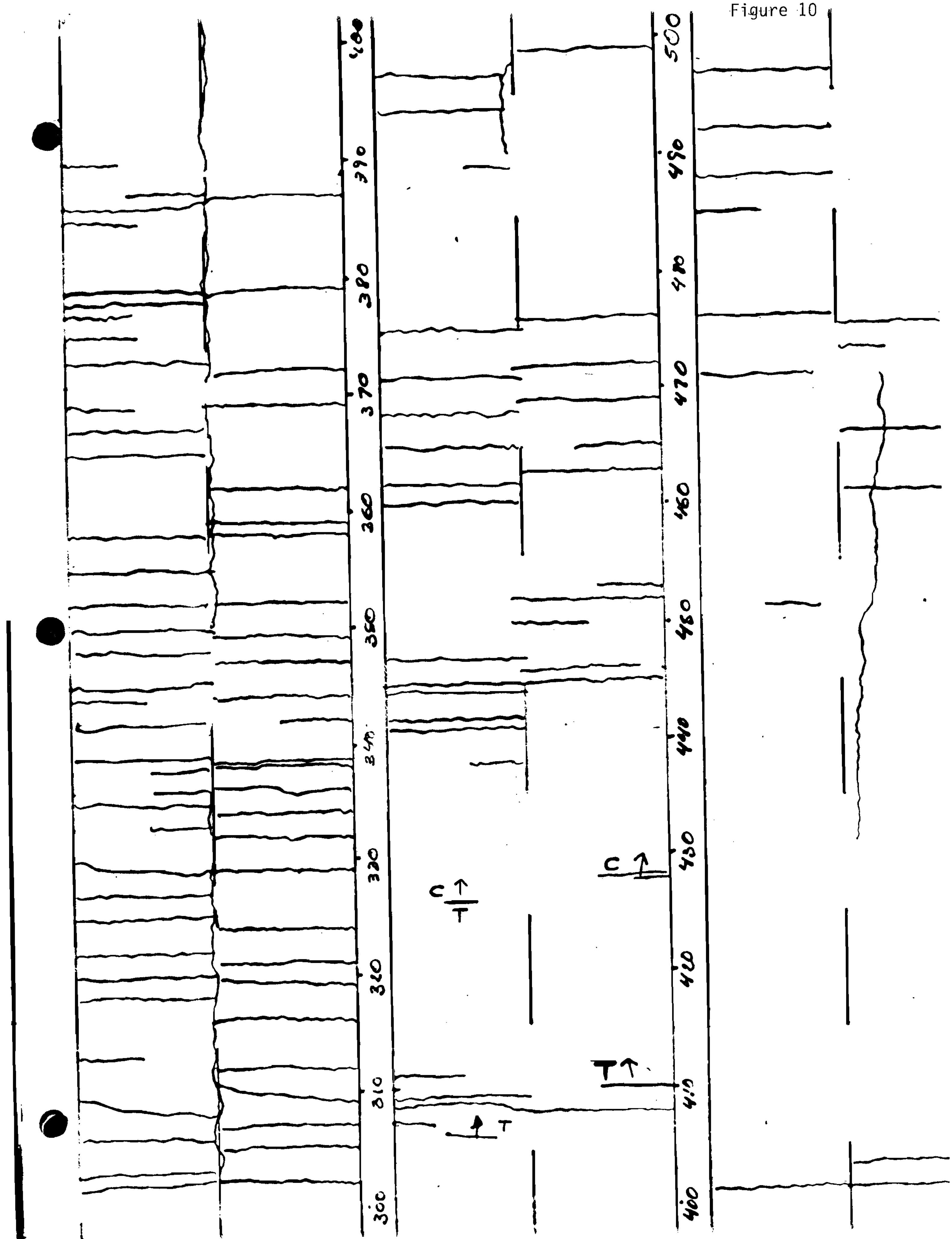
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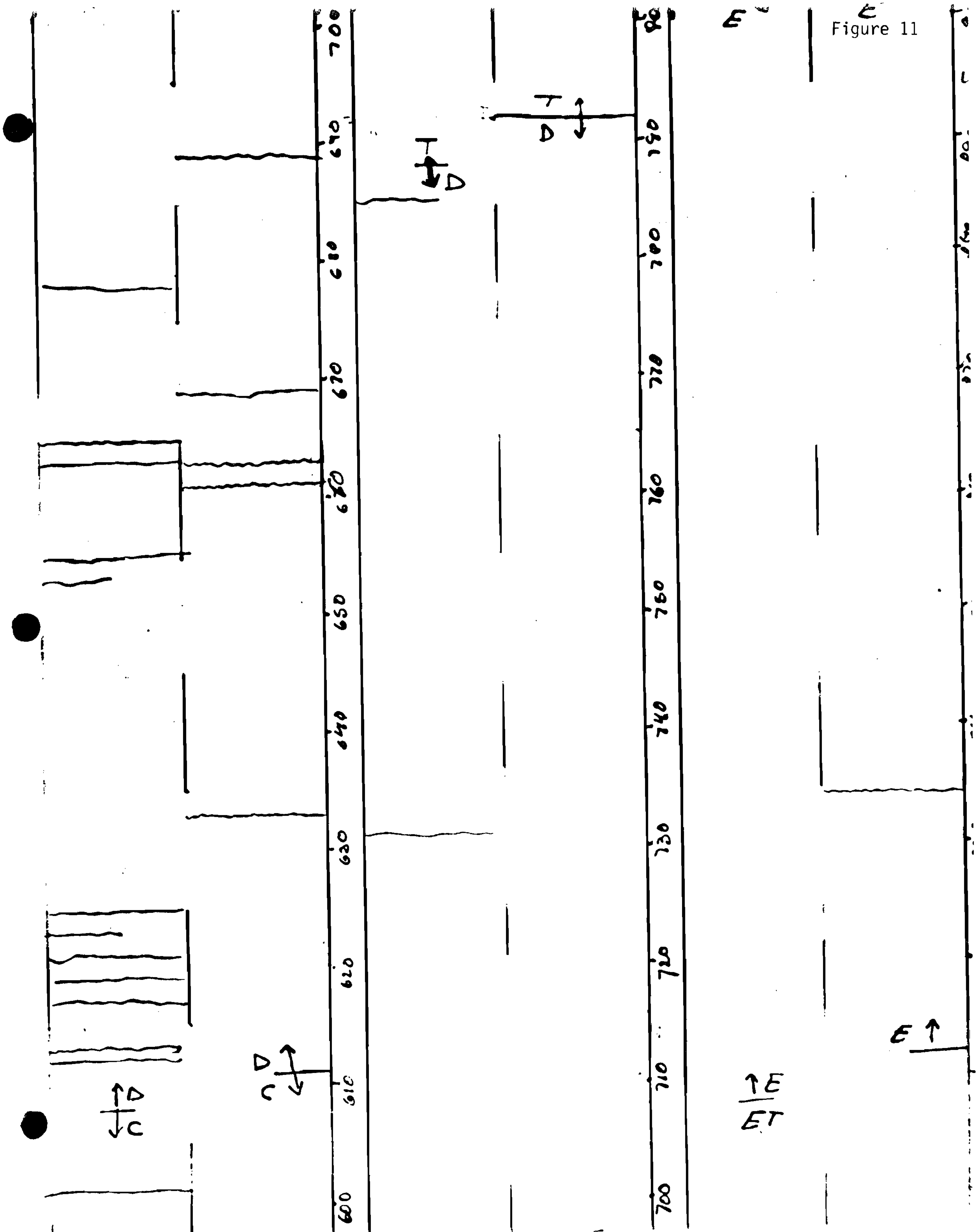

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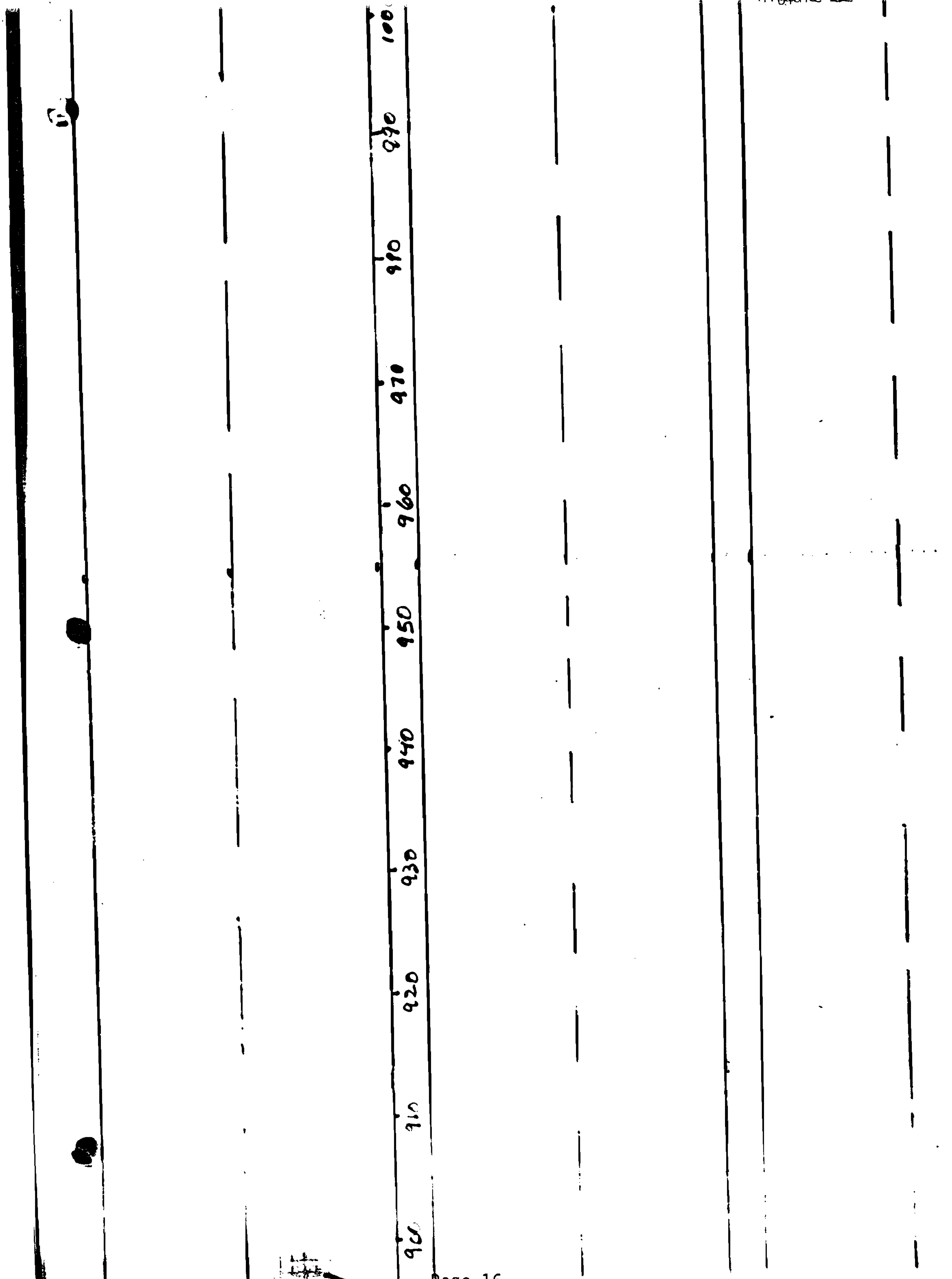

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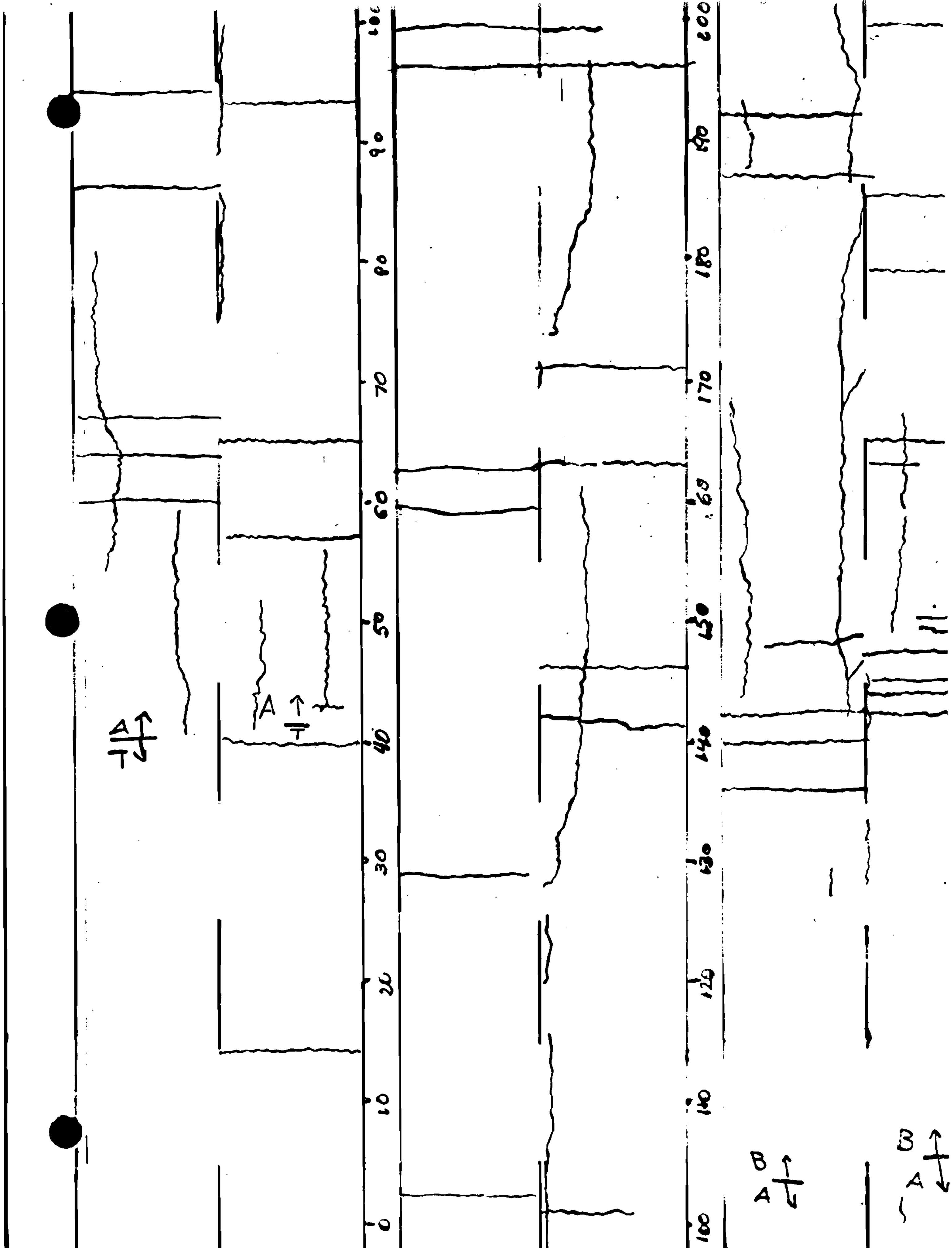

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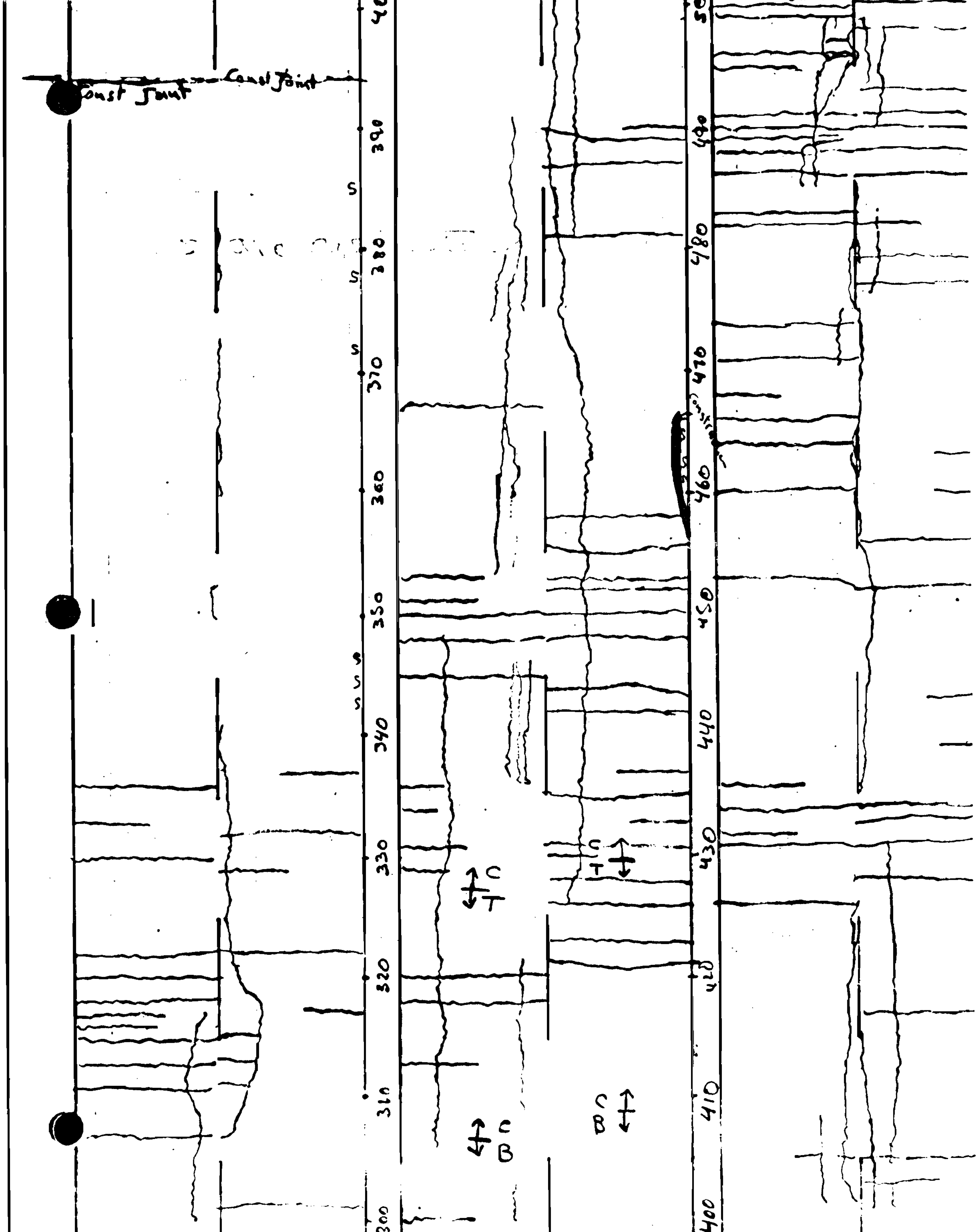
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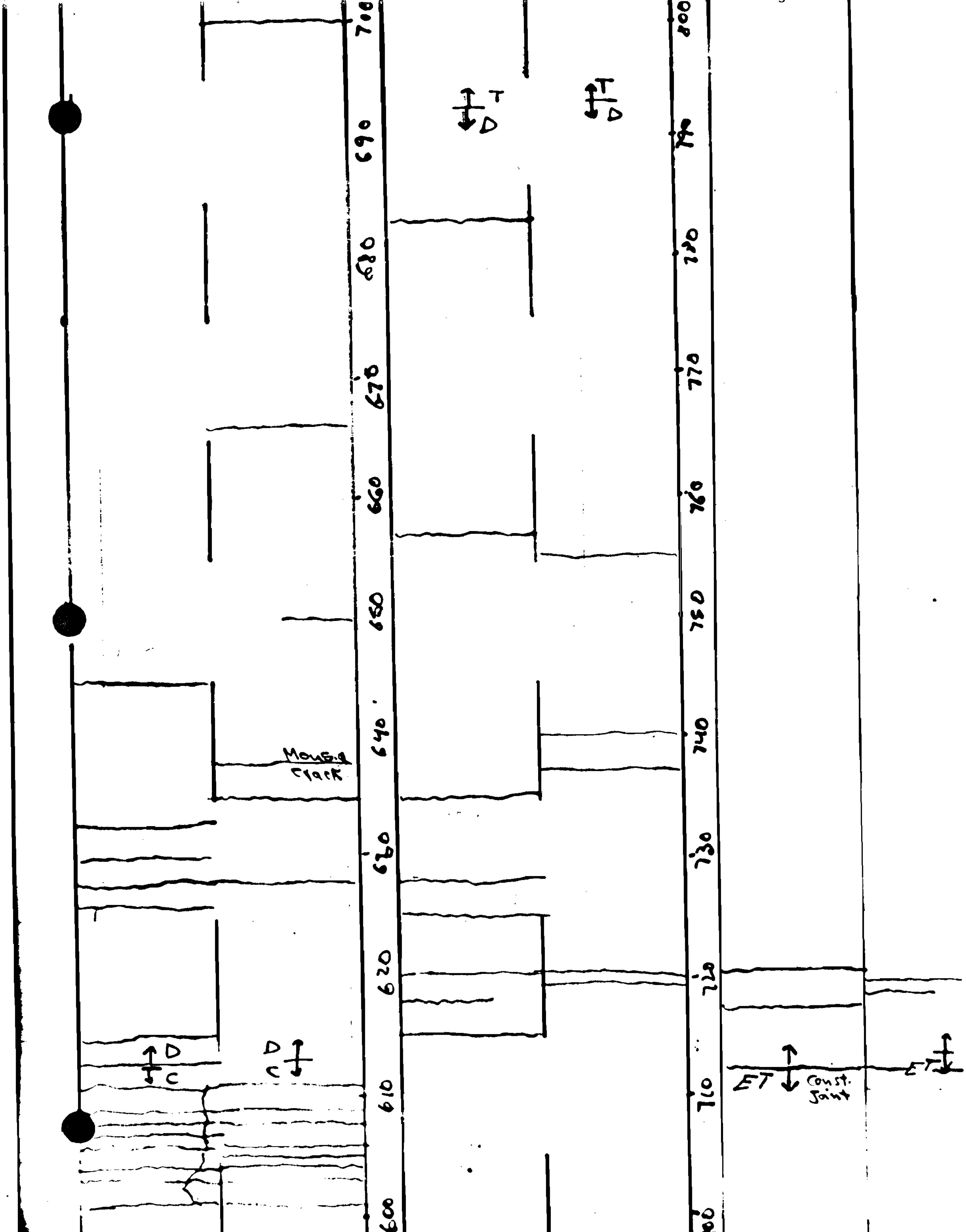
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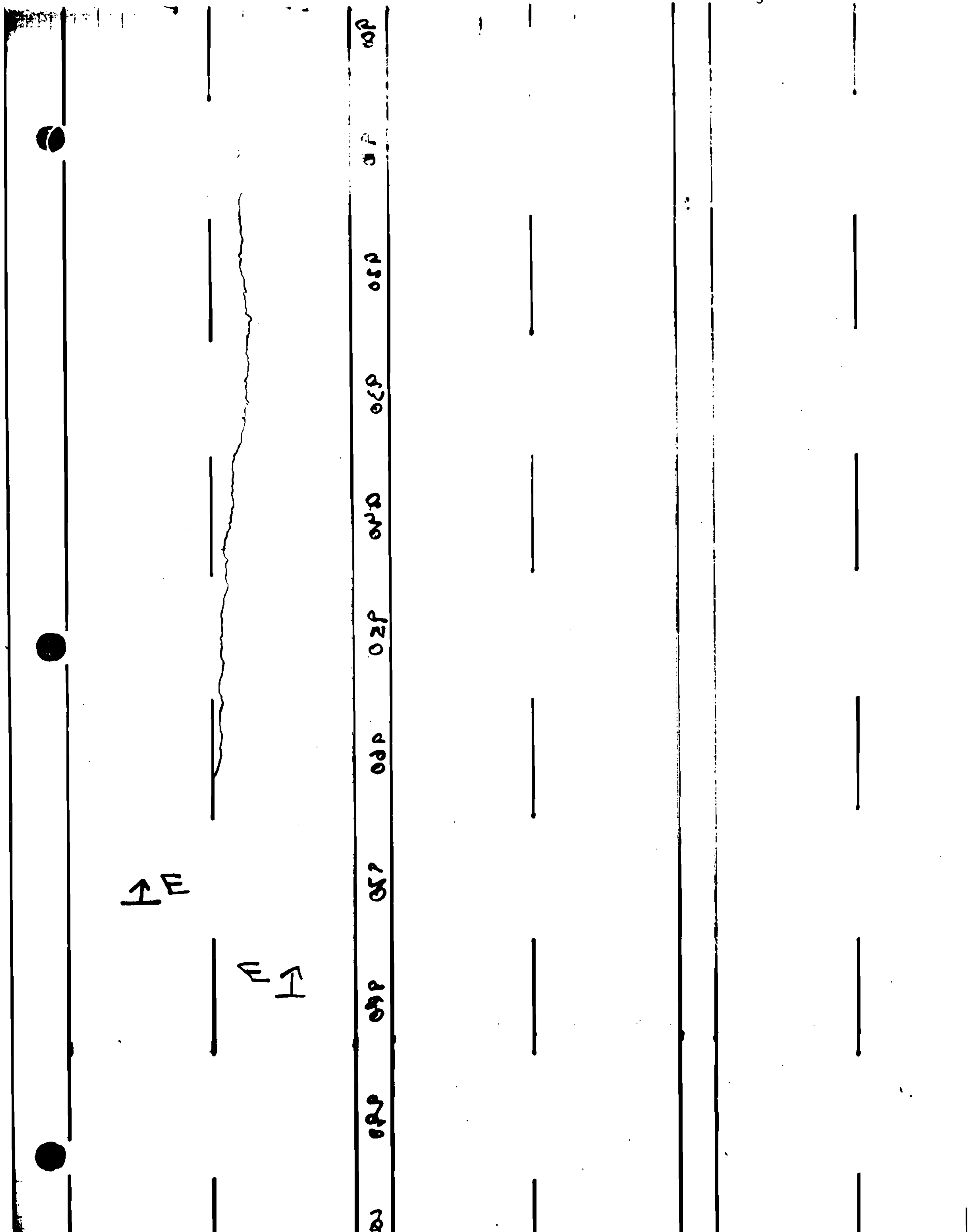

TABLE 1.1 LONGITUDINAL CRACKING BY DATE, SECTION AND LANE (FT)

Date	Section	Lane Number 1	2	3	4	Total
May 1983	2" NR	25	112	121	65	323
	2" R	66	46	24	64	200
	3" R	30	49	152	60	291
	3" F	12	153	183	141	489
	2" F	16	138	122	72	348
Total		149	498	602	402	
February 1984	2" NR	16	101	94	34	245
	2" R	53	59	29	61	202
	3" R	33	143	23	48	247
	3" F	0	4	0	0	4
	2" F	0	56	0	4	60
Total		102	363	146	147	
November 1984	2" NR	51	175	160	89	475
	2" R	219	157	29	147	552
	3" R	277	243	23	52	595
	3" F	0	4	3	117	124
	2" F	0	56	14	4	74
Total		547	635	229	409	
May 1984	2" NR	46	133	89	8	276
	2" R	20	26	72	4	122
	3" R	52	216	8	40	316
	3" F	0	0	0	0	0
	2" F	0	53	0	0	53
Total		118	428	169	52	

TABLE 1.2 TRANSVERSE CRACKING BY DATE, SECTION AND LANE (ACTUAL COUNT)

		Lane Number				
Date	Section	1	2	3	4	Total
May 1983	2" NR	59	65	76	64	264
	2" R	71	82	75	77	305
	3" R	62	71	77	79	289
	3" F	65	72	82	69	288
	2" F	26	29	34	30	119
Total		283	319	334	319	
February 1984	2" NR	6	17	33	25	81
	2" R	5	15	49	47	116
	3" R	103	54	38	28	223
	3" F	2	17	1	8	28
	2" F	2	5	0	4	11
Total		118	108	121	112	
November 1984	2" NR	15	27	53	48	143
	2" R	41	43	87	78	249
	3" R	136	98	76	64	374
	3" F	30	27	21	21	99
	2" F	6	8	8	6	28
Total		228	203	245	217	
May 1983	2" NR	11	10	14	14	49
	2" R	20	16	57	38	131
	3" R	42	48	24	16	130
	3" F	14	11	14	5	44
	2" F	2	2	0	0	4
Total		89	87	109	73	

TABLE 2 SPALLING SUMMARY IN THE VARIOUS DESIGN SECTIONS

Spalling	Design Section	Survey Before Construction May 1983	First Survey After Construction February 1984	Second Survey After Construction November 1984	Third Survey After Construction May 1985
Minor	2" NR	17	0	0	0
	2" R	18	0	0	0
	3" R	9	0	0	0
	3" F	15	0	0	0
	2" F	4	0	0	0
Severe	2" NR	109	0	0	0
	2" R	82	0	0	0
	3" R	103	0	0	0
	3" F	87	0	0	0
	2" F	17	0	0	0

TABLE 3.1 MEAN DEFLECTIONS (1/100 MILS) AT MIDSPAN - MAY 1985

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2"NR	51.6	48.3	43.1	40.5	37.7
	2"R	48.3	45.0	39.3	36.1	32.9
	3"R	46.8	43.4	38.2	35.0	32.2
	3"F	49.0	45.6	39.7	36.2	33.3
	2"F	46.8	43.7	38.1	35.6	33.0
2	2"NR	53.1	48.6	44.9	40.6	38.4
	2"R	52.9	48.6	42.8	37.6	34.2
	3"R	52.3	47.8	41.4	36.6	33.3
	3"F	50.8	46.8	40.7	36.5	33.4
	2"F	51.8	48.1	42.3	38.6	36.0
3	2"NR	56.1	51.9	50.0	44.7	43.0
	2"R	51.7	47.4	44.1	39.6	37.5
	3"R	52.1	47.6	46.4	41.0	39.6
	3"F	47.4	43.6	41.7	37.5	36.0
	2"F	50.1	46.6	45.1	40.9	39.6
4	2"NR	57.5	53.5	50.4	45.4	43.0
	2"R	55.7	50.9	47.9	42.2	39.8
	3"R	49.1	45.2	43.3	38.3	36.4
	3"F	41.2	38.0	37.5	33.8	32.6
	2"F	43.7	40.3	39.1	35.6	34.2

TABLE 3.2 SUMMARY OF MEAN DEFLECTIONS (1/100 MILS) AT CRACKS - May 1985

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2"NR	53.6	49.8	43.6	40.7	38.0
	2"R	50.1	45.6	39.6	35.5	32.8
	3"R	49.8	44.9	38.8	35.3	32.4
	3"F	51.0	45.8	39.3	35.4	32.6
	2"F	47.5	42.5	38.2	34.9	32.4
2	2"NR	54.0	49.8	44.9	40.4	38.2
	2"R	52.1	47.4	41.8	36.9	33.6
	3"R	49.9	45.7	39.6	35.1	32.1
	3"F	52.2	47.1	41.1	36.7	33.8
	2"F	53.0	48.8	42.8	39.4	36.8
3	2"NR	54.0	51.0	47.8	43.4	42.7
	2"R	51.4	47.2	44.7	39.5	37.4
	3"R	52.3	48.5	46.6	41.0	39.1
	3"F	47.3	44.4	42.8	38.3	36.3
	2"F	50.4	46.4	44.3	40.3	38.9
4	2"NR	57.6	53.8	50.9	46.8	43.8
	2"R	53.8	49.7	46.8	41.5	38.7
	3"R	50.6	46.3	44.2	38.6	35.6
	3"F	40.7	37.5	36.3	32.8	31.8
	2"F	41.9	40.0	38.8	35.2	34.2

TABLE 3.3 MEAN DEFLECTIONS (1/100 MILS) AT MIDSPAN - NOVEMBER 1984

		Sensor Number				
Lane Number	Design Section	1	2	3	4	5
1	2" NR	49.9	47.7	42.3	40.2	38.9
	2" R	50.1	47.0	40.8	37.1	33.9
	3" R	46.2	44.2	38.2	36.0	33.8
	3" F	47.2	45.6	39.6	36.6	33.6
	2" F	43.7	42.0	37.7	35.9	33.7
2	2" NR	49.6	47.5	41.0	40.1	38.4
	2" R	51.9	49.2	40.7	37.4	34.4
	3" R	50.8	48.2	40.9	37.7	34.9
	3" F	50.6	47.9	40.9	38.3	35.0
	2" F	49.0	47.4	42.2	40.3	37.9
3	2" NR	52.8	49.6	46.1	42.0	39.8
	2" R	53.2	49.8	45.3	40.4	37.2
	3" R	55.2	51.7	47.4	41.6	39.7
	3" F	51.5	48.6	43.9	39.4	37.6
	2" F	54.6	52.8	48.1	44.4	41.6
4	2" NR	60.1	57.3	52.0	46.9	43.8
	2" R	58.6	56.5	50.0	44.0	40.6
	3" R	53.1	50.5	44.5	39.8	36.0
	3" F	44.9	43.1	38.9	35.8	33.7
	2" F	45.9	44.2	41.3	37.8	36.1

TABLE 3.4 MEAN DEFLECTIONS (1/100 MILS) AT CRACKS - NOVEMBER 1984

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	56.8	52.1	43.9	41.9	40.3
	2" R	49.6	45.6	38.6	35.8	33.3
	3" R	51.0	46.3	39.0	36.6	33.9
	3" F	50.7	46.0	39.1	36.1	33.1
	2" F	46.4	42.8	37.2	35.3	32.8
2	2" NR	50.3	47.6	41.6	40.4	38.5
	2" R	49.8	46.0	40.2	37.1	34.7
	3" R	50.2	46.7	39.4	37.2	34.5
	3" F	50.2	47.0	40.3	37.8	35.2
	2" F	52.7	49.1	42.1	39.9	37.5
3	2" NR	54.1	50.8	47.3	43.2	41.1
	2" R	51.4	48.6	44.0	39.7	37.2
	3" R	51.0	48.3	43.6	39.2	36.6
	3" F	48.4	46.4	41.8	37.8	35.6
	2" F	54.1	51.3	46.0	41.6	39.4
4	2" NR	60.6	56.9	51.6	46.4	43.4
	2" R	56.4	53.3	48.8	42.5	39.2
	3" R	51.6	49.8	44.5	39.7	37.2
	3" F	43.9	42.3	38.4	35.3	33.4
	2" F	46.6	45.2	40.7	38.3	35.7

TABLE 3.5 MEAN DEFLECTION (1/100 MILS) AT MIDSPANS - FEBRUARY 1984

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	50.6	60.3	50.7	55.8	45.5
	2" R	49.8	58.7	48.4	51.6	41.0
	3" R	47.9	51.9	44.2	47.4	37.6
	3" F	55.0	47.8	44.8	48.1	38.5
	2" F	49.8	43.2	40.6	45.6	36.6
2	2" NR	59.8	51.6	48.8	54.2	42.8
	2" R	58.8	50.3	47.2	50.5	40.0
	3" R	61.4	53.0	47.4	50.4	39.6
	3" F	53.3	46.5	43.2	47.7	38.5
	2" F	56.8	50.0	47.3	52.0	42.5
3	2" NR	62.0	53.8	49.4	54.0	43.0
	2" R	63.5	55.2	50.3	53.3	41.5
	3" R	62.3	53.3	49.5	52.2	40.8
	3" F	62.8	52.8	49.0	51.4	40.0
	2" F	63.3	54.8	51.8	57.0	46.0
4	2" NR	72.0	63.3	58.3	60.8	48.0
	2" R	73.5	62.7	57.0	59.8	47.5
	3" R	62.0	53.3	49.2	51.5	40.2
	3" F	53.2	46.0	43.8	46.6	37.8
	2" F	52.4	45.6	43.6	48.4	38.5

TABLE 3.6 MEAN DEFLECTIONS (1/100 MILS) AT CRACKS - FEBRUARY 1984

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	58.2	65.1	52.9	56.9	46.2
	2" R	53.0	60.2	48.4	50.8	40.5
	3" R	52.1	55.4	45.0	47.0	37.0
	3" F	63.6	52.2	47.4	50.7	39.4
	2" F	56.0	46.9	42.4	45.8	36.6
2	2" NR	60.4	51.0	48.4	53.4	43.6
	2" R	62.2	53.3	49.3	52.8	41.8
	3" R	62.6	53.2	48.8	51.6	40.6
	3" F	56.5	48.2	44.0	46.8	38.2
	2" F	63.0	52.8	47.8	51.5	41.3
3	2" NR	59.4	52.4	48.0	52.6	43.0
	2" R	65.5	55.8	51.3	54.8	43.0
	3" R	64.7	54.2	49.8	52.8	41.0
	3" F	64.8	53.2	48.4	50.0	40.4
	2" F	67.7	57.8	52.0	55.5	44.0
4	2" NR	72.0	62.8	58.5	63.3	49.8
	2" R	70.3	61.5	56.0	58.8	46.0
	3" R	64.0	55.0	50.5	52.8	42.0
	3" F	55.4	47.6	43.4	47.0	38.4
	2" F	54.4	47.2	44.2	47.8	38.6

TABLE 3.7 MEAN DEFLECTIONS (1/100 MILS) AT MIDSPAN - SEPTEMBER 1983

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	48.0	45.6	42.8	40.1	36.1
	2" R	49.3	46.3	42.1	38.4	33.9
	3" R	47.0	43.8	39.6	37.0	31.4
	3" F	46.9	44.8	40.7	37.7	32.6
	2" F	44.4	42.8	39.9	37.2	33.9
2	2" NR	49.8	47.5	43.8	41.7	37.6
	2" R	46.2	44.0	39.8	37.2	32.6
	3" R	44.9	43.1	39.1	36.8	31.7
	3" F	46.7	44.5	40.4	37.1	32.4
	2" F	41.9	39.9	37.1	34.7	31.0
3	2" NR	51.8	49.7	46.0	44.0	39.4
	2" R	48.5	46.2	42.2	39.6	34.3
	3" R	47.2	45.1	41.3	38.6	33.9
	3" F	45.1	43.6	40.1	37.8	33.4
	2" F	45.7	44.3	41.0	39.3	34.6
4	2" NR	55.2	52.0	48.3	44.2	39.6
	2" R	54.3	51.2	46.9	42.8	37.3
	3" R	46.0	43.0	39.7	37.0	32.1
	3" F	39.6	37.6	34.9	33.2	29.3
	2" F	41.6	39.9	37.3	35.8	31.0

TABLE 3.8 MEAN DEFLECTIONS (1/100 MILS) AT CRACKS - SEPTEMBER 1983

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	47.6	44.8	41.9	39.1	35.4
	2" R	46.9	44.1	40.5	37.3	32.7
	3" R	47.9	44.3	39.8	36.9	31.6
	3" F	47.6	44.2	39.8	36.9	32.0
	2" F	44.8	42.3	38.6	36.3	32.0
2	2" NR	50.5	47.7	43.8	41.5	37.3
	2" R	47.9	44.6	39.9	37.0	32.5
	3" R	46.8	43.4	38.8	35.9	31.1
	3" F	50.1	45.6	40.6	37.7	31.7
	2" F	46.3	42.7	38.4	35.2	31.4
3	2" NR	48.6	46.7	42.9	40.9	35.9
	2" R	48.3	46.0	42.1	39.3	34.6
	3" R	48.2	45.7	41.8	39.3	34.4
	3" F	45.2	43.4	39.9	37.4	32.8
	2" F	48.3	46.4	43.0	40.9	36.3
4	2" NR	54.1	51.3	48.2	44.4	40.0
	2" R	52.3	49.2	44.8	41.3	35.8
	3" R	46.1	42.8	38.9	36.1	31.4
	3" F	38.8	37.2	34.5	33.0	29.4
	2" F	41.1	39.3	36.6	35.0	30.7

TABLE 3.9 MEAN DEFLECTIONS (1/100 MILS) AT MIDSPAN - MAY 1983

Lane Number	Design Section	Sensor Number				
		1	2	3	4	5
1	2" NR	50.7	47.9	42.8	40.3	35.7
	2" R	52.8	49.4	43.6	39.5	34.0
	3" R	50.6	47.4	42.0	38.0	31.6
	3" F	50.7	47.6	41.7	37.4	30.9
	2" F	43.2	40.1	36.4	34.0	29.3
2	2" NR	52.7	49.0	44.4	41.7	36.3
	2" R	57.6	53.8	46.6	42.7	35.6
	3" R	56.2	52.4	45.1	41.3	34.2
	3" F	54.2	50.9	44.3	39.9	33.5
	2" F	50.2	47.2	43.3	39.7	34.9
3	2" NR	60.7	57.4	49.7	46.3	39.2
	2" R	64.0	60.5	53.1	48.4	40.7
	3" R	66.6	61.6	52.9	47.1	39.2
	3" F	57.3	54.4	47.5	43.1	36.8
	2" F	54.6	51.1	46.8	42.9	37.6
4	2" NR	63.2	58.7	51.8	47.1	40.1
	2" R	64.3	60.0	52.4	47.1	39.4
	3" R	58.6	54.1	47.0	41.9	34.8
	3" F	48.1	44.5	39.9	36.6	30.8
	2" F	47.6	45.5	41.3	38.6	33.2

TABLE 3.10 MEAN DEFLECTIONS (1/100 MILS) AT CRACKS - MAY 1983

Lane Number	Design Section	Sensor Number 1	2	3	4	5
1	2" NR	54.2	49.1	43.2	39.8	35.0
	2" R	57.8	51.0	44.0	39.7	33.5
	3" R	58.0	50.8	43.7	39.0	32.0
	3" F	53.6	48.0	41.0	36.8	31.2
	2" F	49.5	45.2	39.7	36.4	31.6
2	2" NR	53.8	49.3	44.1	41.1	36.3
	2" R	59.0	53.8	47.2	42.6	36.5
	3" R	58.4	53.1	45.3	40.7	33.7
	3" F	56.7	51.8	44.5	40.4	34.0
	2" F	52.2	47.7	42.5	39.7	34.4
3	2" NR	60.4	56.4	48.9	45.0	38.2
	2" R	64.1	59.8	51.5	47.3	39.7
	3" R	69.6	64.2	54.7	48.7	40.3
	3" F	58.8	54.6	47.5	42.6	36.3
	2" F	56.2	50.8	45.2	41.3	35.2
4	2" NR	63.8	59.0	53.0	48.0	41.2
	2" R	64.3	59.8	51.8	46.8	39.2
	3" R	61.2	55.9	47.8	42.4	35.1
	3" F	48.5	45.6	39.9	36.7	31.0
	2" F	47.7	45.2	41.2	38.3	33.1

TABLE 4 RESULTS OF INTERFACE SHEAR STRENGTH TEST

Direction	Section	Core ID	Diameter (inch)	Load at Failure, (lbs.)	Bond Strength, (psi)	Comments
South Loop 610	2"NR	1	3.985	3,100	249	
		20	4.014	2,300	182	
	2"R	4	4.015	1,750	138	Grout
		21	4.012	4,200	332	No Grout
				Average	225	
South Loop 610	3"R	11	3.985	2,500	200	Broke about 1/2" in CRCP
		12	4.014	2,600	206	
				Average	203	
South Loop 610	3"F	14	4.015	2,600	205	
		15	4.017	2,300	182	
	2"F	16	4.011	2,000	158	
		17	4.005	3,200	254	
				Average	200	

Grand Mean = 210
Standard Deviation = 56

TABLE 5 SERVICEABILITY INDEXES BY LANE, SECTION AND DATE

Lane Number	Design Section	Date: May 1983	September 1983	February 1984	November 1984	May 1985
1	2" NR	2.37	3.49	3.36	3.37	3.24
	2" R	3.66	3.35	3.45	2.89	3.19
	3" R	2.67	2.78	2.99	2.56	2.62
	3" F	3.57	2.44	2.24	2.13	2.12
	2" F	4.21	2.36	2.28	2.06	2.32
2	2" NR	3.70	3.66	3.76	3.58	3.33
	2" R	3.57	2.96	3.08	2.78	2.70
	3" R	3.71	3.23	3.46	3.43	3.00
	3" F	3.76	3.33	3.33	3.06	3.17
	2" F	4.41	3.03	3.07	2.06	3.03
3	2" NR	4.11	3.06	3.07	3.00	3.03
	2" R	3.92	3.22	3.46	3.32	3.32
	3" R	3.89	3.44	3.61	3.50	3.14
	3" F	4.08	2.61	2.64	2.45	2.62
	2" F	4.44	3.25	3.59	3.45	3.22
4	2" NR	3.30	3.19	3.09	2.77	3.13
	2" R	3.62	3.40	3.70	3.27	3.44
	3" R	3.94	3.11	3.11	2.80	2.96
	3" F	3.95	2.70	2.82	2.58	2.54
	2" F	3.93	3.23	3.25	2.86	2.14