GAI Report No. 1855

THREE MILE ISLAND NUCLEAR STATION

UNIT 1

REACTOR CONTAINMENT BUILDING

RING GIRDER

SURVEILLANCE TEST

SIX MONTHS AFTER S.I.T.

METROPOLITAN EDISON COMPANY

SUBSIDIARY OF GENERAL PUBLIC

UTILITIES CORPORATION

PREPARED BY

GILBERT ASSOCIATES, INC.

READING, PENNSYLVANIA

November 8, 1974

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METROPOLITAN EDISON COMPANY
Subsidiary of General Public Utilities, Corp.

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DLS

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1.0 SYNOPSIS

The Three Mile Island Nuclear Station Unit 1 (TMI-1) ring girder section of the reactor building was subjected to a surveillance test during the period from October 1, 1974 through October 10, 1974. The purpose of this test was to demonstrate continued confidence in ring girder construction and repair, in accordance with TMI-1 Technical Specification 4.4.2.2, six months after the Structural Integrity Test (S.I.T.).

The stresses in those reinforcing bars being monitored by strain gages do not exceed the allowable tensile stress and have not changed appreciably since the last test.

None of the observed concrete cracks are greater than 0.008 inch wide, (except for a unique case) and most are less than 0.005 inch wide.

These observations indicate that the ring girder is fulfilling its design criteria six months after the Structural Integrity Test.

Collection of data from the reinforcing bar strain gages was performed by Brewer Engineering Laboratories, Inc. Inspection of the concrete cracks was performed by Metropolitan Edison Company/General Public Utilities Corp. with the technical assistance of Gilbert Associates, Inc.

2.0 INTRODUCTION

The objective of the ring girder surveillance test was to establish the stress in selected reinforcing bars in the ring girder area, to inspect the crack patterns in selected areas on the ring girder, and to inspect for cracks in the concrete around all of the dome tendon

bearing plates. Information was obtained during the test to be compared with similar information collected during the prestressing operation and the Structural Integrity Test and to form base information for future tests. The test was performed as the first inspection - six months after the Structural Integrity Test.

Testing was performed in accordance with Gilbert Associates, Inc., procedural requirements as set forth in Reference 1.

Results of prior ring girder surveillance tests during prestressing are contained in Reference 2, and those during the Structural Integrity Test are in Reference 3.

This present surveillance test 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 Technical Specification 4.4.2.2.

3.0 ACCEPTANCE CRITERIA AND CONCLUSIONS

3.1 ACCEPTANCE CRITERIA

Acceptance criteria established prior to the test and specified by the TMI-1 Technical Specification 4.4.2.2 and the TMI-1 Surveillance Test (Reference 1) are:

a. The difference or deviation between reinforcing bar stresses, for the same strain gage shall not exceed ±11,500 psi when a comparison is made between the current readings and the data obtained immediately after full prestress. Any deviations in

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reinforcing bar stresses which exceed the acceptance criterion shall be reported to the Engineer for evaluation and resolution.

b. Any crack width greater than 0.010 inch in the four 6 ft x 12 ft whitewash areas shall be reported to the Engineer for evaluation and resolution.

c. Any crack width greater than 0.010 inch in the concrete around all dome tendon bearing plates shall be reported to the Engineer for evaluation and resolution.

3.2 CONCLUSIONS

Data collected during the present test substantiates that the ring girder is fulfilling its design function.

a. Deviation between reinforcing bar stresses, for the same strain gage, does not exceed ±11,500 psi and is acceptable. The largest deviation, for the same strain gage, is -4,600 psi. For a "sister bar" strain gage the largest deviation is -6,400 psi.

b. Cracks in the concrete surface in the four whitewash areas at azimuths 20, 175, 320, and 350 degrees are all less than 0.010 inch wide and are acceptable. None of the cracks observed are greater than 0.008 inch wide, and most are less than 0.005 inch wide.

c. Cracks in the concrete surface around all accessible dome tendon bearing plates are all less than 0.010 inch wide, except for tendon number D-303 in the southeast quadrant, and are acceptable. Except for the aforementioned tendon, and one crack width of 0.005 inch, all cracks are less than 0.005 inch wide.

4.0 TEST PROCEDURE

4.1 STRAIN GAGE READINGS AROUND RING GIRDER

Strain measurements were made at fourteen locations on both hoop and vertical reinforcing bars (see Figure 1). Readings were also taken on the sister bars in accord with Reference 1, Section 6.3.1.1.

For detailed account of the procedure see Appendix II.

Stresses (Table 1) have been computed using the formula:

$$\sigma = E \times \varepsilon$$

where

σ = Stress (psi)

E = Modulus of Elasticity (29×10^6 psi)

ε = Strain (in/in). The strain listed in Table I of Appendix I is microstrain, or that value times 10^{-6} (i.e., microstrain listed as $66 = 66 \times 10^{-6}$ in/in).

4.2 VISUAL INSPECTION FOR CRACKS IN CONCRETE

An optical comparator was used to measure the cracks in the concrete. Only those cracks 0.005 inch wide, or larger, were measured to be recorded.

4.2.1 Crack Patterns in Selected Whitewash Areas

During the previous tests the four 6 ft x 12 ft areas between elevations 439 ft and 451 ft and centered on azimuths 20, 175, 320, and 350 degrees, had been whitewashed and plotted in a 1-foot grid. For the purposes of the present test no new whitewash was applied. All presently visible cracks were outlined, measured, photographed, and charted on appropriate data sheets (see Figures 3, 4, 5, and 6).

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The crack patterns were then compared with information collected during the prestressing operation and the Structural Integrity Test.

4.2.2 Cracks in Concrete Around Dome Tendon Bearing Plates

All of the visible cracks around the accessible dome tendon bearing plates were visually inspected, and a description of their location, direction, and size was entered on a data sheet (see Table 2 and Figure 2).

5.0 DISCUSSION OF RESULTS

5.1 RESULT OF STRAIN GAGE READINGS

As theorized in Reference 1, Section 6.3.1.1, some of the strain gages have become inoperable, or have questionable readings. On the main bars, of the 23 functioning strain gages at full prestress, 14 have meaningful readings for this test. Sister bar data was used for calculating the stress in four reinforcing bars, as noted in Table 1, giving meaningful readings for approximately 78% of the original 23 functioning gages. This tends to cloud the credibility of the data, and indicates that less information will be available in future tests.

None of the deviations in stress between this test and after full prestress is greater than ±6,400 psi. By deleting the data for the "sister bar", the largest deviation is -4,600 psi, +1,300 psi. This data is well within the acceptance criterion of ±11,500 psi.

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5.2 RESULT OF CRACK INSPECTION IN WHITEWASH AREAS

None of the cracks observed in the whitewash areas of the ring girder are greater than 0.008 inch wide. Most are less than 0.005 inch wide. The cracks are random in pattern and characteristic of shrinkage cracks, with the lack of any stress cracking.

Comparing the plotted cracks in Figures 3, 4, 5, and 6 with those plotted in the prestressing operation and the Structural Integrity Test, it is apparent that during this test there are a greater quantity of cracks plotted. Two contributing factors have probably caused this. The first is the decision as to which cracks less than 0.005 inch wide are to be plotted; i.e., during this test the "hairline" cracks may have been plotted in greater detail than previous tests. The second is that more surface shrinkage cracks have appeared. This may be substantiated by the increased quantity of cracks in the range of 0.005 inch to 0.008 inch as shown in the following table:

Period	No. Cracks 0.005" to 0.008"
After Full Prestress	0
S.I.T. - 30 psi	0
S.I.T. - 63.3 psi	3
S.I.T. - Depressurized to 0 psi	0
Six Months After S.I.T.	9

As the whitewash has weathered, a greater quantity of cracks in the concrete surface is visible and the cracks appear wider.

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These surface shrinkage cracks are all less than 0.010 inch and do not impair the ability of the concrete to function as intended in the design. Future ring girder surveillance includes inspection of these same whitewash areas. The crack growth rate will be carefully monitored during these future tests.

5.3 RESULT OF CRACK INSPECTION AROUND DOME TENDON BEARING PLATES

Of the cracks observed in the concrete surface around the accessible dome tendon bearing plates, one measures 0.035 inch wide and is discussed later, one measures 0.005 inch wide, and the remainder are less than 0.005 inch wide. Table 2 gives the location of these cracks.

As is characteristic of shrinkage cracks, these cracks are random in location with respect to the tendon and lack stress cracking.

The previous tests inspected the area around the dome tendon bearing plates and no cracks were noted over 0.005 inch wide.

The one concrete crack adjacent to tendon number D-303 in the southeast quadrant measuring 0.035 inch wide and about 2 inches long was further examined and a corner section broken off. The crack continues across the bottom of tendon anchorage number D-302 as a crack less than 0.005 inch wide. Examination of the removed section reveals that the concrete is lacking coarse aggregate and shows two layers, with cavities. This appears to result from a poorly made mortar repair.

Examination of the parent concrete does not reveal any other cracking or signs of distress. The tendon bearing plate is 3-3/4 inches thick and was exposed for about 1-1/2 inches of that thickness. Because

the crack does not extend to the bearing surface, does not extend outside of the area of concrete repair, and because no reinforcing is exposed, this broken section appears not to have been caused by an overstress condition and does not impair the structural integrity of the reactor building.

6.0 DEFICIENCIES

The following deficiencies were encountered during the surveillance test.

a. Ten (10) dome tendon bearing areas are blocked from inspection by the vent stack at buttress no. 5, and therefore can not be inspected for cracks. Therefore, 97% of the 294 dome tendon bearing areas were inspected for concrete cracks which provides a good representation of all bearing areas.

b. Strain gage readings from nine additional main reinforcing bars are questionable due to low ground values. The "sister" bar was still available for four of these. This indicates an electrical short in the leads and/or strain gages. As stated in Met-Ed's letter of May 31, 1972 to Mr. A. Giambusso, Directorate of Licensing, U.S. Atomic Energy Commission, "It should be pointed out that every effort will be made to read the strain gages; however, we have no guarantee that the gages will continue to operate throughout the duration of the program."

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7.0 REFERENCES

1. Metropolitan Edison Co., "Ring Girder Surveillance Program", TMI Surveillance Test No. 1303-8.2, December 1973.

2. Metropolitan Edison Co., "TMI-1 Reactor Building Ring Girder Surveillance Report", November 12, 1973.

3. Gilbert Associates, Inc., "TMI-1 Reactor Containment Building Structural Integrity Test", Report No. 1838, Metropolitan Edison Co., June 15, 1974.

Reactor Building

Ring Girder Reinforcing Bar Stresses (KSI)

	DATE		6-6-73	7-5-73	9-18-73	10-2-74								3-9-74
			DURING PRESTRESS			AFTER ACCEPTANCE TEST								S.I.T.
STRAIN GAGE LOCATION	ELEVATION	AZIMUTH	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 psig
52 HOOP	435'	108°	0.9	-0.5	4.2	[illegible].9	-2.3							6.1
52 VERT.	435'	108°	6.2	3.8	1.5	2.1(3,5)	0.6							2.8
53 HOOP	435'	245°	0.5	0.6	4.7	-(6)	-							5.9
53 VERT.	435'	245°	5.7	3.3	0.8	-4.2(3,5)	-5.0							1.0
54 HOOP	435'	352°	1.3	-0.3	5.7	3.4	-2.3							7.2
54 VERT.	435'	352°	7.3	10.6	17.3(4)	-	-							-
55 HOOP	440'	108°	-0.1	1.1	3.2	-(6)	-							3.7
55 VERT.	440'	108°	1.0	0.0	-0.6	-2.1	-1.5							-1.0
56 HOOP	440'	245°	-0.1	1.0	4.0	-0.6	-4.6							4.3
56 VERT.	440'	245°	0.5	-0.5	-5.1	-11.0(3,5)	-5.9							-5.9
57 HOOP	440'	352°	1.4	-1.4	3.9	-2.5(3,5)	-6.4							4.8
57 VERT.	440'	352°	-	-	-	-	-							-
58 HOOP	446'	108°	-	-	-	-	-							-
58 VERT.	446'	108°	3.8	4.8	4.7	4.6	-0.1							5.0
59 HOOP	446'	245°	0.4	2.6	4.4	1.8	-2.6							-
59 VERT.	446'	245°	-0.8	2.5	1.9	0.5	-1.4							1.1
60 HOOP	446'	352°	-0.4	1.9	4.4	-(6)	-							3.8
60 VERT.	446'	352°	4.2	5.4	5.1	-(6)	-							4.9
129 HOOP	446'	80°	-	-	-	-	-							-
129 VERT.	446'	80°	1.2	2.7	3.8	-(6)	-							3.7
130 HOOP	446'	320°	0.1	2.3	5.0	2.2	-2.8							4.6
130 VERT.	446'	320°	0.3	2.7	3.0	0.0	-3.0							2.9
61 HOOP	452'	108°	0.0	2.3	2.6	1.2	-1.4							2.7
61 VERT.	452'	108°	1.6	1.4	1.9	2.2	0.3							1.7
62 HOOP	452'	245°	0.1	1.9	-	-	-							-
62 VERT.	452'	245°	4.2	3.6	3.7	5.0	1.3							4.5
63 HOOP	452'	352°	0.0	2.3	2.8	0.6	-2.2							2.9
63 VERT.	452'	352°	2.3	2.5	3.1	3.7	0.6							2.0

TABLE 1

SPECIAL NOTES;

1. Complete information on strain gage readings is given in Table I of Appendix I.
2. Conversion of strain to stress assumes E steel = 29,000,000 psi.
3. Stress for "sister" bar.
4. S.I.T. determined this gage was not operating. (See Table 1, App. I.)
5. Unuseable reading for main bar due to low ground reading or inoperable gage.
6. Unuseable reading for both main and "sister" bar due to low ground reading or inoperable gages.

TABLE 2

THREE MILE ISLAND NUCLEAR STATION
UNIT 1
CONCRETE CRACKS ADJACENT TO DOME TENDON BEARING PLATES

LEGEND FOR CRACK LOCATION

1st Letter	2nd Letter	3rd Letter
H = Horizontal	L = Lower	R = Right
V = Vertical	C = Center	L = Left
C = Across Corner	U = Upper	C = Center

TENDON NO.	END NO.	CRACK LOCATION	NOTES
107	NE	VLL, VLR	
108	NE	VUC	(Continues Below Anchorage)
109	NE	HUR	
111	NE	VUL, VLL	
112	NE	VLL	
114	NE	VUL	
115	SW	VLL	
117	SW	VLR	
118	SW	VLR, VUR	
119	SW	VLR	
120	SW	VUR	
122	SW	VLR	
123	SW	VUR, VLR	
124	SW	VLR, VUL	
126	SW	VUL	
130	NE	VUL	
133	SW	HUR	
135	SW	VUC	
147	SW	HUR	
148	SW	HUR	
202	NE	HUR	
203	NE	HUR	(0.005" width)
204	NE	HUR	
205	NE	HUR	
206	NE	VUR	
210	SE	HUR	
211	SE	HUR	
223	SE	VUL	
225	SE	VUR	
245	SW	HLR	
246	SW	HLR	
246	SE	HUL	
247	SW	HCR	
247	SE	HUL	
248	SW	HUR, HLR	
248	SE	HUL	
249	SW	HUR, HCR	

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(Continued)

TABLE 2 (CONT'D)

TENDON NO.	END NO.	CRACK LOCATION	NOTES
302	SE	HCR, HUR, HLR, HLL	
303	SE	HUR, HLR, HCR	(0.035" Note A for HCR)
304	SE	VLR, HLR, HCR	
305	SE	CUR, HLR	
306	SE	HUR, HCR, HLR	
306	NE	HUL	
307	SE	VUR	
307	NE	HUL	
308	NE	HUL	
308	SE	HUR, HCR, VLR	
309	NE	HUL	
310	NE	VLL	
310	SE	CUR	
311	NE	Bottom	(Note B)
311	SE	CUR	
312	SE	CUR	
312	NE	Bottom	(Note C)
313	SE	CUR	
313	NE	VLL	
315	SE	HUR	
324	SE	CLL	
324	NW	VLL	
325	SW	CLL	
325	NW	VLL, VUL	(Continues Below Anchorage)
326	NW	VLL	
326	SW	CLL	
327	SW	VUR, HLR, VLL	
328	SW	VUR, VLR	
329	SW	VUR	
343	SW	HUL	
344	SW	HUL	
345	SW	HUL	
346	SW	HUL	
347	SW	CUL	

NOTES

A. This crack was measured as 0.035 in. x 2 in., and during inspection by Met Ed and GPU civil engineers the corner was partially broken away. The broken piece appears to consist of two layers of patching mortar, i.e., there is a difference in shading, and an absence of coarse aggregate.

B. Five cracks less than 0.005 in. 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.

C. Four cracks - similar to those described in Note B.

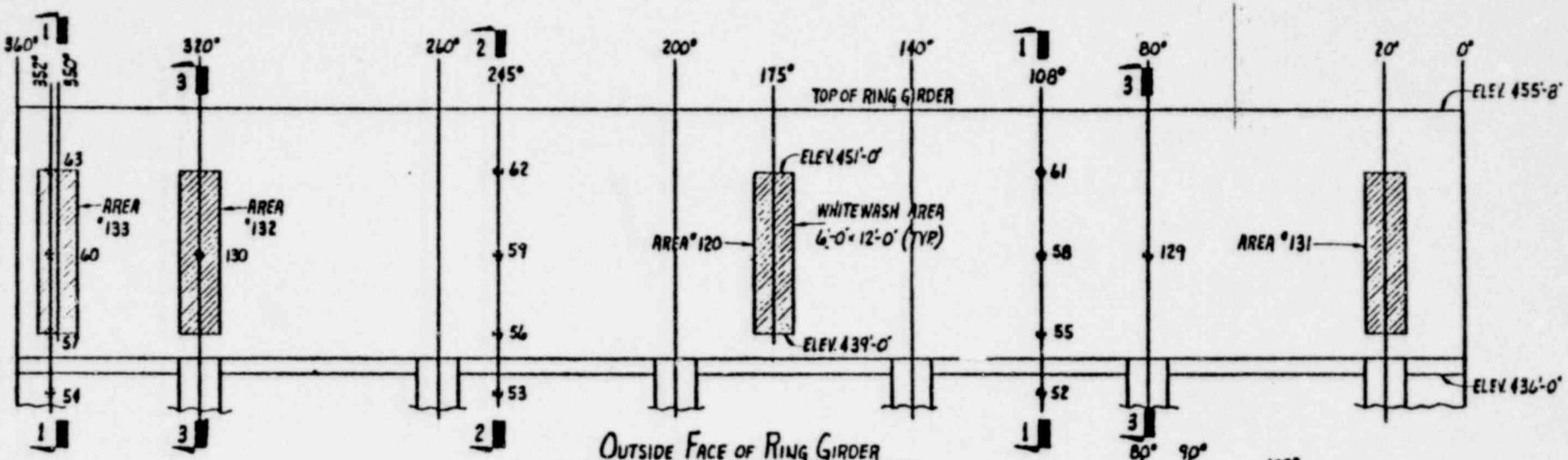
(Continued)

NOTES (for Table 2 continued)

D. All cracks are less than 0.005 in. wide unless noted.

E. Unless otherwise noted the cracks extend from the metal bearing plate across the adjoining two to four inches of concrete.

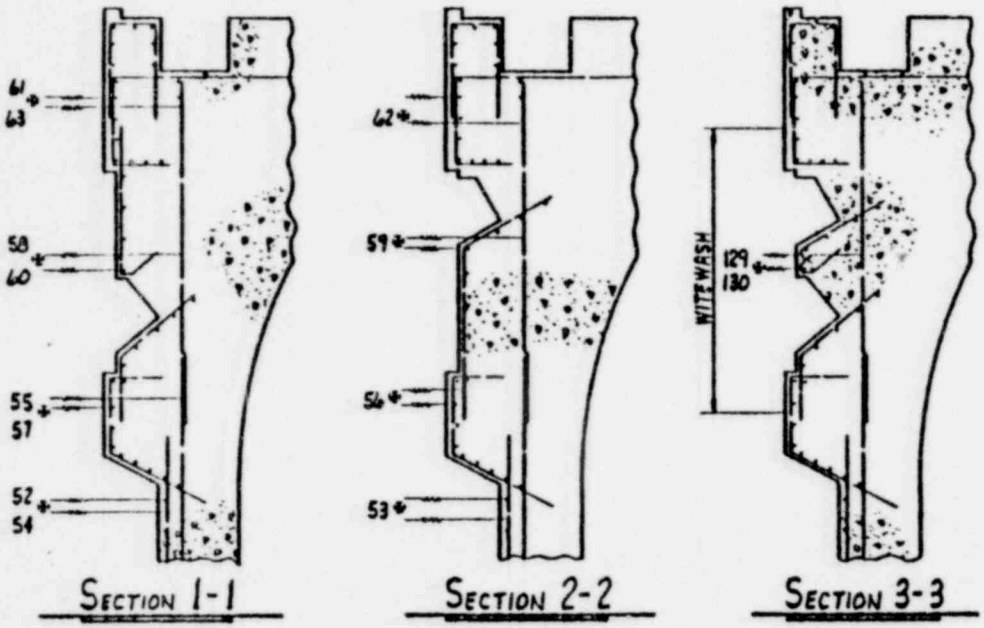
F. For quadrant location of an End No. see Figure 2.



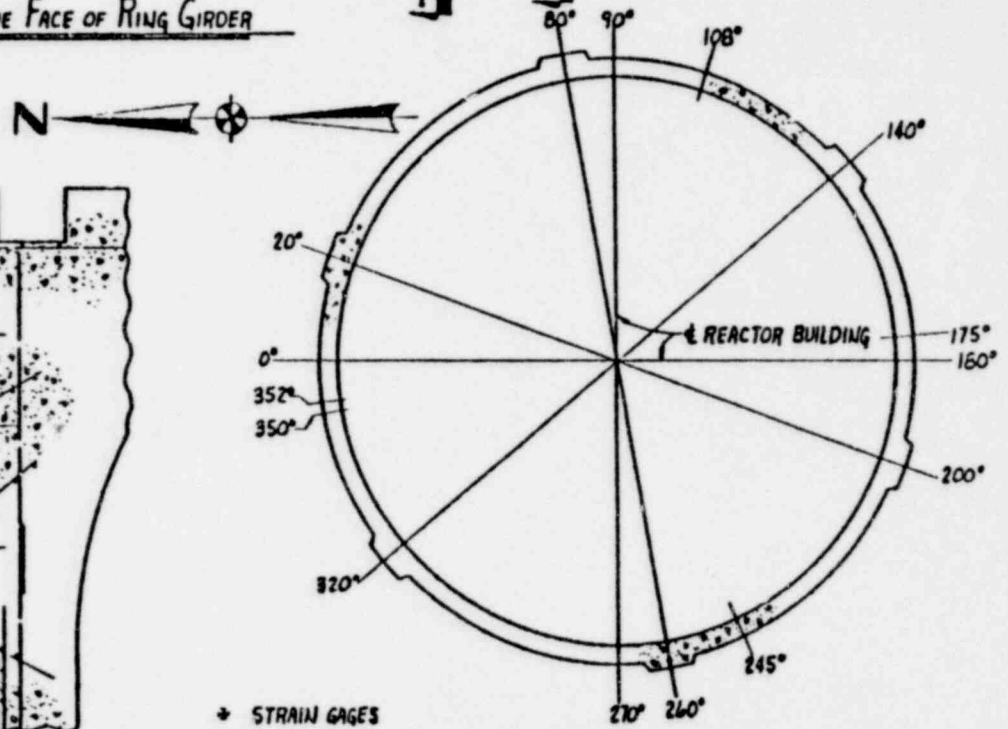
OUTSIDE FACE OF RING GIRDER

NOTE:-

1. REINFORCING LOCATIONS SHOWN IN SECTIONS CORRESPOND TO GILBERT ASSOCIATIONS, INC. DRAWINGS E-421-847 AND E-421-848.



SECTION 1-1 SECTION 2-2 SECTION 3-3



+ STRAIN GAGES

WHITEWASH AREA

PLAN

RING GIRDER SURVEILLANCE

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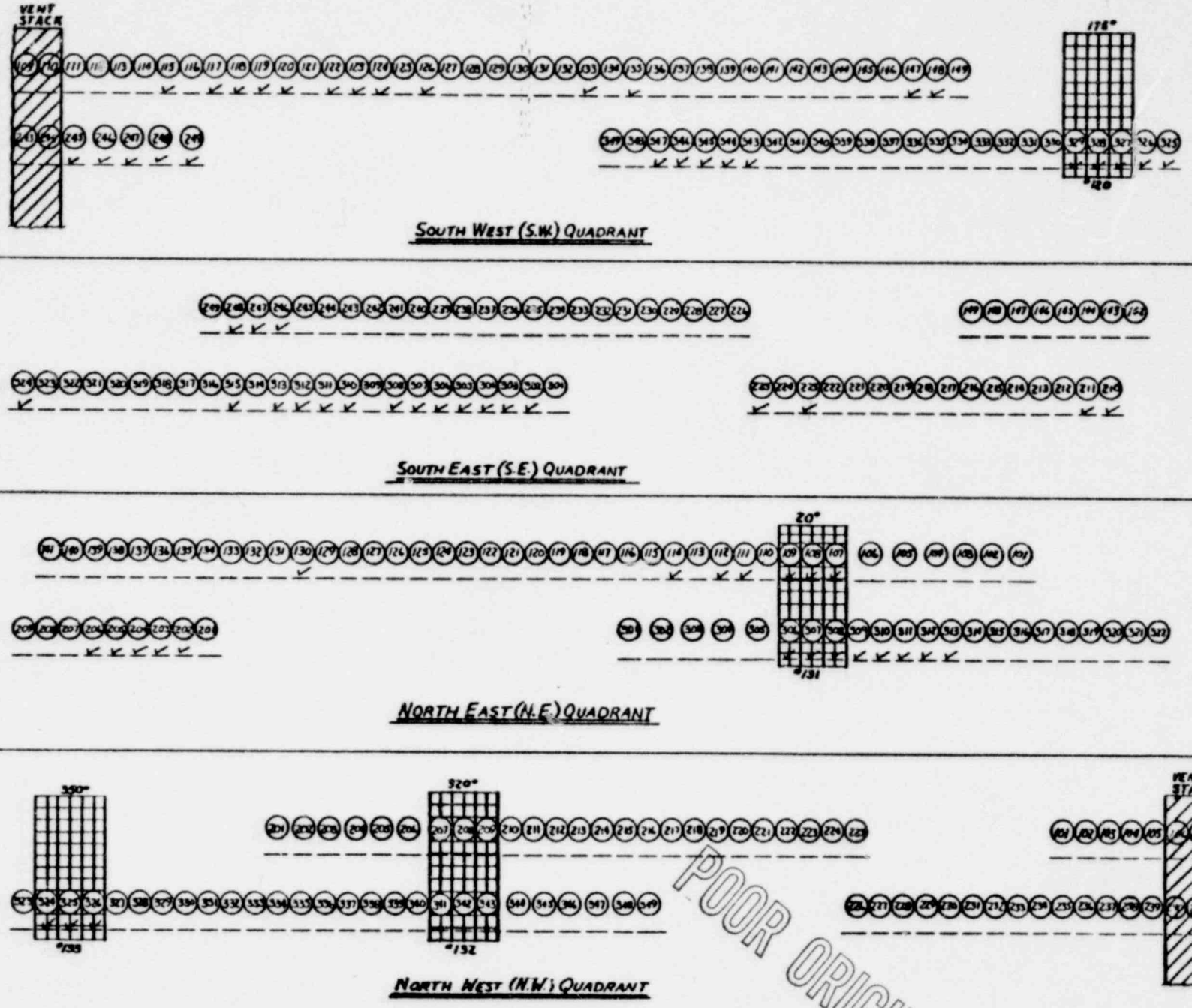
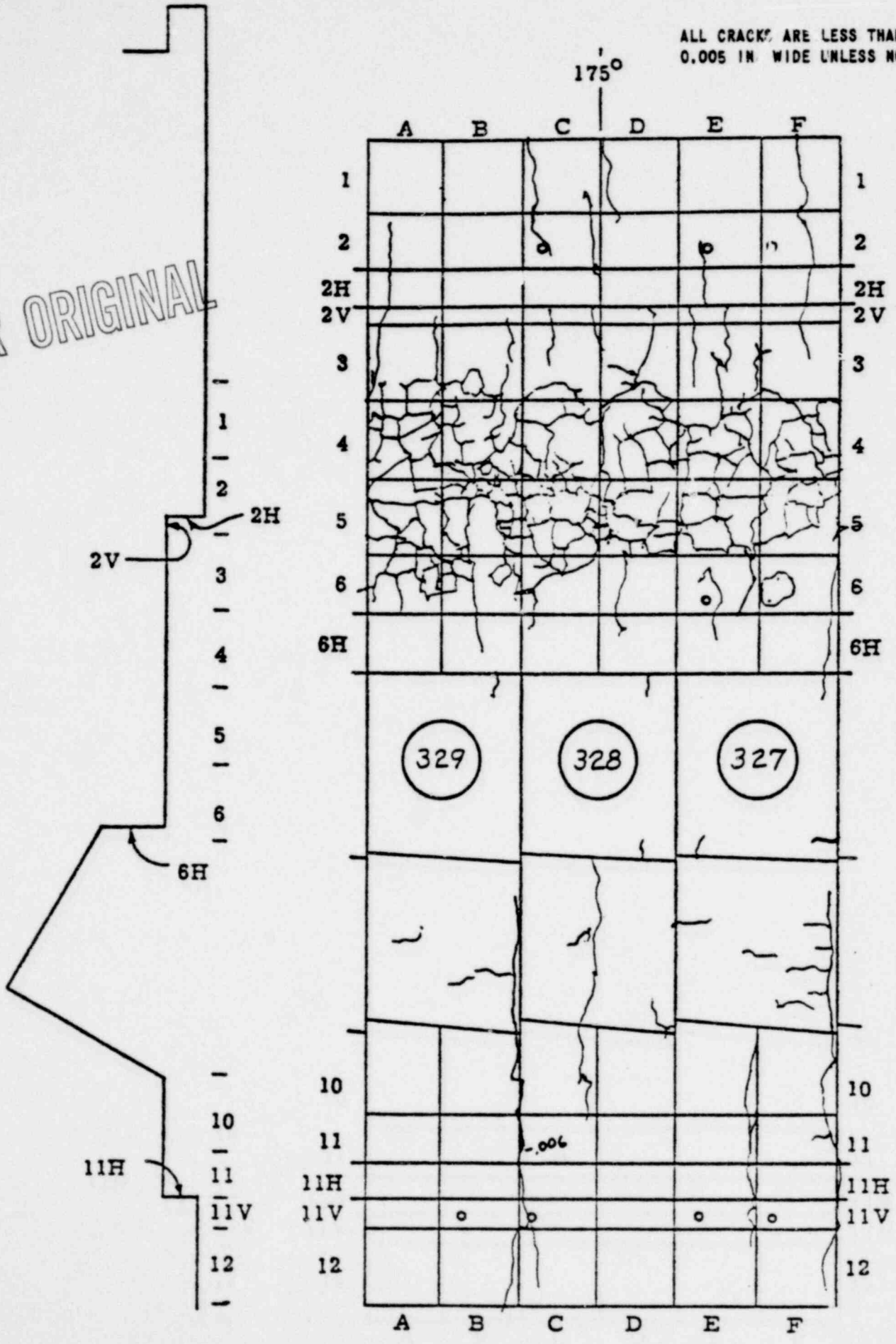
FIGURE 1



NOTE: AREAS WITH CRACKS NOTED THUS ⟋.
SEE TABLE 2 FOR DESCRIPTION.

RING GIRDER SURVEILLANCE TEST
DOME TENDON BEARING AREAS

FIGURE 2



CRACK PATTERN AREA AT AZIMUTH 175°
AREA NO. 120

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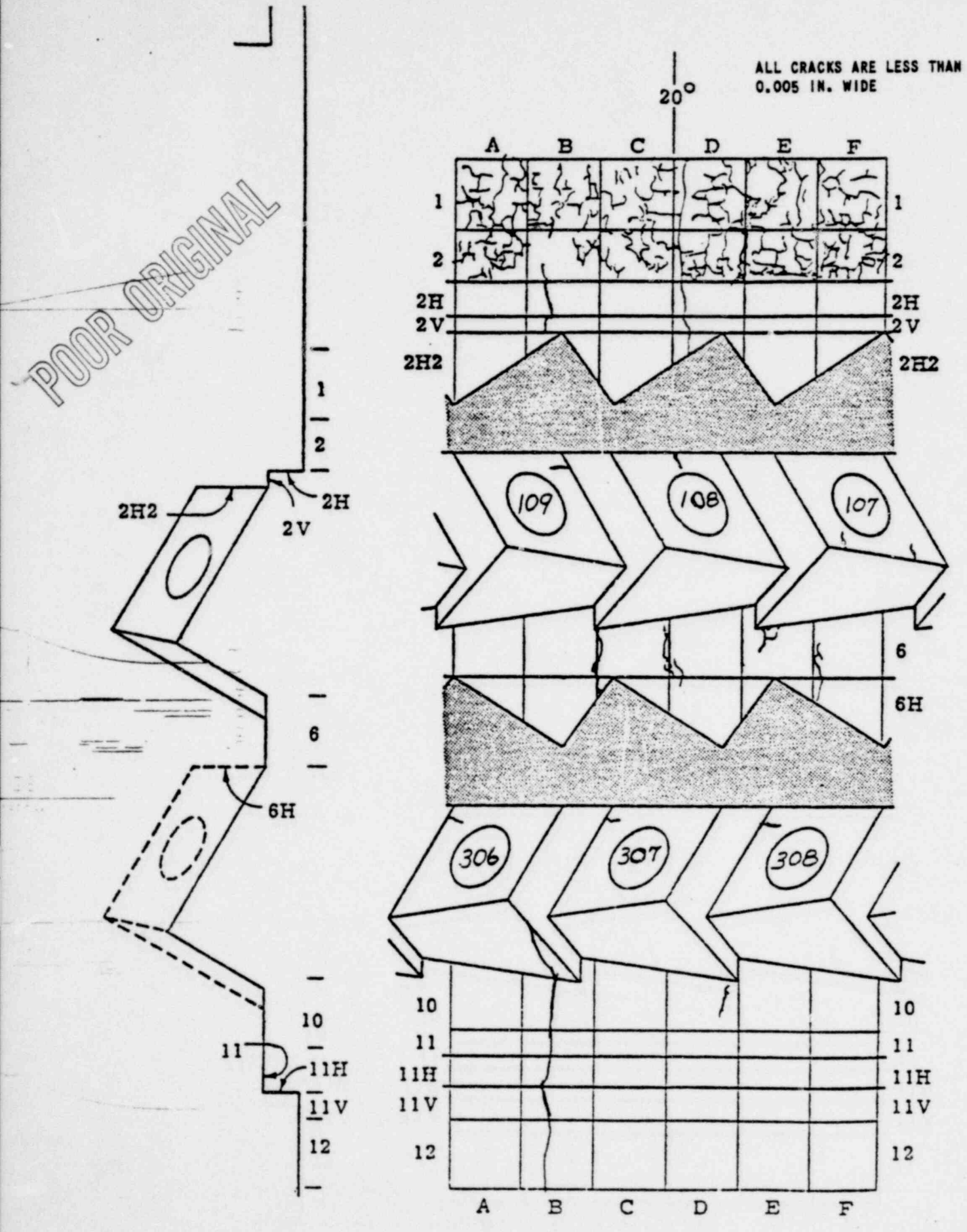
FIGURE 3



CRACK PATTERN AREA AT AZIMUTH 20°
AREA NO. 131

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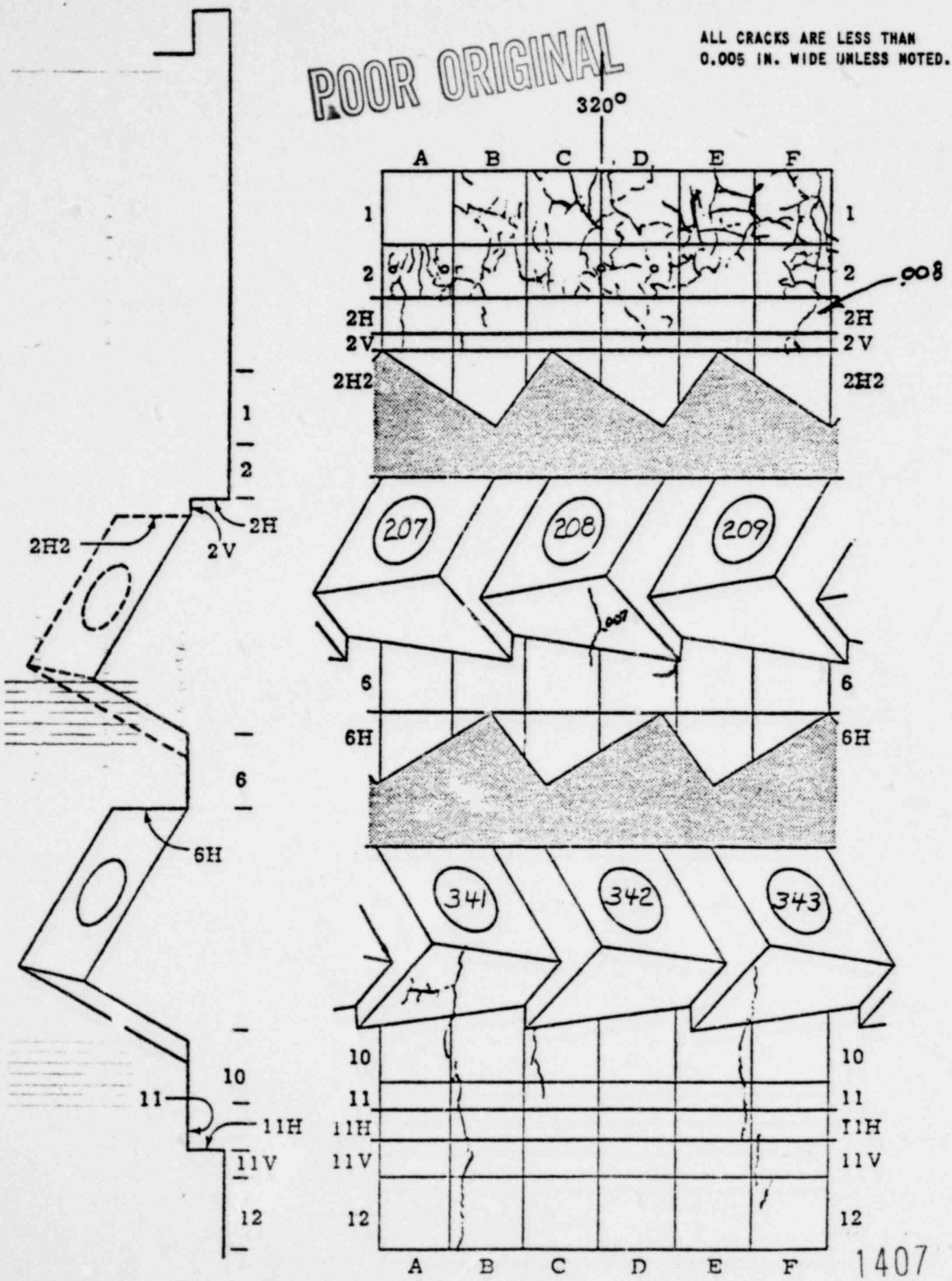
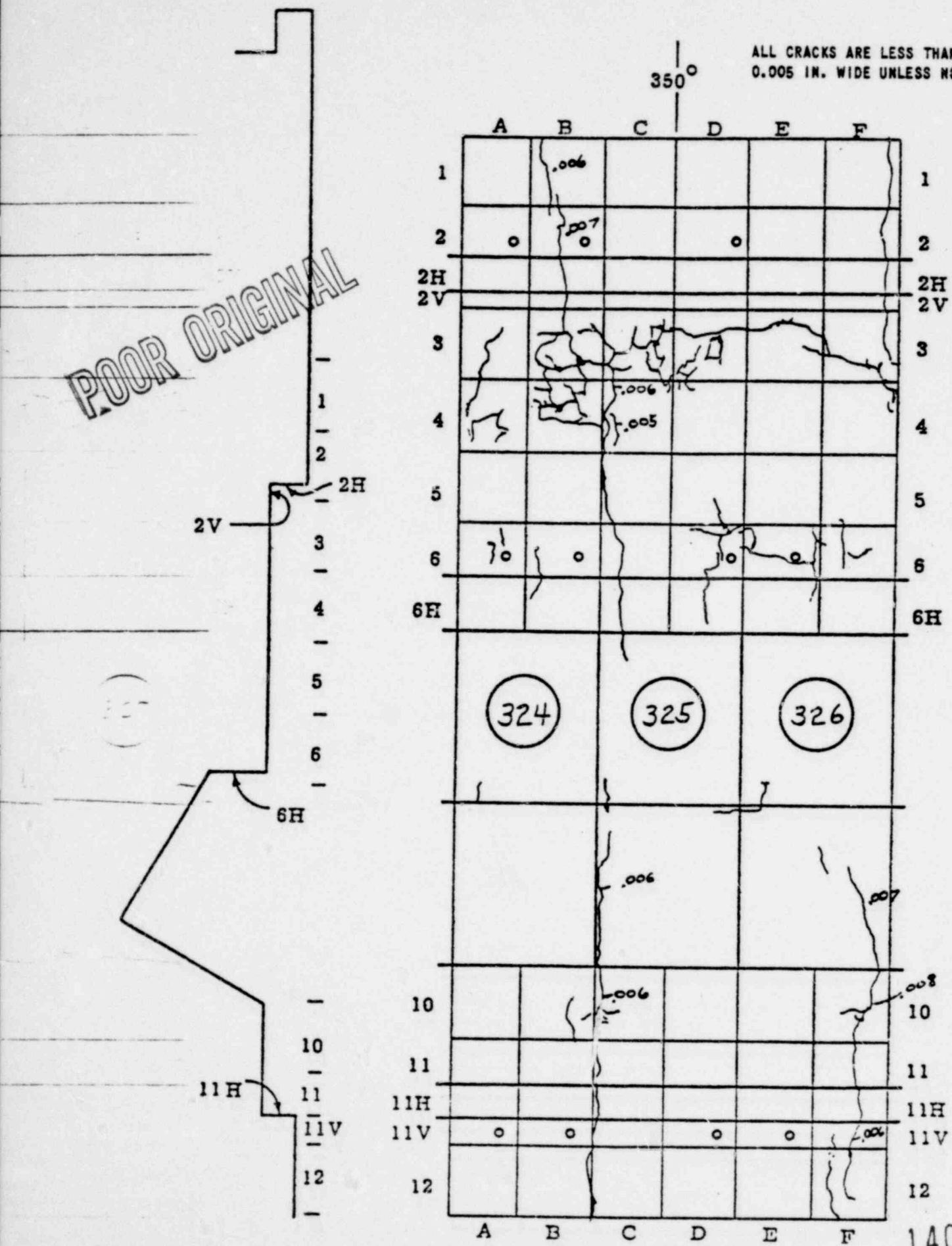
FIGURE 4

ALL CRACKS ARE LESS THAN
0.005 IN. WIDE UNLESS NOTED.



CRACK PATTERN AREA AT AZIMUTH 320°
AREA NO. 132

FIGURE 5



CRACK PATTERN AREA AT AZIMUTH 350°
AREA NO. 133

FIGURE 6

APPENDIX I

STRAIN GAGE DATA
OCTOBER 1 AND 2, 1974

Table I presents both rebar and sister bar information obtained on October 1 and 2, 1974.

TABLE I

THREE MILE ISLAND UNIT 1
RING GIRDER SURVEILLANCE STRAIN GAGE READINGS, OCTOBER 1974
(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	66	47	60M	300M	66	62	118	2	0900
52 Vert	435	108	-72[D]	73	50K	130M					
53 Hoop	435	245	C	2058[D]	9M	10M	60	58	118	1	1430
53 Vert	435	245	301[D]	-144	40M	500M					
54 Hoop	435	352	116	109	50M	500M	52	50	118	2	1500
54 Vert	435	352	C	-75	80M	600M					
55 Hoop	440	108	-83[D]	-40[D]	0.5M	18M	66	62	118	2	0900
55 Vert	440	108	-71	-115	5G	5G					
56 Hoop	440	245	-22	224	80M	400M	60	58	118	1	1415
56 Vert	440	245	-402[D]	-378	28M	350M					
57 Hoop	440	352	50[D]	-86	1M	500M	52	50	118	2	1445
57 Vert	440	352	B	668	B	110M					
129 Hoop	446	80	A	A	A	A	68	66	118	2	1300
129 Vert	446	80	-42[D]	291[D]	25M	10M					
58 Hoop	446	108	A	A	A	A	66	64	118	2	0945
58 Vert	446	108	159	296	1G	800M					
59 Hoop	446	245	61	46	5G	5G	54	54	118	1	1115
59 Vert	446	245	17	228	1M	900M					
130 Hoop	446	320	77	297[D]	120M	20M	51	52	118	2	1530
130 Vert	446	320	3	25[D]	300M	32M					
60 Hoop	446	352	-281[D]	673[D]	20M	400K	52	50	118	2	1400
60 Vert	446	352	217[D]	609[D]	1.5M	1M					
61 Hoop	452	108	42	C	1G	250M	66	64	118	2	1000
61 Vert	452	108	76	78	3G	5G					
62 Hoop	452	245	-66[D]	-27	10M	3G	54	54	118	1	1100
62 Vert	452	246	71	B	2G	200					
63 Hoop	452	352	21	-37	300M	5G	52	50	118	2	1400
63 Vert	452	352	126	134	250M	5G					

NOTES: A. No gage installed at this location.
B. Gage destroyed during construction.
C. Gage inoperative.
D. Reading questionable due to low ground.

APPENDIX II

PROCEDURAL GUIDE

1.0 INTRODUCTION.

1.1 This appendix presents both the background information with locations, cable numbers, gage factors, initial absolute readings, and a step by step procedural guide for an individual reading with the subsequent data reduction.

2.0 BACKGROUND INFORMATION.

2.1 The strain gaged rebars and sister bars are located at five azimuths and are terminated in four-conductor shielded cables housed in NEMA-4 boxes. Figure 1 locates the boxes, and Figures 2 through 6 indicate the cables both by cable label and strain gage location.

2.2 Table I presents a tabulation by strain gage location of gage number (cable label), gage factor, and the initial absolute reading.

3.0 GROUND READINGS.

3.1 The ground reading is an indication of the electrical insolation of the strain gage installation and is measured between the gage lead wires and ground - the tendon covers serve as a readily available ground. These readings may be taken with any high-capacity resistance meter, but DO NOT USE A MEGGER as it may destroy the gages. Any gage installation with less than fifty megohms (50M) is considered suspect and may or may not yield valid readings.

4.0 STRAIN READINGS.

4.1 The strain reading is determined from the imbalance of a four-arm resistance bridge and must be compared with other readings to be meaningful. Thus, the reading obtained in the field must be a true

reading. The recommended procedure calls for taking both forward and reverse readings. This is accomplished by hooking the strain gage cable to the BLH Model 120C portable strain indicator as indicated in Figure 7. Insure that the gage factor is set on 2.00.

4.2 Record the reading in the "forward" column of the data sheet; see Figure 8. Then the red and black wires are reversed, and this new reading is recorded in the "reverse" column.
NOTE: Fabrication of a switch box with a double pole, double throw switch will facilitate the reversing procedure in the field and is recommended; see Figure 9.

5.0 TEMPERATURE READINGS.

5.1 The external temperature readings are taken with an Amprobe Fastemp Temperature Indicator Model T151, presently available from the UE&C instrument shop. The internal temperature is obtained from the continuous logs kept at Unit No. 1 control and is usually collected by the data taker the day following the actual strain readings.

5.2 The effects of radiant heating may be a factor and hence the sun's effect is recorded by indicating whether or not the area of the reading is exposed to the sun or is shaded.

6.0 DATA REDUCTION.

6.1 The strain readings must be corrected for the following:

1. Instrument Zero.
2. Gage Factor.
3. Bridge Factor.

6.2 The correction for instrument zero is made by comparison of the forward and reverse reading in the following manner:

1. Subtract the reverse reading from the forward reading.
2. Divide this number by 2.
3. Record this as the "raw reading."
4. As a check, add the raw reading to the reverse reading. This will yield the instrument zero. If it does not, an error has been made either in taking the reading or the calculations, or it could indicate a faulty gage.

6.3 The bridge factor for all bridges is 2.6 and the gage factor is listed in Table I of this Appendix. Combining these, we obtain one correction factor for each of the three gage factors found. This correction is applied by multiplying the "raw reading" by the applicable factor listed below:

if the gage factor is:	multiply the "raw reading" by:
2.01	0.3827
2.02	0.3808
2.065	.3725

6.4 The reading obtained above must now be compared with the initial or May 13, 1973, reading. The difference in these will give the value for the final tabulation as shown in Table I of Appendix I.

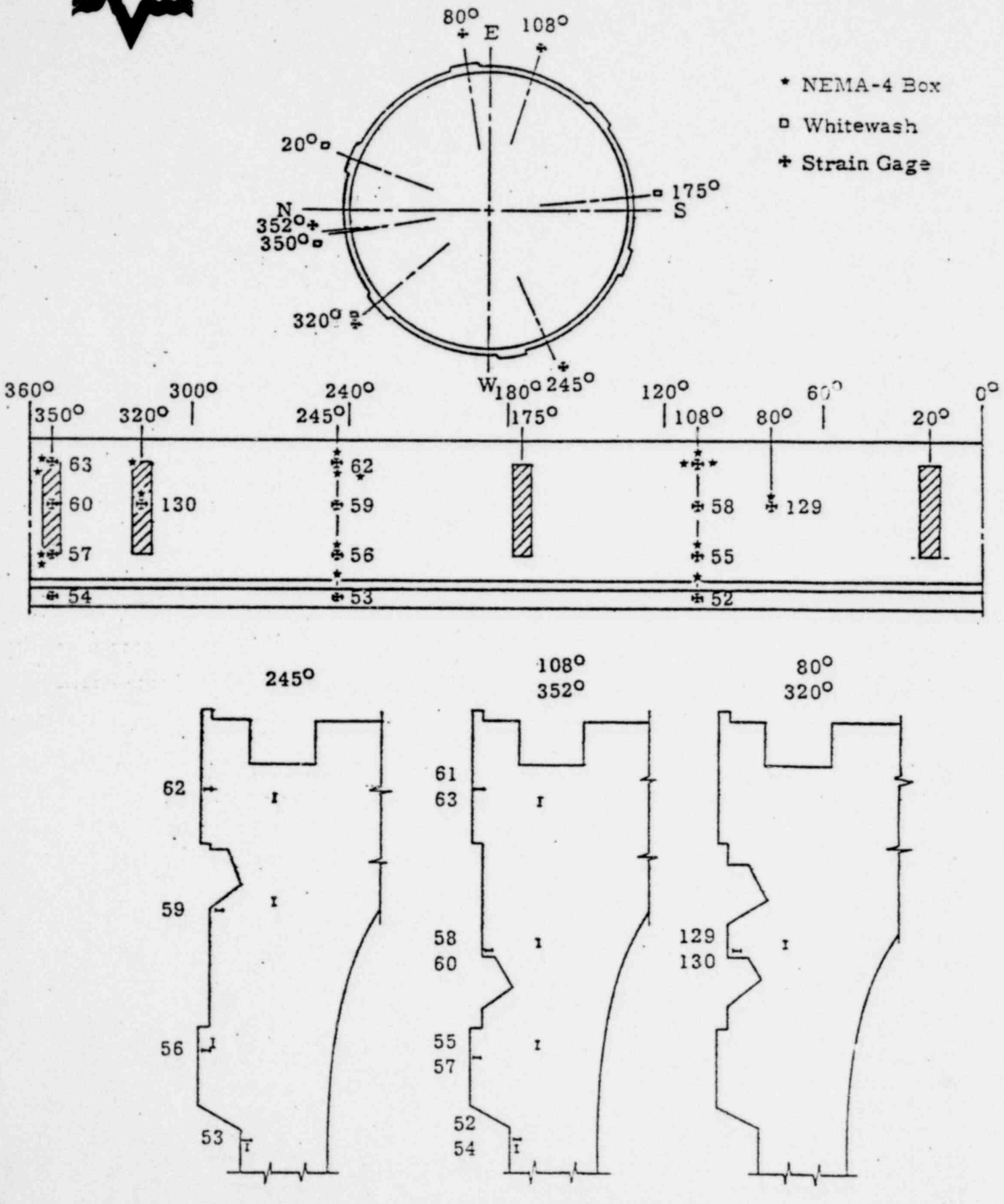


FIGURE 1. RING GIRDER DIAGRAM.

KEY FOR READING DIAGRAM LABELS

Alfa Numeric (Alfa Numeric Letter)

← Blank for Regular, 'S' for Sister Bar.

← 'H' for Hoop, 'V' for Vertical.

← GAI Location Number.

← Cable Label.

• ← Indicates Cable Position.

Cable Labels as Found on October 2, 1974, at Azimuth 80°

Schematic of the One NEMA-4 Box

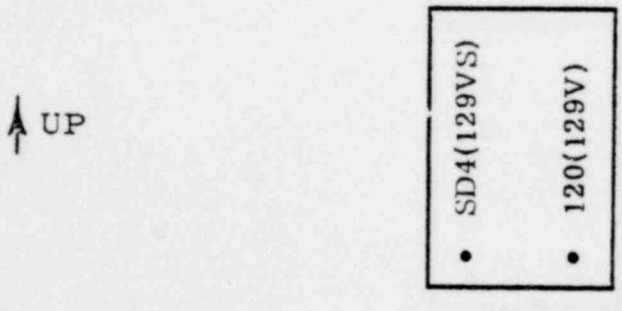
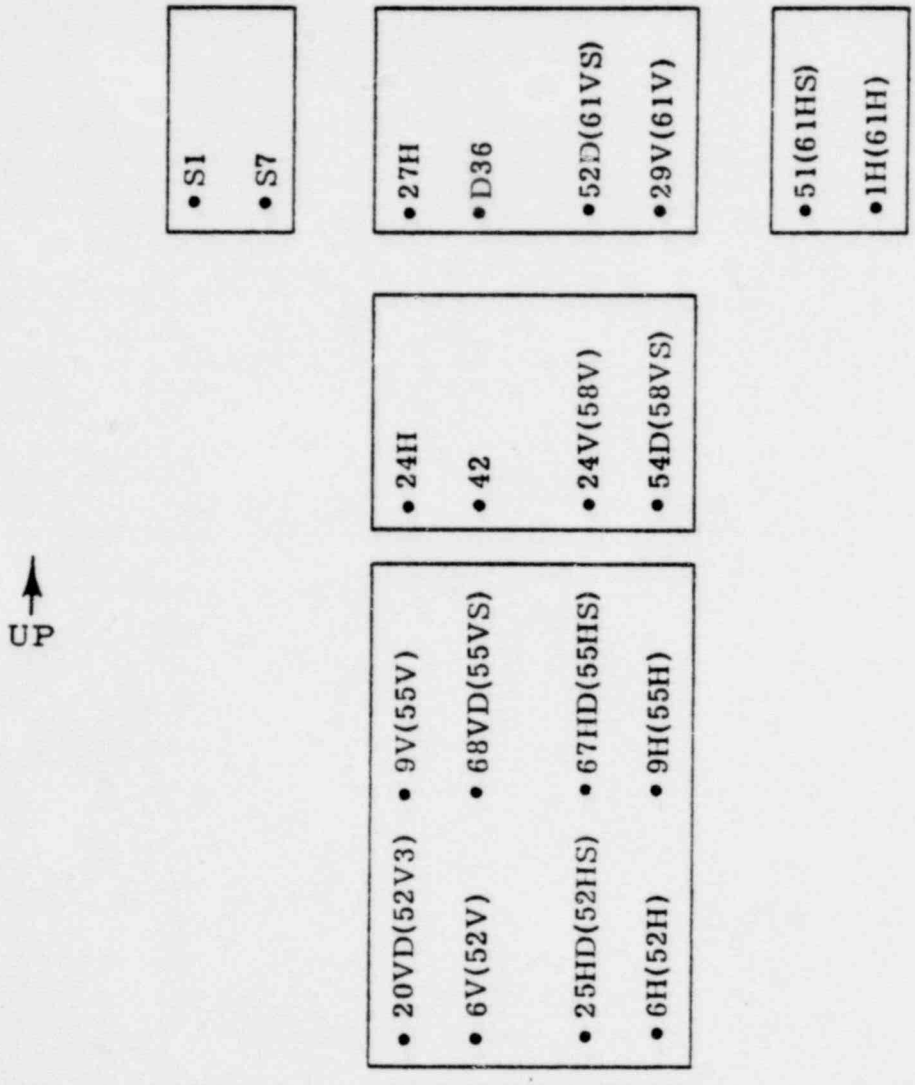


FIGURE 2. CABLE LOCATOR DIAGRAM.

1407 195

Cable Labels as Found on October 2, 1974, at Azimuth 108°

Schematic of the Five NEMA-4 Boxes

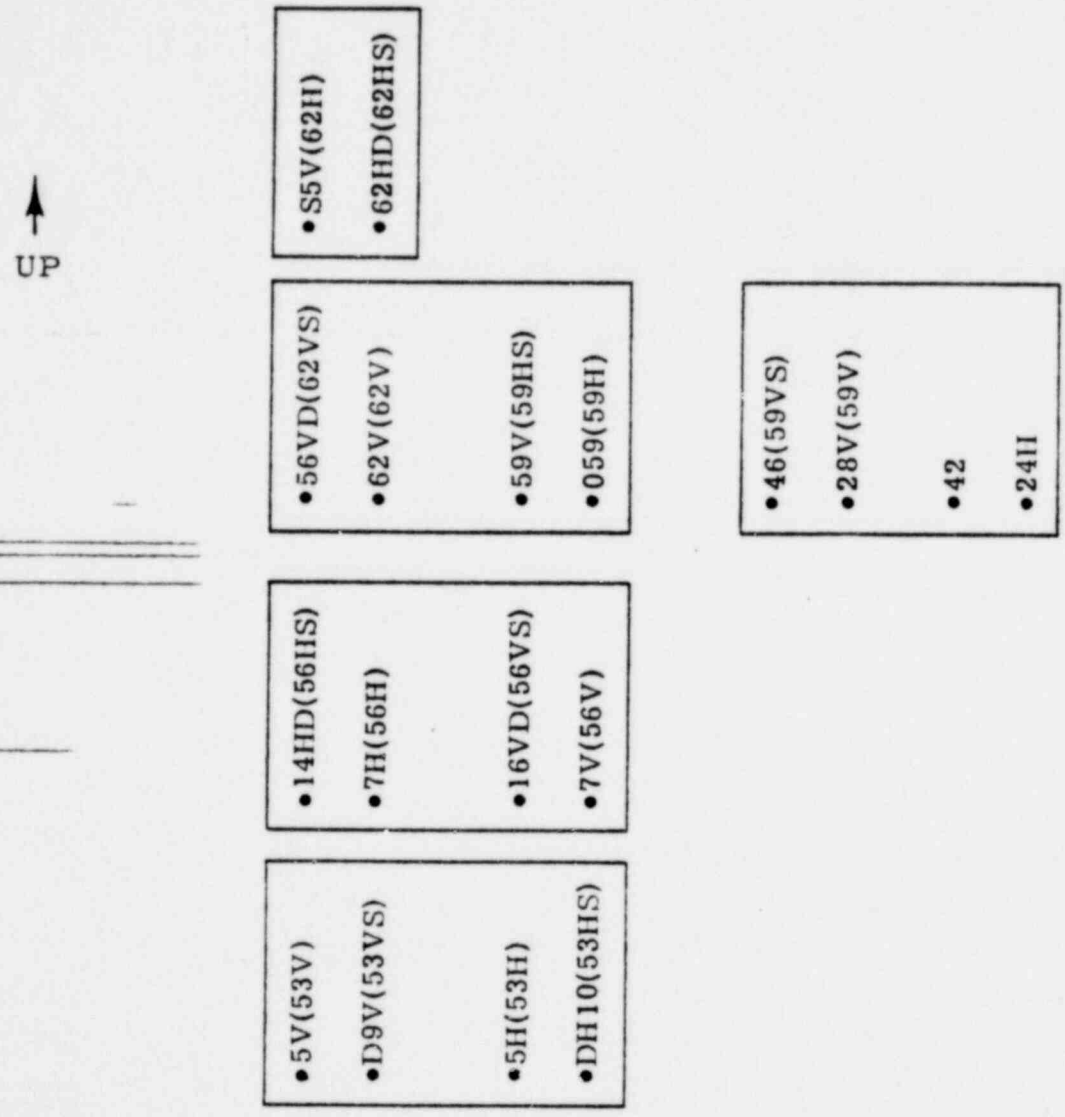


1407 196

FIGURE 3. CABLE LOCATOR DIAGRAM.

Cable Labels as Found October 1, 1974, at Azimuth 245°

Schematic of the Five NEMA-4 Boxes



1407 197

FIGURE 4. CABLE LOCATOR DIAGRAM.

Cable Labels as Found on October 2, 1974, at Azimuth 320°

Schematic of the Two NEMA-4 Boxes

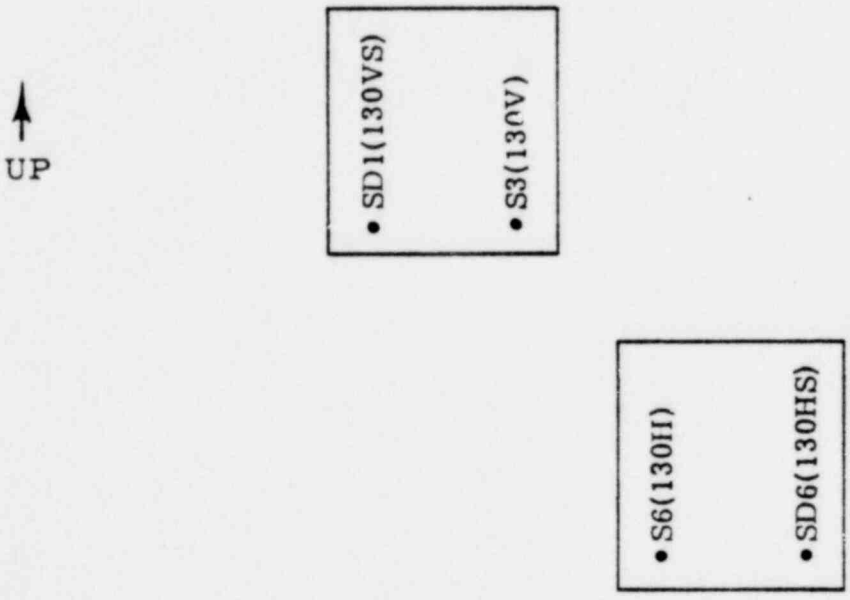
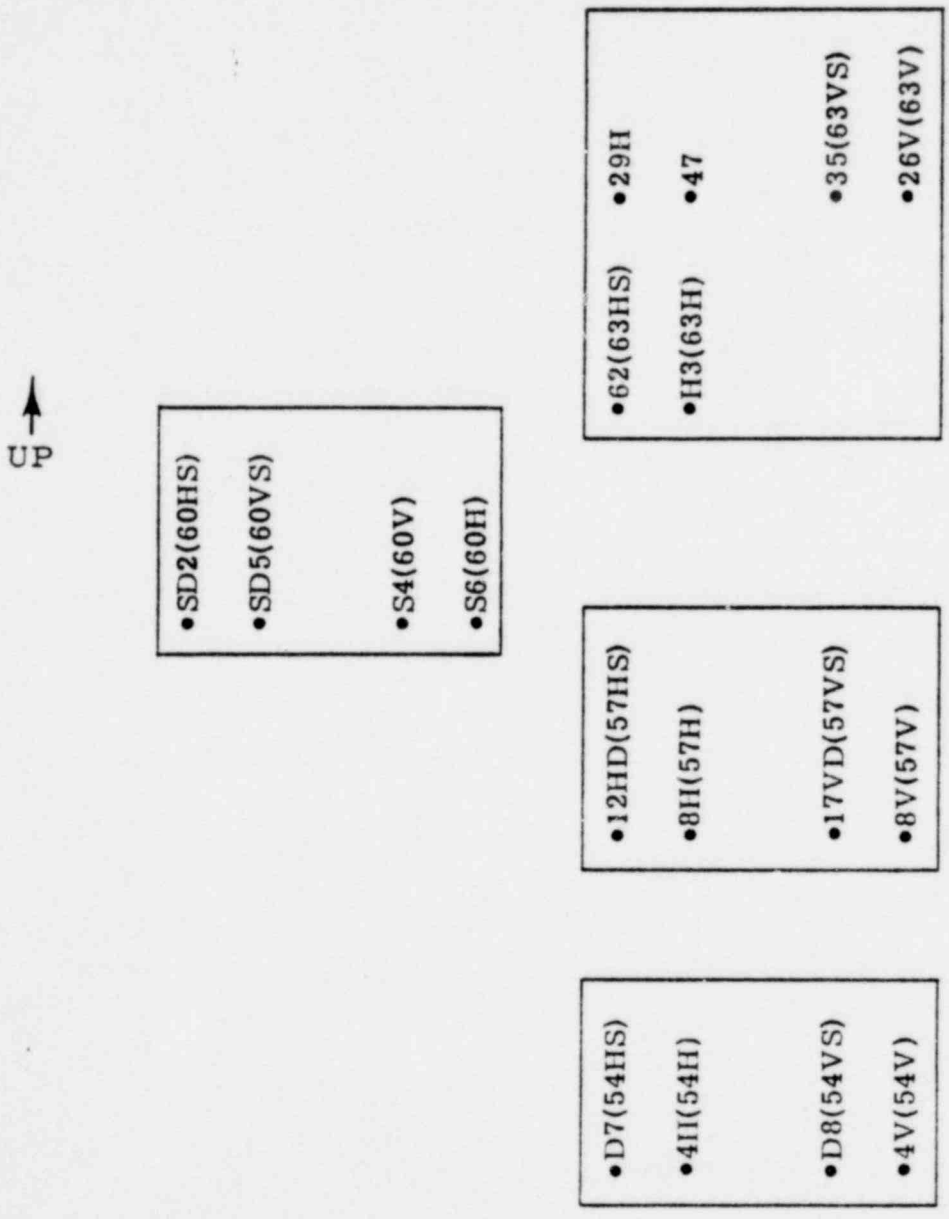


FIGURE 5. CABLE LOCATOR DIAGRAM.

1407 198

Cable Labels as Found on October 2, 1974, at Azimuth 352°

Schematic of the Four NEMA-4 Boxes



1407 199

FIGURE 6. CABLE LOCATOR DIAGRAM.

BLH Model 120C
Full-Bridge Terminal

- - - Hookup for Strain Gage Reading

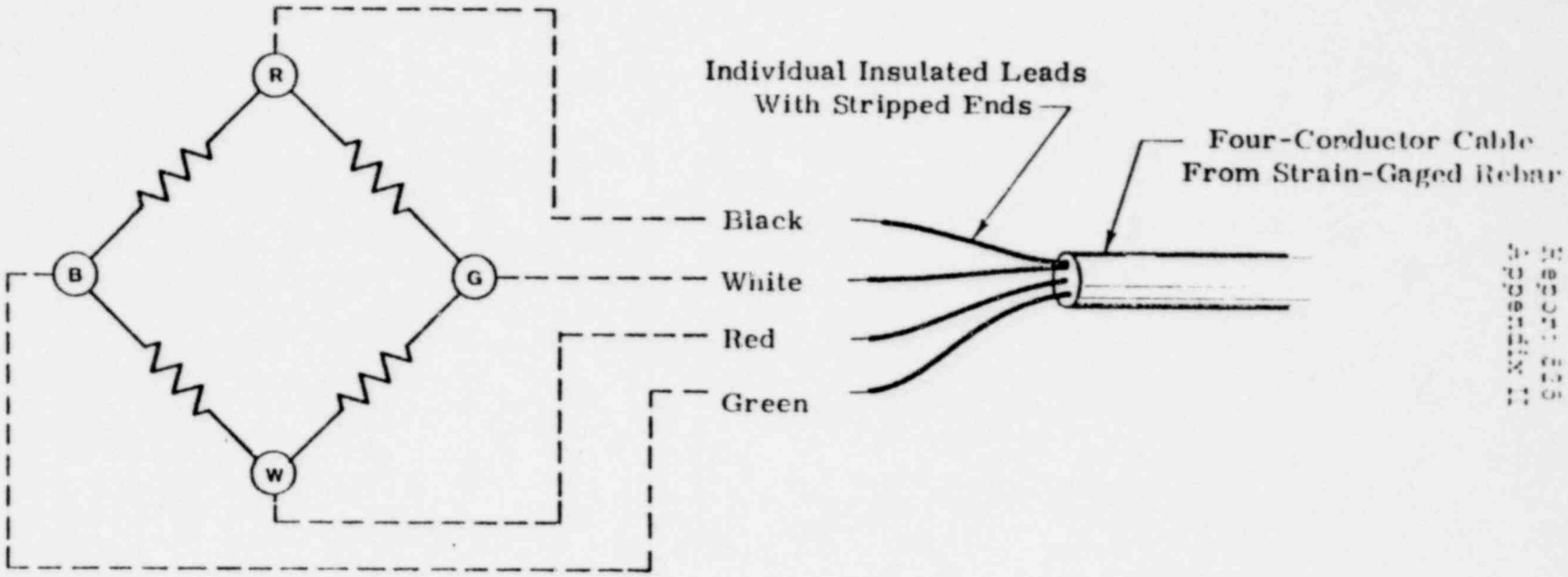
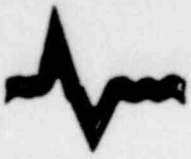


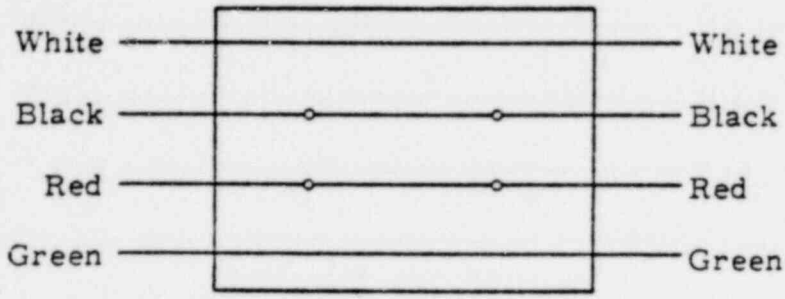
FIGURE 7. DIAGRAM FOR GAGE HOOKUP TO STRAIN INDICATOR.

Gage Number	Ground (ohms)	Microstrain Readings			Temperature (^{o}F)			Sunny or Shade	Date and Time
		Forward	Reverse	Raw	Air	Skin	Internal		

FIGURE 8. DATA SHEET.



Forward Position



Reverse Position

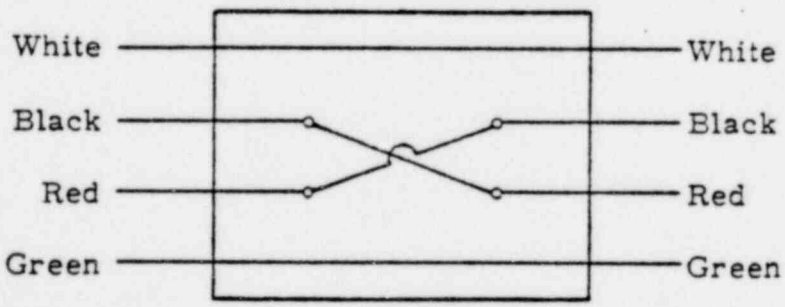


FIGURE 9. DIAGRAM OF REVERSING SWITCH POSITIONS.

1407 202

TABLE I

THREE MILE ISLAND UNIT 1 - RING GIRDER SURVEILLANCE
GAGE FACTOR AND MAY 15, 1973, READINGS

Strain Gage Location	Elevation (ft)	Azimuth (°)	Rebars			Sister Bars		
			Gage Number	Gage Factor	Prior to Prestress May 15, 1973, Reading	Gage Number	Gage Factor	Prior to Prestress May 15, 1973, Reading
52 Hoop	435	108	6H	2.020	-311	25HD	2.020	-507
52 Vert	435	108	6V	2.020	-478	20VD	2.010	+179
53 Hoop	435	245	5H	2.020	-464	10HD	2.010	+398
53 Vert	435	245	5V	2.020	116	9VD	2.010	-192
54 Hoop	435	352	4H	2.020	-158	H6/ D7	2.010	-267
54 Vert	435	352	4V	2.020	+2398	8/ D8	2.010	+25
55 Hoop	440	108	9H	2.065	-82	67HD	2.065	+237
55 Vert	440	108	9V	2.065	-201	68VD	2.065	-220
56 Hoop	440	245	7H	2.020	-256	14HD	2.010	-899
56 Vert	440	245	7V	2.020	-64	16VD	2.010	-369
57 Hoop	440	352	H8	2.020	-454	12HD	2.010	-404
57 Vert	440	352	8V	Gage Destroyed in Construction		17VD	2.010	-120
1 Hoop	446	80		No Gage Installed at This Location				
1 Vert	446	80	120	2.065	-95	SD4	2.065	-878
58 Hoop	446	108		No Gage Installed at This Location				
58 Vert	446	108	24V	2.065	-191	54D	2.065	-371
59 Hoop	446	245	Blank/ 059	2.065	-606	59V	2.065	-320
59 Vert	446	245	28V	2.065	-100	46	2.065	-255
130 Hoop	446	320	80/ S6	2.065	-179	SD6	2.065	-796
130 Vert	446	320	S3	2.065	-112	SD1	2.065	-825
60 Hoop	446	352	S6	2.065	-654	SD2	2.065	-724
60 Vert	446	352	S4	2.065	-137	SD5	2.065	-757
61 Hoop	452	108	1H	2.020	-154	51[A]	2.065	-265
61 Vert	452	108	29V	2.065	-252	52D	2.065	-101
62 Hoop	452	245	S5	2.065	-520	62H	2.065	-784
62 Vert	452	245	62V	2.065	-257	S6VD	Gage Destroyed in Construction	
63 Hoop	452	352	H3	2.020	193	62	2.065	98
63 Vert	452	352	26V	2.065	-175	35	2.065	-357

NOTE: A. Gage opened during vertical prestress.