

June 17, 1977

THREE MILE ISLAND NUCLEAR STATION
UNIT 1

REACTOR CONTAINMENT BUILDING
RING GIRDER SURVEILLANCE TEST
THREE YEARS AFTER S. I. T.

METROPOLITAN EDISON COMPANY
Subsidiary of General Public Utilities, Corp.

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The Three Mile Island Nuclear Station Unit 1 (TMI-1) ring girder was subjected to a surveillance test during the period from May 3, 1977 to May 27, 1977. This conforms with the commitments of the "Report on Containment Ring Girder Construction and Repair" and its subsequent addenda, originally filed December 3, 1971, with the Directorate of Licensing of the United States Atomic Energy Commission and complies with the requirements of TMI-1 Technical Specification 4.4.2.2.A, fourth inspection - three years after "Structural Integrity Test".

The stresses in the reinforcing bars being monitored by strain gages do not exceed the allowable tensile stresses ± 0.004 in./in. or 11,500 psi. Strain gages at two locations indicated strain readings which resulted in the deviation of stress values (stress during fourth surveillance - stress during full initial prestress) greater than 11,500 psi, (57 VS, 22.95 KSI and 129 VS, 20.24 KSI, Ref. Table 1) but these readings are considered to be unreliable due to gage failure. During previous surveillance tests a ground reading less than 50 Mega Ohms was sufficient cause to consider the strain gage inoperative. Each of these gages had ground readings below 50 Mega Ohms in at least one previous test and low ground readings in all the other tests (Table 2). Strain gage 57 VS and 129 VS are located in the Northwest and Northeast Quadrants respectively. There are no cracks wider than 0.010" in these regions which could be attributed to exceeding stresses in the reinforcing bars.

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Crack widths as shown in the crack pattern charts for the white-washed areas, Figures two through five, do not indicate any crack wider than 0.010 inch, which is the acceptance criteria (Tech. Spec. 4.4.2.2.C2). There has been a decrease in the width of a few cracks charted during previous surveillance inspections.

No displacement of the bearing plates or cracks greater than 0.010 inch in width have been observed in the dome tendon areas charted in Tables three through six.

The six month, one year, two years and three years' surveillance inspections have not indicated any significant structural problems. Scaling on the facia is due to the thermal cycling, and the seven voids that were discovered (one during 1975 and six during 1976) in the dome tendon areas were found not to impair the structural integrity of the Reactor Building. The two cavities that were discovered during the third Ring Girder Surveillance (1976) represent an acceptable as built condition. These have been discussed in detail in Met-Ed's report GQL 0771, dated June 3, 1977, in response to the NRC's letter of May 3, 1977. It is planned to repair the voids prior to the end of 1978 Refueling Outage.

Since the six month, one year, two years, and three years' surveillance inspections have not indicated any significant structural problems, Met-Ed will not be conducting further Ring Girder Surveillance Tests as discussed in 4.4.2.2.A.

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TABLE 1

REACTOR BUILDING RING GIRDER REINFORCING BAR STRESSES (KSI)

STRAIN GAGE LOCATION	DATE		6-6-73	7-5-73	9-18-73	10-2-74	4-9-75	7-2-76	5-27-77	3-3-78				
	ELEVATION	HORIZON	DURING PRESTRESS			AFTER ACCEPTANCE TEST								
			FULL VERTICAL	VERTICAL PLUS FULL DOME	COLUMN 1 FULL PRESTRESS	COLUMN 2 6 MONTH	COLUMN 3 DEVIATION COL 2 - COL 1	COLUMN 4 12 MONTH	COLUMN 5 DEVIATION COL 4 - COL 1	COLUMN 6 24 MONTH	COLUMN 7 DEVIATION COL 6 - COL 1	COLUMN 8 36 MONTH	COLUMN 9 DEVIATION COL 8 - COL 1	COLUMN 10 at 63.3 psi S.I.T.
52 HOOP	435'	108°	0.9	-0.3	4.2	1.9	-2.3	2.8	-1.4	3.5(3.5)	-.7	4.58(3.5)	-2.44	6.1
52 VERT	435'	108°	6.2	3.8	1.5	2.1(3.5)	0.6	3.1(3.5)	1.6	-(6)	--	(6)	(6)	2.8
53 HOOP	435'	245°	0.5	0.6	4.7	-(6)	--	-(6)	--	-(6)	--	-(6)	(6)	5.9
53 VERT	435'	245°	5.7	3.3	0.8	-4.2(3.5)	-5.2	-2.2(3.5)	-3.1	-4.0(3.5)	-4.8	-4.55(3.5)	-4.66	1.0
54 HOOP	435'	352°	1.3	-0.3	5.7	3.4	-2.3	2.3	1.6	8.3	2.6	7.34	1.64	7.2
54 VERT	435'	352°	7.3	1.4(3.5)	1.6(3.5)	--	--	--	--	2.0(3.5)	+4.4	1.42(3.5)	-0.15	--
55 HOOP	440'	108°	-0.1	1.1	3.2	-(6)	--	-(6)	--	(6)	--	0.19(3.5)	-2.45	3.7
55 VERT	440'	108°	1.0	0.0	-0.6	-2.1	-1.5	-1.1(3.5)	3.5	-4.4(3.5)	-3.8	-4.60(3.5)	-3.70	-1.0
56 HOOP	440'	245°	-0.1	1.0	4.0	-0.6	-4.6	5.7(7)	1.7	3.4	-1.6	11.69(3.5)	6.02	4.3
56 VERT	440'	245°	0.5	-0.5	-5.1	-11.0(3.5)	-5.9	-11.7(3.5)	-6.6	-13.6(3.5)	-3.5	-13.59(3.5)	-8.70	-5.9
57 HOOP	440'	352°	1.4	-1.4	3.9	-2.5(3.5)	-6.4	5.9(7)	2.0	4.5(3.5)	.6	3.78(3.5)	-0.66	4.8
57 VERT	440'	352°	-.1(3.5)	.5(3.5)	-1.0(3.5)	--	--	--	--	(6)	--	21.99	22.95	--
58 HOOP	446'	108°	--	--	--	--	--	--	--	--	--	--	--	--
58 VERT	446'	108°	3.8	4.8	4.7	4.6	-0.3	7.7	3.0	7.0	2.4	9.02	4.32	5.0
59 HOOP	446'	245°	0.4	2.6	4.4	1.8	-2.1	4.5	0.1	3.3	-1.1	2.63	-1.69	--
59 VERT	446'	245°	-0.8	2.5	1.9	0.5	-1.4	9.7(3.5)	7.9	.2(3.5)	-1.7	-1.24(3.5)	-7.47	1.1
60 HOOP	446'	352°	-0.4	1.9	4.4	-(6)	--	-(6)	--	-(6)	--	(6)	--	3.8
60 VERT	446'	352°	4.2	5.4	5.1	-(6)	--	-(6)	--	-(6)	--	(6)	--	4.9
129 HOOP	446'	80°	--	--	--	--	--	--	--	--	--	--	--	--
129 VERT	446'	80°	1.2	2.7	3.3	-(6)	--	-(6)	--	-(6)	--	24.99	20.24	3.7
130 HOOP	446'	320°	0.1	2.3	5.0	2.2	-2.5	3.6(7)	-1.4	-(6)	--	5.76(3.5)	0.60	4.6
130 VERT	446'	320°	0.3	2.7	3.0	0.0	-3.0	2.1	-0.9	-(6)	--	5.11(3.5)	1.63	2.9
61 HOOP	452'	108°	0.0	2.3	2.4	1.2	-1.4	0.3	-2.3	.8	-1.8	0.37	-2.23	2.7
61 VERT	452'	108°	1.6	1.4	1.9	2.2	0.1	2.1	0.2	1.6	-.3	1.77	-0.13	1.7
62 HOOP	452'	245°	0.1	1.9	2.4(3.5)	--	--	--	--	1.2(3.5)	-1.2	-1.38(3.5)	-1.02	--
62 VERT	452'	245°	4.2	3.6	3.7	5.0	1.5	5.2	1.5	.7	-3.0	--	--	4.5
63 HOOP	452'	352°	0.0	2.3	2.1	0.6	-2.7	2.5	-0.3	2.0	-.8	1.59	-1.21	2.9
63 VERT	452'	352°	2.3	2.5	1.1	3.7	0.1	3.0	-0.1	10.7(3.5)	7.6	3.19	0.09	2.0

Sign Convention: + Tension, - Compression

SPECIAL NOTES:

- Complete information on strain gage readings is given in Table 2.
- Conversion of strain to stress assumes $E_{\text{steel}} = 29,000,000$ psi.
- Stress for "sister bar".

- S.I.T. determined this gage was not operating. (See Table 2).
- Unusable reading for main bar due to low ground reading or inoperable gage.
- Unusable reading for both main and "sister" bar due to low ground reading or inoperable gages.
- Stress for main bar with questionable ground reading.
- For sister bar stresses at full prestress (column 1) Ref. Table 7.

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TABLE 2

THREE MILE ISLAND UNIT 1
RING GIRDER REINFORCING BAR STRAIN GAGE READINGS, 5/3 - 5/24 1977
(ADJUSTED FOR THE INITIAL ZERO TO THE PRIOR-TO-PRESTRESS CONDITIONS OF MAY 13, 1973)

STRAIN GAGE LOCATION	ELEVATION (FT)	AZIMUTH (°)	STRAIN (μ INCH/INCH)		GROUND (OHMS)		TEMPERATURE (°F)			TIME	
							EXTERNAL		INTERNAL		
			REBAR	SISTER BAR	REBAR	SISTER BAR	AIR	SKIN	AIR	DAY	HOUR
52 HOOP	435	108	+3D	+157	35M	200M	79	79	116	5/16/77	1348
52 VERT	435	108	+266D	+206	120K	142M	80	80	116	5/16/77	1340
53 HOOP	435	245	-166D	C	46K	30M	79	79	135	5/23/77	1420
53 VERT	435	245	-159D	-157	5M	120M	79	79	135	5/23/77	1410
54 HOOP	435	352	+253	+274	150M	530M	70	69	80	5/3/77	0900
54 VERT	435	352	C	+49	370M	2400G	69	69	80	5/3/77	0915
55 HOOP	440	108	-85D	+6	2.3M	230M	76	76	116	5/16/77	1330
55 VERT	440	108	+299	-159	23M	24G	82	82	116	5/16/77	1130
56 HOOP	440	245	+110D	+403	4.3M	97M	79	79	135	5/23/77	1450
56 VERT	440	245	-281D	-469	23M	130M	79	79	135	5/23/77	1500
57 HOOP	440	352	+53D	+130	1.1M	380M	65	65	80	5/3/77	0950
57 VERT	440	352	B	+758	F	142M E	65	65	80	5/3/77	1000
58 HOOP	446	108	A	A	A	A	A	A	A	A	A
58 VERT	446	108	+311	-166	700M	2G	79	79	116	5/16/77	1450
59 HOOP	446	245	+91	+56	4G	2.1G	74	74	132	5/24/77	1010
59 VERT	446	245	+536 D	-43	1.3M	700M	74	74	132	5/24/77	1000
60 HOOP	446	352	+744D	+1102D	0.6M	1.2M	67	67	80	5/3/77	1035
60 VERT	446	352	+636D	+775 D	1.5M	0.5M	67	67	80	5/3/77	1045
129 HOOP	446	80	A	A	A	A	A	A	A	A	A
129 VERT	446	80	-161D	+862D	10.6M	83M E	76	77	112	5/13/77	1010
130 HOOP	446	320	+406D	+199	13.2M	87M	67	67	82	5/6/77	1010
130 VERT	446	320	+317D	+176	8.5M	170M	72	72	82	5/6/77	1040
61 HOOP	452	108	+13	C	325M	2G	82	82	135	5/23/77	1030
61 VERT	452	108	+61	+46	6.1G	1.8G	78	78	135	5/23/77	1005
62 HOOP	452	245	C	-47	250K	4.2G	77	77	132	5/24/77	1400
62 VERT	452	245	+201	B	785M	F	74	74	132	5/24/77	1000
63 HOOP	452	352	+55	-23	1.1G	3.6G	67	67	80	5/3/77	1135
63 VERT	452	352	+110	+102	700M	5G	67	67	80	5/3/77	1125

NOTES: A. NO GAGE INSTALLED AT THIS LOCATION.

B. GAGE DESTROYED DURING CONSTRUCTION.

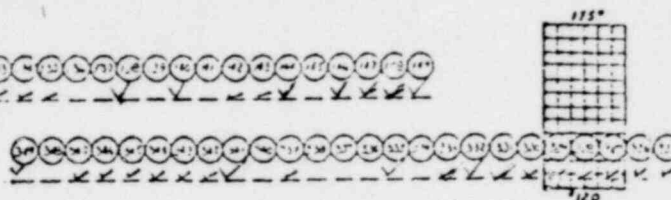
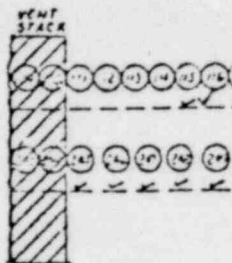
C. GAGE INOPERATIVE.

D. READING QUESTIONABLE DUE TO LOW GROUND.

E. ALTHOUGH GOOD GROUND READING FOR THIS TEST,
READING QUESTIONABLE DUE TO LOW GROUND IN
PAST TESTS.

F. GROUND READING NOT MEANINGFUL DUE TO B.

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS
AND CONCRETE-TO-METAL GAPS
Southwest (S.W.) Quadrant



Areas with cracks noted thus: ✓

LEGEND FOR CRACK/GAP LOCATION

1st Letter

H = Horizontal
V = Vertical
C = Across Corner

2nd Letter

L = Lower
C = Center
U = Upper

3rd Letter

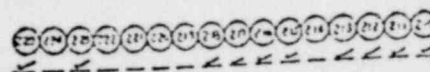
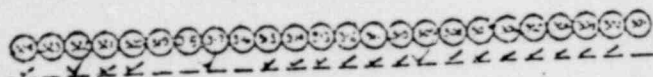
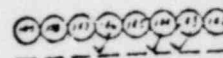
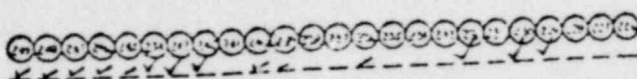
R = Right
L = Left
C = Center

Tendon No.	Location Cracks	Location Gaps	Remarks	Tendon No.	Location Cracks	Location Gaps	Remarks	Tendon No.	Location Cracks	Location Gaps	Remarks
109	--	Note 3		133	HUR, VLL	No		325	VUR, CLR, VLC	No	
110	--	Note 3		134	VLC	No		326	VUR, VLC, CLL	No	
111	--	No		135	VLL, VUL, VUC	No		327	HUR, VLL, CLL	No	
112	--	No		136	--	No		328	VUR, VLC, VLL	No	
113	--	No		137	--	No		329	HUR, VLL	No	
114	--	No		138	CUR, VUL	No		330	VUR, CLR, VLC	No	
115	VLL	Note 4		139	--	No		331	VUR, CLL, VLL	No	
116	CUL	No		140	HLR	No		332	CUR, CLR, VLL	No	
117	VLR, VLL	No		141	--	Note 4		333	CUR, VLL, VLC	No	
118	VUR, VLR, HUL	No		142	VLL	Note 4		334	--	No	
119	VUR, CLR, VLR	No		143	CUR, VUC	No		335	HUL	No	
120	VUR	No		144	HVR	No		336	--	No	
121	VUR	No		145	--	No		337	--	No	
122	VUR, VLR	No		146	VLL	No		338	--	No	
123	VUR, VLR, VUC	No		147	HUR	No		339	CUL	No	
124	VUR, VLR, VUC	No		148	HUR	No		340	--	No	
125	--	No		149	CVR, VUL	No		341	CUR, HUL	No	
126	VLL, VUL	No		243	--	Note 3		342	VLL, CVL, VUC	No	
127	VUL	No		244	--	Note 3		343	VLR, HUL	No	
128	VUL	No		245	HCR, HLR	No		344	VLR, HUL, VUC	No	
129	VUL, CLL	No		246	HUR, CLR, HLR	No		345	VUR, VLR, HUL	No	
130	VUL	No		247	HLR, HLR, VUC	Note 5		346	CUR, VLR, HUL	No	
131	CUL, HUR	No		248	HUR, HLR	Note 5		347	VUR, HUL	No	
132	WL	No		249	HUR, HCR	No		348	--	No	
								349	CLR	No	

NOTES

1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Bearing area blocked from inspection by vent stack.
4. Voids Discovered. (All Voids are shown on Figures 6-12).
5. D 247SW & D248SW have very narrow gaps (unmeasurable) between the bottom of the bearing plate and the adjoining concrete.
6. Note 4 & 5 refer to 1976 data. No additional cavities or voids were discovered during 1977.

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS
AND CONCRETE-TO-METAL GAPS
Southeast (S.E.) Quadrant



Areas with cracks noted thus: ✓

LEGEND FOR CRACK/GAP LOCATION

1st Letter

H = Horizontal
V = Vertical
C = Across Corner

2nd Letter

L = Lower
C = Center
U = Upper

3rd Letter

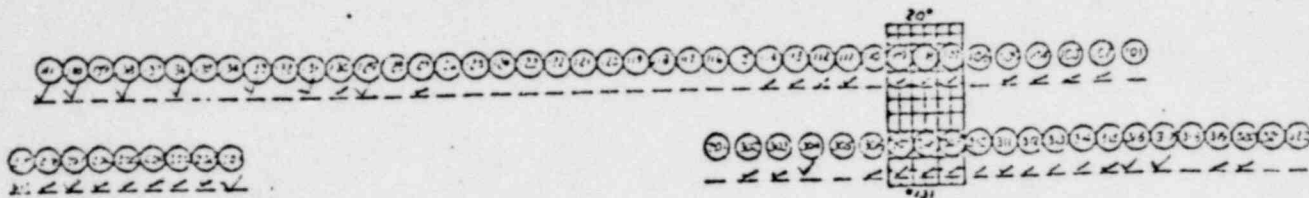
R = Right
L = Left
C = Center

Tendon No.	Location Cracks Gaps	Remarks	Tendon No.	Location Cracks Gaps	Remarks	Tendon No.	Location Cracks Gaps	Remarks
142	--	No	226	--	No	301	--	No
143	CUL	No	227	--	No	302	HUR, HCR, HLR	No
144	VUR, CUL	No	228	--	No	303	HVR, VLR, GUL	No
145	--	No	229	CUR, VLR	No	304	VUR, HCR, VLR	No
146	CUL		230	CUR	No	305	CUR, HLR, VLR	No
7	--		231	--	No	306	HUR, HCR, HLR	No
148	--		232	CUR	No	307	VUR, HLR, VUL	No
149	--	Note 4	233	--	No	308	HVR, HCR, VLR	No
210	CUR	No	234	--	No	309	CUR, CLR, VUC	No
211	CUR	No	235	--	No	310	CUR, VUC	No
212	CUR	No	236	VUR	No	311	CUR, HLR	No
213	CUR	No	237	VUR	No	312	CUR, HCR, CLR	No
214	--	No	238	--	No	313	CUR, HCR, HLR	No
215	HUR, VLL	No	239	VLR	No	314	CUR, VUR, HLR	No
216	HUR	No	240	CUR	No	315	HUR	No
217	CUR	No	241	--	No	316	--	No
218	CUR, HLR	No	242	CUR	No	317	CUL	No
219	--	No	243	VLR, HUL	No	318	--	No
220	--	No	244	CUL	No	319	--	No
221	--	No	245	HUL	No	320	--	No
222	--	No	246	CUR, HUL	No	321	CUR, HUL	No
223	VUL	No	247	CUR	No	322	VUC, VLC	No
224	--	No	248	HUL	No	323	--	No
225	VUC	Note 4	249	CUL	No	324	CLR, CUR	No

NOTES

1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. No gaps were noted between concrete and bearing plates.
4. Small cavities found. (approximately 1" deep and 1 in. 3/4 in volume.)
Note 4 refers 1976 data. No additional cavities or voids were discovered during 1977.

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS
AND CONCRETE-TO-METAL GAPS
Northeast (N.E.) Quadrant



Areas with cracks noted thus: ✓

LEGEND FOR CRACK/GAP LOCATION

1st Letter

H = Horizontal
V = Vertical
C = Across Corner

2nd Letter

L = Lower
C = Center
U = Upper

3rd Letter

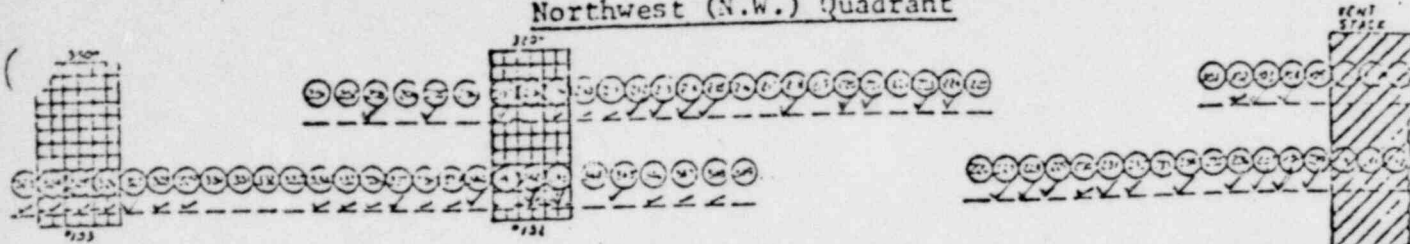
R = Right
L = Left
C = Center

Tendon No.	Location Crack Gap	Remarks	Tendon No.	Location Crack Gap	Remarks	Tendon No.	Location Crack Gap	Remarks
101	-- No		125	No		208	HUR, VLC	No
102	CVR, HUL	No	126	No		209	CUR, VLR, VLC	No
103	VUR, HUL	No	127	No		301	--	No
104	-- VVL	No	128	No		302	HUL, VUC	No
105	-- CVR	No	129	VUR, VLR	No	303	HVL	No
106	--	No	130	HUR, HVL, VVL	No	304	VUR, CUR, CVL	No
107	CUR, VLR, VIL	No	131	VUR	No	305	--	
108	VUC	No	132	No		306	VUR, VLL, HVL	No
109	HUR	No	133	CUR	No	307	HUR, HVL	No
110		No	134	Note 5		308	CLR, HVL	No
111	VVL, VLL	No	135	No		309	VUR, VLL, HUL	No
112		No	136	VVR	No	310	HUR, VLR, VIL	No
113	VUR	No	137	No		311	VLR	Note 3
114	VVL	No	138	HVL	No	312	VUL	Note 4
115		No	139	Note 5		313	HUL, VLL	No
116		No	140	CUR, HVL	No	314	VLR, HUL	No
117	Note 5		141	VUR, VLR	No	315	CUL, VLR, HUR	No
118	No		201	VLL	No	316	HLL	No
119	No		202	CUR, VLR, CVL	No	317	CVR	No
120	No		203	CUR, VLR, CUL	No	318	--	No
121	No		204	HVR	No	319	VUR	No
122	No		205	CUR, VLR, CUL	No	320	VUR	No
123	No		206	HUR, CUL, HUL	No	321	--	No
124	No		207	CUR, VLL, CUL	No	322	--	No

NOTES

1. All cracks are less than 0.005 in. wide.
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Five cracks less than 0.005 inc. radiate down from the bottom of the bearing plate, spaced approximately five inches on centers and terminating about one inch from the edge of the bearing plate.
4. Four cracks -- similar to those described in Note 3.
5. Void Discovered. (All Voids are shown on Figures 6-12).
6. Note 4 & 5 refer to 1976 data. No additional cavities or voids were discovered during 1977.

CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING AREAS
AND CONCRETE-TO-METAL GAPS
Northwest (N.W.) Quadrant



Areas with cracks noted thus: ✓

LEGEND FOR CRACK/GAP LOCATION

1st Letter

H = Horizontal
V = Vertical
C = Across Corner

2nd Letter

L = Lower
C = Center
U = Upper

3rd Letter

R = Right
L = Left
C = Center

Tendon No.	Location Cracks Gaps	Remarks	Tendon No.	Location Cracks Gaps	Remarks	Tendon No.	Location Cracks Gaps	Remarks
101	--	No	219	--	No	325	VLL, VUR, VOL, No	
102	CVR, HUL	No	220	CLL	No	326	VLL, VUC	No
103	VUR, HUL	No	221	CVR, CVL	No	327	CVR	No
104	VUR, HUL	No	222	--	No	328	HUL	No
105	--	No	223	CVR, CVL	No	329	HVL, VUL	No
106	--	Note 3	224	VUR	No	330	--	Noted
107	--	No	225	--	No	331	--	No
108	--	No	226	--	No	332	--	No
201	--	No	227	CVL	No	333	--	No
202	--	No	228	VUL, VUC	No	334	--	No
203	HUL	No	229	CUL, VVC	No	335	CVR, VLR	No
204	--	No	230	CUR	No	336	CVR	No
205	CVL	No	231	CUR, VUL	No	337	VUL	No
206	--	No	232	CVR, VUC	No	338	HVR, VLC	No
207	HUL, VUR	No	233	--	No	339	HUR, VLC	No
208	--	No	234	HUR, CVL	No	340	CVR	No
209	VVC	No	235	--	No	341	--	No
210	CUL	No	236	CVR	No	342	HUR, CUL, VUC	No
211	VUR	No	237	CVR	No	343	HUR, CLR	No
212	VVR, CVL	No	238	HUR	No	344	--	No
213	VUR	No	239	HUR	No	345	HUR	No
214	VUR, CVL	No	240	--	Note #3	346	HVR	No
215	VUR, VLR	No	241	--	No	347	HUR, VUR, HUL	No
216	--	No	242	--	No	348	CVR	No
217	--	No	323	VUR, VUL, VLL	No	349	--	No
218	HUL	No	324	CUL, VLL, HVL	No			

NOTES

1. All cracks are less than 0.005 in. wide
2. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.
3. Bearing area blocked from inspection by vent stack.
4. Void Discovered. (All Voids are shown on Figures 6-12).
5. Note 4 refers to 1976 data. No additional cavities or voids were discovered during 1977.

TABLE 7

THREE MILE ISLAND UNIT I-RING GIRDER SURVEILLANCE

Microstrain based on Prior-To-Prestress readings of 15May73

Strain Gage Location	Elevation (ft)	Azimuth (°)	REBARS				SISTERBARS					
			Gage Number	Vert 6, 7 June 73	Vert & Dome 5 July 73	Full Prestress 18, 19 Sept. 73	Gage Number	Vert 6, 7 June 73	Vert & Dome 5 July 73	Full Prestress 13, 19 Sept. 73		
52 Hoop	435	108	6H	31	-17	146	25HD	20	-20	242	52H	
52 Vert	435	108	6V	213	130	53	20VD	231	150	101	52V	
53 Hoop	435	245	5H	16	22	162	10HD	-14	-34	213	53H	
53 Vert	435	245	5V	197	115	26	9VD	197	96	4	53V	
54 Hoop	435	352	4H	43	-11	198	H6	45	-19	14	54H	
54 Vert	435	352	4V	251	366 ²	597 ²	8	236	152	54	54V	
55 Hoop	440	108	9H	-4	39	111	67HD	23	1	91	55H	
55 Vert	440	108	9V	33	1	-21	68VD	39	14	-31	55V	
56 Hoop	440	245	7H	-5	34	139	14HD	8	54	196	56H	
56 Vert	440	245	7V	18	-17	-176	16VD	-3	-17	-179	56V	
57 Hoop	440	352	H8	48	48	133	12HD	75	-18	153	57H	
57 Vert	440	352	8V	Gage destroyed in const.				17VD	-2	19	-33	57V
129 Hoop	446	80	No gage installed at this location				-	-	-	-	-	129H
129 Vert	446	80	120	41	94	131	SD4	38	115	164	129V	
58 Hoop	446	108	No gage installed at this location				-	-	-	-	-	
58 Vert	446	108	24V	130	166	162	54D	153	198	221	58V	
59 Hoop	446	245	Blank	12	91	152	59V	5	79	149	59H	
59 Vert	446	245	28V	-29	86	65	46	134	156	215	59V	
130 Hoop	446	320	80	5	81	171	SD6	5	94	178	130H	
130 Vert	446	320	S3	13	92	105	SD1	20	88	120	130V	
60 Hoop	446	352	S6	-12	66	152	SD2	-21	64	517 ²	60H	
60 Vert	446	352	S4	144	187	178	SD5	164	191	7243	60V	
61 Hoop	452	108	1H	0	81	89	Gage opened during vert. prestress				61H	
61 Vert	452	108	29V	56	49	65	52D	63	65	76	61V	
62 Hoop	452	245	S5	3	67	-4	62H	5	65	83	62H	
62 Vert	452	245	62V	145	126	129	S6VD	Gage destroyed in const.				62V
63 Hoop	452	352	H3	2	78	95	62	15	77	60	63H	
63 Vert	452	352	26Y	80	87	106	35	85	94	114	63V	

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- Notes: 1. Reading questionable - low ground.
 2. Reading questionable - no correlation with corresponding locations.
 3. Lead wire severed - not repaired for this reading.
 4. Gage shorted to Ground.

Table 7

Note: For values in Column 9, table 1, wherever sisterbars are considered in Column 8, values of stress at full prestress (Column 1, table 1) have been calculated from corresponding strains in table 7.

52HS, $242 \times 10^{-6} \times 29 \times 10^6 = 7.02$ (KSI)	57VS, $-33 \times 10^{-6} \times 29 \times 10^6 = -0.96$
53VS, $4 \times 10^{-6} \times 29 \times 10^6 = 0.11$	129VS, $164 \times 10^{-6} \times 29 \times 10^6 = 4.76$
54VS, $54 \times 10^{-6} \times 29 \times 10^6 = 1.57$	
55HS, $91 \times 10^{-6} \times 29 \times 10^6 = 2.64$	
55VS, $-31 \times 10^{-6} \times 29 \times 10^6 = -0.90$	
56HS, $196 \times 10^{-6} \times 29 \times 10^6 = 5.68$	
56VS, $-169 \times 10^{-6} \times 29 \times 10^6 = -4.90$	
57HS, $153 \times 10^{-6} \times 29 \times 10^6 = 4.44$	
59VS, $215 \times 10^{-6} \times 29 \times 10^6 = 6.24$	
130HS, $178 \times 10^{-6} \times 29 \times 10^6 = 5.16$	
130VS, $120 \times 10^{-6} \times 29 \times 10^6 = 3.48$	
62HS, $83 \times 10^{-6} \times 29 \times 10^6 = 2.41$	

The above values are to be substituted for the corresponding values in Column 1, table 1 in order to arrive at values in Column 9, table 1.

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- * NEMA-4 Box
- Whitewash
- ✱ Strain Gage

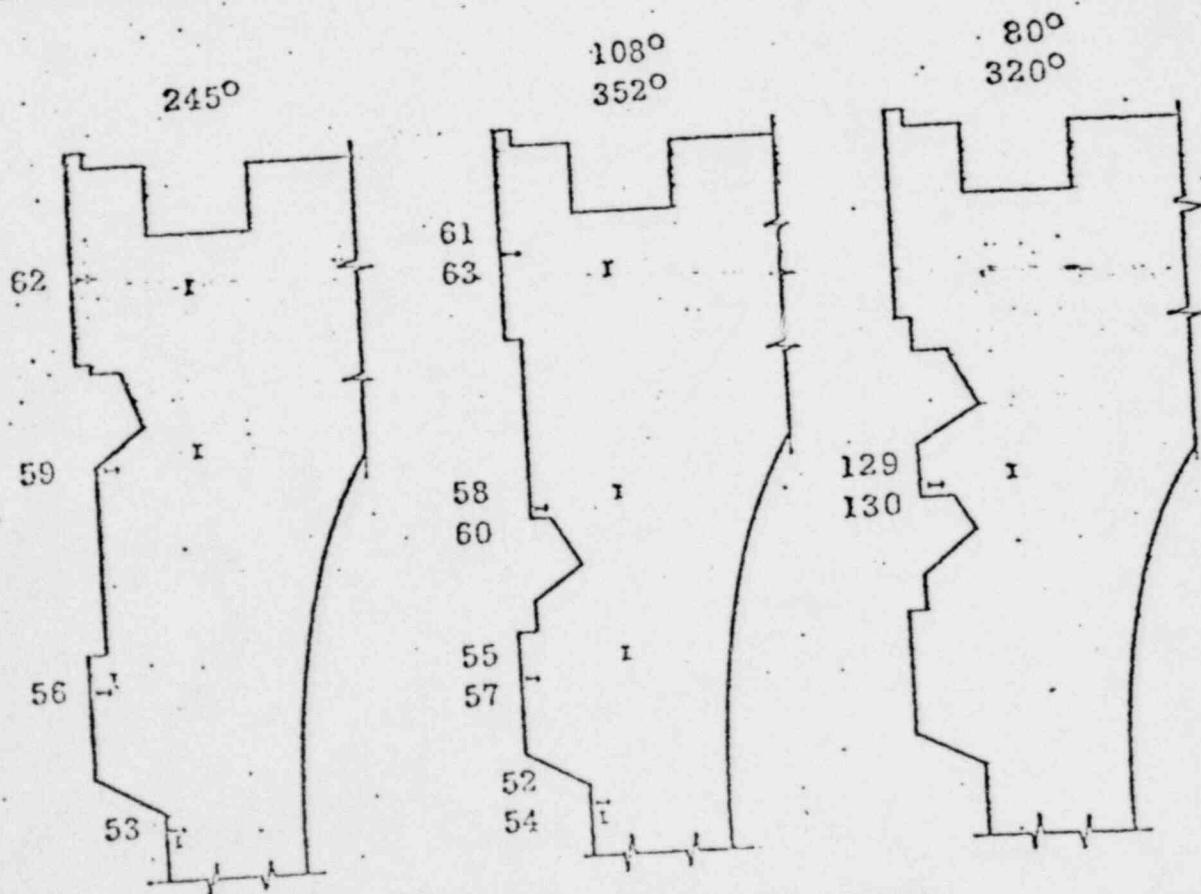
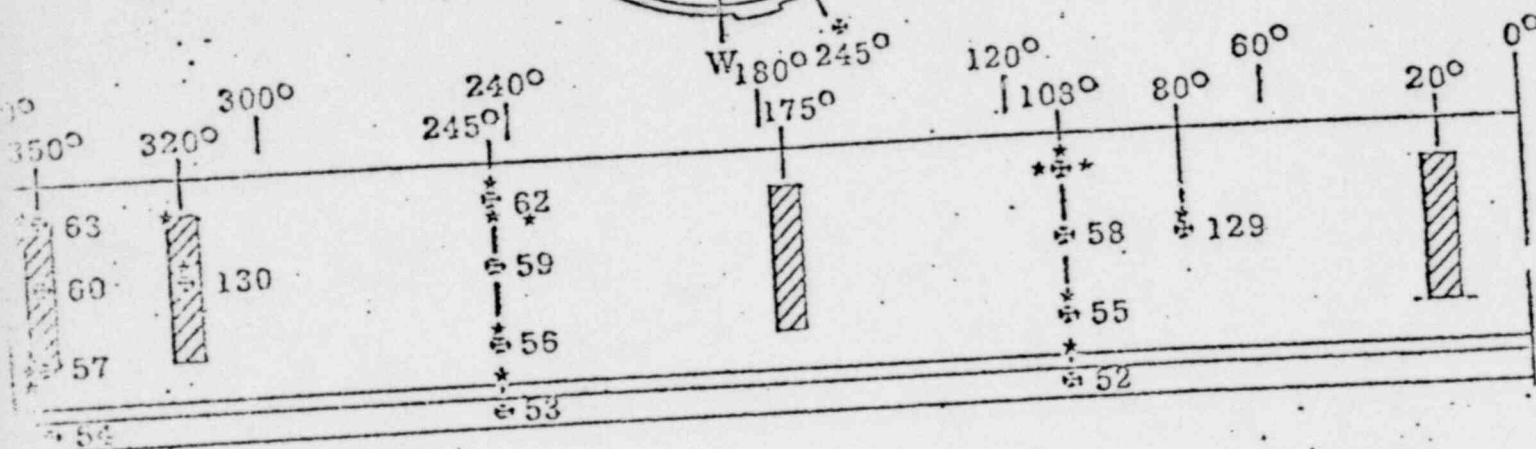


FIGURE 1.

RING GIRDER DIAGRAM.
STRAIN GAGE LOCATION
24.0

1491 237

NEW CRACKS SHOWN IN RED

175°

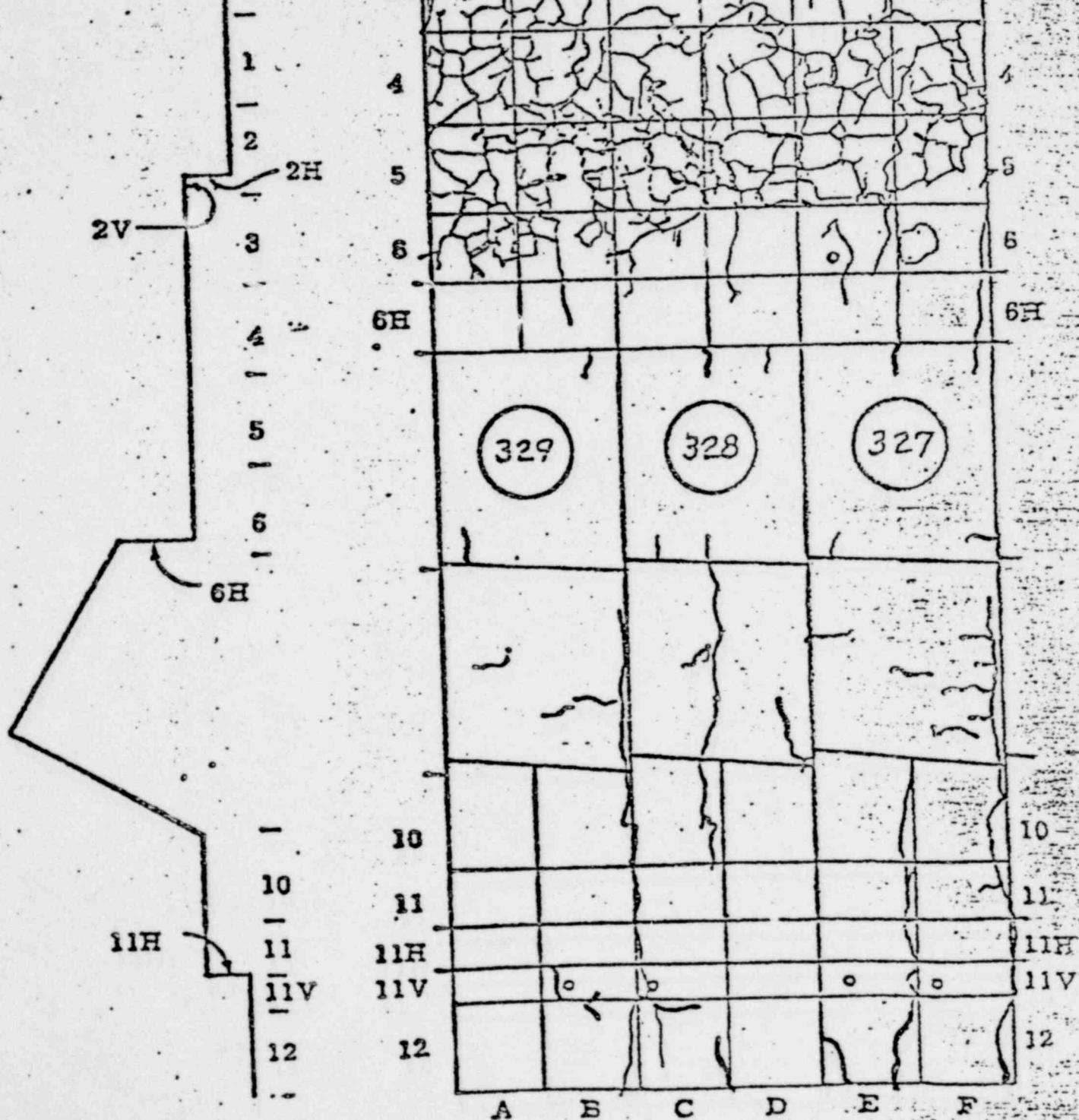
0.005 IN. WIDE UNLESS NOTED.

SAME AS 1976

NOTHING ADDITIONAL

ALL CRACKS LESS

THAN 0.005"



CRACK PATTERN AREA AT AZIMUTH 175°
AREA NO. 120

FIGURE 2

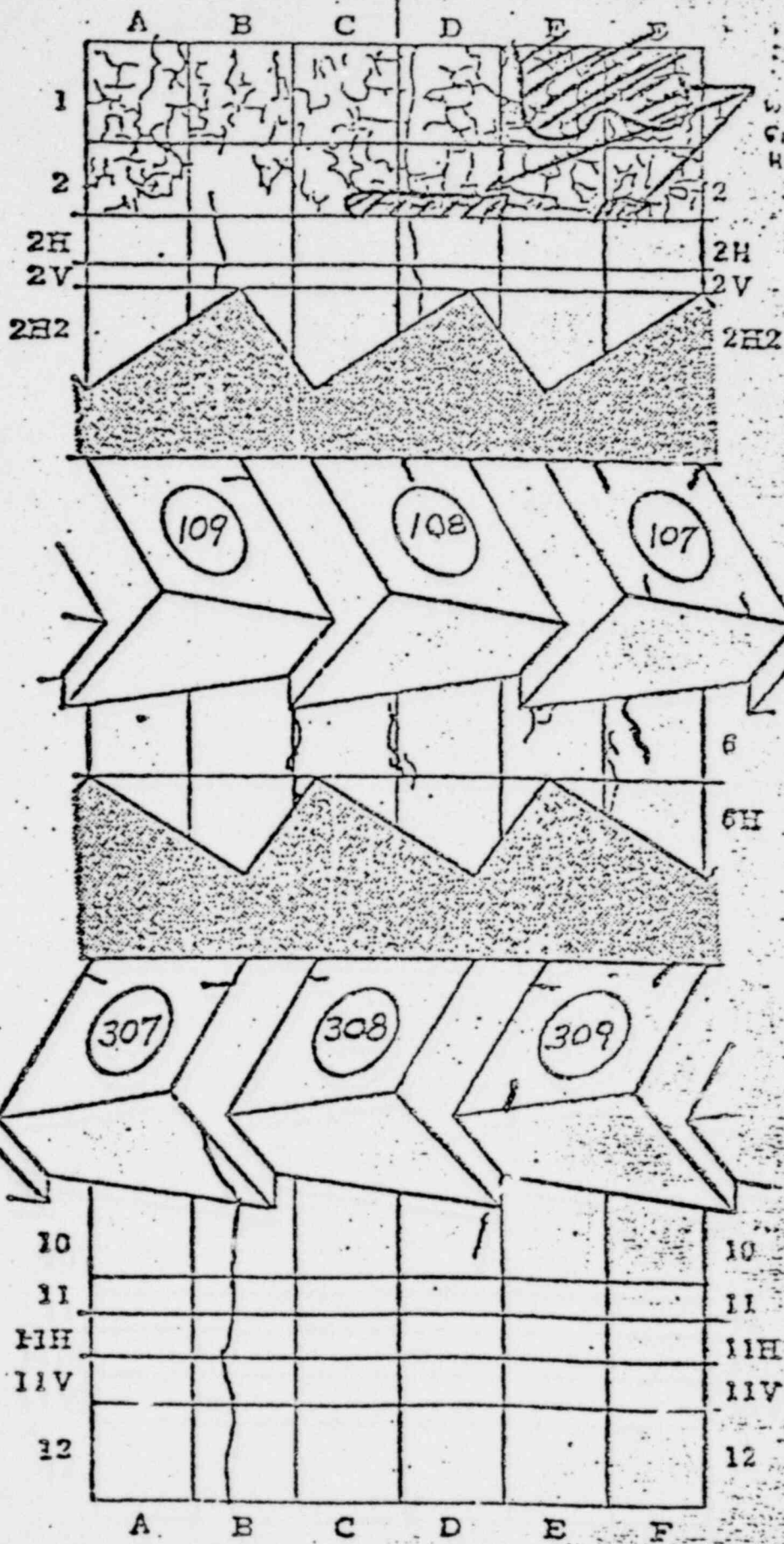
1491 238

CRACKS SHOWN IN RED

ALL CRACKS ARE LESS THAN
0.005 IN. WIDE

20

SAME AS IN 1976
NOTHING ADDITIONAL
ALL CRACKS LESS
THAN 0.005



AREAS
WHERE GIRDER FA
HAD BACK LANE

2H2 2H 2V

6H

11H 11V

CRACK PATTERN AREA AT AZIMUTH 20°

AREA NO. 13F

FIGURE 3

1491 239

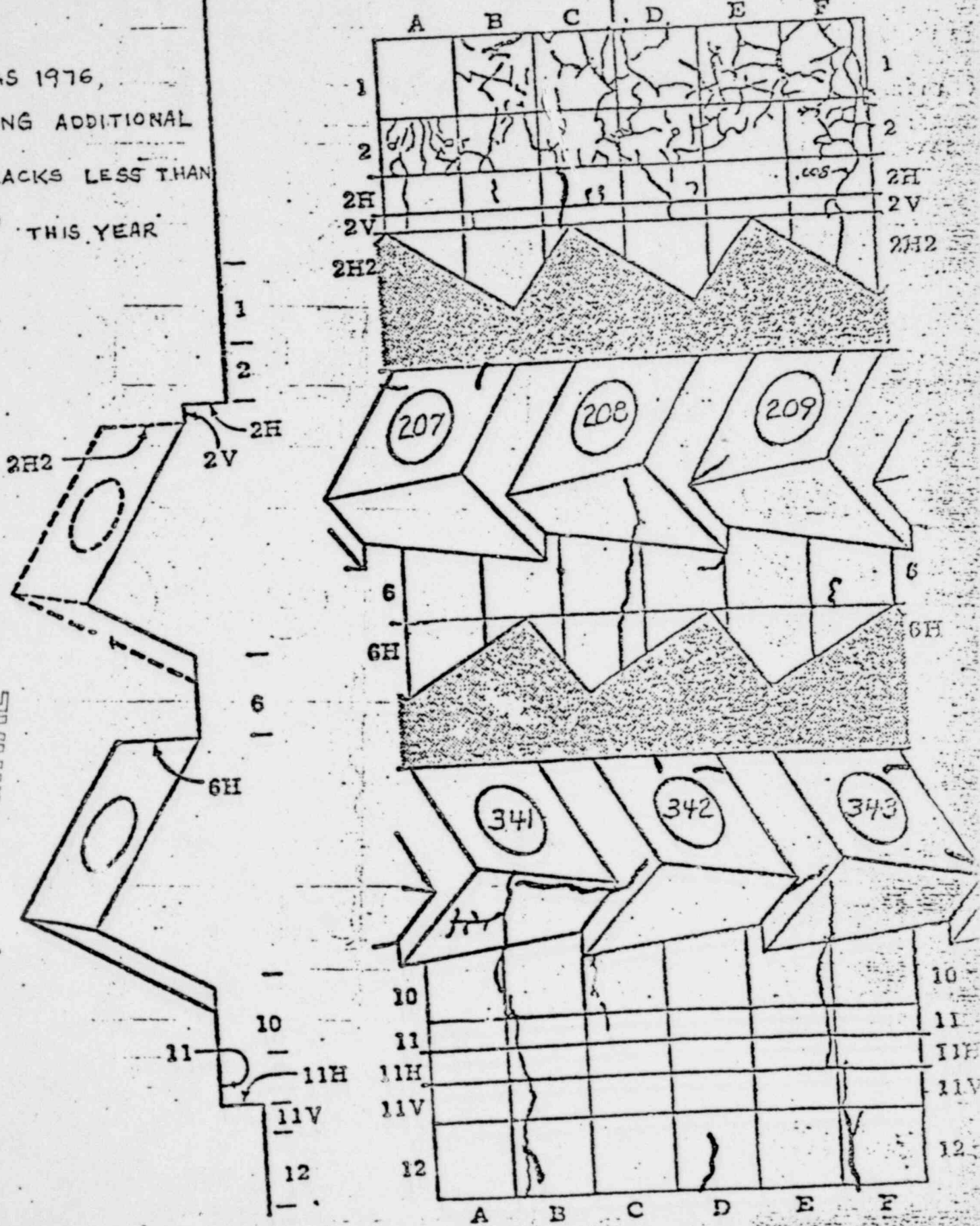
POOR ORIGINAL

NEW CRACKS SHOWN IN RED

ALL CRACKS ARE LESS THAN
0.005 IN. WIDE UNLESS NOTED

320°

SAME AS 1976,
NOTHING ADDITIONAL
ALL CRACKS LESS THAN
0.005" THIS YEAR



CRACK PATTERN AREA AT AZIMUTH 320° AREA 1132

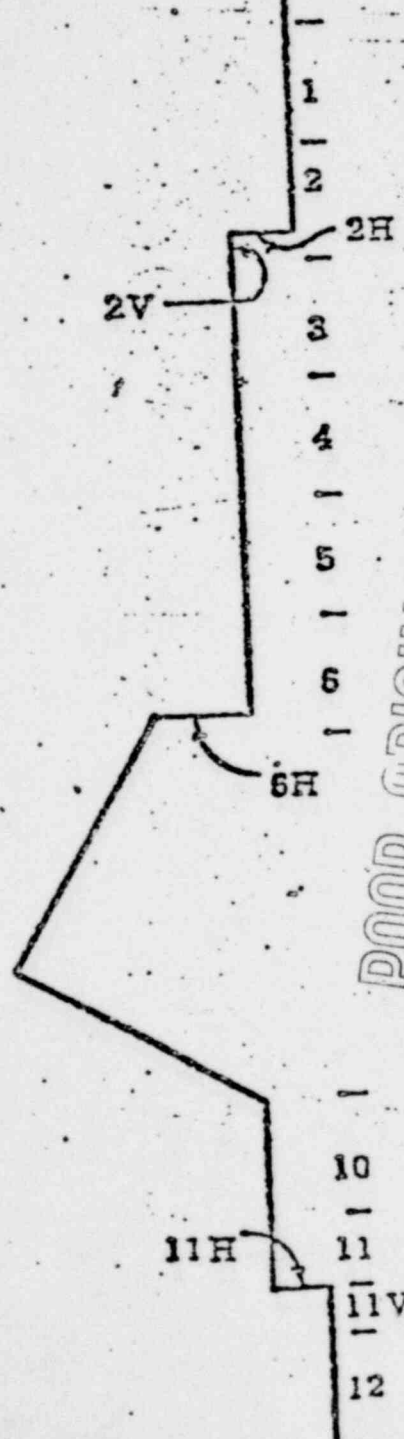
1491 240

NEW CRACKS SHOWN IN RED

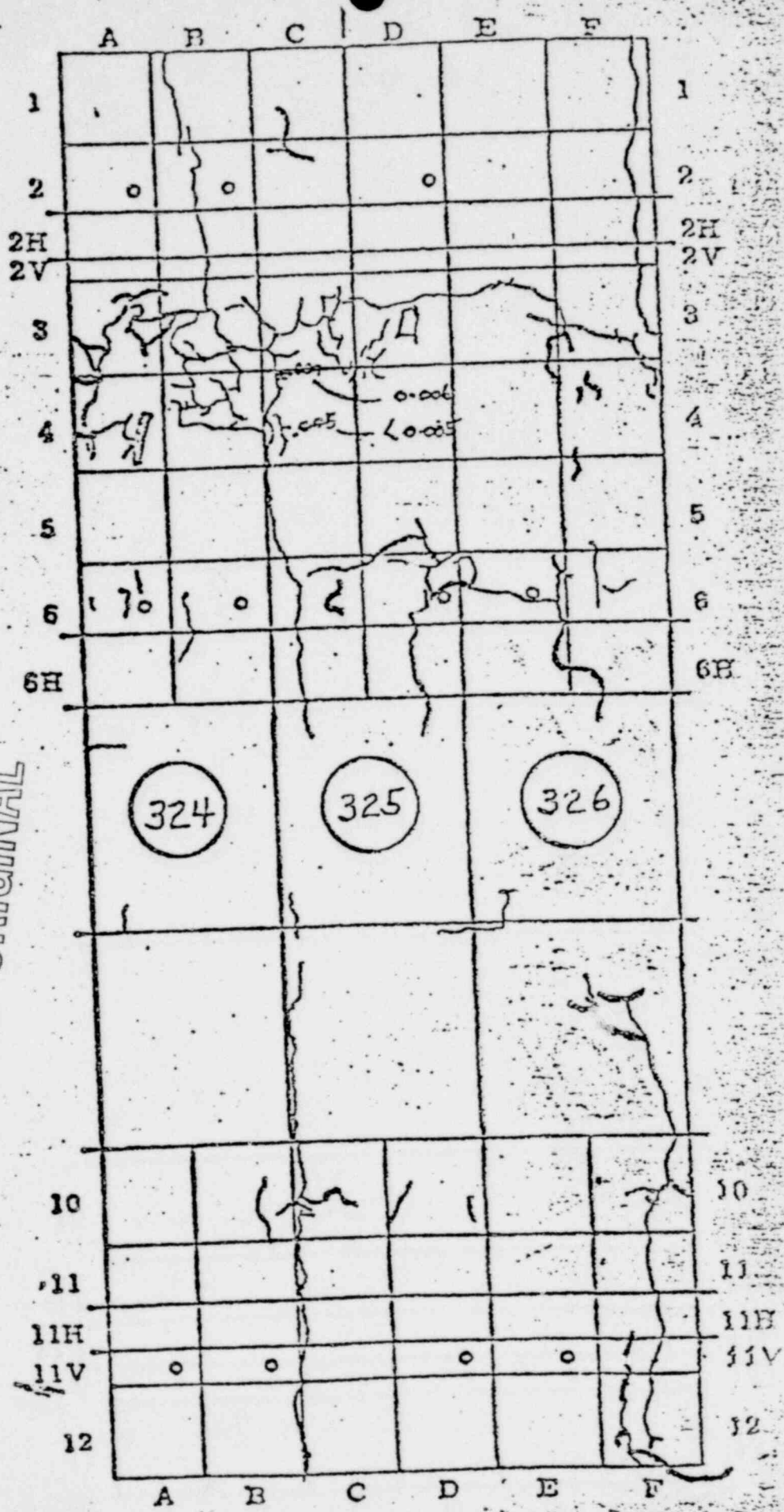
350°

0.005 IN. WIDE UNLESS NOTED.

NOTHING ADDITIONAL
EXCEPT AS NOTED
I.E. DECREASE IN SIZE
OF TWO CRACKS



POOR ORIGINAL



CRACK PATTERN AREA AT AZIMUTH 350°
AREA NO. 133

FIGUR

1491 241