

SDW Public Meeting
Jan 13, 1984

Soils #63-67 Reports
Stan - introduction

Pete - months activity

Stan - stop work resolution

- Last months open items

Jim - Last months open items

- ① crack report chrs verbal & written
- ② NCR's on Carlson meters
- ③ track turning
- ④ lessons learned on out to SWPS
- ⑤ crack mapping

~~*crack mapping~~ ^{only for cracks} > 5 miles > 2 feet in length

~~Billres got EN 83-67~~

so does ~~Henry~~ Henry

(OVER)

Questions

Barb

- ① swps instrument 20mil jump
- ② NIR 012
- ③ lack of swr doing their job

Billie

- ① cracks question 28, W.J.E & Ass., CTL
Survey

Mary

Bob

. Set us up.

Thanks you for saying me

LIST OF ATTENDEES

OF NRC/CPCO/BECHTEL ETC
MIDLAND ON 1/4/82.

NAME	ORGANIZATION
1. JAMMOUSEI	CPCO
2. RB Landsman	NRC
3. GA Harstead	NRC Consultant
4. FRANK RINALDI	NRC
5. STEVE DOULOS	NRC - GEI, Consultant
6. RUBEN SAMUELS	NRC - CSA/CEI "
7. Joseph Kane	NRC - NRR - DE, SGEB
8. <u>DARR HODD</u>	NRC/DL/LBT
9. T.R. THIRUVENGADAM	CPCO
10. Metz A. Sozen	Bechtel Cons.
11. Malay Das Gupta	Bechtel
12. John W. Darby	BECHTEL
13. Ernst Cvikl	Bechtel
14. BIMAL DHAR	Bechtel
15. ROD WIELAND	CPCO
16. ROBERT WHEELER	CPCO
17. N. RAMANUJAM	CPCO
18. K. RAZDAN	CPCO
19. John Schenk	CPCO
20. L. GOULD.	Vergerkine.
21. P. Majeski	SEW
22. S. Lucks	SEW
23. Neal Swanberg	Bechtel
24. BILL KERN	CPCO LICENSING
25. DAVE LAVELLE	BECHTEL

EXIT

1-6-84

more
① Extensions for eg of 685 of roof (unclear first)
E-W direction
critical sections

② stresses & strains + deflections in structure @ critical locations
for various construction sequences & possible limits (up & down)
do not want to have within code allowable
loading conditions
summary table with explanations

③ significant cracks - our understanding P. 3-27

we would like you to survey entire building
to identify areas of cracking (please identify
unaccessible areas on maps)
EPA, control, man ex.

of evaluate with computer significance to new widening cracks
to previous history

④ clarify the word
critical sections verified upward based on
downward that its the same for
upward

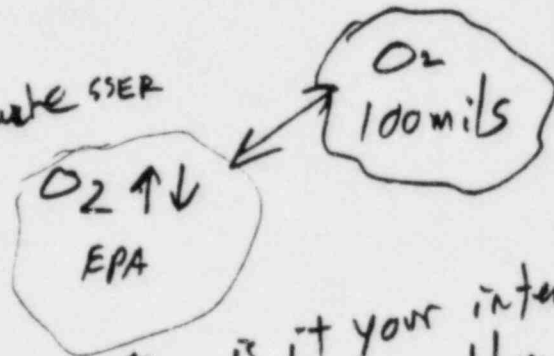
5) what ~~at~~ c200 actions will you take
if control tower moves down

6) new cracks @ EL685 report

stayed to use
70-25 mils
of uplifting
EPA's

7) uplift movement

Δ , $\uparrow\downarrow$ — reevaluate SSER
@ ~~control~~
control tower no Δ ,
on EPA's



is it your intent to
level building or
maintain rigid body
straightness

8) original Δ values (how much has building moved)

9) how do you ^{assure} control symmetry of underpinning
for control

10) ~~copy of drawing~~

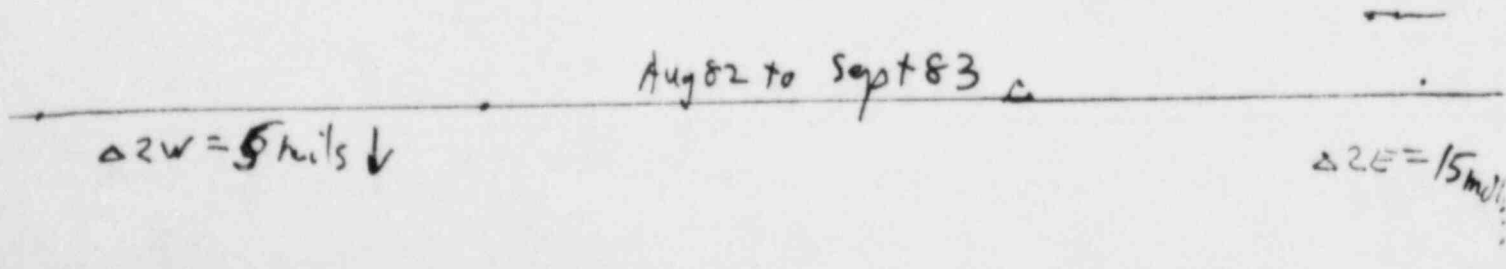
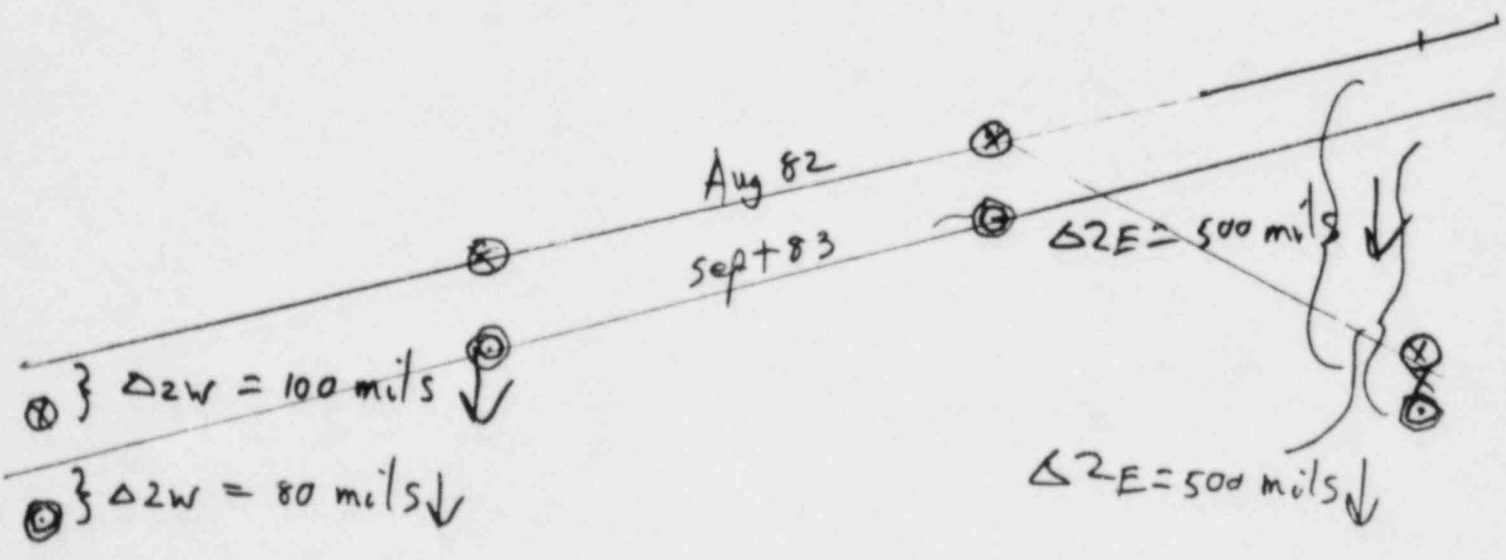
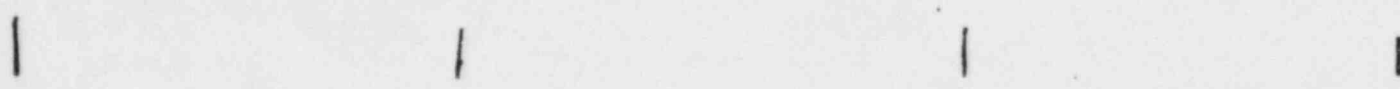
item ⑥ 20.25 m/s → closed because of raising EPA

critical sections → areas of high stress

Δ values @ Aug 82 since 7/78

W				E
	A6	A5	A4	A3
	.95	.7	.5	.85

50 mils ↓



Wednesday, P.M., January, 4, 1983

- I. Discussion of CPCo jacking program for maintenance of building elevation
 - A. Review of design basis for Auxiliary Building underpinning (Gould) 20 Min
 - B. Review of pertinent data (Darby) 20 Min
 - C. Allowable horizontal torsion between the control tower and Main Auxiliary Building (Swanberg) 20 Min

Tour - Thursday, A.M., Thursday, P.M., January 5, 1983

- II. Discussion of other NRC issues
 - A. Acceptability of building check to ACI-349 (Swanberg) 15 Min
 - B. El. 659 fix - ACI 318 vs. ACI 349 (Swanberg) 15 Min
 - C. Removal of building stresses during permanent underpinning (Swanberg) 15 Min
 - D. Analysis of Auxiliary Building with differential settlement values of .25" vs .17" (Swanberg) 30 Min
 - E. Mechanical interface between control tower and main Auxiliary Building 15 Min
- III. Methods of crack measurement (Darby/Sozen) 20 Min
- IV. Discussion of higher alert/action level for downward movement of SWPS (Swanberg/McElwey) 30 Min
- V. SWPS plate load test (Davie/Ogelby [Hanson]) 30 Min

Friday, A.M., January 6, 1983

- VI. Review and closure of discussion items (Mooney) 2 Hr

INTRODUCTION

①

- ① methods of crack measurement
- ② frequency of crack mapping
- ③ evaluation of new crack mapping
- ④ worst locations of cracks and ~~add~~ recommendations where to put

adequate capacity of existing structure
loads vs movement

construction sequence

Malon
Passout (3)

Passout (4) loads at final temporary jacking

Passout (5) vs dCTI loads higher

Passout (6) need to put in additional load ahead of time

(7)
(8)

* why can't you wait until load comes by itself

Chuck

passout (9)

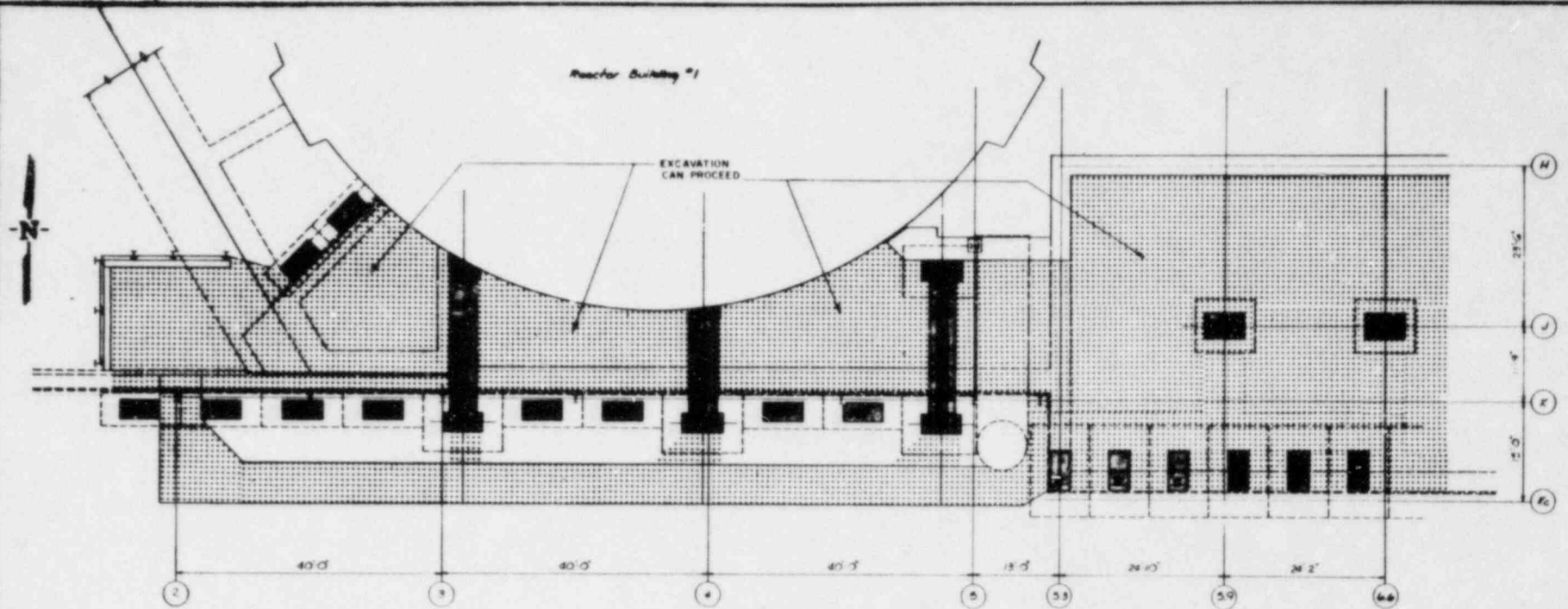
John

passout (10) settlements



passout (11) cracks

Reactor Building #1

EXCAVATION
CAN PROCEED



GENERAL PLAN
(WEST SIDE)

-  AREA OPEN FOR ACCESS
-  AREA OF COMPLETED CONSTRUCTION

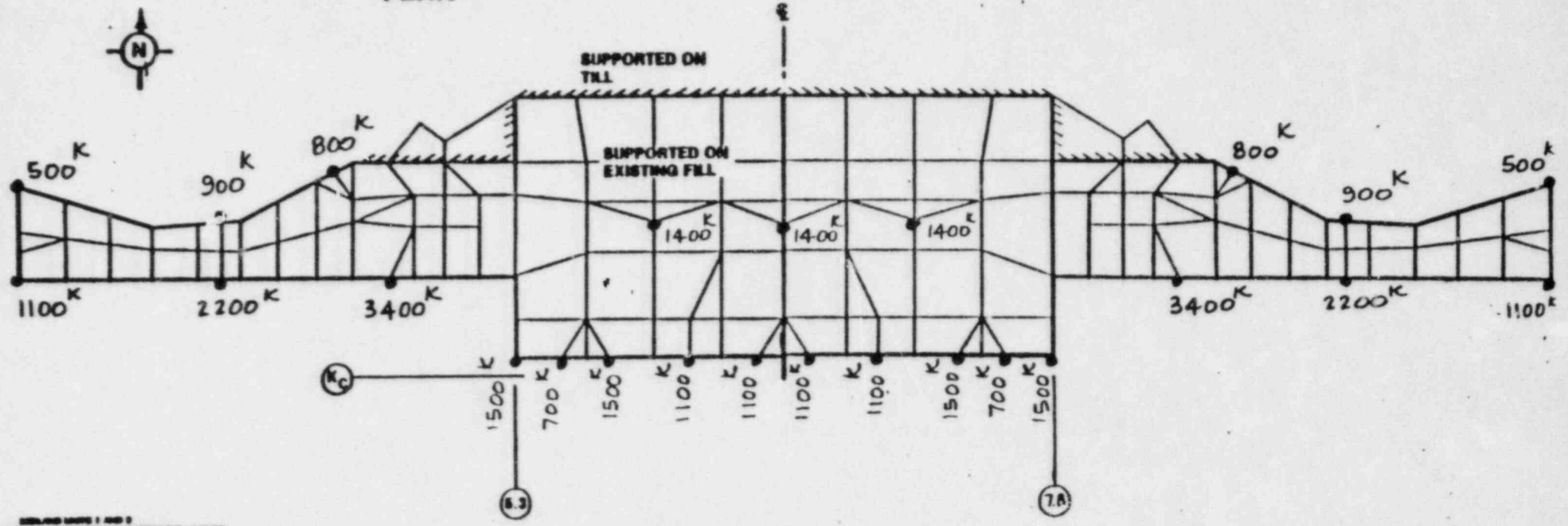
Attachment #1

CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2

CONCEPT DRAWING
UNDERPINNING AUXILIARY BUILDING
CONSTRUCTION AFTER 31 WEEKS

APPENDIX C FIGURE 8

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION AREA PLAN



TEMPORARY JACKING LOADS (JL)
(TOTAL JACKING = 33,800^k)

FIGURE 3

SCALE: 1/4" = 1'-0"
DATE: 10/1/68

(A)

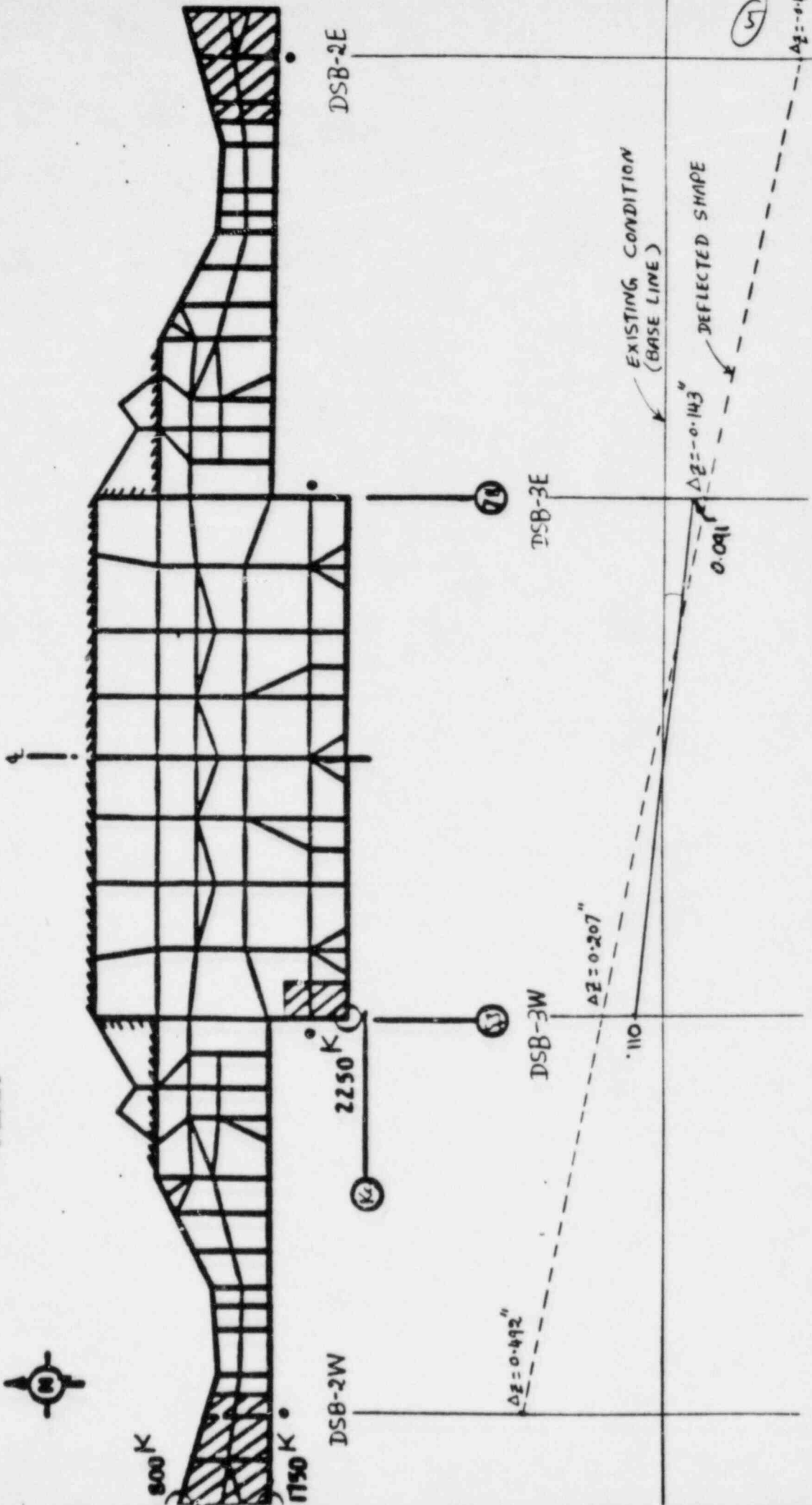
LEGEND



EXCAVATION



**AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION AREA
PLAN**

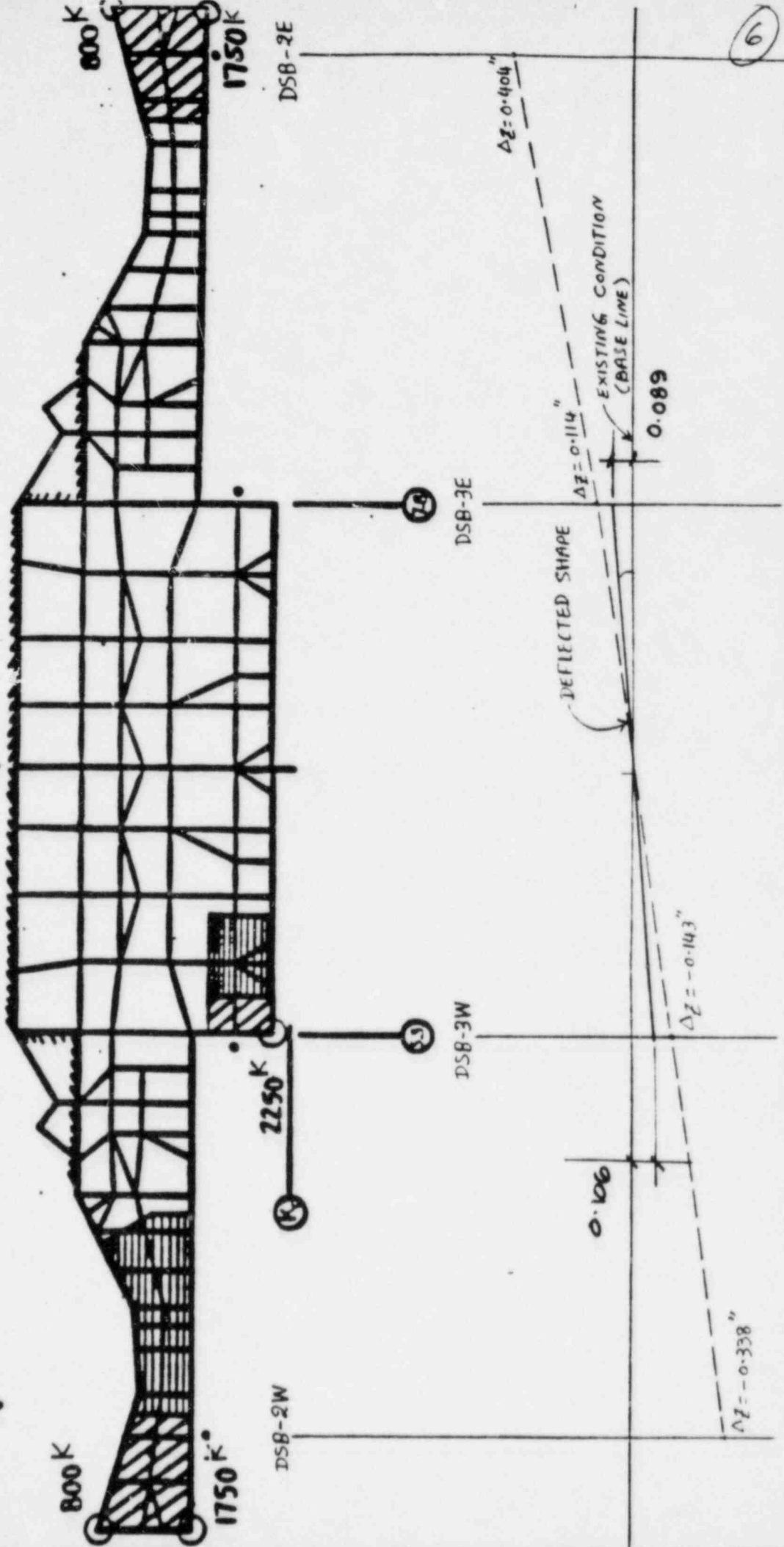


LEGEND



○ JACKING LOAD

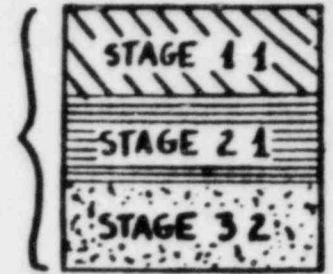
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION AREA
PLAN



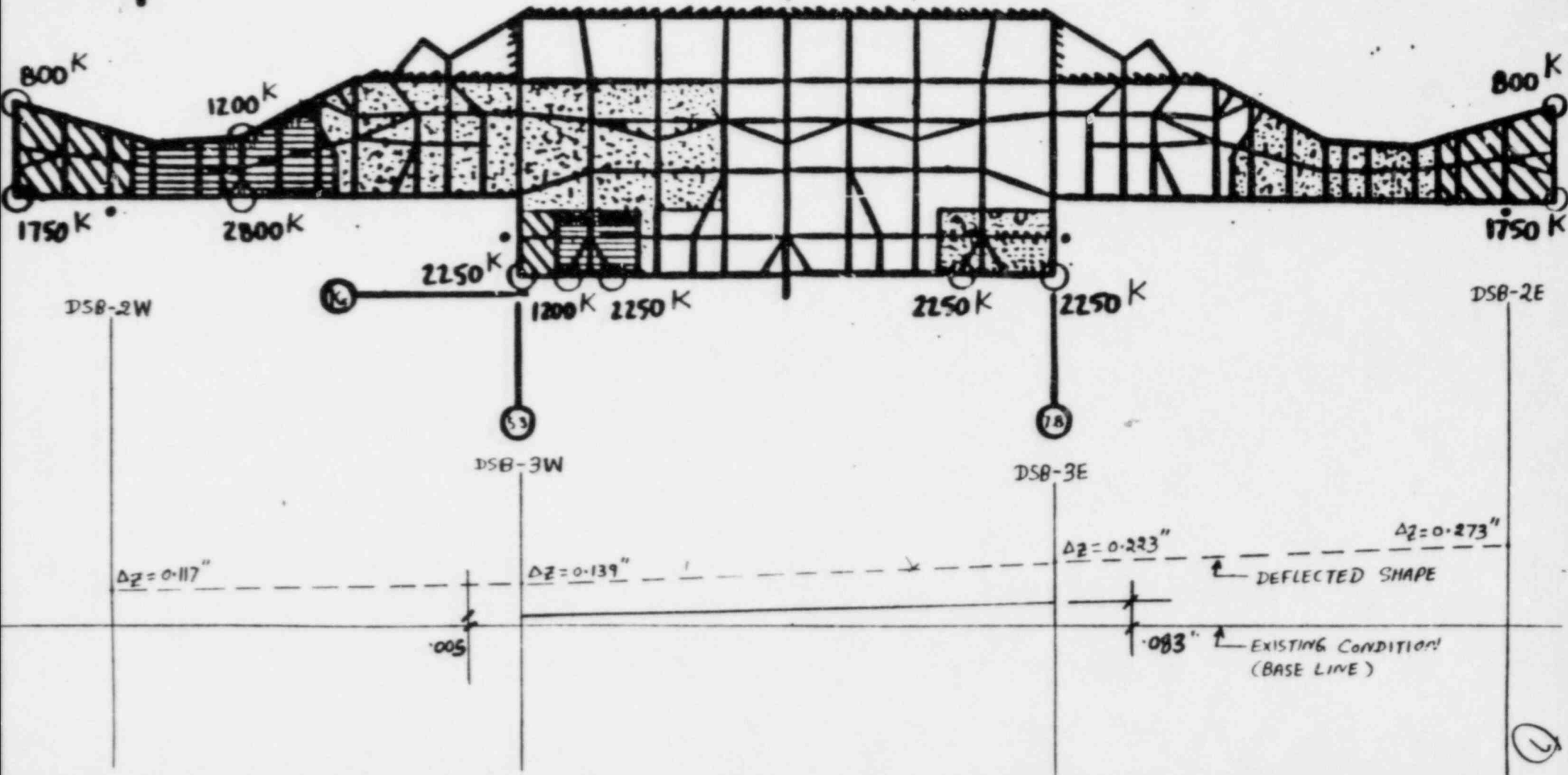
AUXILIARY BUILDING UNDERPINNING CONSTRUCTION AREA PLAN

EXCAVATION

LEGEND



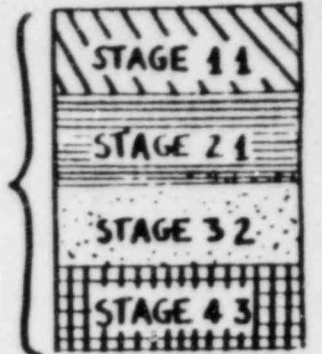
○ JACKING LOAD



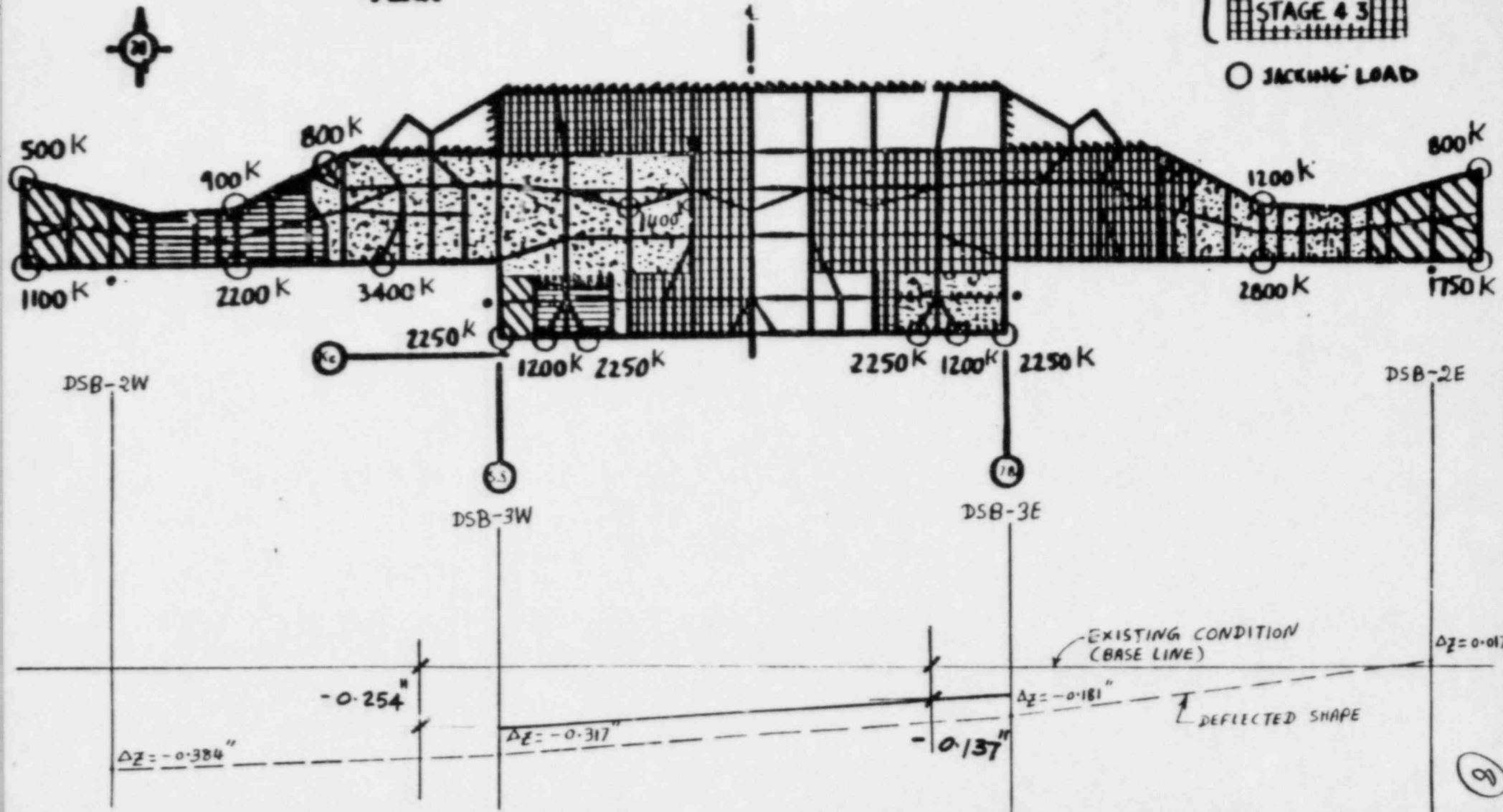
LEGEND

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION AREA PLAN

EXCAVATION



○ JACKING LOAD



Attachment #2
DESIGN BASIS

9

OBJECTIVE

- NO INTOLERABLE STRESSES OR STRAINS IMPOSED

STRATEGY

- REDUCE POTENTIALLY HIGH LEVELS OF STRESS OR STRAIN PRIOR TO REMOVAL OF ANY SIGNIFICANT PORTION OF EXISTING SUBGRADE SUPPORT

TACTICS

- USE TEMPORARY SUPPORT
- INITIAL EXCAVATION FOR TEMPORARY SUPPORT WHICH MINIMIZES DISTURBANCE TO SUBGRADE SUPPORT
- ACTIVATE EXISTING STRUCTURE STRENGTH TO REDUCE POTENTIALLY HIGH PRE-EXISTING STRESSES

CONDITIONS

- SOIL UNDER WINGS HAS INDETERMINATE AND HIGHLY VARIABLE STATE OF COMPACTNESS
- SOIL UNDER CONTROL TOWER IS IN ADEQUATE STATE COMPACTNESS
- EPA TIPS HAVE SETTLED DIFFERENTIALLY WITH RESPECT TO CONTROL TOWER
- CONTROL TOWER HAS SETTLED DIFFERENTIALLY WITH RESPECT TO MAIN AUXILLARY BUILDING

DESIGN TERMS

SPECIFIED LOAD (SL)

- THE REACTION OF THE EXISTING STRUCTURE TO BE DEVELOPED AT THE UNDERPINNING SUPPORT POINTS BASED ON TRIBUTARY LOADS FROM EXISTING STRUCTURE AT THE COMPLETION OF THE INSTALLATION OF ALL THE TEMPORARY SUPPORT (END OF PHASE 3) viz: THE LOAD ON THE UNDERPINNING AT THAT POINT IN TIME

RESERVE CAPACITY LOAD (RCL)

- THE REACTION OF THE EXISTING STRUCTURE TO BE DEVELOPED AT UNDERPINNING SUPPORT POINTS IN EXCESS OF THE SPECIFIED LOAD REQUIRED FOR
 - CALCULATED TRANSIENT TRIBUTARY LOADS FROM THE EXISTING STRUCTURE
 - RESPONDING TO UNEXPECTED TRANSIENT LOADS FROM THE EXISTING STRUCTURE ADJUSTING EXISTING REACTIONS TO REDUCE HIGH STRESSES RESULTING FROM UNEXPECTED STRUCTURE AND/OR PIER
 - ACCELERATION OF PIER AGING PROCESS AND PROOF TESTING OF PIER FOR SPECIFIED LOADS OR REVERSE CAPACITY LOADS

SPECIFIED LOAD + TRANSIENT LOAD* = PREDETERMINED LOAD*

SHEET 5 OF 9

* TRANSIENT LOAD < RESERVE CAPACITY LOAD

** SPECIFIC LOAD DETERMINED BY STRUCTURAL ANALYSIS

DESIGN TERMS

ALLOWABLE UPWARD MOVEMENT (AUM)

*relative to
start of each
jacking sequence*

- THE AMOUNT OF ABSOLUTE UPWARD STRUCTURE MOVEMENT (AT DEEP SEATED BENCH MARK NEAREST JACKING LOCATION) ALLOWED DURING A JACKING OPERATION WITHOUT EVALUATION BY RESIDENT STRUCTURAL ENGINEER

LIFT-OFF LOAD

- THE JACKING FORCE REQUIRED TO FREE THE WEDGES BETWEEN THE JACKSTAND AND THE BEARING PLATE

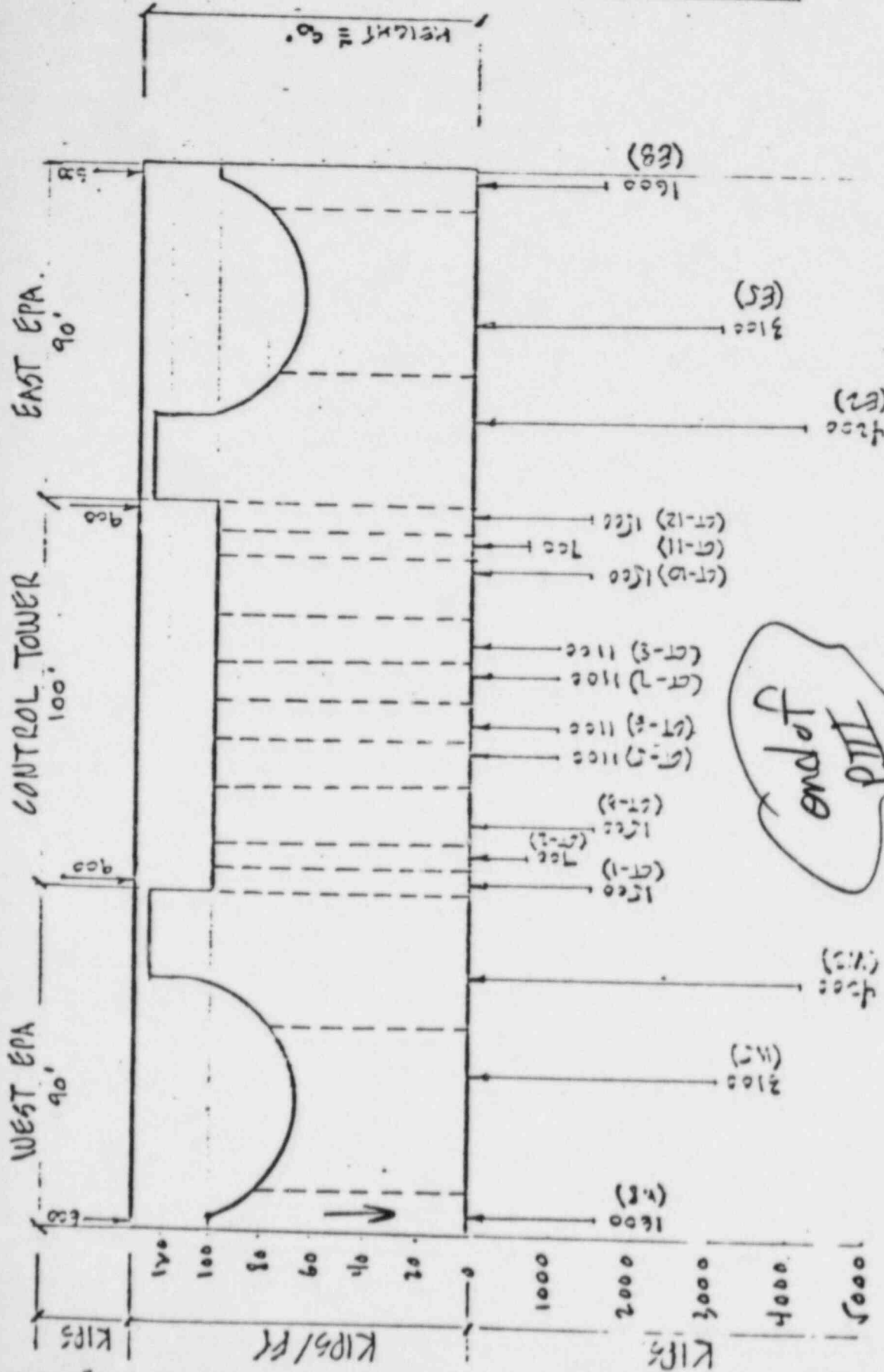
LOCK-OFF LOAD

JUST BEFORE THE JACKING FORCE AT THE TIME THE WEDGES WERE DRIVEN TIGHT.

KEY OPERATIONS

- STEP 1 Put in Specified Load (SL) at E/W 8 grillage.
- STEP 2 After installation of E/W 8 grillage and jacking, put in a portion $\frac{1}{2}$ of Reserve Capacity (RCL) at E/W 8. $\frac{1}{2}$ Based on calculations.
- STEP 3 Put in SL plus all of RCL at CT 1/12.
- STEP 4 While putting in SL $\frac{1}{2}$ RCL at E/W 5, maintain/adjust E/W to values used in STEP 2.
- STEP 5 While putting SL at E/W 2 reduce E/W 5 and 8 to SL.

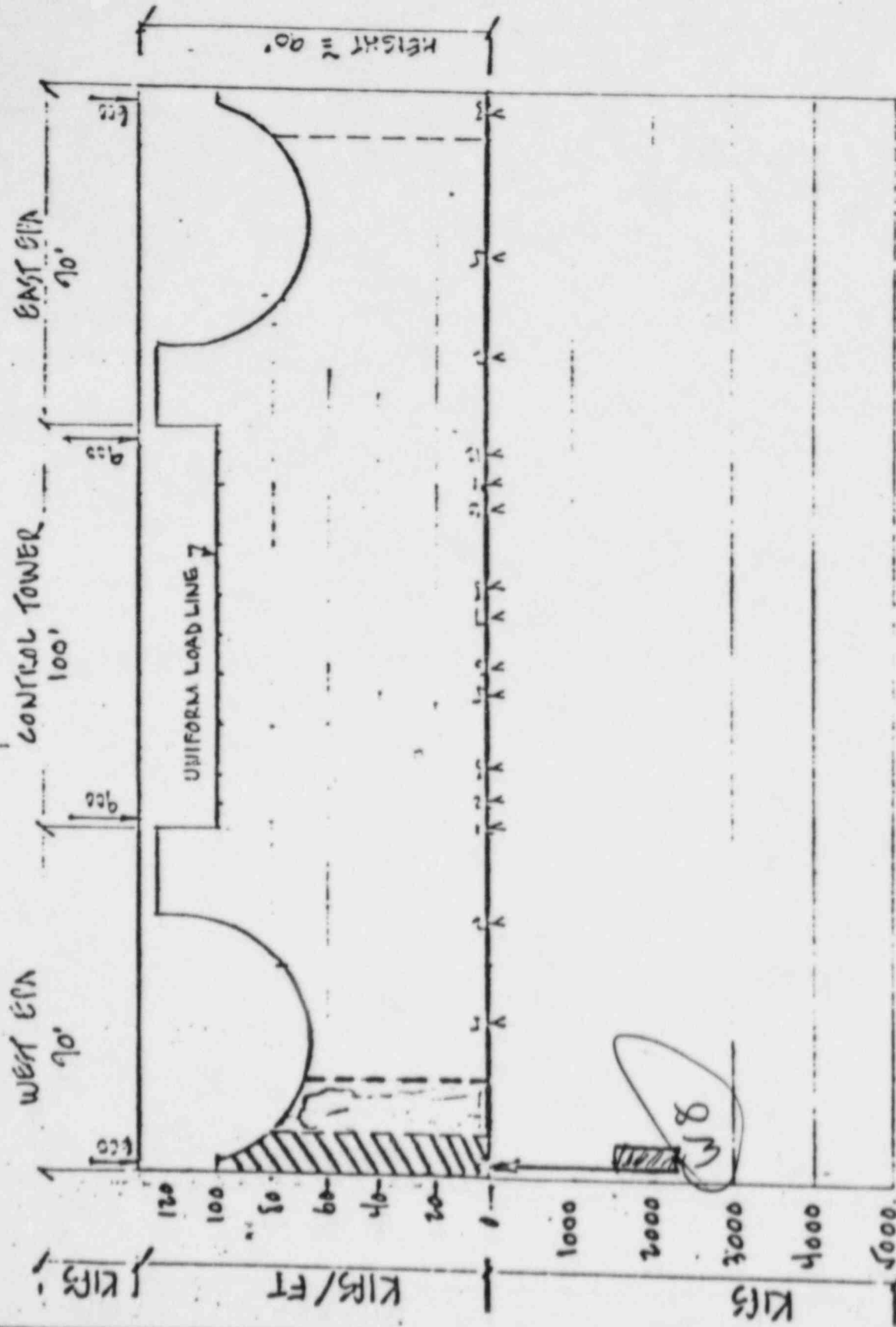
LEAD SCALES:
 $r = 2000$
 $r = 60 \sqrt{ft}$
 DISTANCE SCALE $r = 40 - 0$



PRIMARY LOADS / REACTIONS / TRIBUTARY ZONES - END PHASE III



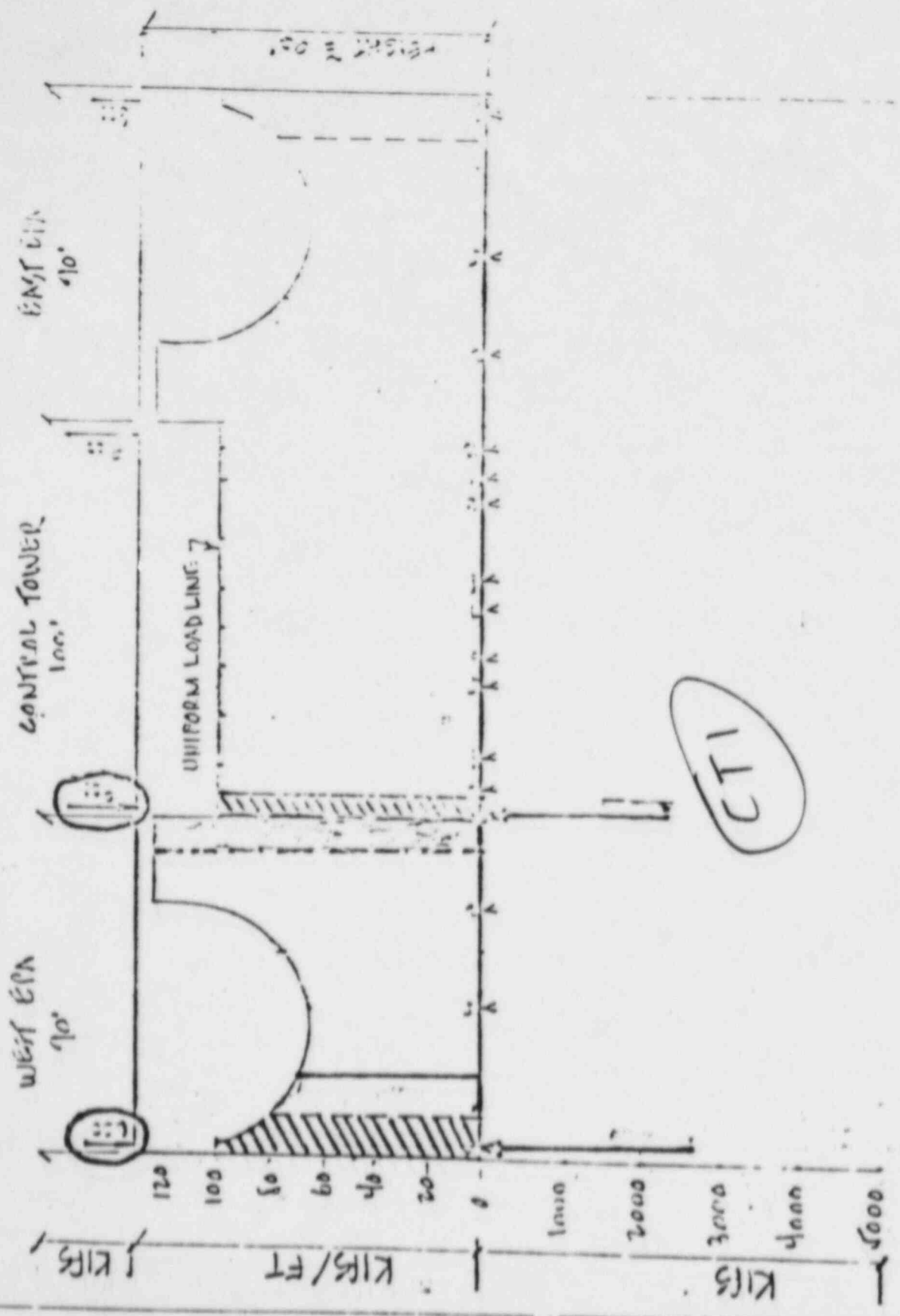
LOAD SCALE
 1" = 2000 K
 1" = 60 K/FT
 1" = 10' - 0"



▨ TRIBUTARY ZONE AT END OF PHASE III

▨ PRIMARY LOADS/ REACTIONS/ TRIBUTARY ZONES - STEP I - PHASE III

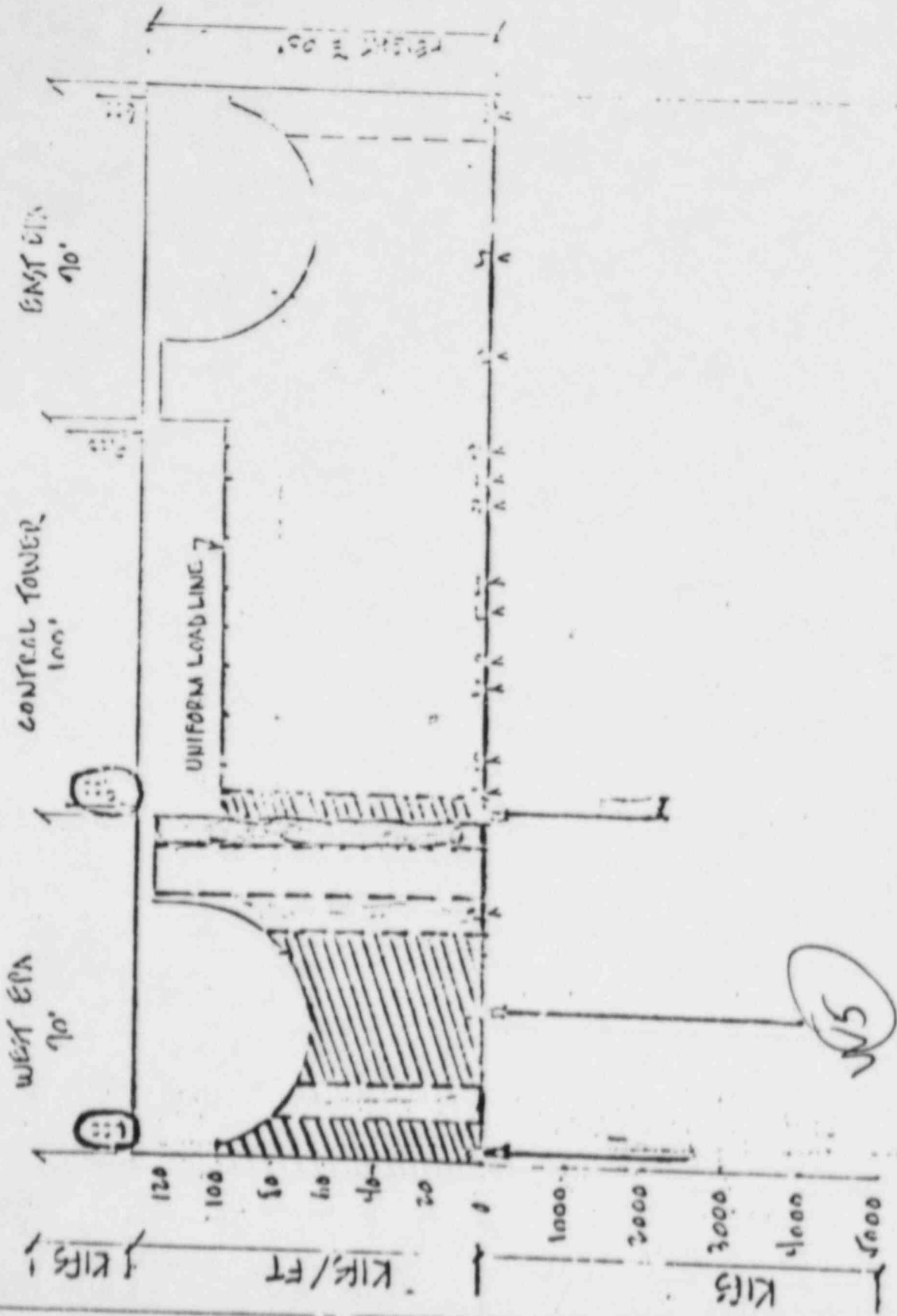
DATE: 11/13/67
BY: [illegible]



▨ TRIBUTARY ZONE AT END OF PHASE III

PRIMARY LOADS/REACTIONS/ TRIBUTARY ZONES - STEP PHASE III

DATE: 5-10-68
BY: [unclear]
CHECKED: [unclear]
APPROVED: [unclear]



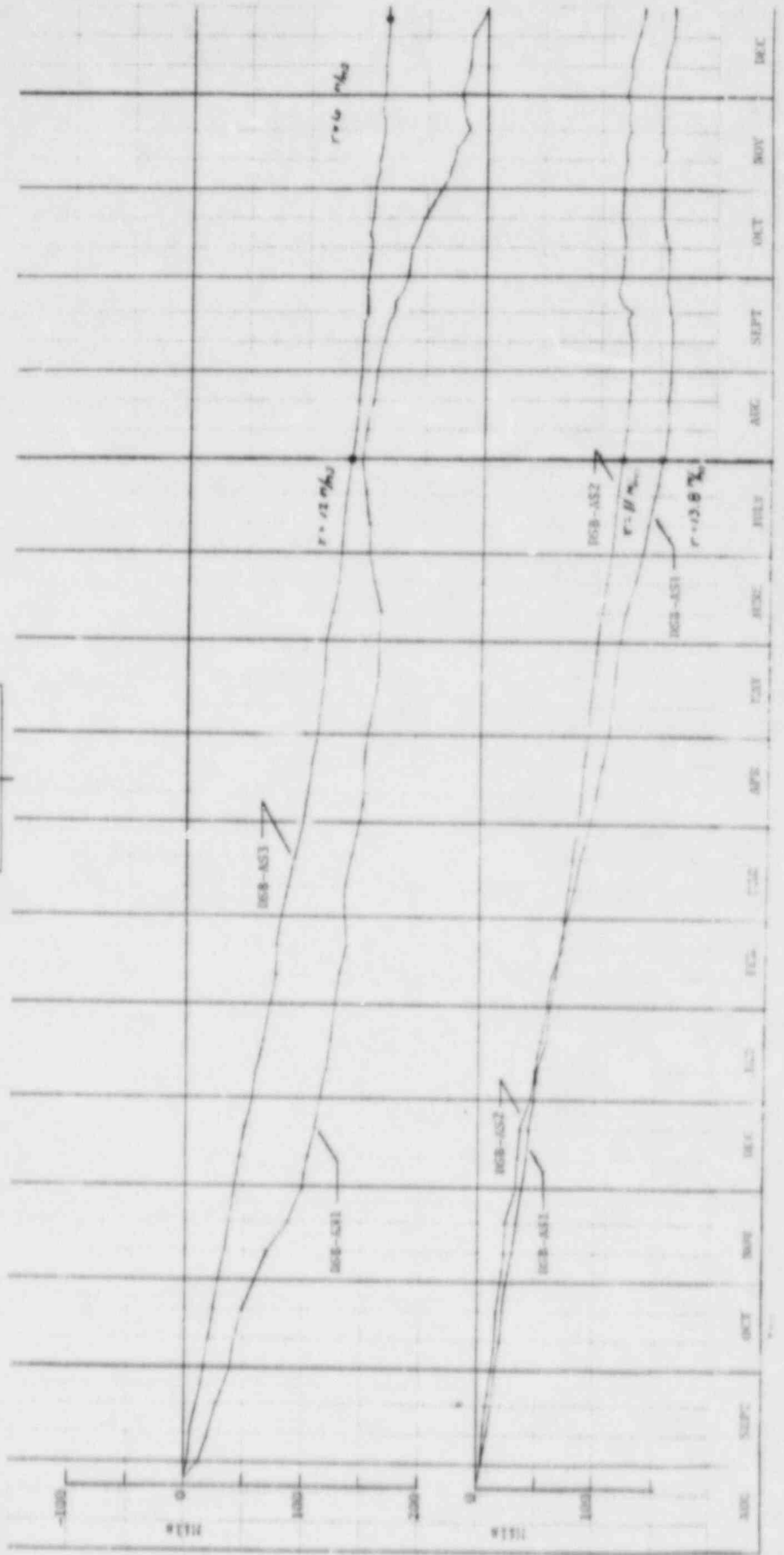
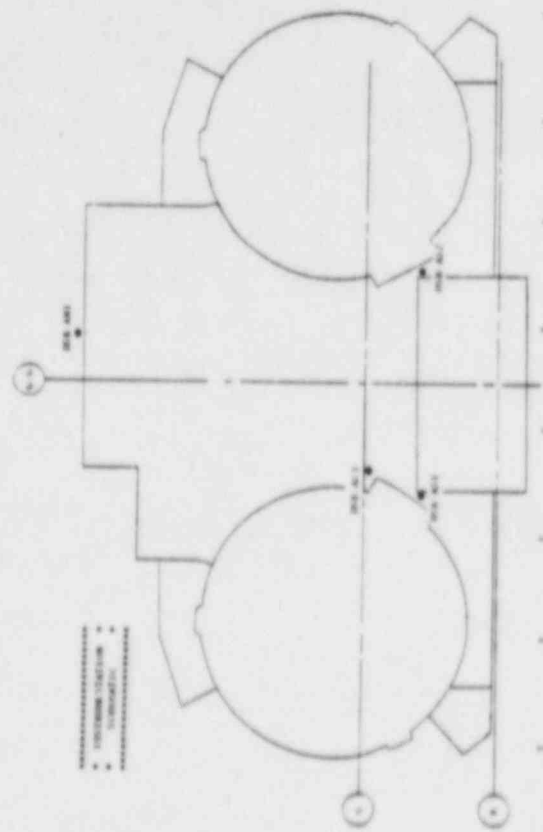
 PRIMARY LOADS/REACTIONS/ TRIBUTARY ZONE - STEP 5 - PLATE III
 TRIBUTARY ZONE AT END OF PILING III

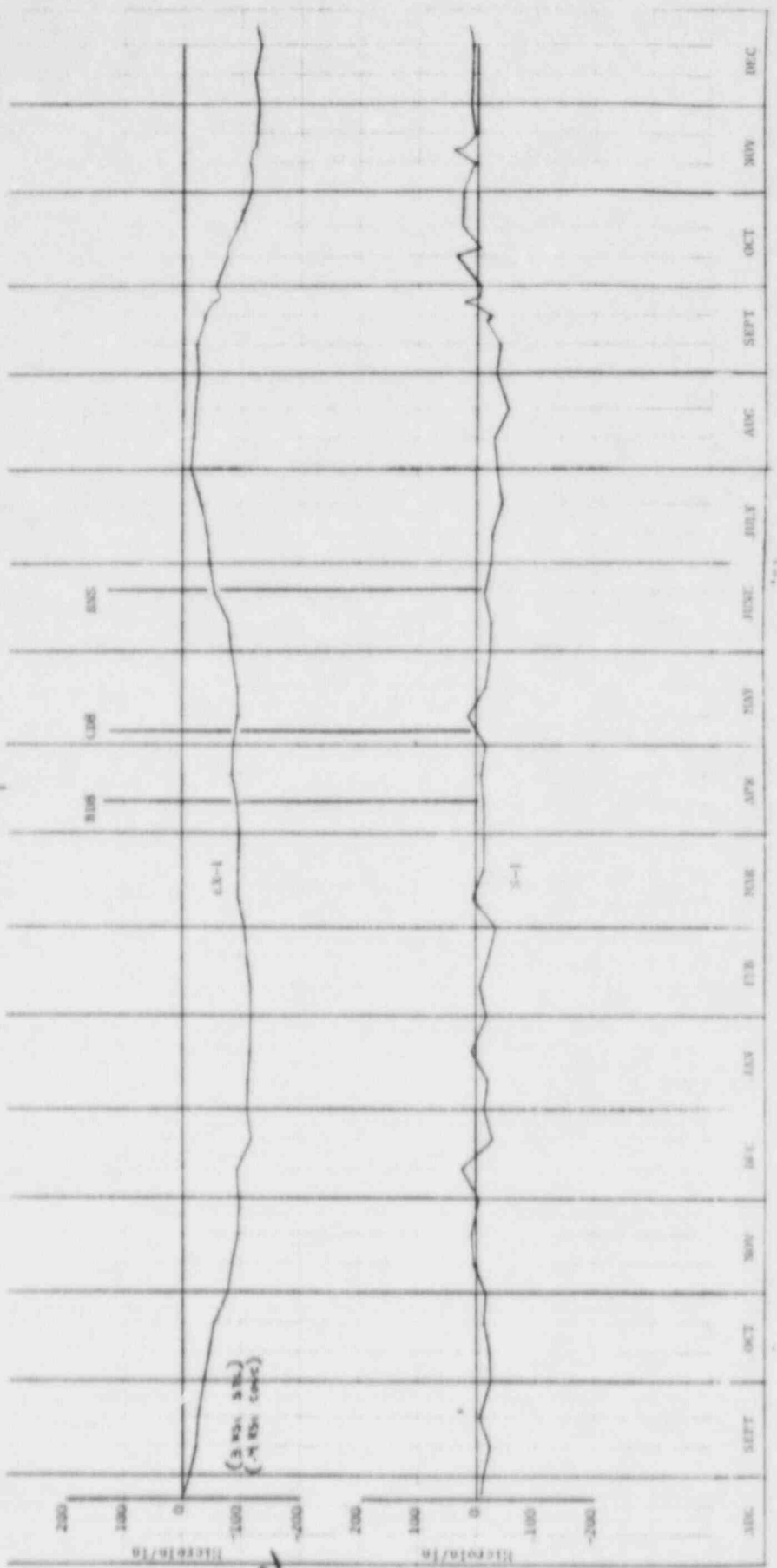
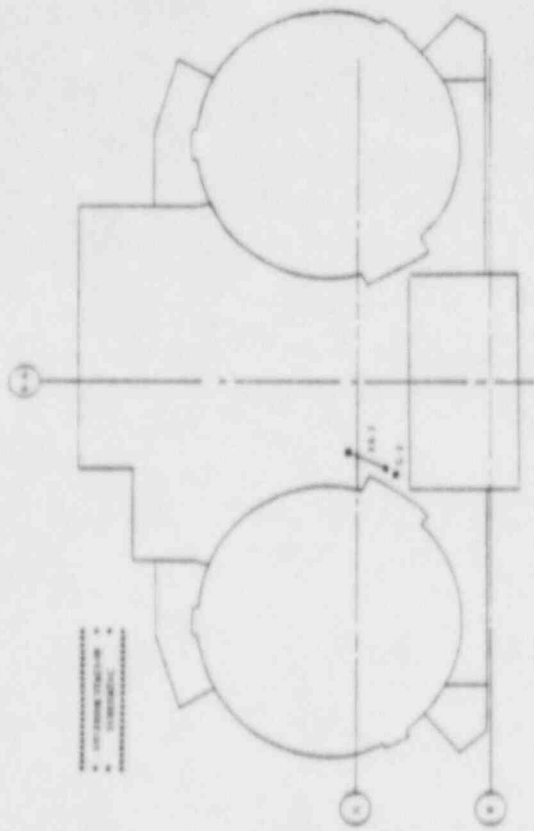
 PRIMARY LOADS/REACTIONS/ TRIBUTARY ZONE - STEP 5 - PLATE III

Attachment #3

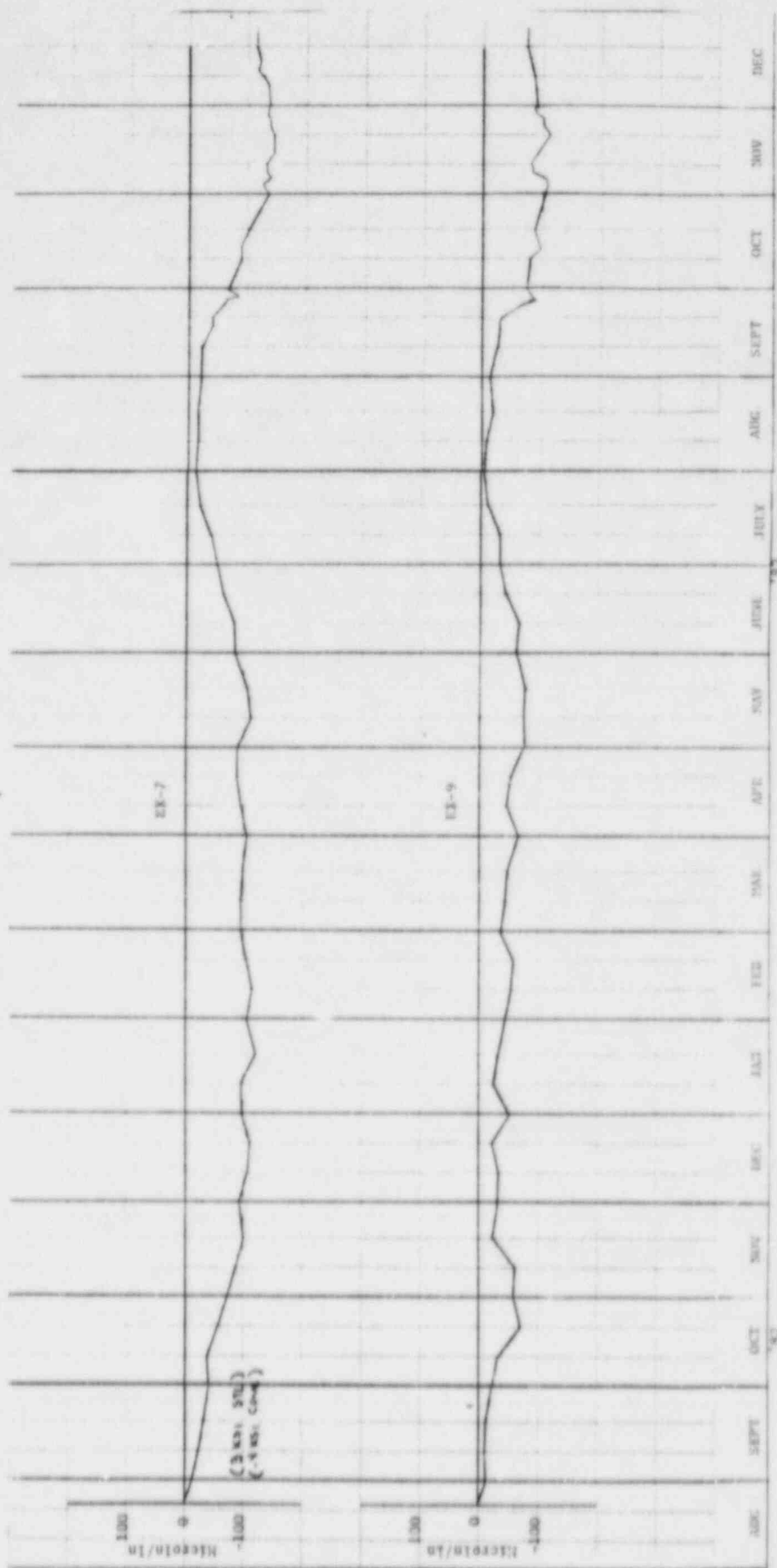
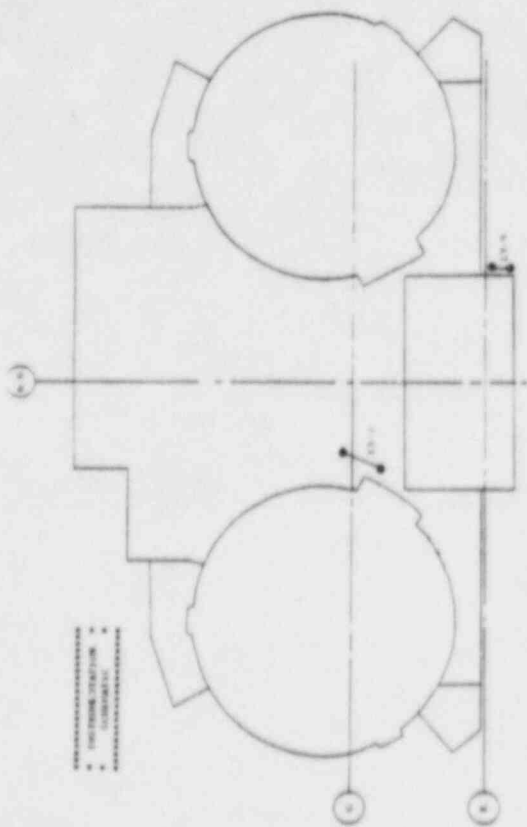
4/4/84

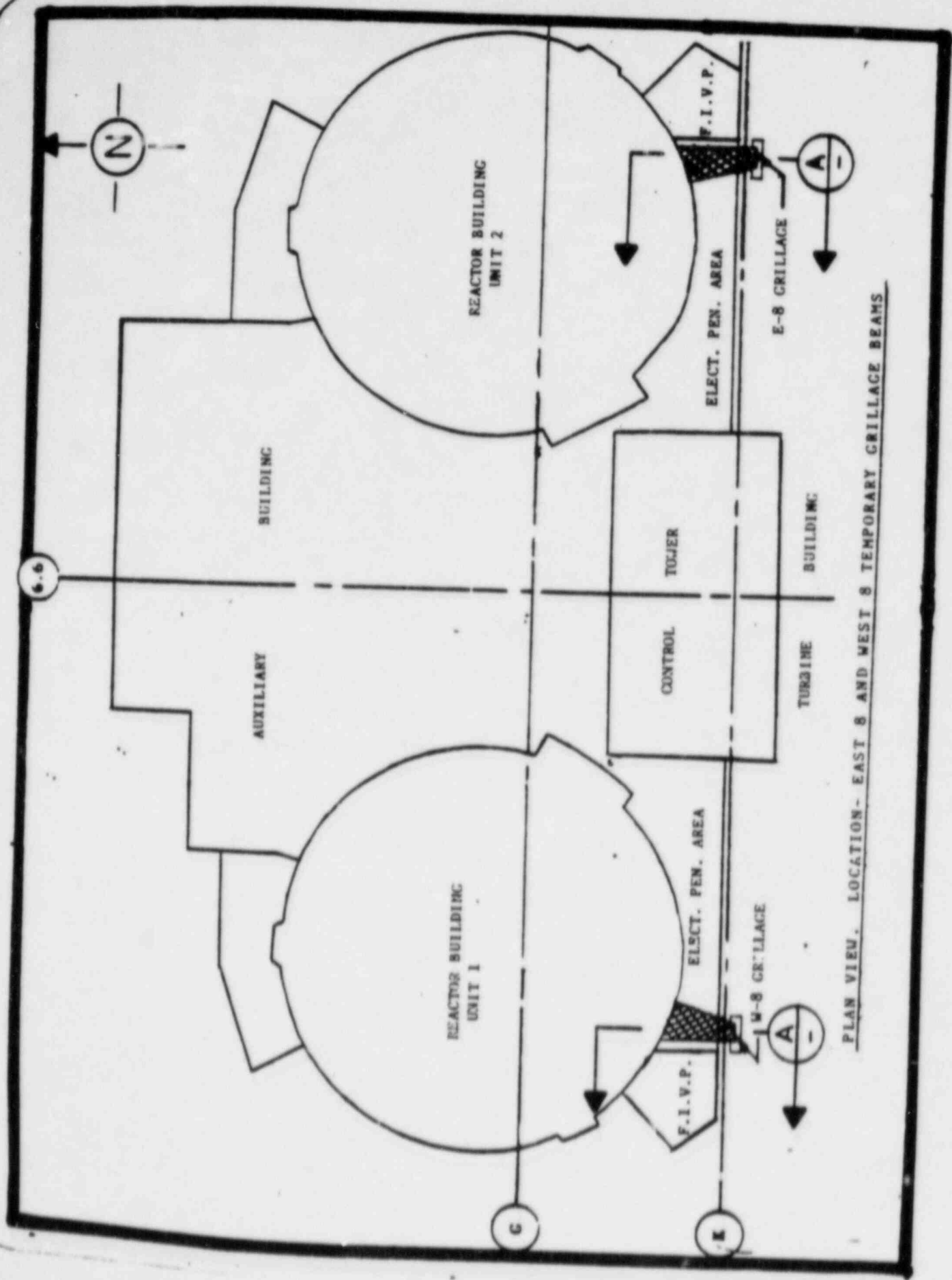
10



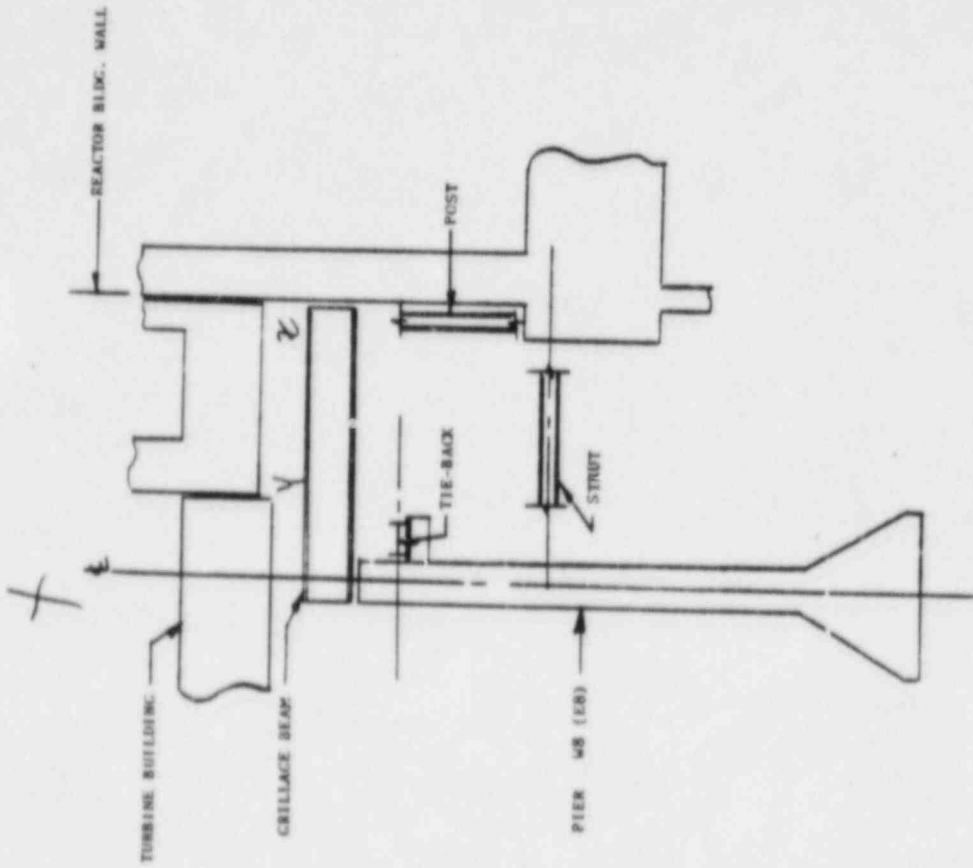


Compressive

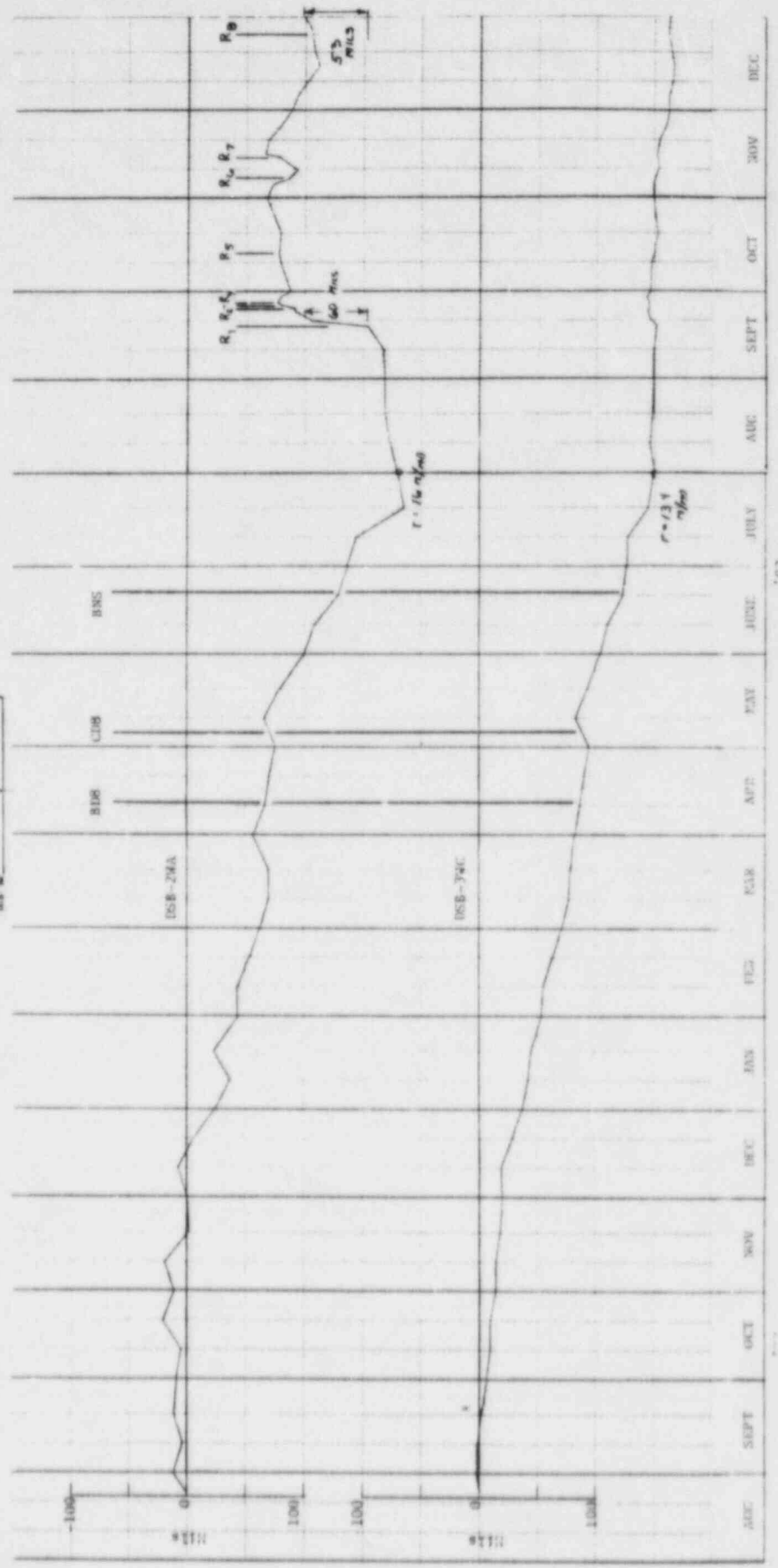
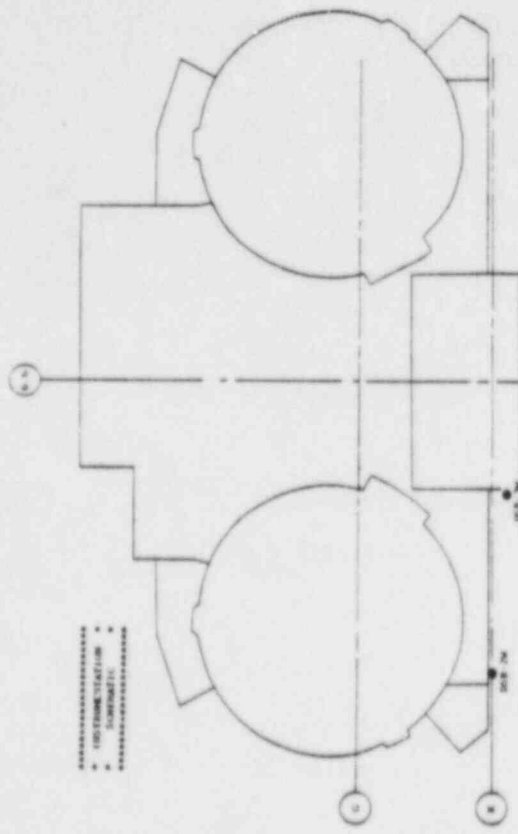




PLAN VIEW. LOCATION - EAST 8 AND WEST 8 TEMPORARY GRILLAGE BEAMS



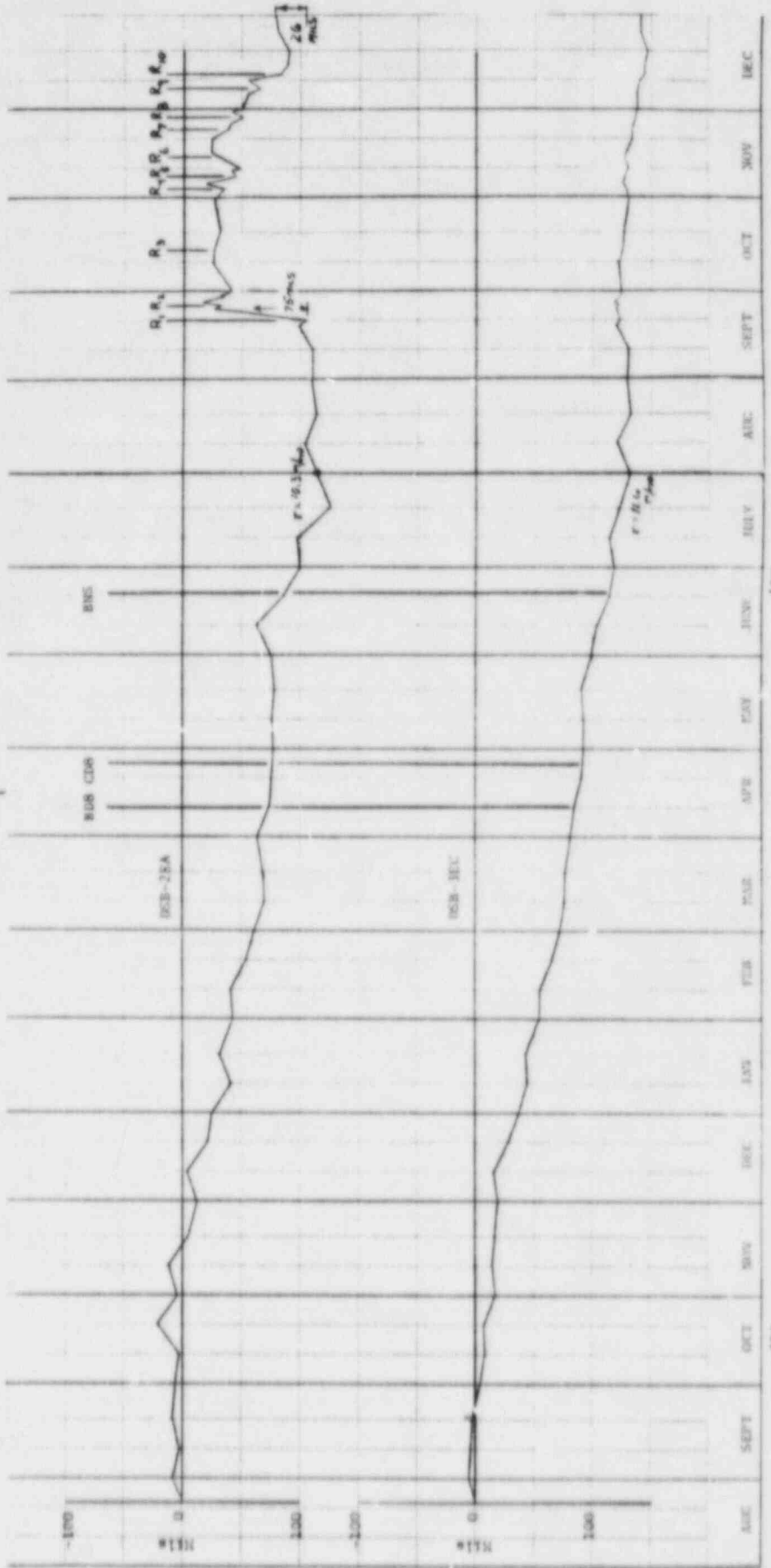
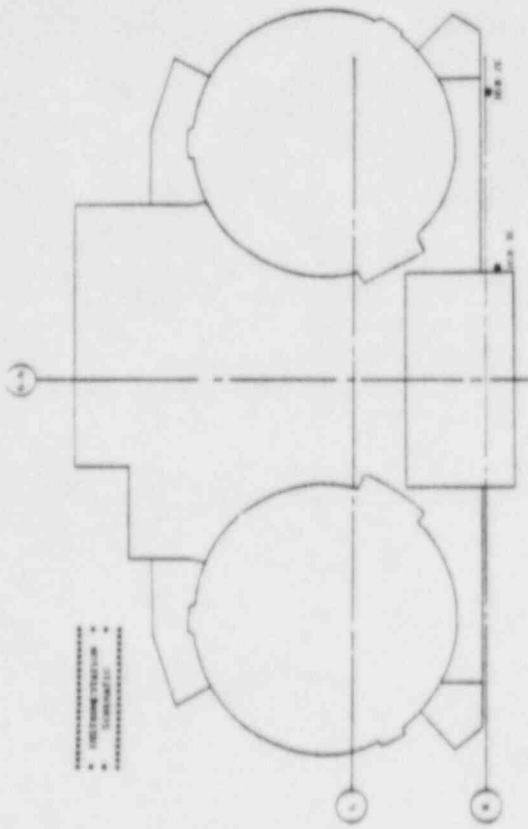
SECTION A



JACKING HISTORY
 USSF - 7
 GRILLAGE

GRILLAGE 8
 JACK LOCATIONS
 X--TURB. BLDG SLAB
 Y--SOUTH EPA
 Z--NORTH EPA

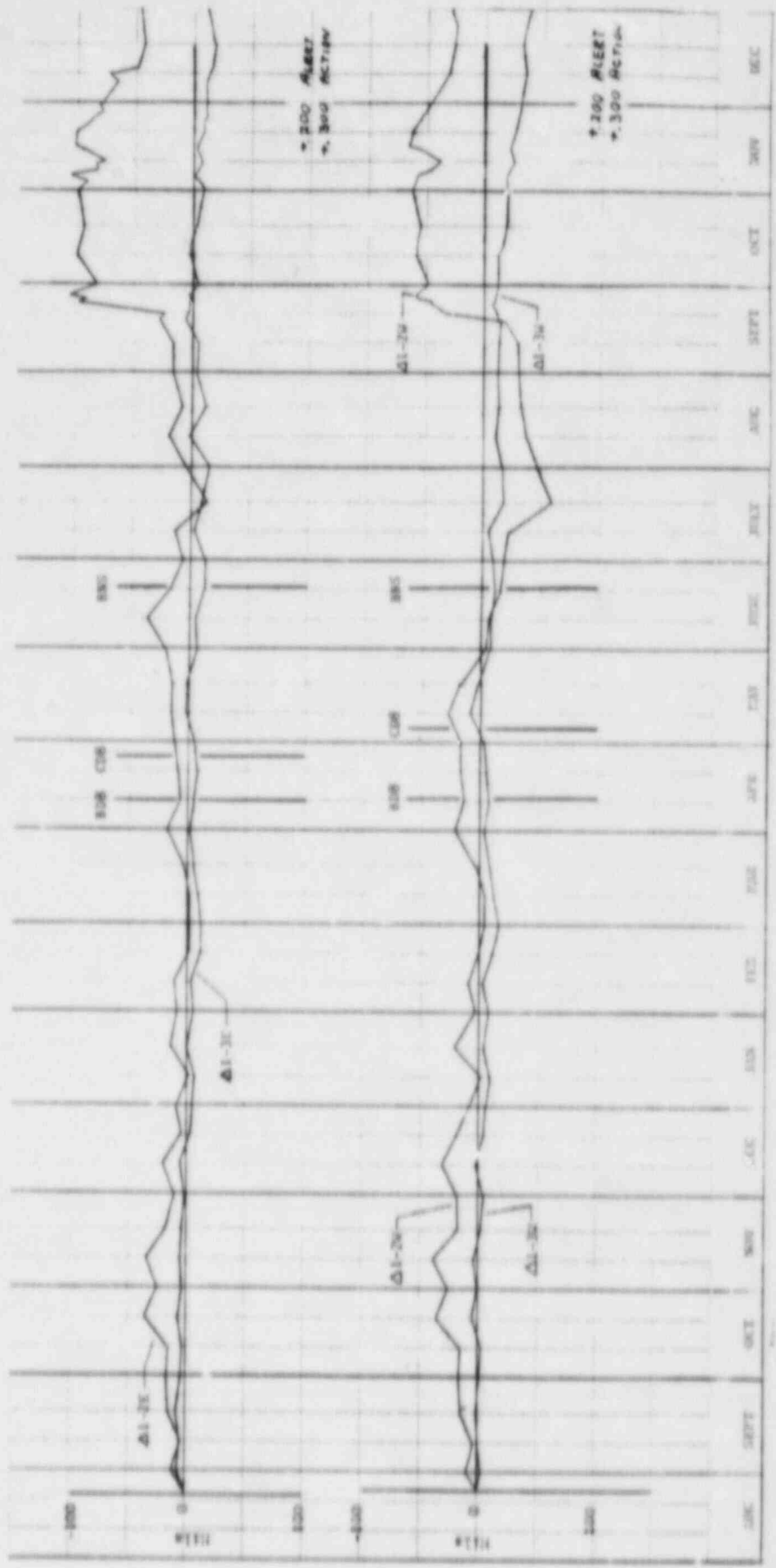
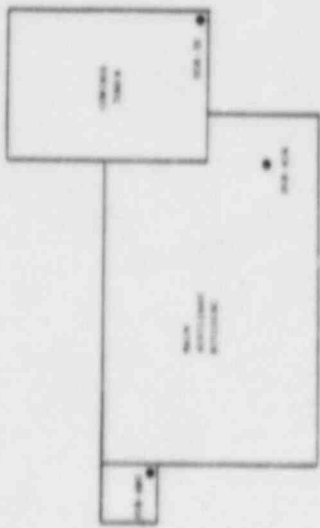
ACT. I.D. NO.	ACTIVITY	DATE INITIATED	DATE LOCKED-OFF	CAUSE	LIFT-OFF (%SL)			HOLD (%SL)			LOCK-OFF (%SL)		
					X	Y	Z	X	Y	Z	X	Y	Z
W-R ₁	Initial jacking of W-8 grillage	9-19-83	9-23-83	-----	89.5	--	--	89.5	--	--	89.5	125	125
W-R ₂	First day re-jacking	9-24-83	9-24-83	Rout ine re-jacking	101.4	125	125	101.4	125	125	101.4	125	125
W-R ₃	Second day re-jacking	9-25-83	9-25-83	Rout ine re-jacking	112	125	125	112	125	125	112	125	125
W-R ₄	Third day re-jacking	9-26-83	9-26-83	Rout ine re-jacking	125	125	125	115	125	125	115	125	125
W-R ₅	Maintain bldg. elevation	10-13-83	10-13-83	Strain gages not within +20% of lock-off	109.4	125.6	120.4	109.4	124.6	125	109.4	124.6	125
W-R ₆	Maintain bldg. elevation	11-7-83	11-9-83	10 mils/43 hrs.	113.3	134.8	134.1	113.3	125.0	125.0	113.3	125	125
W-R ₇	Maintain bldg. elevation	11-14-83	11-15-83	Strain gages not within +20% of lock-off	128	118.4	116.6	110	125	125	110	125	125
W-R ₈	Maintain bldg. elevation	12-26-83	12-26-83	Strain gages not within +20% of lock-off	85.6	136.8	120.4	110	125	120.4	110	125	120.4

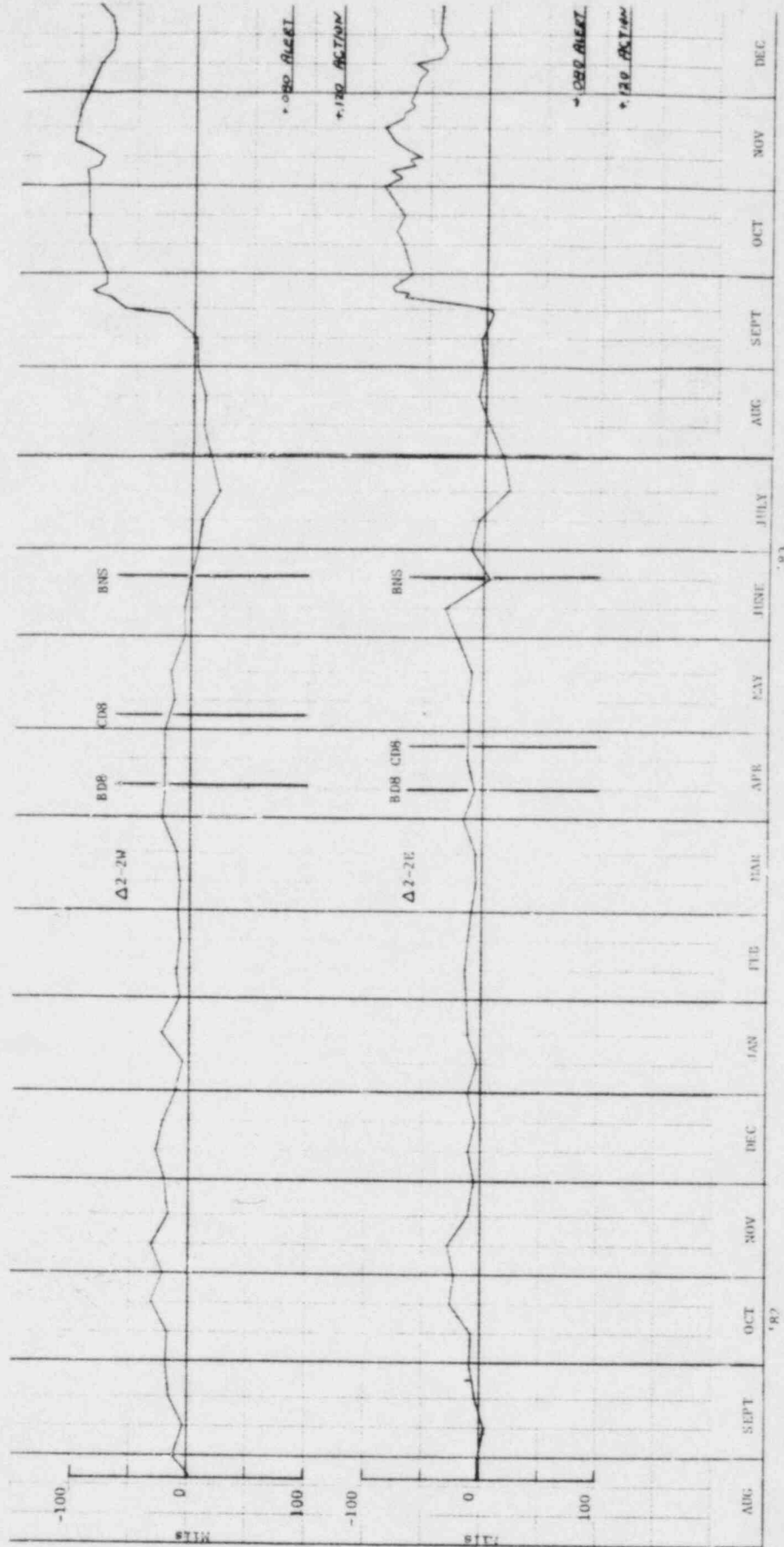


JACKING HISTORY
EAST - 8
GRILLAGE

GRILLAGE 8
JACK LOCATIONS
X--TURB. BLDG SLAB
Y--SOUTH EPA
Z--NORTH EPA

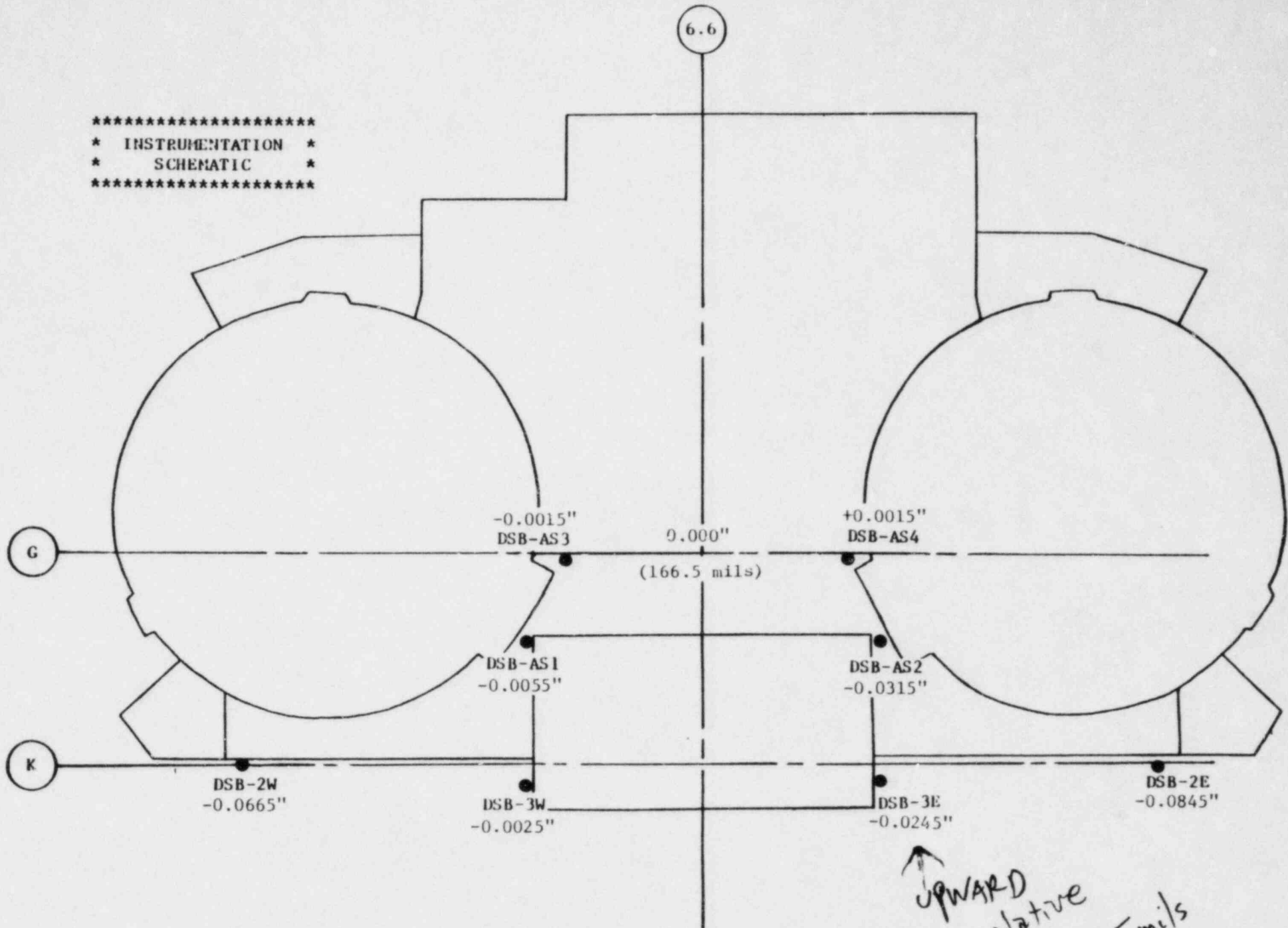
ACT. I.D. NO.	ACTIVITY	DATE INITIATED	DATE LOCKED-OFF	CAUSE	LIFT-OFF (%SL)			HOLD (%SL)			LOCK-OFF (%SL)		
					X	Y	Z	X	Y	Z	X	Y	Z
E-R ₁	Initial jacking of E-8 grillage	9-20-83	9-24-83	-----	107.5	--	--	--	--	--	107.5	125	125
E-R ₂	Maintain bldg. elevation	9-25-83	9-27-83	11 mils/24hr@ EPA; 14 mils/24 hrs. @ T.B.	126	130.6	130.6	115	130.6	130.6	115	130.6	130.6
E-R ₃	Maintain bldg. elevation	10-14-83	10-14-83	Strain gages not within ±20% of lock-off	116.7	123.2	124.7	115	123.2	124.7	115	123.2	124.7
E-R ₄	Maintain bldg. elevation	11-3-83	11-5-83	10 mils/48hrs.	128.7	127.3	132.6	110	125	125	110	125	125
E-R ₅	Maintain bldg. elevation	11-7-83	11-9-83	10 mils/48 hrs.	131.3	133.5	146.4	110	125	125	110	125	125
E-R ₆	Maintain bldg. elevation	11-14-83	11-14-83	Strain gages not within ±20% of lock-off	134	119.1	136.6	110	125	125	110	125	125
E-R ₇	Maintain bldg. elevation	11-23-83	11-25-83	10 mils/48 hrs.	126.0	141.7	146.4	110	125	125	110	125	125
E-R ₈	Maintain bldg. elevation	11-27-83	11-29-83	16 mils/48 hrs.	136.6	141.7	150.3	115	141.7	149	115	135	135
E-R ₉	Maintain bldg. elevation	12-7-83	12-10-83	11 mils/48 hrs.	141.9	152.1	162.2	115	152.1	160.0	115	135	135
E-R ₁₀	Maintain bldg. elevation	12-12-83	12-15-83	11 mils/48 hrs.	144.6	158.3	158.2	115	158.3	151.0	115	135	135





6.6

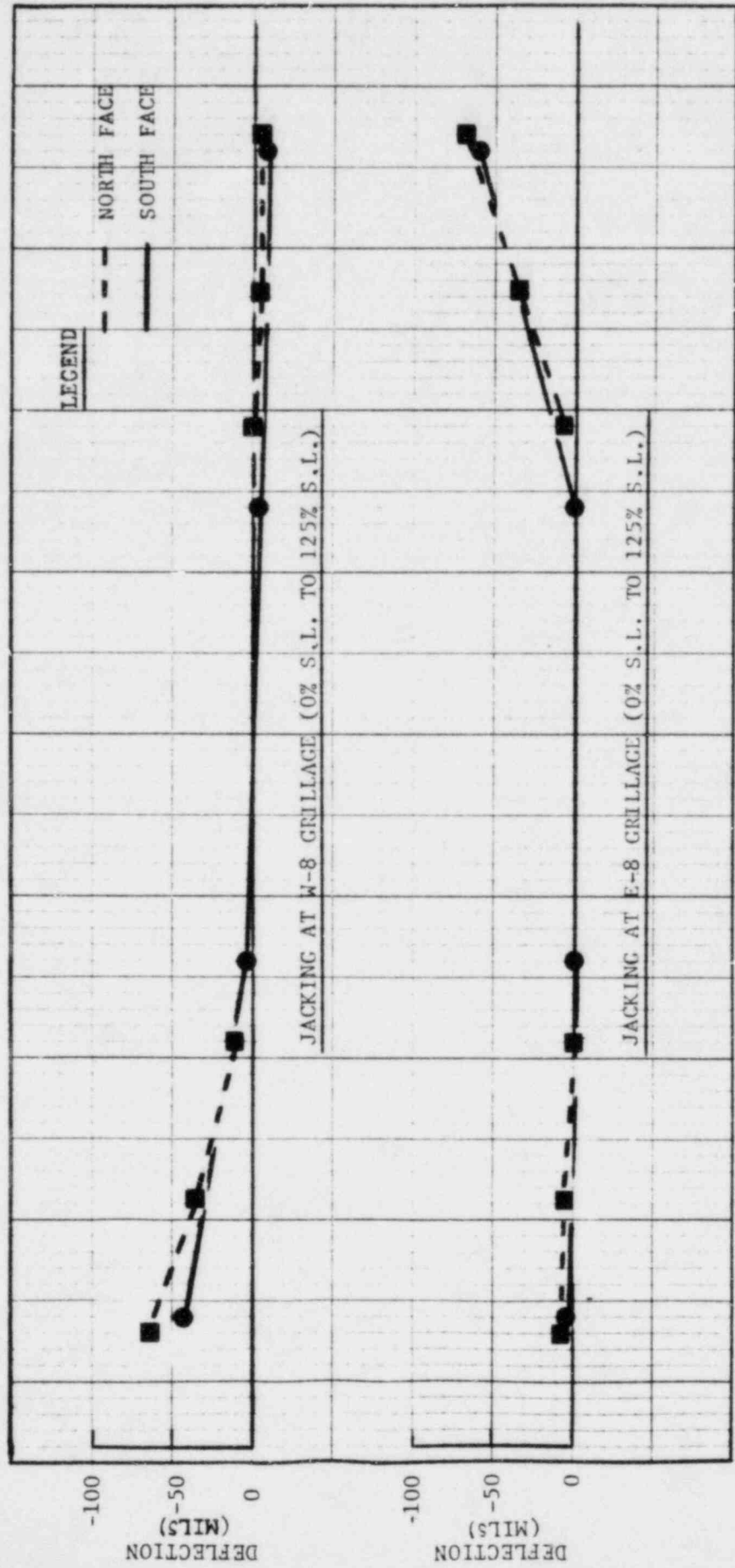
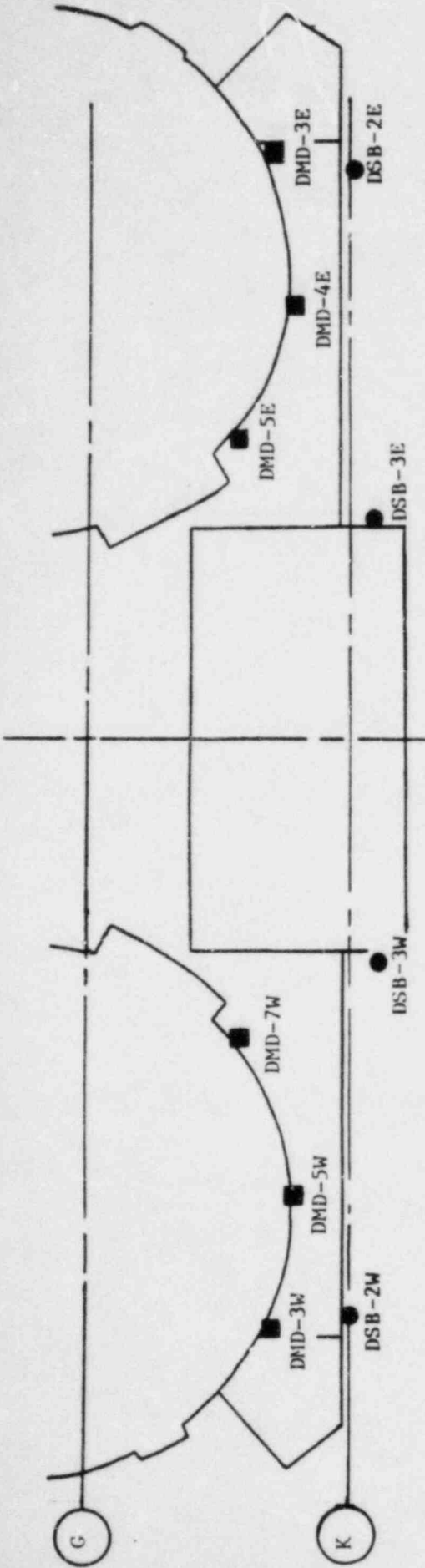
* INSTRUMENTATION *
* SCHEMATIC *



DECEMBER 30, 1983

(Baseline of August 23, 1982)

↑
UPWARD
relative
to 166.5 mils



CHANGES IN ELEVATION DURING JACKING

Attachment #4

CRACK MAPPING

1-4-84

(11)

We are presently monitoring approximately 1000 cracks in the Auxiliary Building south of Col. Line G. To date we have completed three full crack mappings. The baseline was completed 9/14/82. The next mapping was performed after the undermining of the EPA's and was completed 8/2/83. The third mapping was performed after the initial jacking of the Electrical Penetration Areas and was completed on 10/22/83. On 11/28/83, the Resident Structural Engineering group requested WJE to remeasure specific cracks after we had experienced the elevated lift-off loads on the East side. The cracks were chosen because they were the cracks which were reported to have changed in the previous mappings. A fourth full mapping requested by Resident Engineering is in progress. To date the East EPA was completed from 12/20/83 through 12/28/83. The remaining sections are scheduled for completion by 2/17/84.

Initial Jacking

Evaluation of the mappings performed immediately after initial jacking had shown that 23 cracks had changes in width and 21 new cracks were reported. The width changes which had occurred were 0.005 inches or less except for two cases. In both cases the reported changes were in floor slabs. After a field review, it was determined that the changes were attributable to fluctuations in measurements.

The observed changes in crack patterns and widths, were in general, consistent with previous patterns that indicate volume change movements. The width changes are within the estimated tolerance limits of 0.005 inches. All crack widths were below the alert limits.

GRILLAGE 8 REJACKING

After we had experienced elevated lift off loads when rejackng the grillages, we requested WJE to check the width of cracks which had been reported to have changed during initial jacking. Evaluation of this data indicated that all measured crack width changes were within the estimated tolerance of 0.005 inches.

CONCLUSION EAST EPA MAPPING COMPLETED 12/28/83

There are approximately 400 cracks which are monitored in the East EPA. The most recent crack mapping (completed 12/28/83) has shown that 18 of these cracks changed in width, 27 cracks increased in length and 11 new cracks were found, when compared to previous mapping.

All of the 18 cracks which changed in width, increased or decreased by 0.005 inches or less. These small changes can be attributable to variations in measurement. The length increases were approximately 1'-0" or less except for two cracks which increased by approximately 2'-0" and 3'-0". Only 3 of the 27 cracks which increased in length also increased in width.

Only two of the newly identified cracks were at the alert level of .010 inches. After further checking, it was determined that these cracks were present prior to this mapping. These cracks were identified on a previous report by Construction Technology Labs.

The observed crack changes which occurred were within the measurement tolerance. The crack changes do not indicate any structural distress in the slabs and walls of the East EPA due to jacking at East 8 Grillage.

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
CRACK MAPPING					
INITIAL GRILLAGE JACKING	EAST WEST				
GRILLAGE RE-JACKING	EAST WEST				
X JACKS	110% S.L.				
Y JACKS	125% S.L.				
Z JACKS	125% S.L.				

SUMMARY OF CRACK CHANGES FOR
INITIAL JACKING AT E/W & GRILLAGE

DESCRIPTION	NEW	INCREASED	DECREASED
Total number of cracks.	21	10	13
Number of cracks greater than 0.005" change.	0	1	1

As shown above, relatively few cracks were observed to have changed in width during the introduction of the initial jacking loads for the Grillages. Of the reported twenty-one (21) new cracks after initial jacking, eight (8) were determined to have existed before start of underpinning based on subsequent inspection.

SUMMARY OF SELECTED CRACK CHANGES FOR REJACKING AT
E/W 8 GRILLAGE

	INCREASED	DECREASED
Total number of crack changes.	6	7
Number of cracks greater than 0.005" change.	1	0

SUMMARY OF CRACK CHANGES FOR EAST EPA

	<u>NEW</u>	<u>INCREASED</u>	<u>DECREASED</u>	<u>ELONGATED</u>
Total No. of Cracks	11	9	9	28
No. of Cracks with Width Changes > 5 Mils	2*	0	0	0
% of Crack Width Changes > 5 Mils	18%	0	0	0
No. of Cracks which Elongated & Increased in Width	N/A	N/A	N/A	3
% of Cracks which Elongated and Increased in Width	N/A	N/A	N/A	11%

*Two new cracks were identified as alect level cracks on the N.F. of wall @ Col. Line K between Col. Lines 8.6 & 9.1 (area 191). These two cracks were identified on a CTL Report prior to baselining of cracks for the Auxiliar, Building. The two cracks are therefore not new cracks but existing cracks which were not identified during crack baselining.

Thursday

①

~~① crack report~~

④ structural drawings

① calcs

② cracks, new ways to measure

③ new crack → to early

⑤ before Aug 02, settlements
✓ of EPA, control tower,
etc.
passout ⑥

John crack monitoring system

passout ①

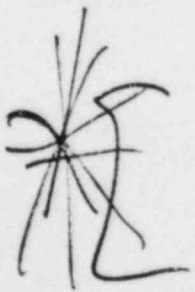
passout ②

passout ③, ④, ⑤

Questions

① Ans. methods of crack measurement

No need to look at them
any more actually than we are.



They are not mapping whole building.
only critical areas?]

that's why the 685 crack was missed.
maybe computer run assuming rigid body is
not so accurate

(Ans.) frequency of crack mapping
as addressed in spec of Johns passout
as a matter of fact, they were
thinking of decreasing frequency

Benzi

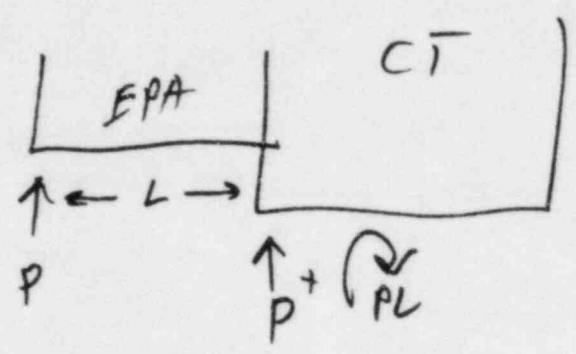
calculation of movement vs loads
passout ①

$12590 \rightarrow 2000^k = \Delta_2$ of 105 mils / 85 mils

how does this compare to calculation

It doesn't, cal say $\frac{132}{2} = 66$ mils

Ans. Upward Limits of Δ_1 & Δ_2
Passout (8)



Attachment #5

①

I Current State of Crack Mapping as of December 28, 1983

Wiss, Janney, Elstner (WJE) personnel have been monitoring crack locations, patterns and widths since August of 1982. To date they have completed three mappings and they are presently performing the fourth.

WJE procedures presently require the mapping to be performed by an originating technician with a second technician performing a check of the mapping in the field. The whole process is overviewed by a Lead Engineer.

The building is broken into smaller units and assigned area numbers by WJE. Mappings of the areas are documented on standard forms. Mappings from several areas are combined to form a submittal which is given to Resident Engineering. The submittal is reviewed by Resident Engineering and then released through Document Control.

As of December 28, 1983, WJE had documented 990 cracks in the EPA and Control Tower Areas. The range of crack widths varied from approximately 3 mils up to 25 mils.

The maximum crack width was .025 inches. WJE had identified 3 cracks of this width which were located in floor slabs.

Table I shows the breakdown of the measurements for the Control Tower and EPA areas.

Mean Crack Width .0042 inches

Standard Deviation .0034 inches

It is our estimation that the accuracy at measurement is approximately .005 inches.

Listed in Attachment A are required crack mappings. There are twenty-one events which require crack mapping. Also listed is the option of Resident Engineering to request a mapping at any time. This would be based on our evaluation of a building movement indicated by instrumentation data. The requested mappings may be of a localized area or may be for the entire area based on our expected behavior of the structure.

Method of Monitoring and Evaluation

As an example of a portion monitoring and evaluation process, the following data from the grillage at W/8 is presented.

Before we started jacking, a discussion was held between B. Dhar, Vish Verma of Ann Arbor and John Darby. In that discussion they gave Resident Engineering deflection values that could be expected during the jacking. In addition, they outline the criteria we should use in evaluating the structural response to the jacking loads. This information is given in REM-S-1115 (Attachment B).

These criteria were then included on the forms that the residents use for monitoring during the jacking operation. Copies of the actual records for the grillage W/8 jacking are given in Attachment C. This shows that we monitor the jacked structure, adjacent structures, and the grillage/pier system at least twice during each load increment. This information was evaluated when received and we did not proceed with jacking until we were satisfied with the behavior the building is exhibiting. If we had any doubts or questions, the situation was investigated and/or discussed with Project Engineering, FSO and Mergentime personnel until we were satisfied.

In addition, to the intensive review of the data during the jacking operation Resident Engineering receives readings from the instrumentation system every four hours. This data is reviewed by Resident Engineering when received. We are staffed to support this twenty-four hours a day. During our reviews we look for any changes occurring which appear to be out of the ordinary.

We maintain plots of selected instrumentation data. These plots are updated and reviewed daily in order to identify trends that the buildings may be exhibiting or any identifiable reaction that could be related to construction events.

Finally an evaluation is performed by Resident Engineering of the crack mappings after the mappings have been reviewed and released. During this process we identify the changes that had occurred from the previous mapping, the crack location and respective change is then placed on a sketch of the building (see Attachment D). The changes are reviewed for any

Not during actual jacking

distinguishable patterns. The data is tabulated and field reviews are performed if it is judged necessary to evaluate the change further. This information is then forwarded to our consultants for their review.

At times we may see a change in a single submittal that warrants discussion with our consultants. A complete report is not necessarily written by Resident Engineering. The information is forwarded to our consultant and the situation discussed. These discussions are documented in our daily reports.

CRACK SUMMARY FOR CONTROL TOWER AND EAST & WEST EPA'S

TABLE I

CRACK WIDTH, IN.	(0.0025) HL	.005	.0075	.010	.0125	.015	.0175	.020	.025	.030	TOTAL CRACKS
TOTAL NO. OF CRACKS WITH INDICATED WIDTH	602	150	30	72	3	17	1	8	3	0	886
% OF TOTAL NO. OF CRACKS	67.9	16.9	3.4	8.1	0.3	1.9	0.1	0.9	0.3	0	

CRACK AREAS = 104 (NOT INCLUDED IN TOTAL NO. OF CRACKS)

MEAN CRACK WIDTH, \bar{x} = 0.0042

STANDARD DEVIATION OF CRACK WIDTH, σ = 0.0034

Attachment #7

③

SCHEDULED CRACK MAPPINGS

- a. Before the start of Phase 2 (Drawing 7220-C-1418) construction for first baseline measurements (mapping of existing cracks) in the electrical penetration areas of the auxiliary building.
- b. After soil support removal for placing pier E/W 8 grillage beams at the ends of the electrical penetration areas.
 - b.i. After completion of jacking at pier E/W 8 grillage beams to support the electrical penetration areas.
- c. After completion of the access drift from the utility access tunnel (UAT) to piers CT1 and CT12, and removal of soil support for excavation of piers CT1 and CT12.
- d. After completion of jacking above piers CT1 and CT12.
- e. After removal of soil support from the excavation of the drift north of pier E/W 5.
- f. After completion of jacking above E/W 5 grillage beams.
- g. After removal of soil support for excavation of piers CT3 and CT10.
- h. After completion of jacking for piers CT3 and CT10.

(Hold Items i through t inclusive)
- i. After removal of soil support due to excavation for piers CT5, 8, 13 and 15.
- j. After excavation of drift north of piers E/W 2.
- k. After completion of jacking above piers CT5, 8, 13 and 15.
- l. After completion of jacking above pier E/W 2 grillage beams.
- m. After removal of soil support because of excavation for piers CT6, 7, and 14.
- n. After completion of jacking for piers CT6, 7, and 14.
- o. After mass excavation between 5.3 to 5.9 and 7.2 to 7.8, down to El. 591'-0".
- p. After completion of excavation under the control tower and electrical penetration areas down to El 591'-0".

MIDLAND PROJECT
RESIDENT ENGINEER MEMORANDUM



RE S-1115

DATE SEPT. 16, 1983

SUBJECT BLDG. LIMITS WHEN MONITORING FOR W/B GRILLAGE JACKING

REF PHONE CONVERSATION WITH B. DHAR, V. VERMA, K. RAZDAN, 9/16/83

AAO COORDINATION Date - /Time - AAO Contact V. VERMA

THIS REM DOCUMENTS THE CRITERIA FORWARDED TO ME FROM PROJECT ENGINEERING FOR USE IN MONITORING THE TURBINE BLDG., FIVP AND EPA DURING INITIAL JACKING OF THE GRILLAGE AT W/B.

THE ANALYSIS OF THE EPA HAS SHOWN A 140 MIL DISPLACEMENT FOR 4000^K OF LOAD (UPLIFT). IT WAS INDICATED THAT THIS VALUE WAS CONSERVATIVE AND THAT A VALUE OF 160 MILS COULD BE UTILIZED. THIS LEADS TO A RELATIONSHIP OF 4 MILS DISPLACEMENT PER 100^K OF LOAD. THEREFORE WE WOULD HAVE THE FOLLOWING:

LOAD	THEORETICAL UPLIFT
SL = 1600 ^K	102 MILS
SL + ADD'L W/S LOAD = 2550 ^K	160 MILS
SL + REL = 4000 ^K	160 MILS

160 MILS Project Engineering Comment. VV 10-14-83

JOB 7220	PROJ ENGR	ACT	INT
	ASST PE T	ACT	INT
	ASST PE T	ACT	INT
	ASST PE T	ACT	INT
	ASST PE P	ACT	INT
	ASST M. Swanberg	2	
	MECH		
	ELECT		
	CS		
	CIVIL Soils, H. Dhar	1	
PE			
ARCH			
OE			
CIVIL ENGR PL			
PROJ ENGR			
PROJ MGR			
FIELD			
CONST COORD			
FSAR			
ADMIN			
M. Fuller		3	
FILE NO	0186.1		
RS 033.01			

RESIDENT ENGINEER [Signature] 9/23/83

APPROVED DISAPPROVED

AAO Review: Group Supervisor [Signature]
Date 11/1/83

With Comments.

Comment altered. 11/8/83

DURING THE INITIAL JACKING OF THE GRILLAGE
AT W/B WE WILL UTILIZE THE FOLLOWING CRITERIA:

I. FOR EPA, ~~MA~~, Δ_2 or absolute

changed

LIMIT	ACTION
30 MILS	DROP LOAD TO 80% OF MARL AS REQUIRED BY PROCEDURE BUT WE ARE CLEARED TO PROCEED
40 MILS	HOLD FOR 24 HRS AND EVALUATE BLDG MOVEMENTS
50 MILS	" " " " " "
60 MILS	HOLD LOAD AND EVALUATE

IF ANY LIMIT ABOVE 30 MILS IS REACHED DURING THE JACKING ANN ARBOR WOULD BE CONTACTED AND THE MOVEMENTS EVALUATED BEFORE PROCEEDING WITH THE JACKING.

II. DSB-2W RELATIVE TO DSB-3W : 40 MILS

IF THE CHANGE IN THE RELATIVE DISPLACEMENT BETWEEN DSB-2W WITH RESPECT TO DSB-3W HITS 40 MILS JACKING SHOULD HOLD AT THAT POINT.

III. CHANGE IN DSB-3W : 50 MILS DOWNWARD

JACKING OPERATIONS WILL HOLD IF THE CONTROL TOWER CORNER DISPLACES DOWNWARD 50 MILS.

IV. FIVP RELATIVE DISPLACEMENT : 10 MILS

IF THE FIVP DISPLACES MORE THAN 9 MILS WITH RESPECT TO TURB. BLDG OR REACTOR BLDG, JACKING WILL HOLD UNTIL THE SITUATION IS EVALUATED.

V. TURB. BLDG. MAT

30 MILS FROM ACTIVATION of X JACKS

25 MILS FROM ACTIVATION of Y/Z JACKS

specified Load = 1,100 kips
 PIER W-8
 R S E MONITORING FORM
 PIER W-8
 Y-1
 PIER AREA = 2592 in²

DATE	INCREASING HORIZONTAL LOADS IN STEPS OF 10 KIPS	JACKING LOADS (KIPS)	TIME ATTAINED	W J E		DES-2 W AUK (in.)	DES-3 W C.T. (in.)	Δ (in.)	STRAIN GAUGE, μ in./in.				UPPER CARLSON METER (psi)	LOWER CARLSON METER (psi)		PIER NOTE, LOAD (KIP)	INITIALS	REMARKS									
				RUN NO.	TIME				Force 1	Force 2	Force 3	Force 4		TOP EAST #1	TOP WEST #2				TOP AVG.	NOTE: WEST #3	NOTE: EAST #4	NOTE: LOAD (KIP)					
9-18-63	Initial Load																										
"	800 kips			2693	8:00:55	.156	.150	0	0	3	0	1	5	16	0	1	192	-270	-231	598.8	-416	-171	-293.5	780.8	W.C.		
"	New slope line			2694	8:32:52	.155	.150	0	0	3	2	5	6	19	-1	3	-192	-269	-230.5	597.5	-410	-175	-292.5	758.2	W.C.	.556	
"				2696	9:28:33	.153	.150	0	0	3	10	-11	11	12	2	2	-208	-245	-251.5	651.9	-436	-198	-317.0	821.7	W.C.	.557	
"				2697	9:56:49	.154	.150	0	0	3	12	-10	-11	-16	-4	-3	-209	-289	-249.0	645.4	-442	-195	-308.5	825.8	W.C.	.557	
"				2698	10:24:39	.151	.150	0	0	3	6	-28	-21	35	17	-4	-13	-230	-322	230	710	-493	-230	-371.0	710.0	W.C.	.557
"				2699	10:37:39	.151	.129	-0.014	-0.01	3	6	-29	-22	36	24	-5	-10	-231	-325	278	720.6	-487	-229	-358.0	927.9	W.C.	.557
"				2700	11:04:13	.148	.129	-0.027	-0.01	3	12	-33	-33	33	39	-20	-16	-253	-348	310.5	778.9	-526	-259	-392.5	1017.4	W.C.	.557
"				2701	11:13:53	.148	.129	-0.027	-0.01	3	12	-33	-33	33	39	-20	-16	-253	-351	302.0	782.8	-535	-264	-398.5	1035.5	W.C.	.557
"				2702	11:44:50	.145	.129	-0.010	-0.01	3	12	-33	-33	33	39	-20	-16	-277	-381	329.0	852.8	-571	-292	-430.5	1118.4	W.C.	.557
"				2703	11:52:54	.145	.129	-0.011	-0.01	3	12	-33	-33	33	39	-20	-16	-279	-378	328.5	836.5	-578	-295	-436.5	1131.4	W.C.	.957
"				2705	12:18:15	.142	.129	-0.013	-0.01	3	12	-33	-33	33	39	-20	-16	-301	-404	332.5	913.7	-615	-327	-471.0	1208.8	W.C.	.557
"				2707	12:46:17	.141	.128	-0.014	-0.02	3	12	-33	-33	33	39	-20	-16	-301	-403	353.0	921.4	-631	-327	-477.0	1241.4	W.C.	.557
"				2708	13:09:41	.139	.128	-0.016	-0.02	3	12	-33	-33	33	39	-20	-16	-326	-430	338.0	949.8	-646	-356	-512.0	1327.1	W.C.	.556
"				2709	13:14:15	.138	.129	-0.017	-0.02	3	12	-33	-33	33	39	-20	-16	-324	-432	378.0	949.8	-674	-352	-513.0	1347.1	W.C.	.556
"				2710	13:45:58	.135	.128	-0.020	-0.02	3	12	-33	-33	33	39	-20	-16	-341	-459	400.0	1028.0	-719	-388	-558.5	1441.7	W.C.	.556
"				2711	14:10:02	.134	.128	-0.021	-0.02	3	12	-33	-33	33	39	-20	-16	-349	-460	401.5	1048.5	-723	-383	-553.0	1453.4	W.C.	.556
"				2712	14:48:14	.131	.128	-0.024	-0.02	3	12	-33	-33	33	39	-20	-16	-370	-488	427.5	1121.1	-764	-412	-588.0	1521.1	W.C.	.556
"				2713	14:58:02	.131	.128	-0.024	-0.02	3	12	-33	-33	33	39	-20	-16	-371	-487	429.0	1113.0	-768	-414	-591.0	1531.9	W.C.	.556
"				2714	16:00:24	.131	.128	-0.024	-0.02	3	12	-33	-33	33	39	-20	-16	-367	-483	476.0	1011.6	-772	-407	-581.5	1528.0	W.C.	.556
"				2715	17:00:03	.130	.128	-0.025	-0.02	3	12	-33	-33	33	39	-20	-16	-364	-482	423.0	1094.4	-778	-402	-590.0	1521.3	W.C.	.556
"				2716	20:00:11	.130	.128	-0.025	-0.02	3	12	-33	-33	33	39	-20	-16	-364	-482	423.0	1094.4	-778	-402	-590.0	1521.3	W.C.	.556
"				2717	22:20:14	.120	.128	-0.02	-0.02	3	12	-33	-33	33	39	-20	-16	-364	-482	423.0	1094.4	-778	-402	-590.0	1521.3	W.C.	.556
"				2718	23:02:23	.129	.128	-0.026	-0.02	3	12	-33	-33	33	39	-20	-16	-375	-498	436.5	1134.1	-807	-412	-607.5	1574.8	W.C.	.555

Specified Load = 500 kips

R S E MONITORING FORM
PIER W-B "Z" Jacks

DATE	TICKETS: HORIZONTAL NUMBER OF SL	TENSILE LOAD NORMAL 3.07 K.	JACKING LOADS (KIPS)	TIME ATTAINED	W J E		Δ ₂ at DSB-2W	Change in Δ ₂	F I V P DSB-1WF	Δ ₄ at DSB-1WF	DSB-2WT		Δ ₄ DSB-2WT from "X" baseline	Δ ₄ DSB-2WT from "Y/Z" baseline	NITIALS
					RUN NO.	TIME					"X" Jack	"Y/Z" Jacks			
9-18-85	Initial Load		Transfer for		St. Stage										
"	done line														
"	New base line														
"	1	10	10	50.0	9:41	2693	9:00:55	.005	.057	0	.093 ^a	.087	-.006	0	WC
"	2	10	20	100.0	10:23	2694	9:51:52	.003	.057	0	.093 ^a	.087	-.006	0	WC
"	3	10	30	150.0	11:04	2696	9:48:33	.002	.057	0	.086	.086	-.007	-.001	WC
"	4	10	40	200.0	11:43	2697	9:58:49	.002	.057	0	.086	.086	-.007	-.001	WC
"	5	10	50	250.0	12:08:15	2698	10:24:30	-.001	.056	-.001	.085	.085	-.008	-.002	WC
"	6	10	60	300.1	12:46:17	2699	10:37:19	-.001	.055	-.002	.085	.085	-.008	-.002	WC
"	7	10	70	350.0	13:15:42	2700	11:06:13	-.003	.053	-.004	.084	.084	-.009	-.003	WC
"	8	10	80	400.1	14:45	2701	11:13:53	-.003	.053	-.004	.083	.083	-.010	-.004	WC
"	9	5	85	424.9	23:02:25	2702	11:24:53	-.006	.052	-.005	.082	.082	-.011	-.005	WC
"	10	5	85	424.9	23:02:25	2703	11:54:50	-.006	.052	-.005	.082	.082	-.011	-.005	WC
"	11	5	85	424.9	23:02:25	2705	12:08:15	-.008	.051	-.006	.081	.081	-.012	-.006	WC
"	12	5	85	424.9	23:02:25	2707	12:46:17	-.008	.050	-.007	.081	.081	-.012	-.006	WC
"	13	5	85	424.9	23:02:25	2708	13:09:41	-.011	.049	-.008	.080	.080	-.013	-.007	MS
"	14	5	85	424.9	23:02:25	2709	13:19:15	-.012	.049	-.008	.080	.080	-.013	-.007	MS
"	15	5	85	424.9	23:02:25	2710	13:45:53	-.014	.048	-.009	.079	.079	-.014	-.008	MS
"	16	5	85	424.9	23:02:25	2711	14:02:02	-.015	.049	-.008	.079	.079	-.014	-.008	MS
"	17	5	85	424.9	23:02:25	2712	14:16:34	-.017	.048	-.009	.078	.078	-.015	-.009	MS
"	18	5	85	424.9	23:02:25	2713	14:50:02	-.017	.045	-.012	.079	.079	-.014	-.008	MS
"	19	5	85	424.9	23:02:25	2714	16:00:24	-.017	.048	-.009	.079	.079	-.014	-.008	MS
"	20	5	85	424.9	23:02:25	2715	17:00:59	-.016	.049	-.008	.078	.078	-.015	-.009	MS
"	21	5	85	424.9	23:02:25	2716	20:00:11	-.015	.049	-.008	.078	.078	-.014	-.008	MS
"	22	5	85	424.9	23:02:25	2717	21:00:11	-.014	.049	-.008	.079	.079	-.014	-.008	MS
"	23	5	85	424.9	23:02:25	2718	23:02:25	-.015	.049	-.008	.078	.078	-.015	-.009	MS
"	24	5	85	424.9	23:02:25	2719	23:02:25	-.015	.049	-.008	.078	.078	-.015	-.009	MS

* from 9-17-85, 19:19:32 when $\frac{1}{2}$ reach method

LIMIT = -.010

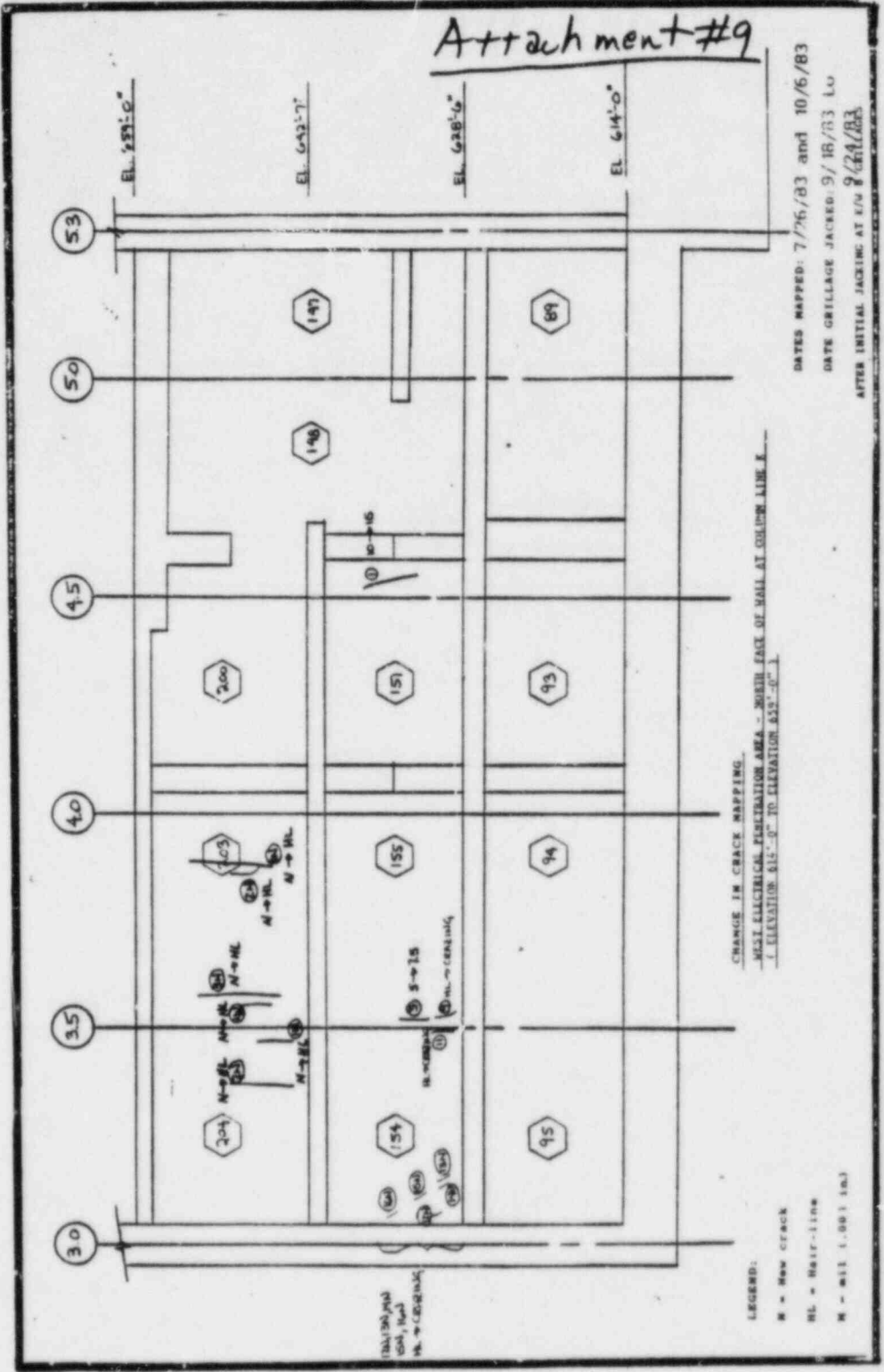
LIMITS = -.030

LIMITS = -.025

5

ATTACHMENT D
Pg 1 of 3

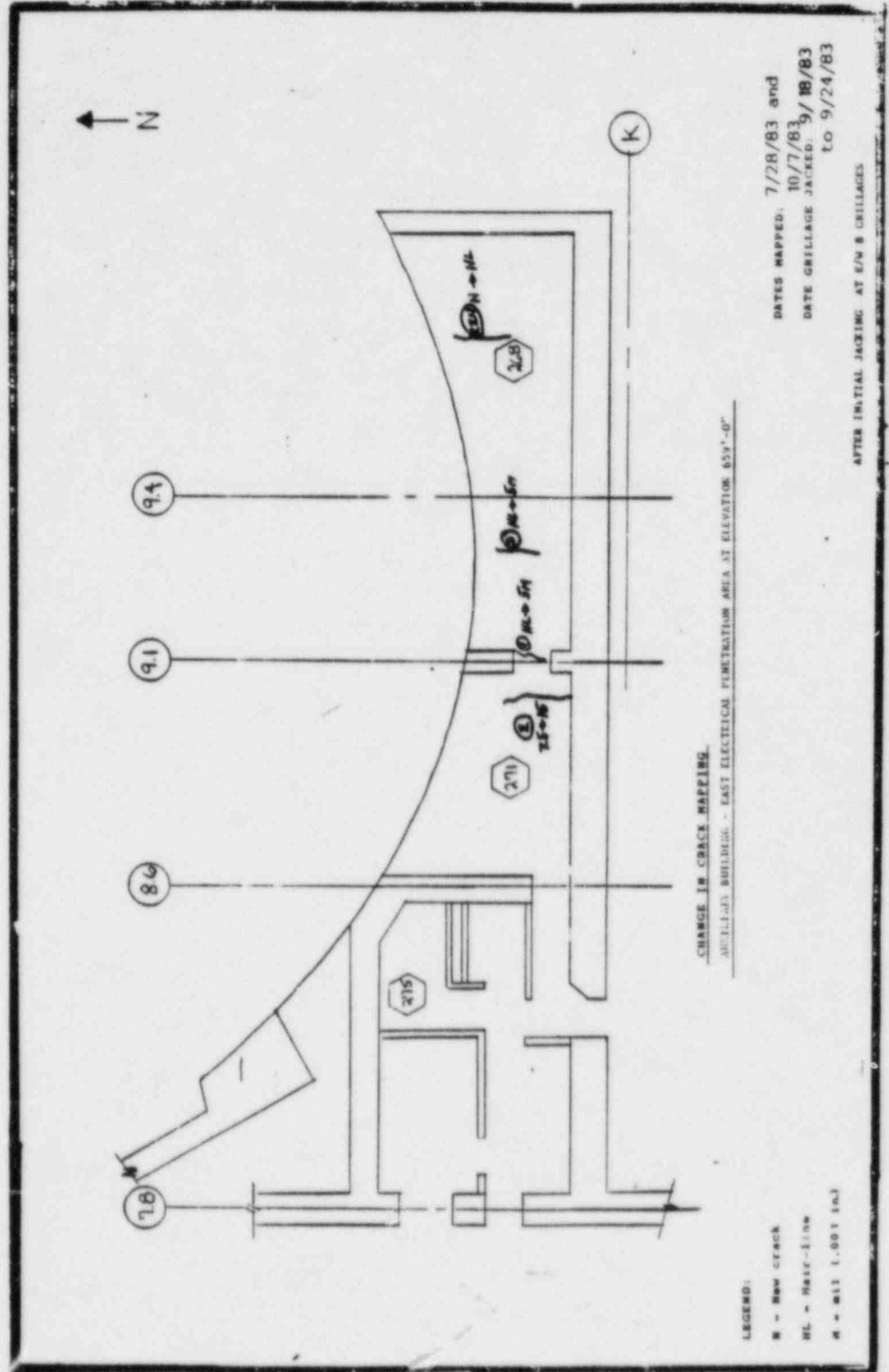
Attachment #9



DATES MAPPED: 7/76/83 and 10/6/83
 DATE CRACKS JACKED: 9/18/83 LU
 AFTER INITIAL JACKING AT 1/4 9/24/83

LEGEND:
 N = NEW CRACK
 BL = HAIR-LINE
 M = 1/8" (1 in.)

ATTACHMENT D
pg 2 of 3

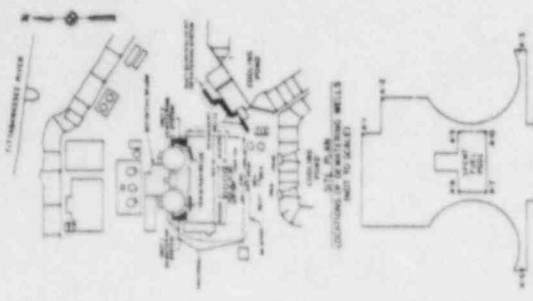


LOCATION	AREA	CRACK I.D. NO	CRACK MEASUREMENTS (1 MIL=.001 in.)						EVALUATION
			WIDTH CHANGE AFTER INITIAL JACKING (MILS)			WIDTH CHANGE AFTER REJACKING (MILS)			
			FROM	TO	> 5 MILS	FROM	TO	> 5 MILS	
West EPA Slab @ 628' 6"	146	9N	N	HL	No				Within Tolerance.
West EPA slab @ 659' 0"	238	*3	15	5	Yes				Crack #3 in area 238 is in floor topping with poorly defined worn off edges which could have lead to measurement dispersion. All other cracks within tolerance.
	238	*13N	N	HL	No				
	239	*1	15	10	No	10	5	No	
	239	*6	7.5	5	No				
	242	*8	15	10	No				
West EPA Slab @ 674' 6"	282	1	7.5	5	No				Within Tolerance.
West EPA North face of wall @ Col. Line K 614'-0" to 659'-0"	151	1	10	15	No				Both cracks within tolerance.
	154	3	5	7.5	No	7.5	5	No	
	203	*1N	N	HL	No				
	203	*2N	N	HL	No				
	203	*3N	N	HL	No				
	203	*4N	N	HL	No				
	204	*1N	N	HL	No				
204	*2N	N	HL	No					
South face of wall.	339	6	7.5	5	No				Within Tolerance.
East EPA Slab @659'-0"	268	*1	HL	5	No				Crack #2 in area 271 is in floor topping with poorly defined worn off edges which could have lead to measurement dispersion. All other cracks within tolerance.
		*3	HL	5	No	5	10	No	
		*22N	N	HL	No				
	271	*2	7.5	15	Yes				
East EPA Slab @674'6"	312	1	10	Crazing	N/A	10	5	No	Cracks were noted as crazing when mapped after initial jacking. Valves from 7/28/83 to 11/28/83 were within tolerance.
		11	10	Crazing	N/A	10	7.5	No	
East EPA North face of wall @ Col. Line K 614'-0" to 659'-0"	187	2N	N	HL	No				Both cracks within tolerance.
	139	1N	N	HL	No				
Control Tower West face of wall @ Col. Line 7.8	66	2N	N	HL	No				All cracks within tolerance.
		3N	N	HL	No				
	70	14	7.5	5	No				

SUMMARY OF AUXILIARY BUILDING CRACK CHANGES

ATTACHMENT D
Pg 3 of 3

6



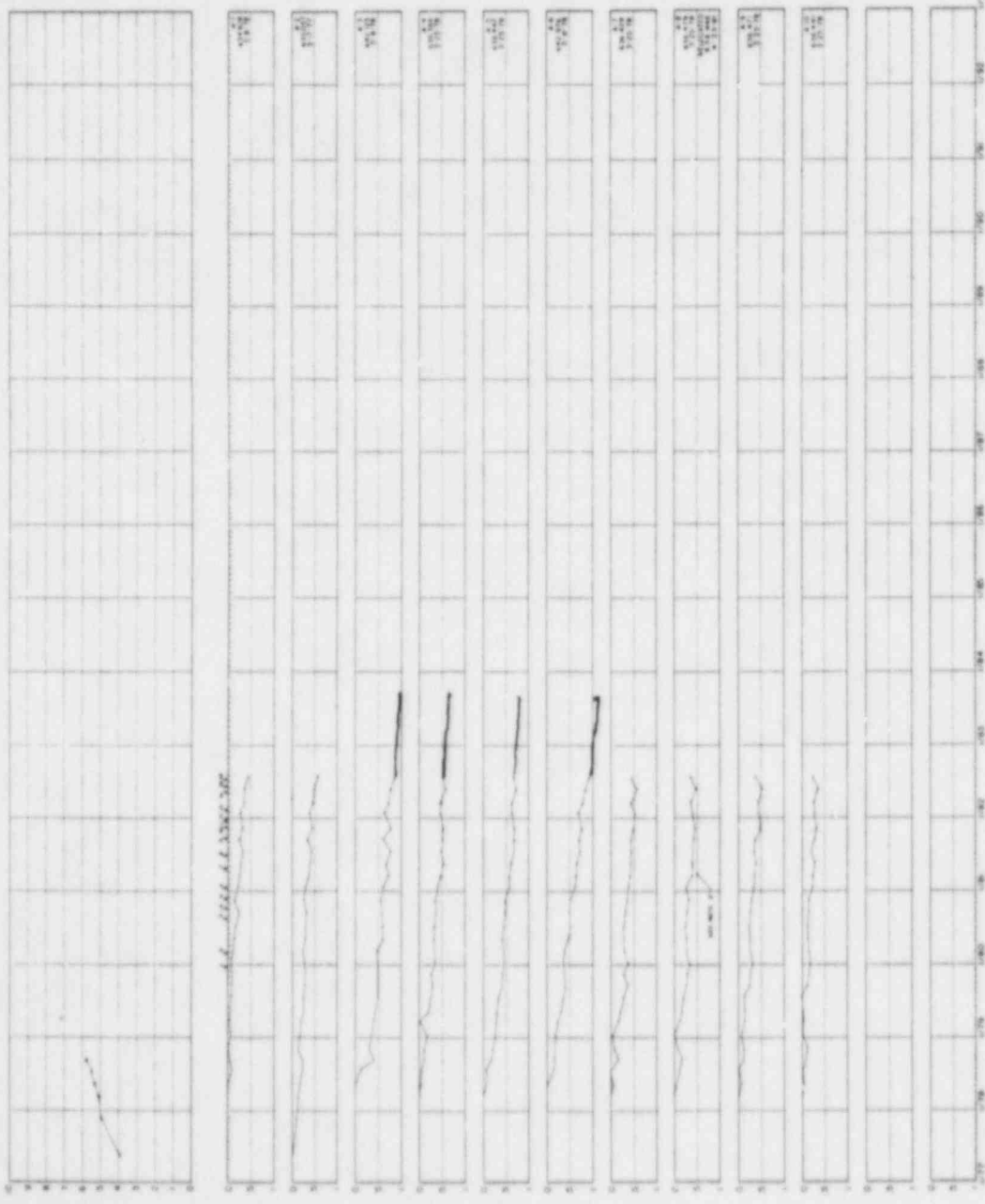
LOCATIONS OF SETTLEMENT MARKERS
NOT TO SCALE

EXPLANATION

- A- SETTLEMENT MARKER
- B- INITIAL ELEVATION FEET
- C- FINAL ELEVATION FEET
- D- SETTLING IN INCHES
- E- SETTLING PERCENT

NOTES

1. The degree of structure settlement varies from 0.5% to 1.5%.
2. Marker A-B was installed on 4/20/50 because of malfunction.



1. The degree of structure settlement varies from 0.5% to 1.5%.

2. Marker A-B was installed on 4/20/50 because of malfunction.

3. The degree of structure settlement varies from 0.5% to 1.5%.

4. The degree of structure settlement varies from 0.5% to 1.5%.

5. The degree of structure settlement varies from 0.5% to 1.5%.

6. The degree of structure settlement varies from 0.5% to 1.5%.

7. The degree of structure settlement varies from 0.5% to 1.5%.

8. The degree of structure settlement varies from 0.5% to 1.5%.

9. The degree of structure settlement varies from 0.5% to 1.5%.

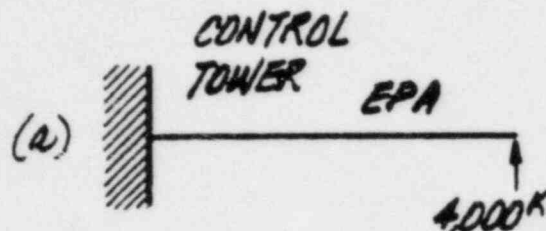
**CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT**

Settlement vs Time
Auxiliary Building
(SK-G-418, Rev 4)
FSAR Figure 2E.1-1

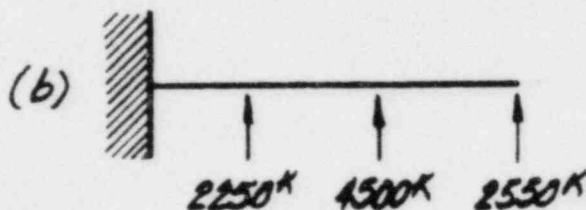
12/82 Revision 47

UPWARD MOVEMENT ESTIMATESUMMARY OF ANALYSES

1. EPA AS CANTILEVER BEAM



$\Delta_2 = 158$ MILS
MODEL CONSIDERED TO BE REALISTIC FOR JACKING OF GRILLAGE.



$\Delta_2 = 166$ MILS
MODEL IGNORES MOVEMENT OF CONTROL TOWER DUE TO APPLIED LOAD.

CRITICAL LOADS FOR MAXIMUM Δ_2

2. FINITE ELEMENT MODEL

(a) SOIL UNDER MAIN AUX. ($K = 5 \times 30$ KCF)

(b) NO SOIL UNDER EPA

19 STAGES OF EXCAVATION & JACKING OPERATIONS CONSIDERED

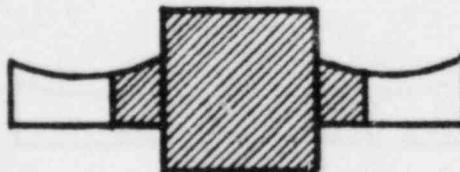
$\Delta_2 = 126$ MILS
WHEN CT-1 & CT-12 EXCAVATED (RELATIVE TO START OF JACKING)

3. FINITE ELEMENT MODEL

(a) SOIL UNDER MAIN AUX. ($K = 5 \times 30$ KCF)

(b) SOIL UNDER CONTROL TOWER & PART OF EPA ($K = 5 \times 30$ KCF)

(c) NO SOIL UNDER REST OF EPA



$\Delta_2 = 154$ MILS
WHEN CT-1 & CT-12 EXCAVATED (RELATIVE TO START OF JACKING)

PROPOSED Δ_2 LIMIT (UPWARD)

FACTORS: ACTUAL OBSERVATIONS
 CALCULATIONS WITH FACTORS
 15 mils SEATING LOSS
 20 mils OBSERVED THERMAL MOVEMENT

ALERT LEVEL: 175 MILLS
 ACTION LEVEL: 300 MILLS
 REQUALIFY LEVEL: 2/3 OF CAPACITY
 (700-800 mils)

NRC MEETING ACTION ITEMS

1. To supply the NRC with a list of critical areas (areas of high stress during underpinning) in the Auxiliary Building. This list should be based on both upward as well as downward movement of the building.
2. Provide a list of locations where additional extensometers may be provided in the Auxiliary Building. The locations should be based on the following:
 - a. E-W direction of EPA Control Tower.
 - b. Slab at elevation 685' in Control Tower in connection with observed cracks.
 - c. At EPA/Control Tower roof level if cracking is observed: (The roofing should be removed in areas of high stress and inspected for cracking).
3. Provide a table showing rebar and concrete stresses, strains (for the element) and associated deflections at critical locations of the structure for the various construction stages of temporary underpinning.
4. Perform a survey of the entire EPA, CT, and Main Auxiliary Building to identify areas of cracking. 10 mills or larger cracks, must be identified. Areas having clusters of multiple cracks, smaller than 10 mills, should be identified. Drawings showing cracks, should be prepared. The drawings should show the pattern of cracking and also, inaccessible areas which could not be surveyed.

Based on this survey, an evaluation of any new cracks should be made and an explanation provided regarding the cause of these cracks based on past construction history and implications for future underpinning construction.

Subsequently, a meeting will be held with Region III/NRC, to discuss CPCo evaluation and any changes to the existing crackmapping program.

5. Indicate what C-200 actions will be taken if the Control Tower has a significant movement during excavation of CT1 and CT12 piers.
6. Provide a report evaluating the cause of the cracks discovered in the Control Tower slabs at elevation 685'.
7. Based on settlement readings from the beginning of monitoring (i.e. 1977), provide equivalent plots of Δ_1 , and Δ_2 , at 6 months intervals.

8. How far out of symmetry can the construction proceed between the East and West side underpinning? What are stresses and deflections for any unsymmetrical conditions allowed? Also, has the effect of cracking (i.e. twisting of EPA/CT, compared to the Main Auxiliary Building) has been considered?

9. After the above information is provided, NRC would discuss with CPCo, the following upward Δ_2 limits proposed by CPCo:

1. Alert = 0.175 inches

2. Action = .300 inches

The alert and action definitions are consistent with the present definitions in Specification C-200.

CPCo would also submit proposed values for upward Δ_1 , values in the Auxiliary Building.

10. In the interim, NRC recommended that the following upward limits be used:

Δ_1 (Control Tower) = .50 inches

Δ_2 = .100 inches

There is no limitation on jacking loads, provided they are within the capacity of the structure (the above criteria supersedes the present interim criteria, as contained in the CPCo letter dated , being used).

12/30/82
DN

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
CONSUMERS POWER COMPANY)
(Midland Plant, Units 1 and 2))

Docket Nos. 50-329
50-330

CONFIRMATORY ORDER

I

Consumers Power Company (the licensee) is the holder of construction permits CPPR-81 and CPPR-82 issued by the Atomic Energy Commission (now the Nuclear Regulatory Commission (the Commission)), which authorize the construction of the Midland Plant, Units 1 and 2 (the facility). The facility is under construction in Midland, Michigan.

II

Since the start of construction, the facility has experienced significant quality assurance (QA) problems. Although the licensee took corrective actions in each case, problems continue to be experienced in the implementation of its QA program.

On October 6, 1983, the Director of Inspection and Enforcement issued a "Confirmatory Order for Modification of the Construction Permits" which required that the licensee adhere to the Construction Completion Program (CCP), dated August 26, 1983, for the duration of the construction of the facility. 48 FR 46673 (October 13, 1983). As more fully described in that order, the development of such a program was necessary to verify the adequacy of prior construction and to insure the adequacy of future construction in view of the identification of widespread QA problems in late 1982, the facility's history of QA problems, and the ineffectiveness of previous corrective actions to fully resolve these problems. An important aspect of the CCP is the third party overview by Stone and Webster Engineering Corporation which is required until the Regional Administrator, Region III, finds that the overview is no longer necessary to provide reasonable assurance that the facility can be constructed in accordance with Commission requirements. One element in any decision regarding the relaxation of the overview requirement will be a finding of confidence in the ability of the licensee's management to properly construct the facility in accordance with Commission requirements without a third party overview. Such a finding cannot now be made.

III

On December 6, 1979, the Director of the Office of Inspection and Enforcement and the Director of the Office of Nuclear Reactor Regulation issued jointly an Order Modifying Construction Permits for the Midland plant. The order was based in part on a breakdown in quality assurance related to soils work at the Midland plant which had led to excessive settlement of the facility's diesel generator building. The licensee demanded a hearing on the order, and the proceeding on the order was eventually consolidated with the proceeding on Consumers Power Company's application for operating licenses for the Midland plant. During the course of the proceeding, the Atomic Safety and Licensing Board issued an order that authorized the Director of the Office of Nuclear Reactor Regulation to amend the Midland construction permits to incorporate certain limitations on remedial soils work at Midland. See Consumers Power Co. (Midland Plant, Units 1 & 2), LBP-82-35, 15 NRC 1060, 1072-73 (April 30, 1982). In accordance with the Board's order, the construction permits were amended on May 26, 1982 to include the Board-ordered conditions.

Among the restrictions imposed by the Board's order and the permit amendment was a condition that the licensee "shall obtain explicit prior approval from the NRC staff...before proceeding with the following soils-related activities...: any placing, compacting, excavating, or drilling soil materials around safety-related structures and systems."

Construction Permit Nos. CPPR-81 & CPPR-82, ¶ 2.G.(1) & 2.G.(1)a; compare LBP-82-35, supra, 15 NRC at 1072-73. On July 28, 1982, an NRC inspector discovered that the licensee had excavated soil from below the deep "Q" duct bank and had initiated relocation of the fireline in "Q" soils without prior NRC authorization. Excavation below the deep "Q" duct bank had begun on July 23rd and relocation of the fireline had begun on July 27th. Neither activity had received explicit prior approval from the NRC staff as required by the construction permits. In fact, excavation of soil material below the deep "Q" duct bank was contrary to prior directives of the NRC staff which instructed the licensee that such excavation was not authorized. Thus, excavation of the deep "Q" duct bank and relocation of the fireline by the licensee constituted violations of the construction permits.

IV

The history at this site demonstrates that management has not been effective in providing the attention to detail and high quality standards necessary to the proper construction of this facility. In view of this history, including the violation identified in section III of this order, I have determined that a management appraisal is required at this time. The licensee, in a meeting on October 25, 1983 with the Director of the Office of Inspection and Enforcement and the Regional Administrator, Region III, and in a subsequent meeting on January 4, 1984 with the

Regional Administrator, agreed to submit a management appraisal program to the Commission. It is appropriate to confirm the licensee's commitment by order.

V

In view of the foregoing, pursuant to Sections 103, 161(i), 161(o) and 182 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR Part 2 and 10 CFR Part 50, IT IS HEREBY ORDERED THAT:

Within 30 days of the effective date of this Order, the licensee shall submit to the Region III Administrator for review and approval a plan for an independent appraisal of site and corporate management organizations and functions that would develop recommendations where necessary for improvements in management communications, controls, and oversight. Upon approval of the plan, the plan shall be implemented and the scheduled milestone completion dates shall not be extended without good cause and the concurrence of the Region III Administrator.

The plan shall include at least the elements itemized below:

- (1) An appraisal conducted by an independent management consultant organization retained by the licensee to evaluate the licensee's

Does this mean that within 3 days the appraisal has to be completed?

current organizational responsibilities, management controls, communications systems and practices, both at the Midland site and between the corporate office and the site. The appraisal shall include a review of the licensee's site and corporate construction management and supervisory personnel involved in the Midland project to determine their capability and competency for managing construction activities consistent with regulatory requirements.

- (2) A description of the appraisal program, the qualifications of the appraisal team, a discussion of how the appraisal is to be documented, and a schedule with appropriate milestones.
- (3) The provision of recommendations for changes in the aforementioned areas that will provide assurance that the licensee will implement NRC requirements.

The licensee shall direct the approved organization to submit to the Region III Administrator a copy of the report of the appraisal and recommendations resulting from the appraisal, and any drafts thereof, at the same time they are sent to the licensee or any of its employees or contractors. Prior notice shall be given the Administrator of any meeting between the licensee and the organization to discuss the results, recommendations, or progress made on the appraisal. In addition, the licensee shall consider the recommendations resulting from the appraisal

and provide to the Region III Administrator an analysis of each such recommendation and the action to be taken in response to the recommendation. The licensee shall also provide a schedule for accomplishing these actions.

The Administrator of Region III may relax or terminate in writing any of the preceding conditions for good cause.

VI

The licensee may request a hearing on this Order. Any request for hearing shall be submitted to the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555 within 25 days of the date of this order. A copy of the request shall also be sent to the Executive Legal Director at the same address and to the Regional Administrator, NRC Region III, 799 Roosevelt Road, Glen Ellyn, Illinois 60137.

If a hearing is to be held concerning this Order, the Commission will issue an order designating the time and place of hearing. If a hearing is held, the issue to be considered at such hearing shall be whether this Order should be sustained.

This Order shall become effective upon the licensee's consent or upon expiration of the time within which the licensee may request a hearing or, if a hearing is requested by the licensee, on the date specified in an order issued following further proceedings on this Order.

FOR THE NUCLEAR REGULATORY COMMISSION

Richard C. DeYoung, Director
Office of Inspection and Enforcement

Dated at Bethesda, Maryland
this day of January 1984.

Ross

DEC 29 1983

Docket No. 50-329
Docket No. 50-330

Consumers Power Company
ATTN: Mr. James Mooney
Executive Manager
for Soils
1945 West Parnall Road
Jackson, MI 49201

Gentlemen:

We have completed our review of the corrective actions which you have taken in regards to identified crack monitoring system deficiencies. Specifically, the following corrective actions were reviewed:

1. Wiss, Janney, Elstner and Associates, Inc. (WJE) procedures were revised and reissued.
2. Crack monitoring system specification was revised and issued.
3. Pertinent PQCI's were revised and issued.
4. NCR's (59) documenting the crack-monitoring deficiencies were closed.
5. QAR's (11) documenting the crack-monitoring deficiencies were closed.

This letter documents the satisfactory review of these corrective actions by the NRC staff.

Sincerely,

*Original signed
by L. J. Warnick*

for J. J. Harrison, Chief
Section 2, Midland

cc: See attached distribution list

RIII
RNS for
Landsman/lb
12/29/83

RIII
RNS
Gardner

RIII
RFC for
Harrison

RIII
RFW
Warnick

~~8401040216~~

DEC 29 1982

cc: DMB/Document Control Desk (RIDS)
Resident Inspector, RIII
The Honorable Charles Bechhoefer, ASLB
The Honorable Jerry Harbour, ASLB
The Honorable Frederick P. Cowan, ASLB
The Honorable Ralph S. Decker, ASLB
William Paton, ELD
Michael Miller
Ronald Callen, Michigan
Public Service Commission
Myron M. Cherry
Barbara Stamiris
Mary Sinclair
Wendell Marshall
Colonel Steve J. Gadler (P.E.)
Howard Levin (TERA)
Billie P. Garde, Government
Accountability Project
Lynne Bernabei, Government
Accountability Project
Stone and Webster Michigan, Inc.



J A Mooney
Executive Manager
Midland Project Office

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0774

December 9, 1983

Mr J J Harrison
Midland Project Section
U S Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

*Crack
mapping
WT said / 1/25/83
- eff. mapped
on 02/24/83*

MIDLAND ENERGY CENTER GWO 7020
AUXILIARY BUILDING CRACK EVALUATIONS
File: 0485.16 UFI: 42*05*22*04 Serial: CSC-7074

REFERENCE: Serial CSC-7063 dated December 6, 1983 and Serial
CSC-6960 dated October 24, 1983.

The attached report, "Auxiliary Building Crack Evaluations", evaluates the changes in cracks after the initial jacking of Grillage 8 and concludes that few changes had occurred and in these cases the changes were within measurement tolerance of .005". This report also evaluates changes in selected cracks after re-jacking of Grillage 8 and concludes that these changes were also within the measurement tolerance.

Dr. Mete Sozen of University of Illinois and Dr. A. E. Fioroto of Construction Technology Laboratories have reviewed the contents of this report, inspected cracks which in their opinion warranted their inspection and concurred with the conclusions of this report.

JAMooney
JAM/RMW/klw

Attachment

CC RJCook
DSHood

DEC 19 1983

OC1283-0003A-CN01

~~831A20379~~

BCC JWCook, P-26-336B
DBMiller, Midland (3)
TABuczynski, Midland-207
JNLeach, P-24-507
DASommers, P-14-106 (For SER Related Issues)
DFLewis, Bechtel
DJVandeWalle, P-24-614B
MIMiller, IL&B, Chicago
FCWilliams, IL&B, Washington, DC
GALow, P-12-237A
NRC Correspondence File, P-24-517
UFI, P-24-517
BJWalraven, P-24-517
Hearings File, P-24-517
Reading File, P-24-517

OM/OL SERVICE LIST

Mr Frank J Kelley, Esq
Attorney General of the
State of Michigan -
Ms Carole Steinberg, Esq
Assistant Attorney General
Environmental Protection Division
720 Law Building
Lansing, MI 48913

Mr Myron M Cherry, Esq
Suite 3700
Three First National Plaza
Chicago, IL 60602

Mr Wendell H Marshall
RFD 10
Midland, MI 48640

Mr Charles Bechhoefer, Esq
Atomic Safety & Licensing
Board Panel
U S Nuclear Regulatory Commission
Washington, DC 20555

Dr Frederick P Cowan
6152 N Verde Trail
Apt B-125
Boca Raton, FL 33433

Mr Fred Williams
Isham, Lincoln & Beale
1120 Connecticut Avenue, NW, Suite 325
Washington, DC 20036

Mr James E Brunner, Esq
Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Mr D F Judd
Babcock & Wilcox
PO Box 1260
Lynchburg, VA 24505

Mr Steve Gadler, Esq
2120 Carter Avenue
St Paul, MN 55108

Atomic Safety & Licensing
Appeal Board
U S Nuclear Regulatory Commission
Washington, DC 20555

Mr C R Stephens (3)
Chief, Docketing & Services
U S Nuclear Regulatory Commission
Office of the Secretary
Washington, DC 20555

Ms Mary Sinclair
5711 Summerset Street
Midland, MI 48640

Mr William D Paton, Esq
Counsel for the NRC Staff
U S Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety & Licensing
Board Panel
U S Nuclear Regulatory Commission
Washington, DC 20555

Ms Barbara Stamiris
5795 North River Road
Rt 3
Freeland, MI 48623

Mr Jerry Harbour
Atomic Safety & Licensing
Board Panel
U S Nuclear Regulatory Commission
Washington, DC 20555

Mr M I Miller, Esq
Isham, Lincoln & Beale
Three First National Plaza
52nd Floor
Chicago, IL 60602

Mr John DeMeester, Esq
Dow Chemical Building
Michigan Division
Midland, MI 48640

Ms Lynne Bernabei
Government Accountability Project
1901 Q Street, NW
Washington, DC 20009

CONSUMERS POWER COMPANY
Midland Units 1 and 2
Docket No 50-329/50-330

Letter Serial CSC-7074 Dated December 9, 1983

At the request of the Commission and pursuant to the Atomic Energy Act of 1954, and the Energy Reorganization Act of 1974, as amended and the Commission's Rules and Regulations thereunder, Consumers Power Company submits letter serial CSC-7074 dated December 9, 1983 from R. M. Wheeler to J. J. Harrison.

CONSUMERS POWER COMPANY

By J A Mooney
J A Mooney
Executive Manager

Sworn and subscribed before me this 9th day of Dec, 1983.

Patricia A. Puffer
Notary Public

PATRICIA A. PUFFER
Notary Public, Bay County, MI
My Commission Expires Mar. 4, 1986

My Commission Expires 3-4-86

AUXILIARY BUILDING
CRACK MAPPING EVALUATIONS
FOR
GRILLAGE 8 INITIAL JACKING & REJACKING

~~8912280385~~

AUXILIARY BUILDING CRACK MOVEMENT

PURPOSE

The purpose of this report is to evaluate the changes in cracks in critical Auxiliary Building walls and slabs between when the soil was removed beneath the East and West Electrical Penetration Areas (EPA), and when initial jacking load was transferred to both East and West 8 Grillage Beams. The crackmapping in these critical walls and slabs is required per the design specifications.

The changes in widths for selected cracks were also evaluated after re-jacking. The cracks considered for this evaluation were those which were reported to have changed in width after initial jacking of Grillage 8.

An overall plan and elevation of the Auxiliary Building are given in Attachment A. The location of Grillage 8 is also shown on these sketches. Attachment B shows the dates of crackmapping, initial jacking of Grillage 8 and re-jacking of Grillage 8.

METHOD OF ANALYSIS

1. Each critical wall and slab was divided into several areas with unique area numbers, (e.g. 18).
2. All cracks which were reported to have increased or decreased in width and all reported new cracks were reviewed after initial jacking. These crack changes are shown in Attachment C.
3. All the cracks which changed in width and all new cracks found after initial jacking, were again measured after re-jackings of Grillage 8. Observed changes in the width of these cracks are given in Attachment D.
4. Crack width measurements at a given location have an estimated tolerance of $\pm .0025$ inches. Therefore, readings taken at two different times for the same crack could easily differ by .005 inches.
5. The location, width and direction of cracks which changed were compared qualitatively with expected structural behavior during excavation, initial jacking and re-jackings.
6. The evaluation of cracks after the initial jacking event and the selected cracks after re-jacking is tabulated in Attachment E.
7. Dr. Mete Sozen of the University of Illinois and Dr. A. E. Fiorato of Construction Technology Laboratory inspected cracks which in their opinion warranted field inspection. They also reviewed this report and concurred with the conclusions which follow.

CONCLUSION

A. For Grillage 8-Jacking

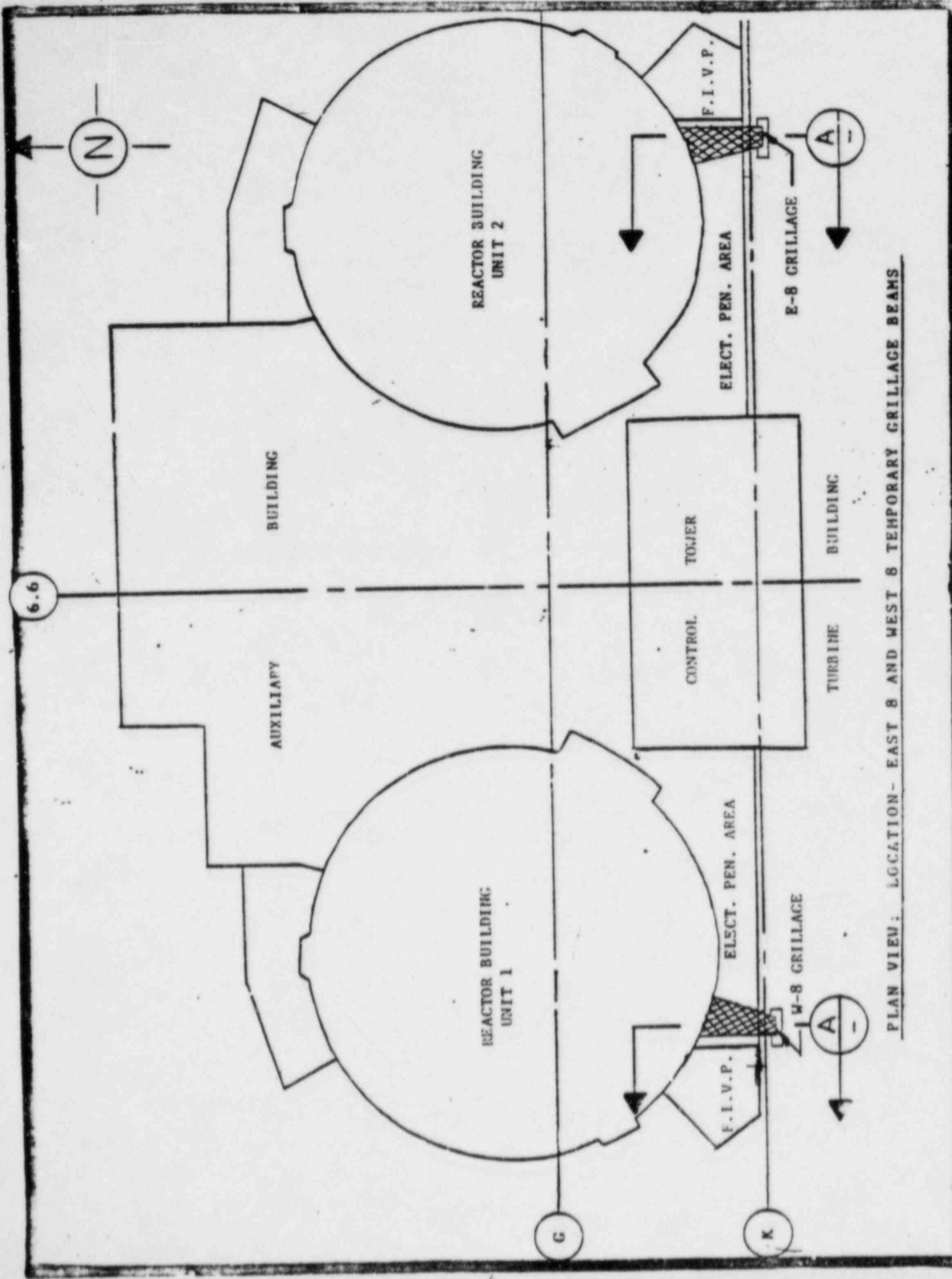
There are approximately 2,000 cracks which were monitored in the Auxiliary Building after initial Grillage 8 jacking. Evaluation of the crackmapping data has shown that only twenty-three (23) of these cracks changed in width (approximately 1%) while only twenty-one (21) new cracks were found (approximately 1% increase). The width changes which occurred were .005 inches or less except for two cases. In both of these cases the observed cracks were in the floor topping. After physical observation, it was judged that in these two cases, width changes were attributable to measurement dispersion. See Attachment E for summary of crack changes and evaluation of these changes. No alert or action level cracks were found during mapping.

It should be noted that crackmapping is intended to be used to identify a need for evaluation of the building. Alert and action levels for the crack widths are set forth to trigger this evaluation. The primary monitoring device is the building movement instrumentation. The strain instrumentation, is the secondary monitoring device.

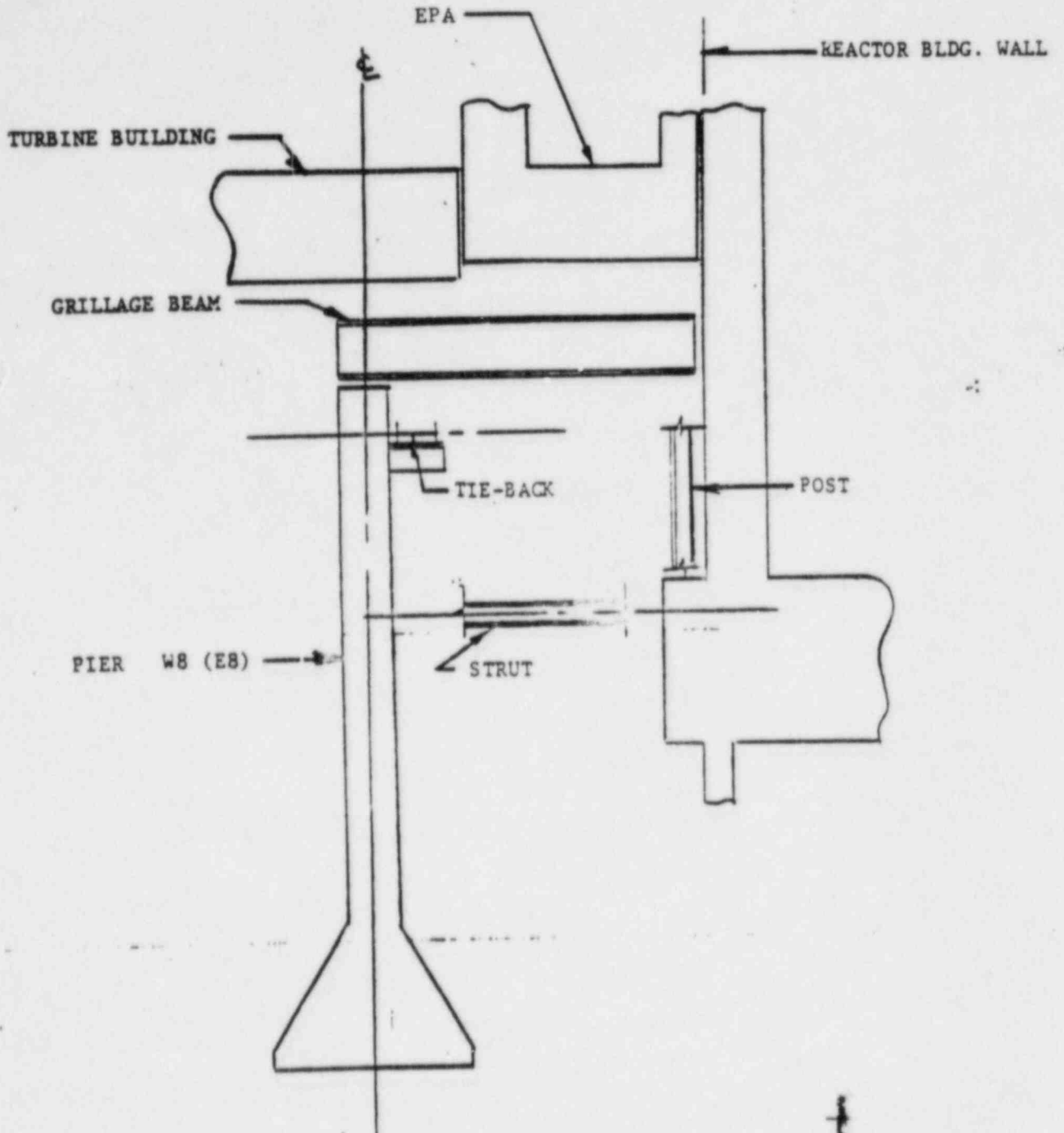
The observed changes in crack patterns and widths are in general consistent with previous patterns that indicate volume change movements. The width changes are within the estimated tolerance limits of measurements. All of the crack widths are well below the alert limits, therefore need for special evaluation is not warranted.

B. For Grillage 8 Re-jacking

Width of cracks which had been observed to have changed during initial jacking, were measured after re-jacking. Evaluation of this data, indicates that all measured crack width changes are within the estimated tolerance of .005 inches. None of these cracks reached alert level.



PLAN VIEW: LOCATION - EAST 8 AND WEST 8 TEMPORARY GRILLAGE BEAMS

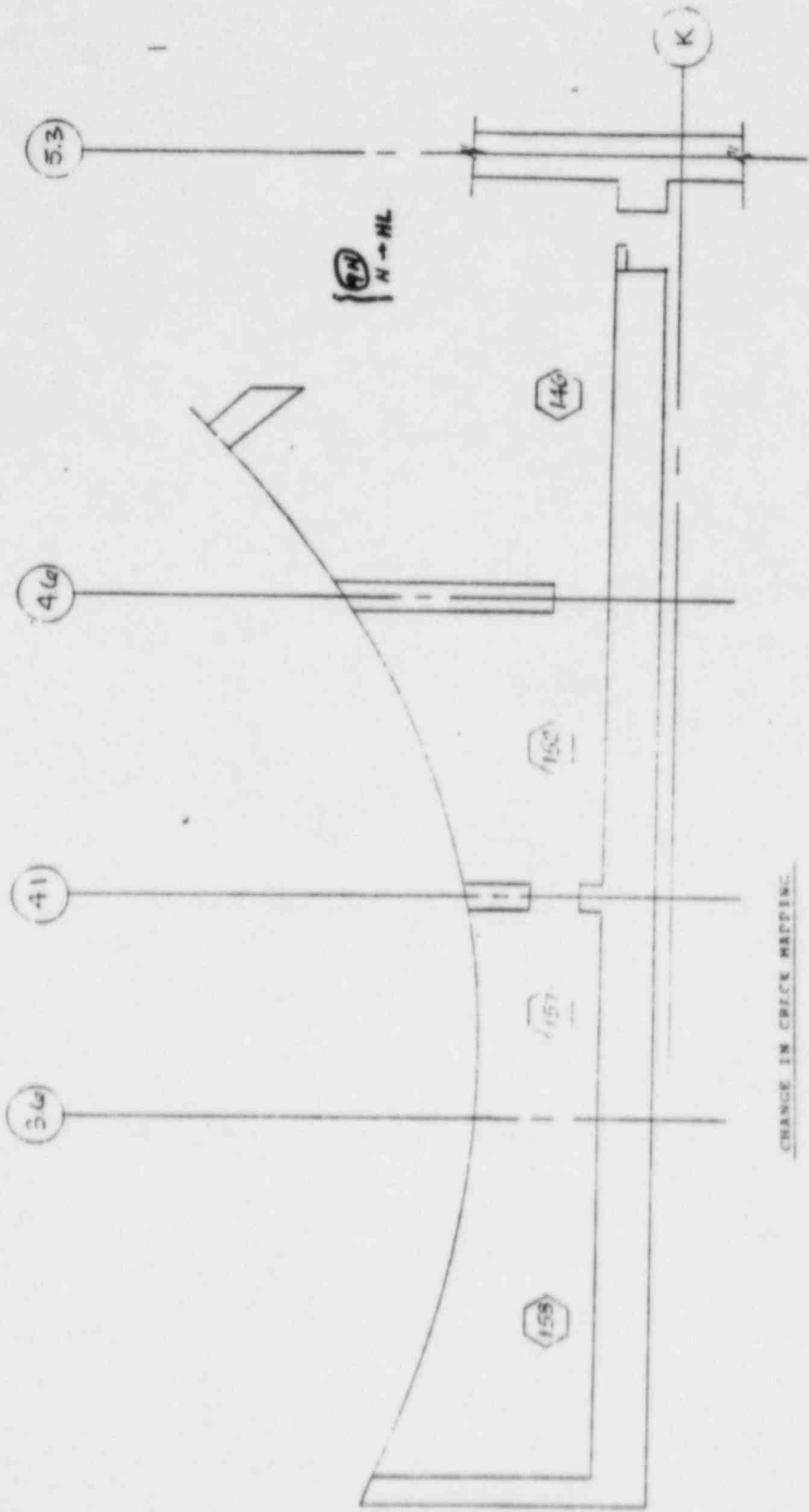


SECTION

A

	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
CRACK MAPPING					
INITIAL GRILLAGE JACKING	EAST WEST		 		
GRILLAGE REJACKING	EAST WEST		 	 	
X JACKS	110% S.L.				
Y JACKS	125% S.L.				
Z JACKS	125% S.L.				

--- LIFT - OFF LOADS ---



CHANGE IN CRACK MAPPING.

ARBITRARY DIMENSIONS - WEST ELECTRICAL FINISHING AREA AT ELEVATION 628'-6"

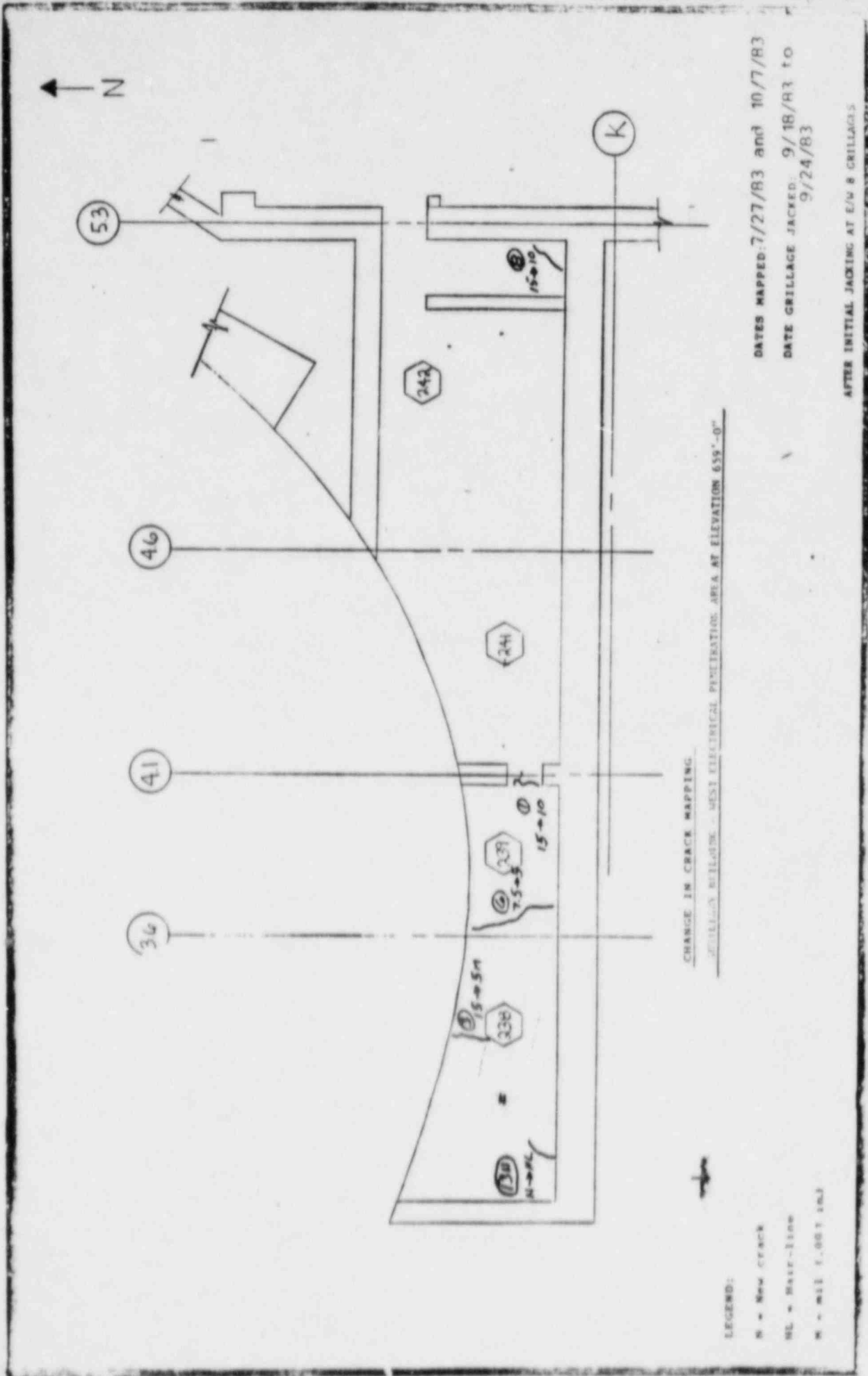
LEGEND:

- N = New Crack
- HL = Hair-Line
- N = 1/16" - 1/8" (1/16)

DATES MAPPED: 7/27/83 and
10/6/83
DATE GRILLAGE JACKED:

9/10/83 to
9/24/83

AFTER INITIAL JACKING AT E/W B GRILLAGES

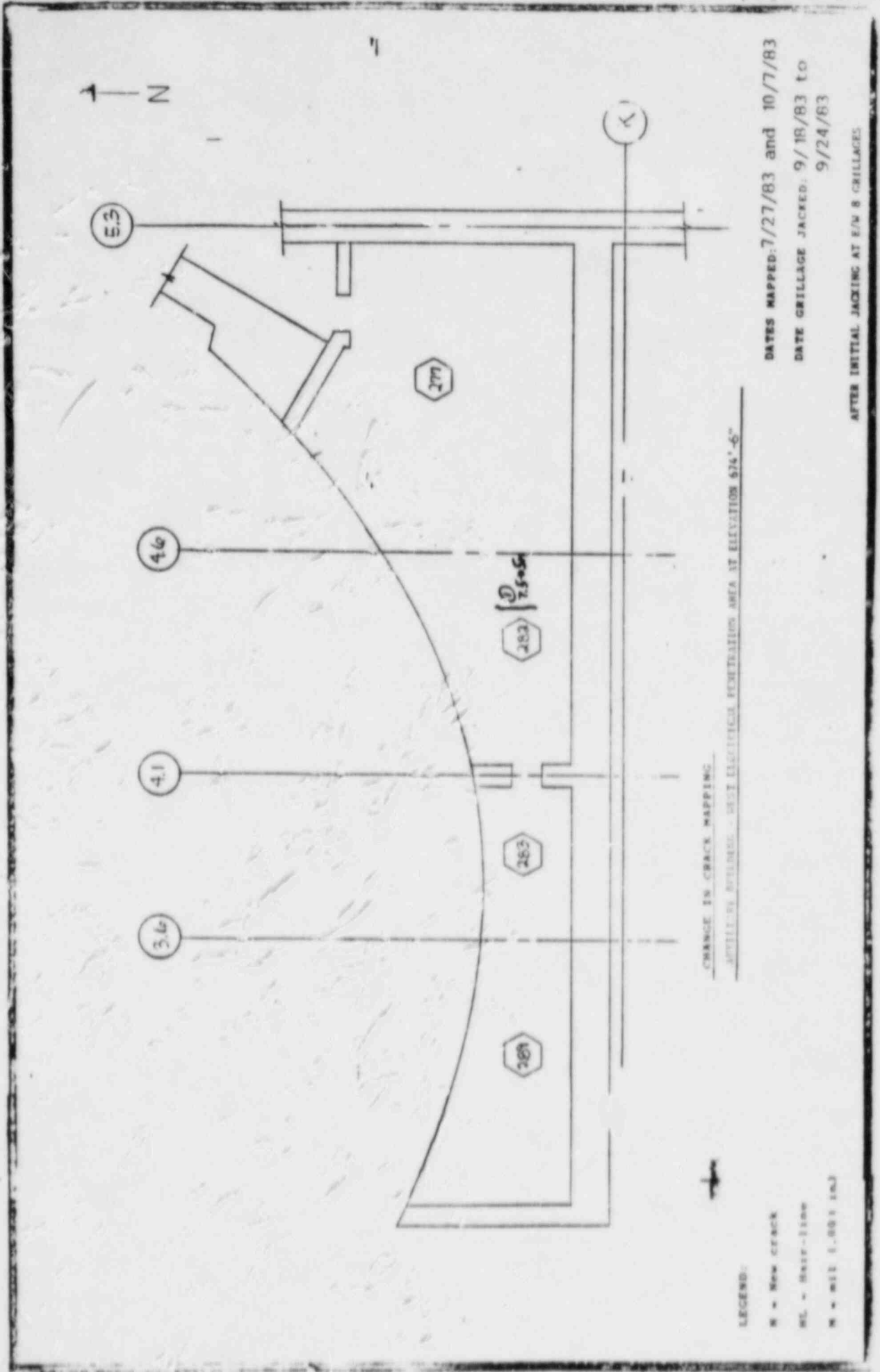


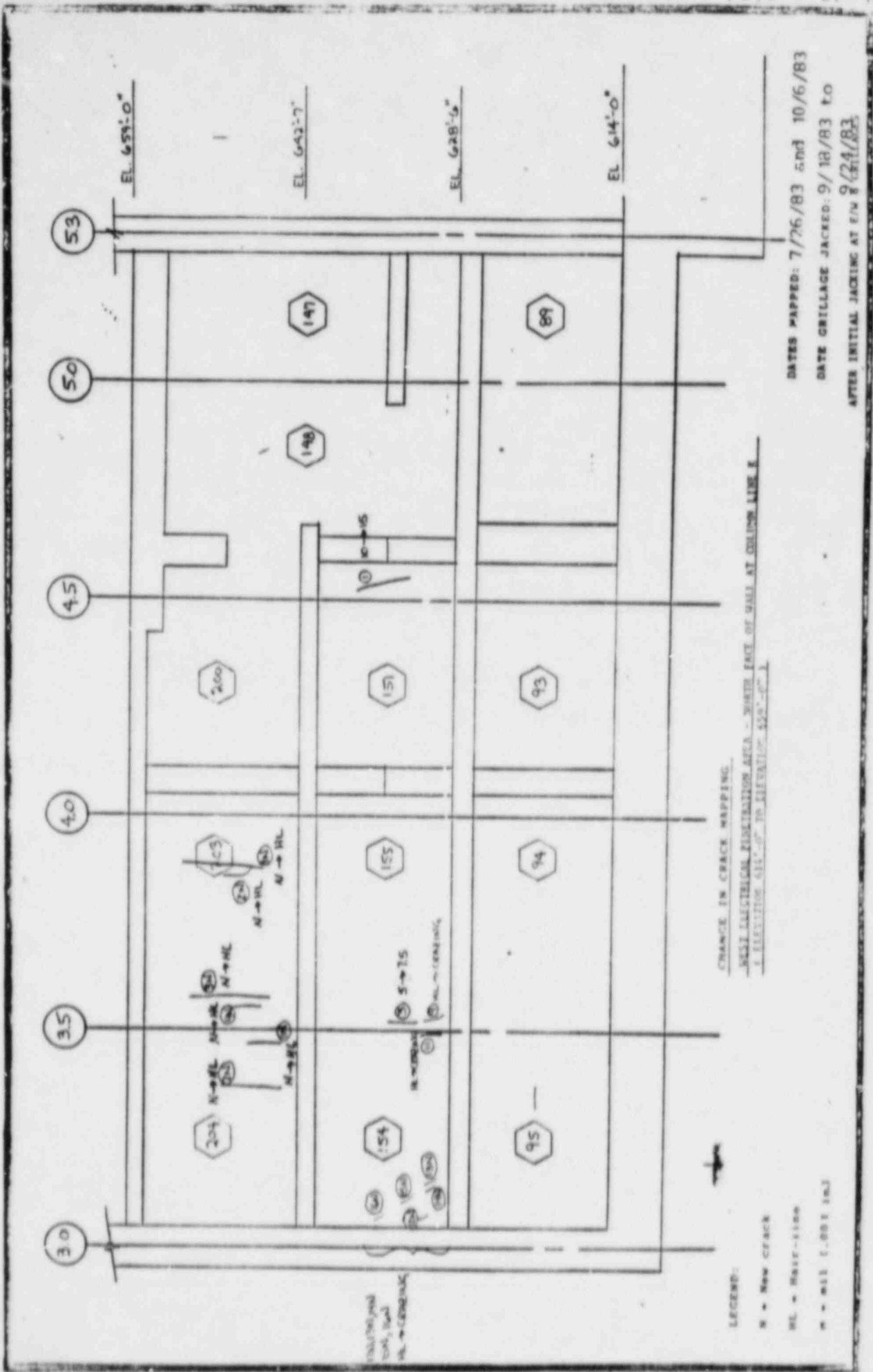
DATES MAPPED: 7/27/83 and 10/7/83
 DATE GRILLAGE JACKED: 9/18/83 to 9/24/83

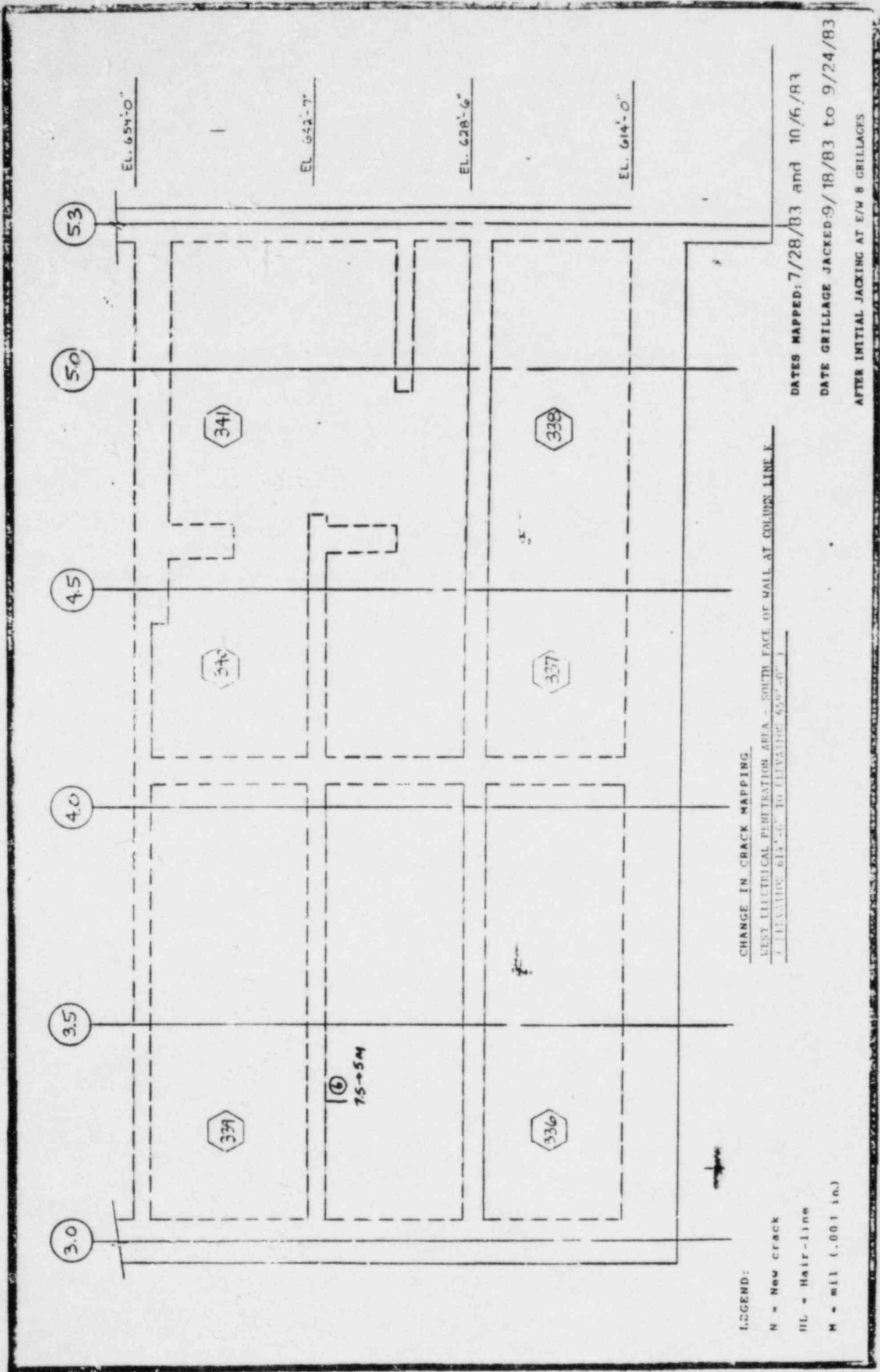
AFTER INITIAL JACKING AT E/W 8 GRILLAGES

CHANGE IN CRACK MAPPING
 WEST ELECTRICAL PENETRATION AREA AT ELEVATION 659'-0"

LEGEND:
 N = New crack
 NL = Hair-line
 W = 1/16" (0.0075 in.)







LEGEND:

N = New crack

HL = Hair-line

M = mil (.001 in.)

CHANGE IN CRACK MAPPING

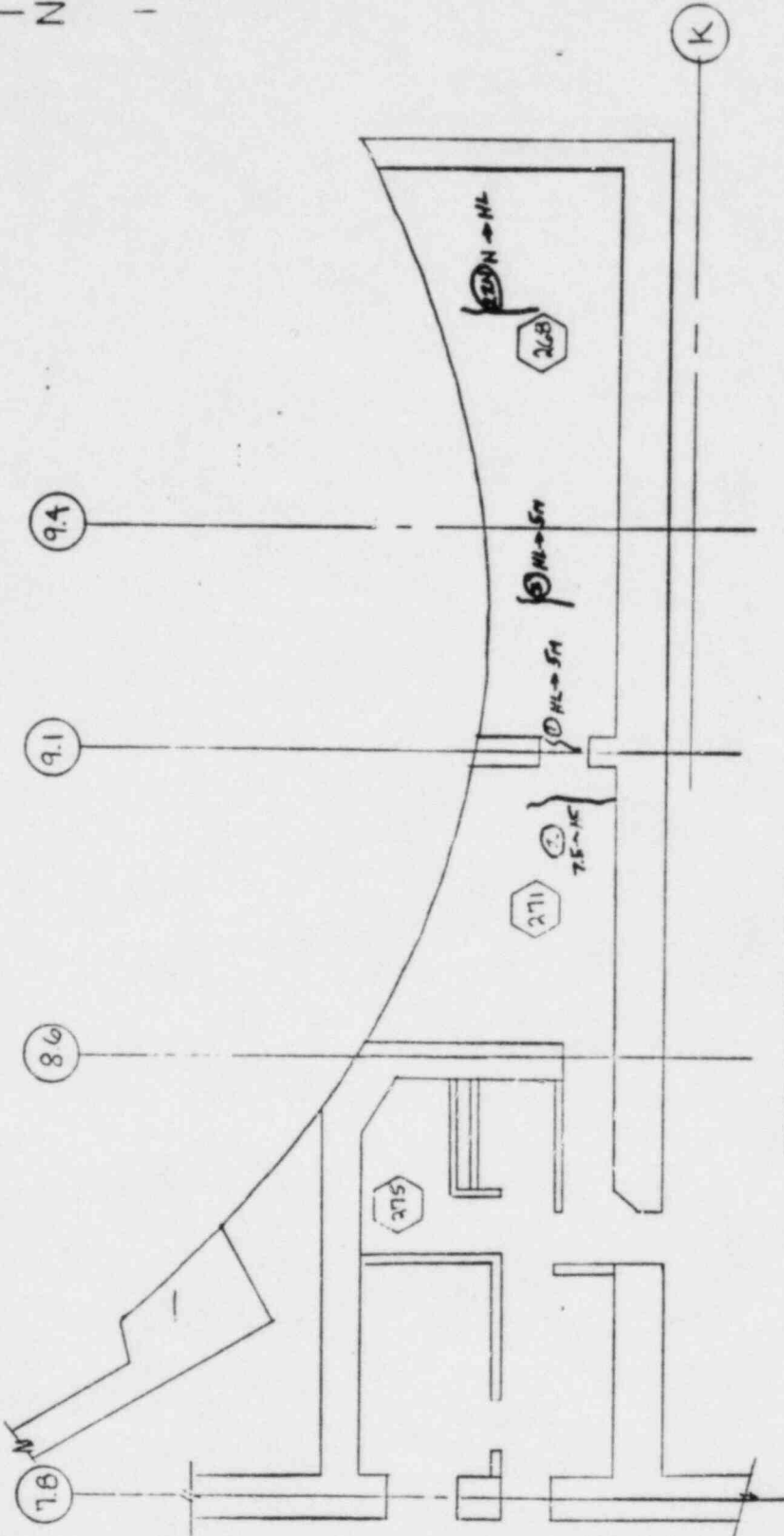
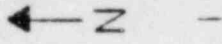
WEST ELECTRICAL PENETRATION AREA - SOUTH FACE OF WALL AT COLUMN LINE F

ELEVATIONS: 614'-0" TO ELEVATION: 654'-0"

DATES MAPPED: 7/28/83 and 10/6/83

DATE GRILLAGE JACKED: 9/18/83 to 9/24/83

AFTER INITIAL JACKING AT E/W 8 GRILLAGES



CHANGE IN CRACK MAPPING

WELLS BUILDING - EAST ELECTRICAL PENETRATION AREA AT ELEVATION 659'-0"

LEGEND:

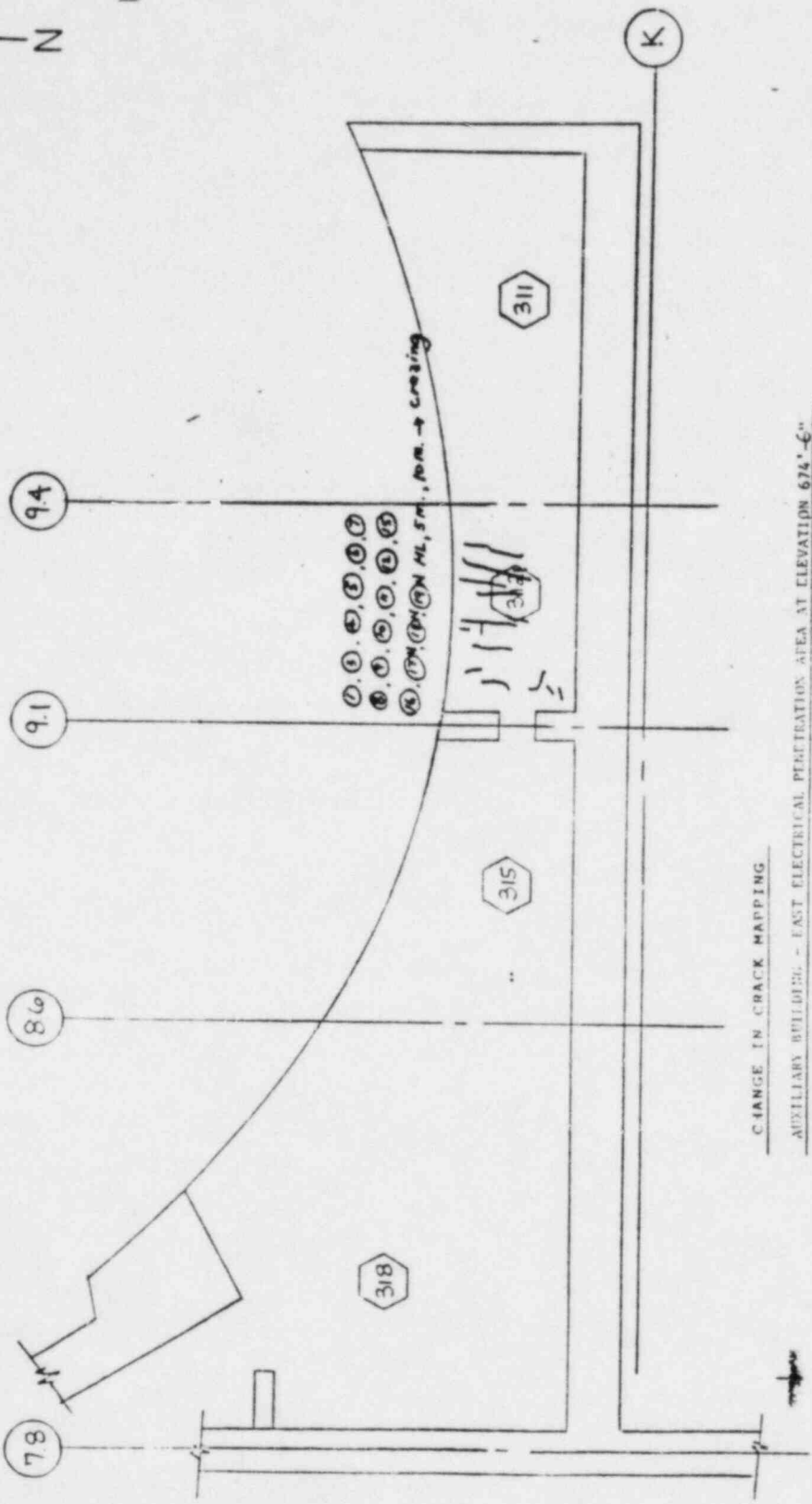
N = New crack

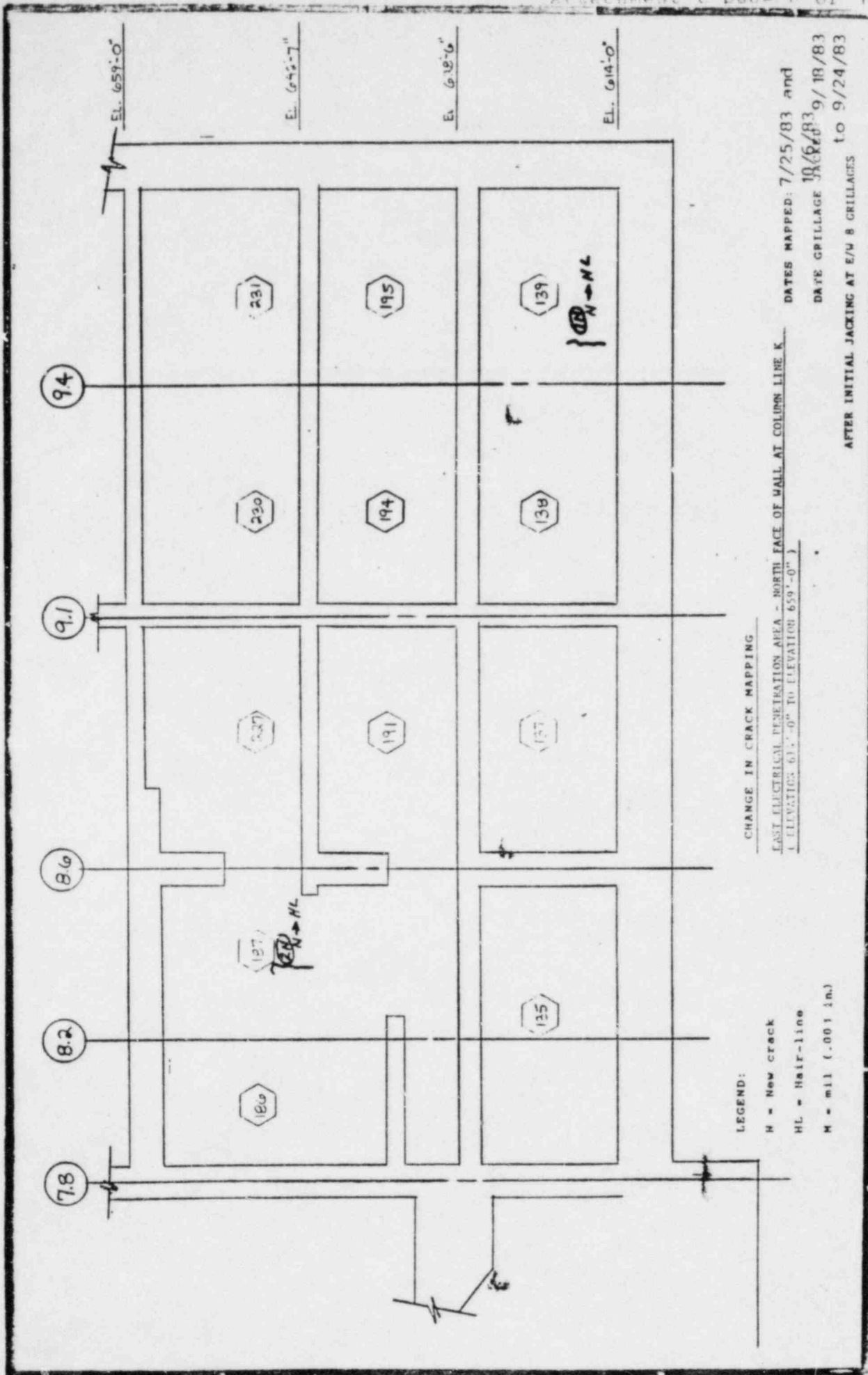
HL = Hair-line

M = mil (.001 in.)

DATES MAPPED: 7/28/83 and
 10/7/83
 DATE GRILLAGE JACKED: 9/18/83
 to 9/24/83

AFTER INITIAL JACKING AT E/W 8 GRILLAGES





LEGEND:

M = New crack

HL = Hair-line

M = mil (.001 in.)

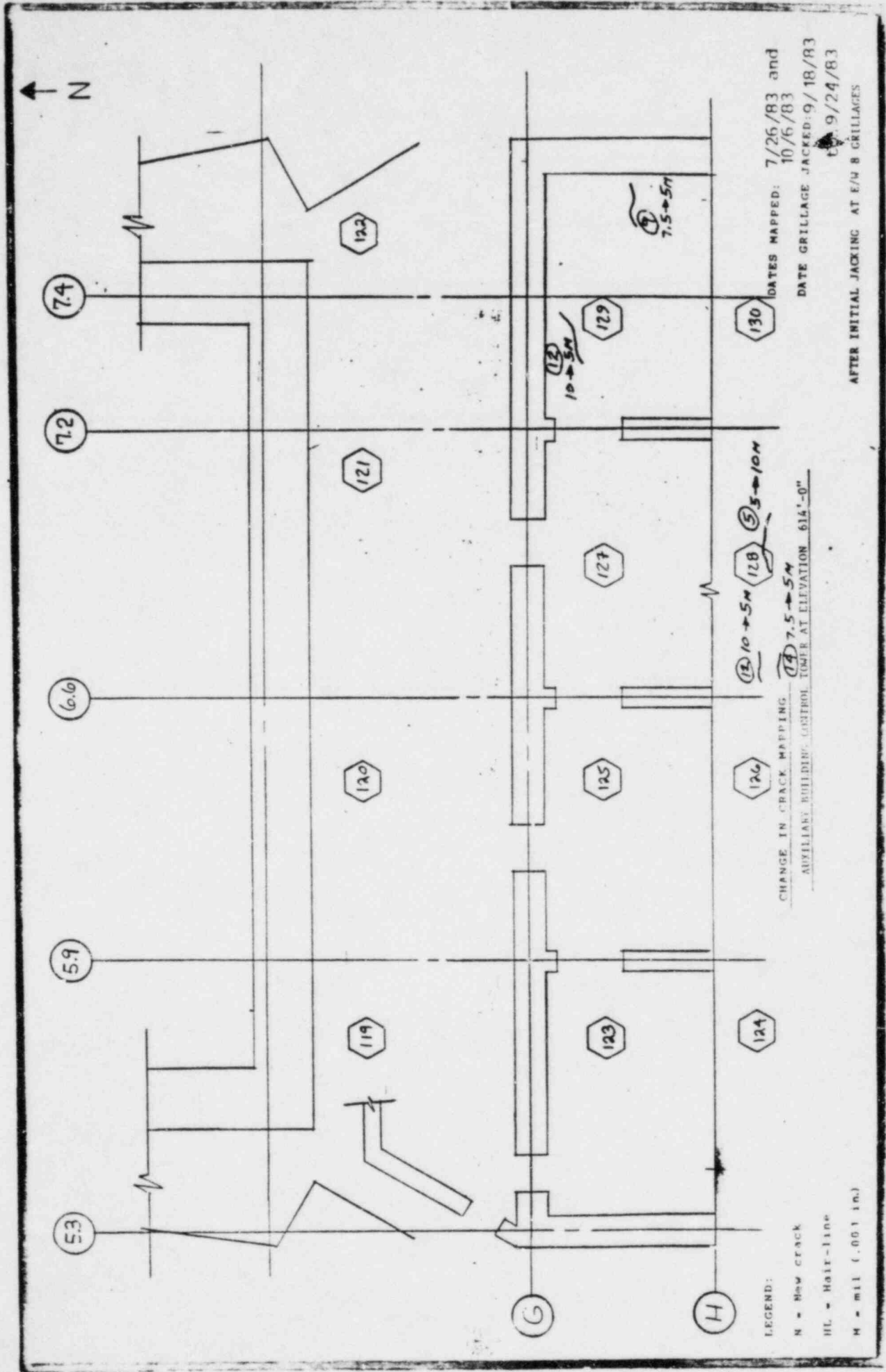
CHANGE IN CRACK MAPPING

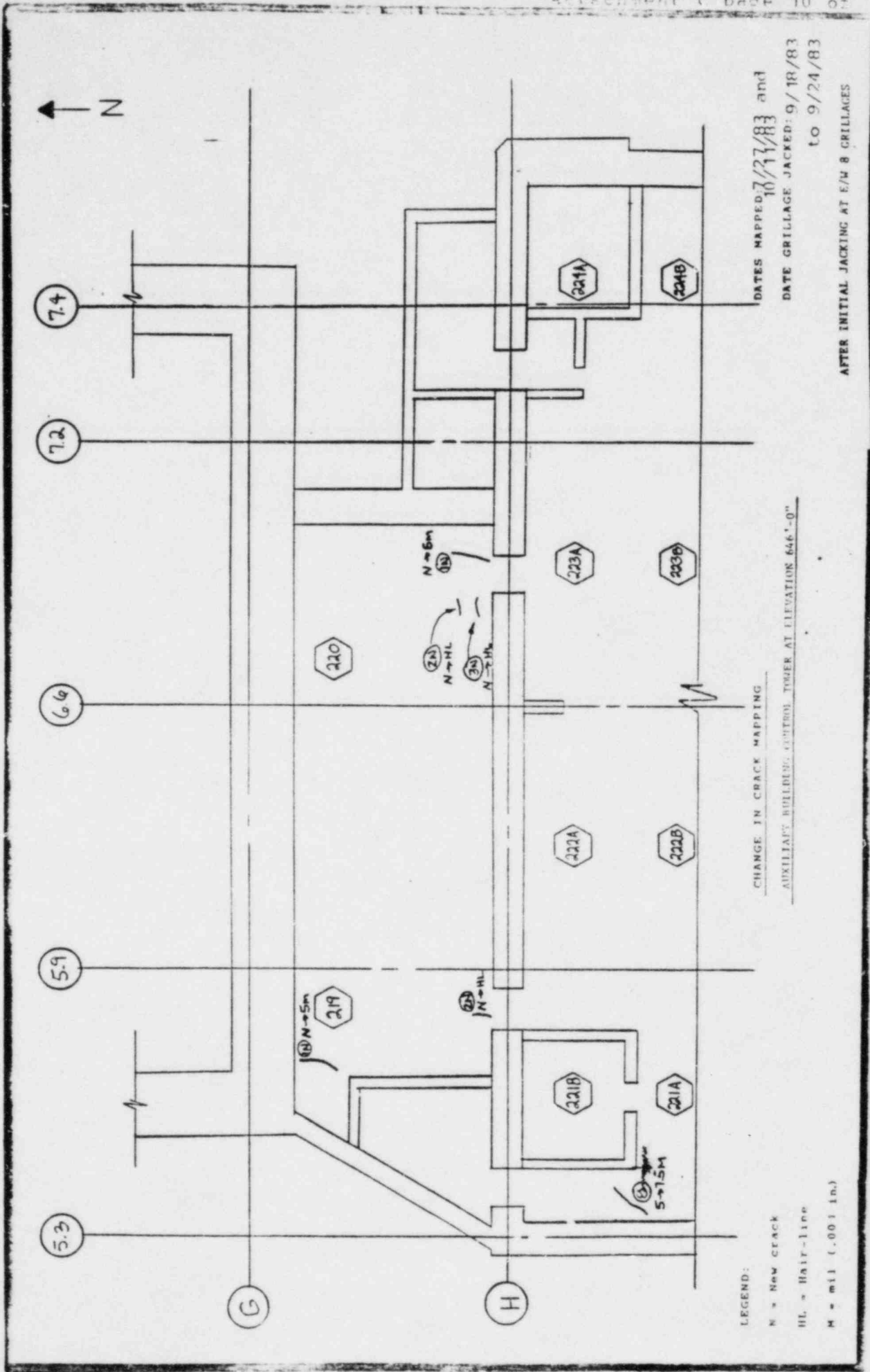
EAST ELECTRICAL PENETRATION AREA - NORTH FACE OF WALL AT COLUMN LINE K (ELEVATION 659'-0" TO ELEVATION 659'-0")

DATES MAPPED: 7/25/83 and 10/6/83

DATE GRILLAGE 9/18/83

AFTER INITIAL JACKING AT E/W 8 GRILLAGES TO 9/24/83

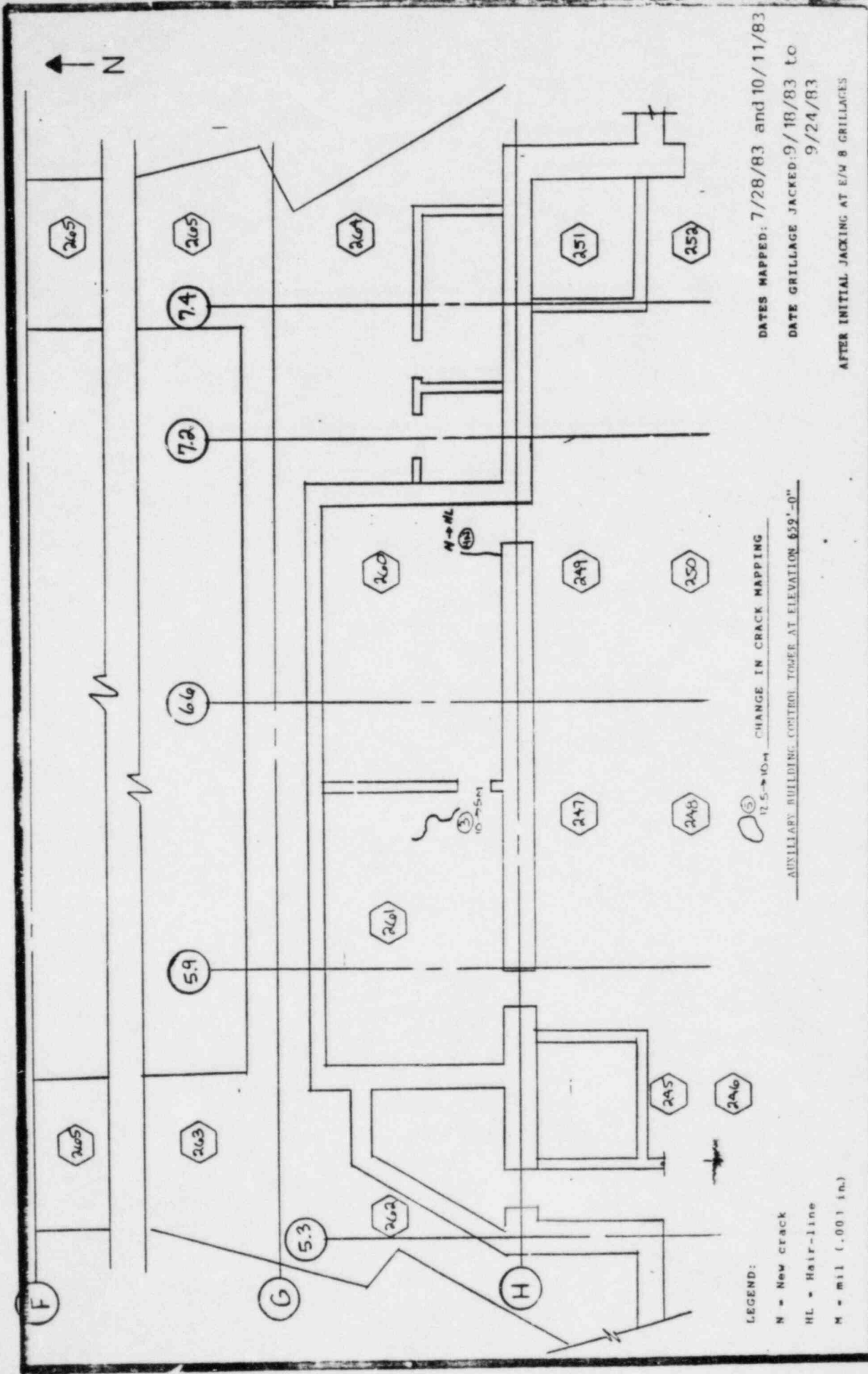


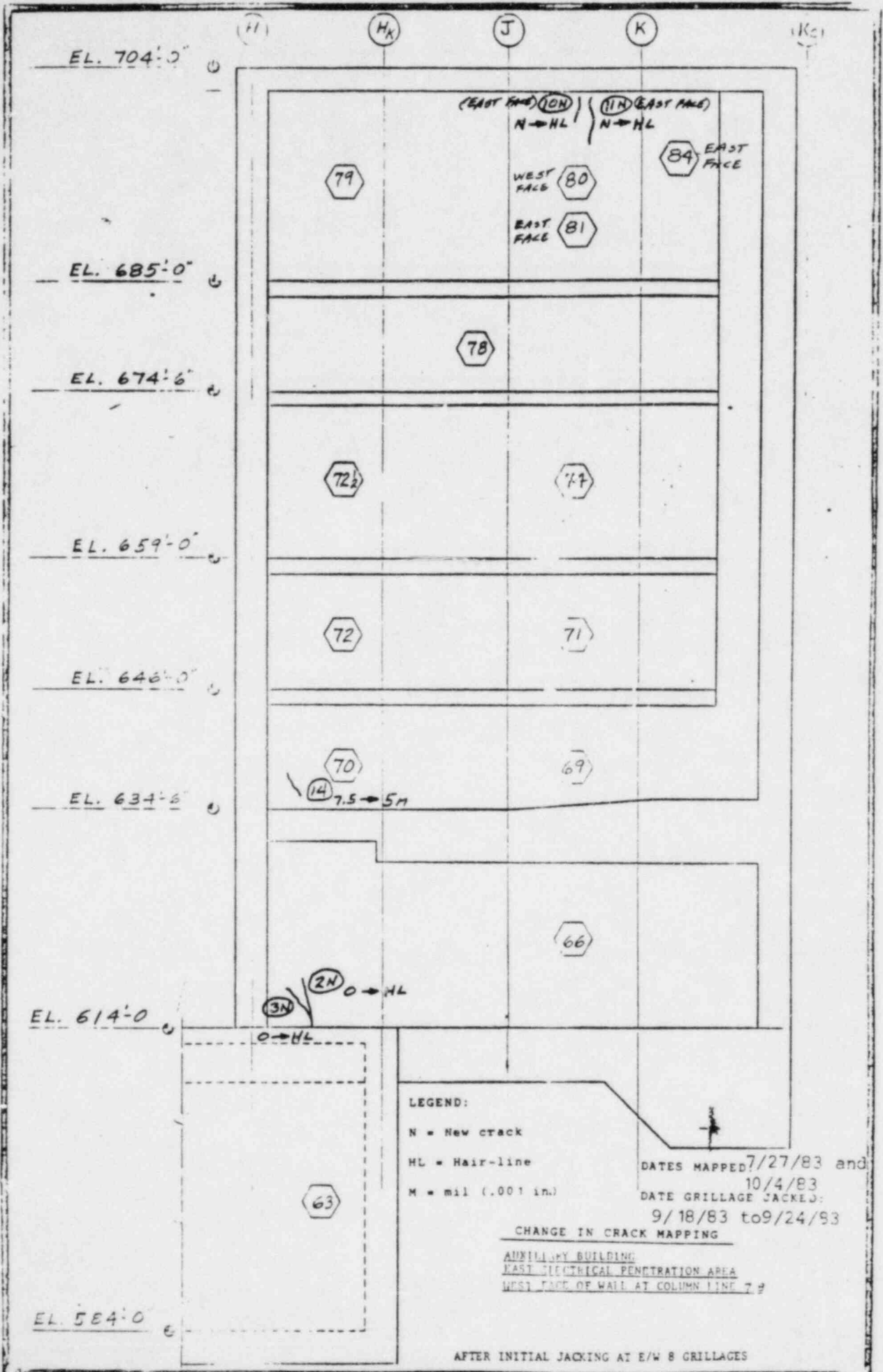


DATES MAPPED 7/27/83 and 10/17/83
 DATE GRILLAGE JACKED: 9/18/83 to 9/24/83
 AFTER INITIAL JACKING AT E/W 8 GRILLAGES

CHANGE IN CRACK MAPPING
 AUXILIARY BUILDING CENTER TOWER AT ELEVATION 646'-0"

LEGEND:
 N = New Crack
 HL = Hair-line
 M = mil (.001 in.)





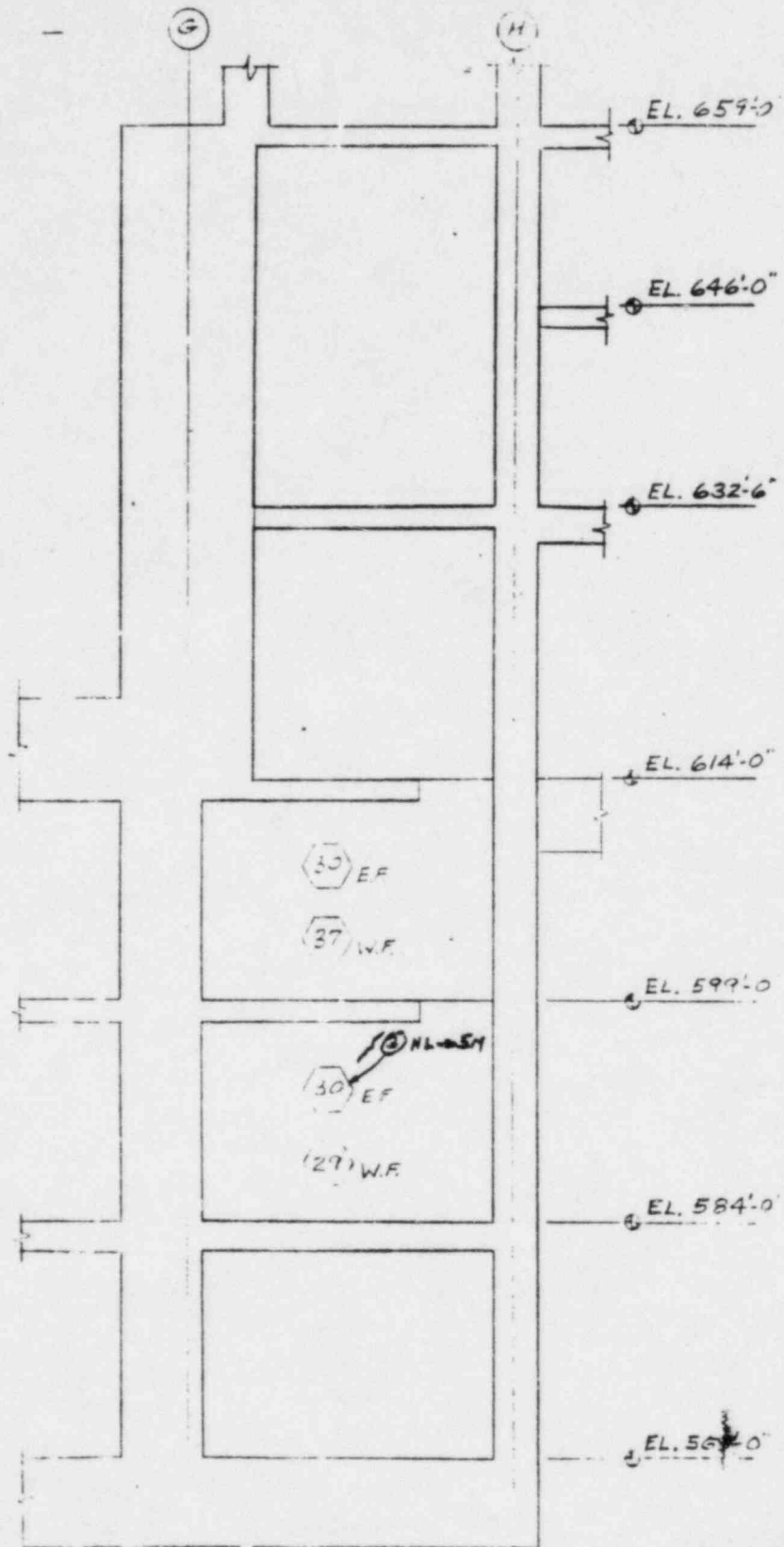
LEGEND:

- N = New crack
- HL = Hair-line
- M = mil (.001 in.)

DATES MAPPED 7/27/83 and 10/4/83
 DATE GRILLAGE JACKED: 9/18/83 to 9/24/83

CHANGE IN CRACK MAPPING
AUXILIARY BUILDING
PAST ELECTRICAL PENETRATION AREA
WEST FACE OF WALL AT COLUMN LINE 7.9

AFTER INITIAL JACKING AT E/W 8 GRILLAGES



LEGEND:

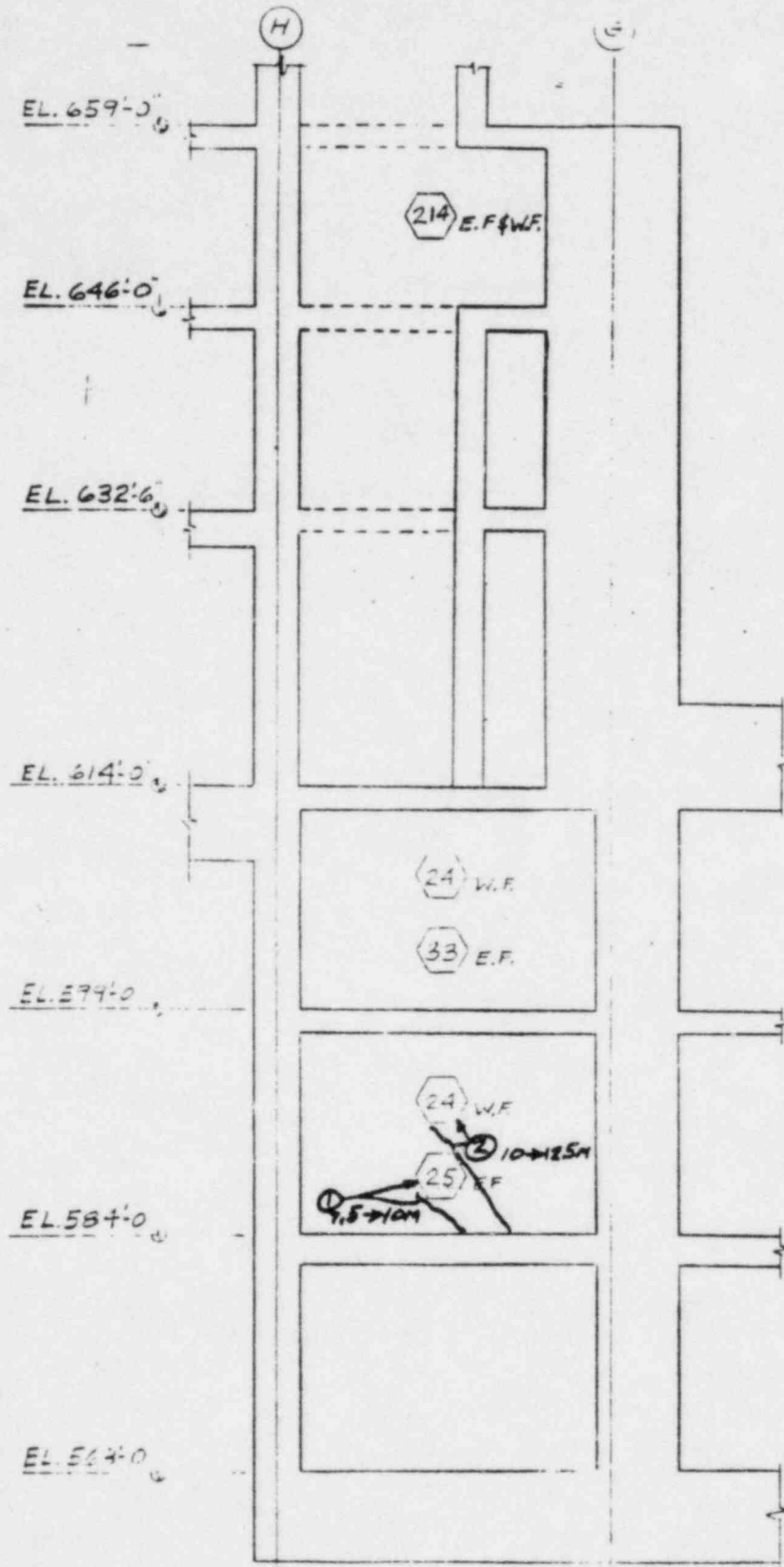
- N = New crack
- HL = Hair-line
- M = mil (.001 in.)

CHANGE IN CRACK MAPPING

WALL AT COLUMN LINE 7.4 A AND 7.8

DATES MAPPED: 7/25/83 and
 10/3/83
 DATE GRILLAGE JACKED:
 9/18/83 to 9/24/83

AFTER INITIAL JACKING AT E/W 8 GRILLAGES



LEGEND:

N = New crack

HL = Hair-line

M = mil (.001 in.)

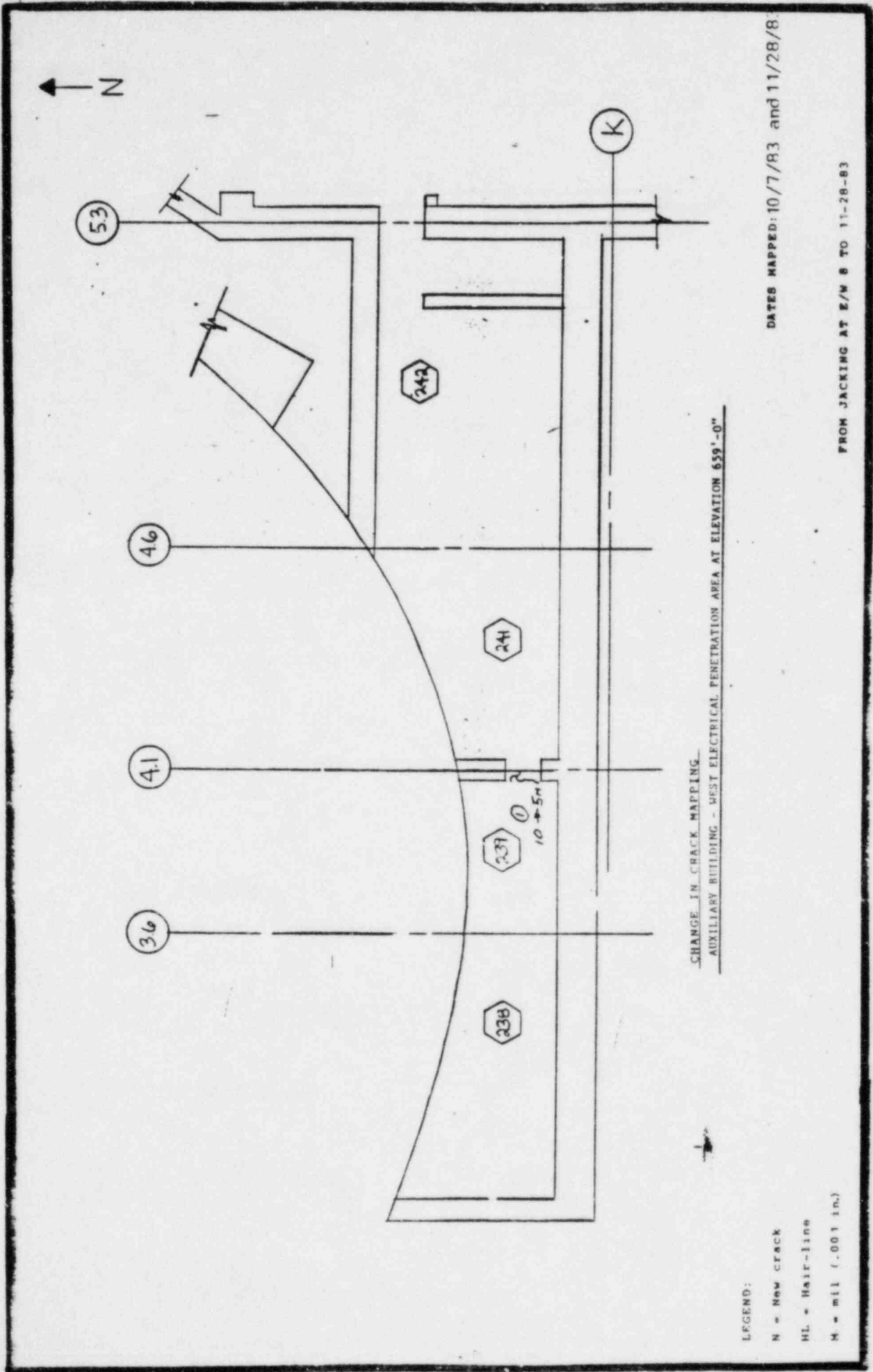
DATES MAPPED: 7/25/83

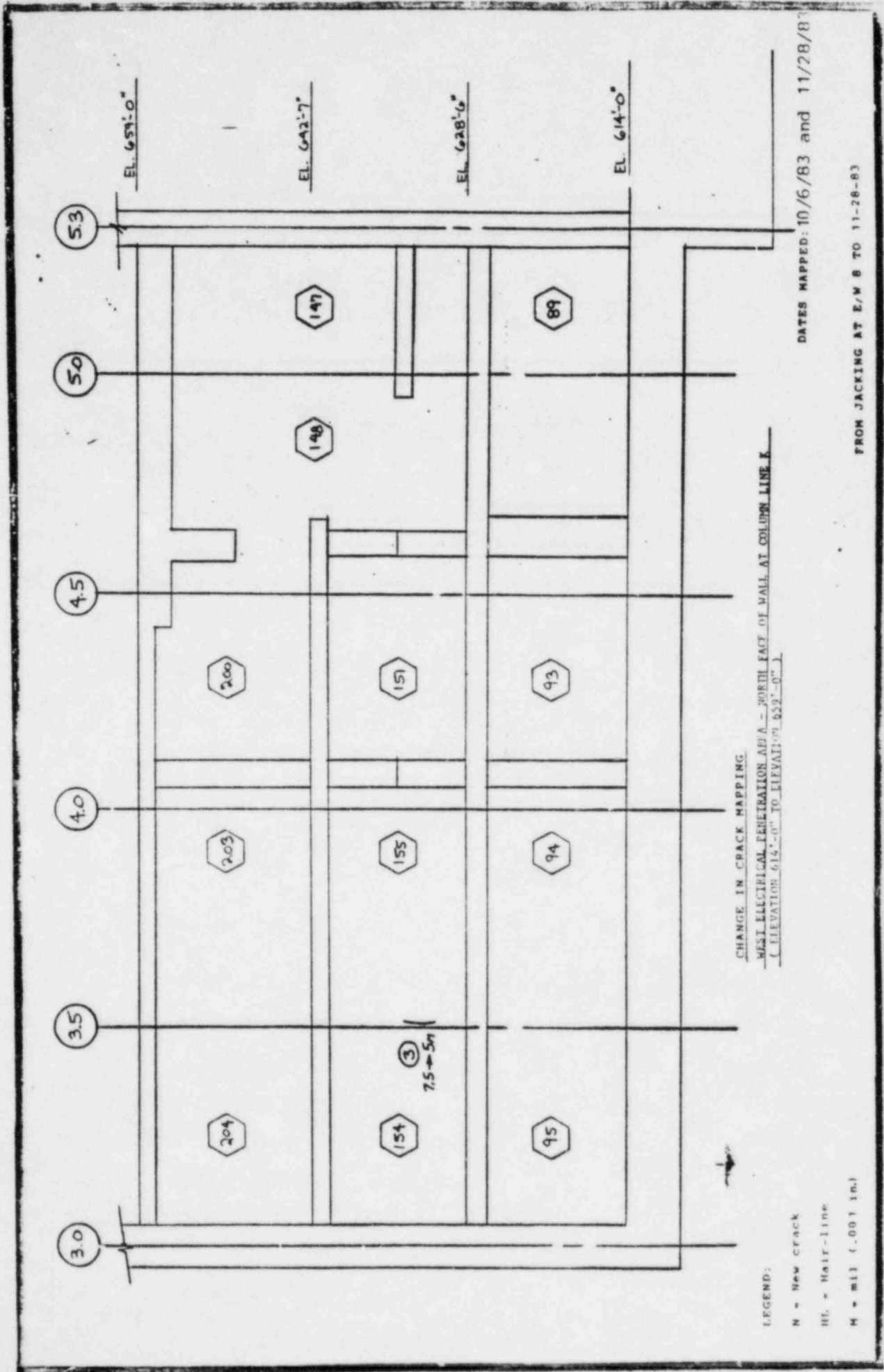
and 10/3/83
DATE GRILLAGE JACKED:
9/18/83 to 9/24/83

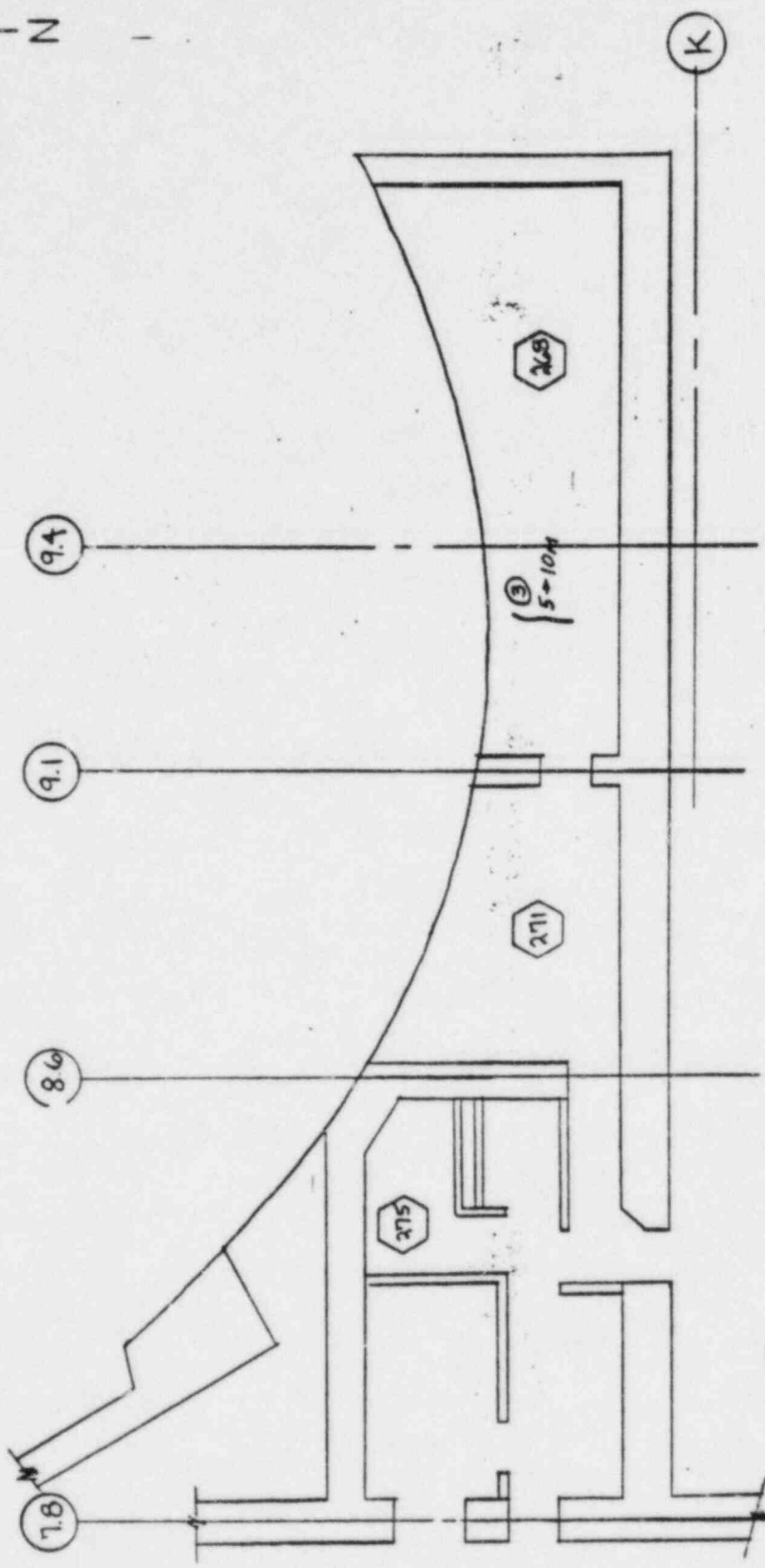
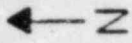
CHANGE IN CRACK MAPPING

WALL AT COLUMN LINE 5.3 AND 5.6

AFTER INITIAL JACKING AT E/W 8 GRILLAGES





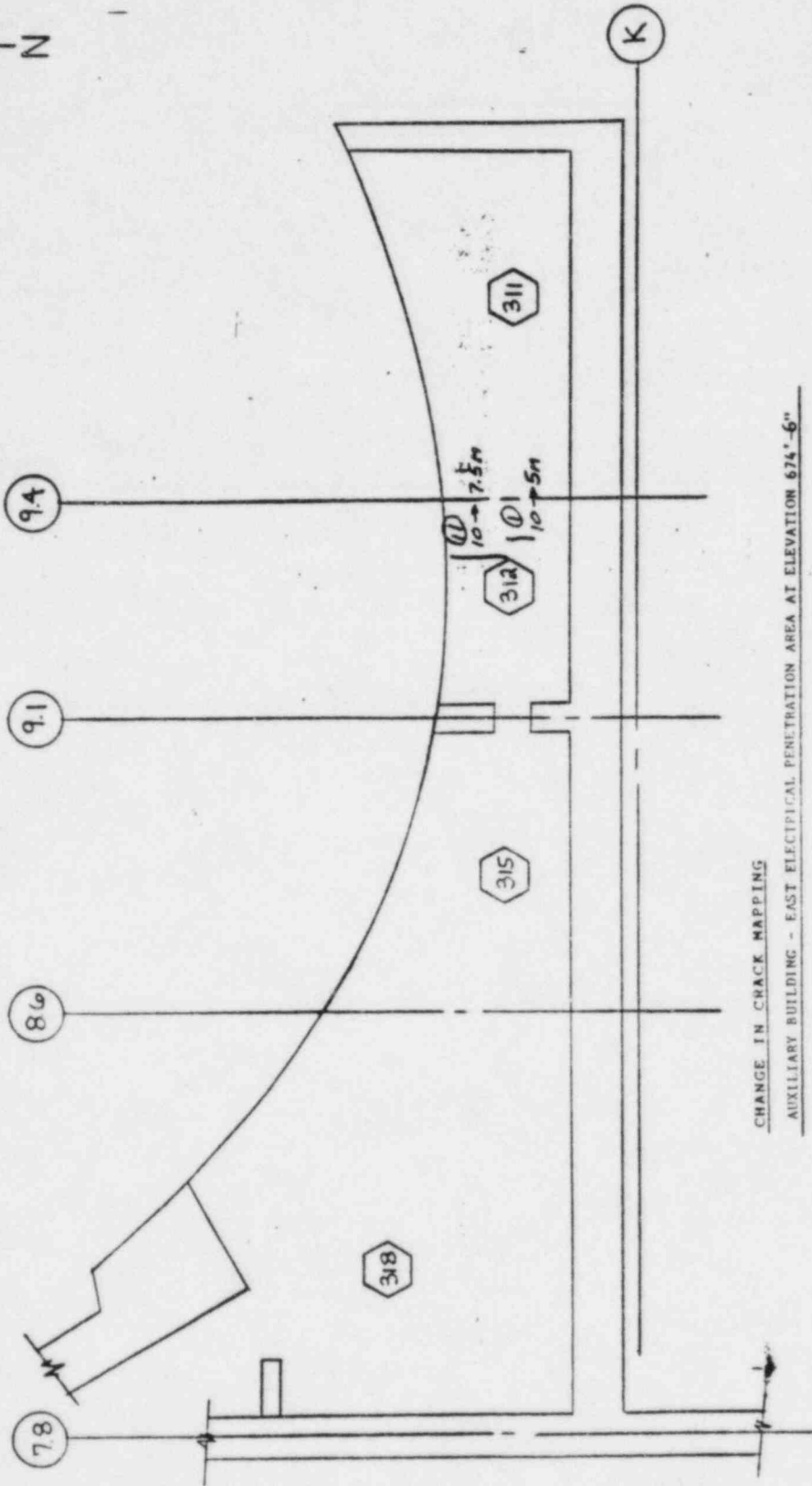
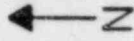


CHANGE IN CRACK MAPPING
 AUXILIARY BUILDING - EAST ELECTRICAL PENETRATION AREA AT ELEVATION 658'-0"

DATES MAPPED: 10/28/83 and

FROM JACKING AT E/W 8 TO 11-28-83

LEGEND:
 N = New crack
 H = Hair-line
 M = mil (.001 in.)



LEGEND:

N = New crack

HL = Hair-line

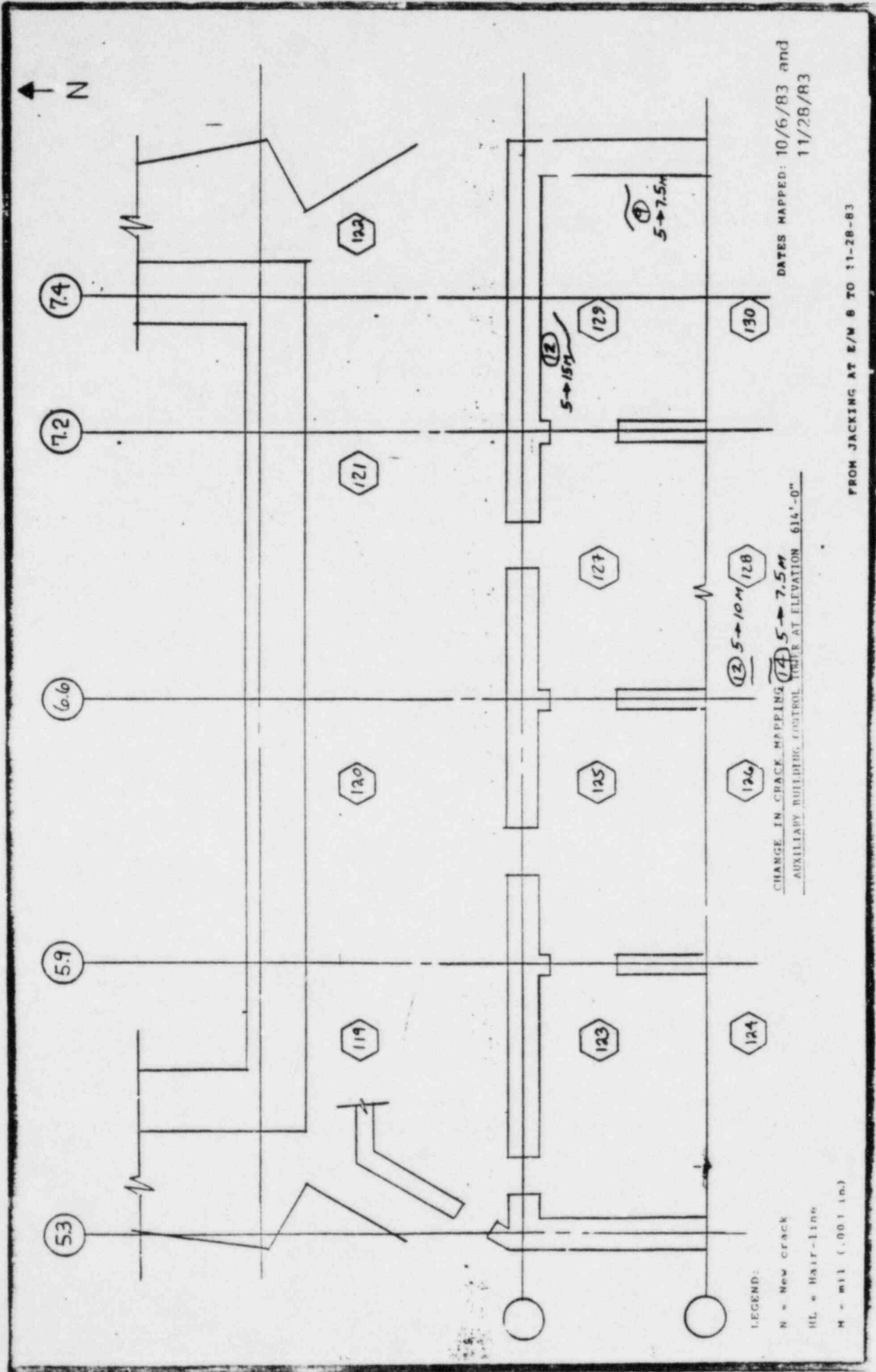
M = mil (.001 in.)

CHANGE IN CRACK MAPPING

AUXILIARY BUILDING - EAST ELECTRICAL PENETRATION AREA AT ELEVATION 674'-6"

DATES MAPPED: 7/28/83 and 11/28/83

FROM JACKING AT E/W 8 TO 11-28-83

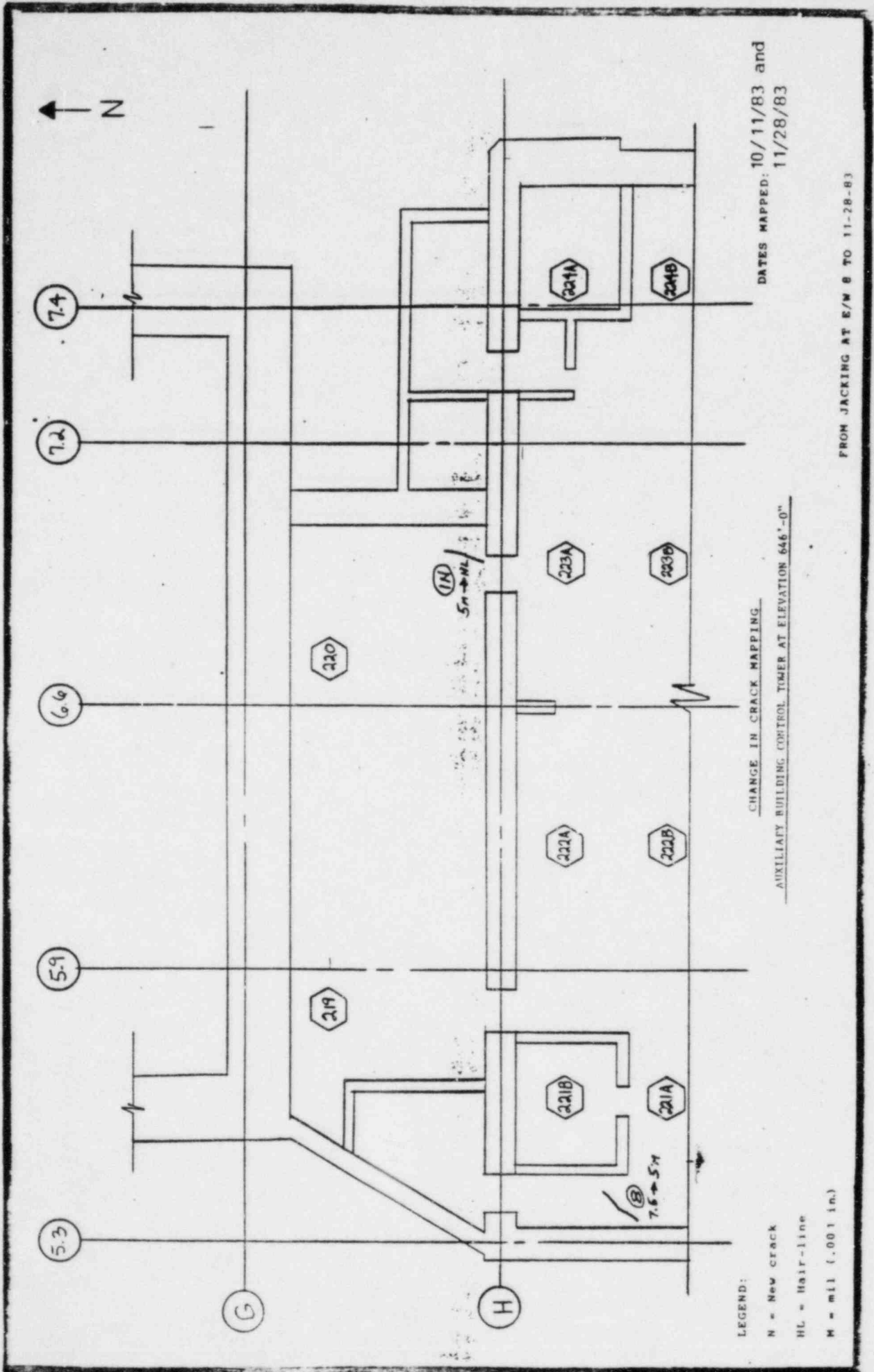


DATES MAPPED: 10/6/83 and 11/28/83

CHANGE IN CRACK MAPPING (7.4) 5 → 7.5M
AUXILIARY BUILDING CONTROL JUMP AT ELEVATION 614'-0"

LEGEND:
 N = New crack
 HL = Hair-line
 M = mil (.001 in.)

FROM JACKING AT E/W 6 TO 11-28-83

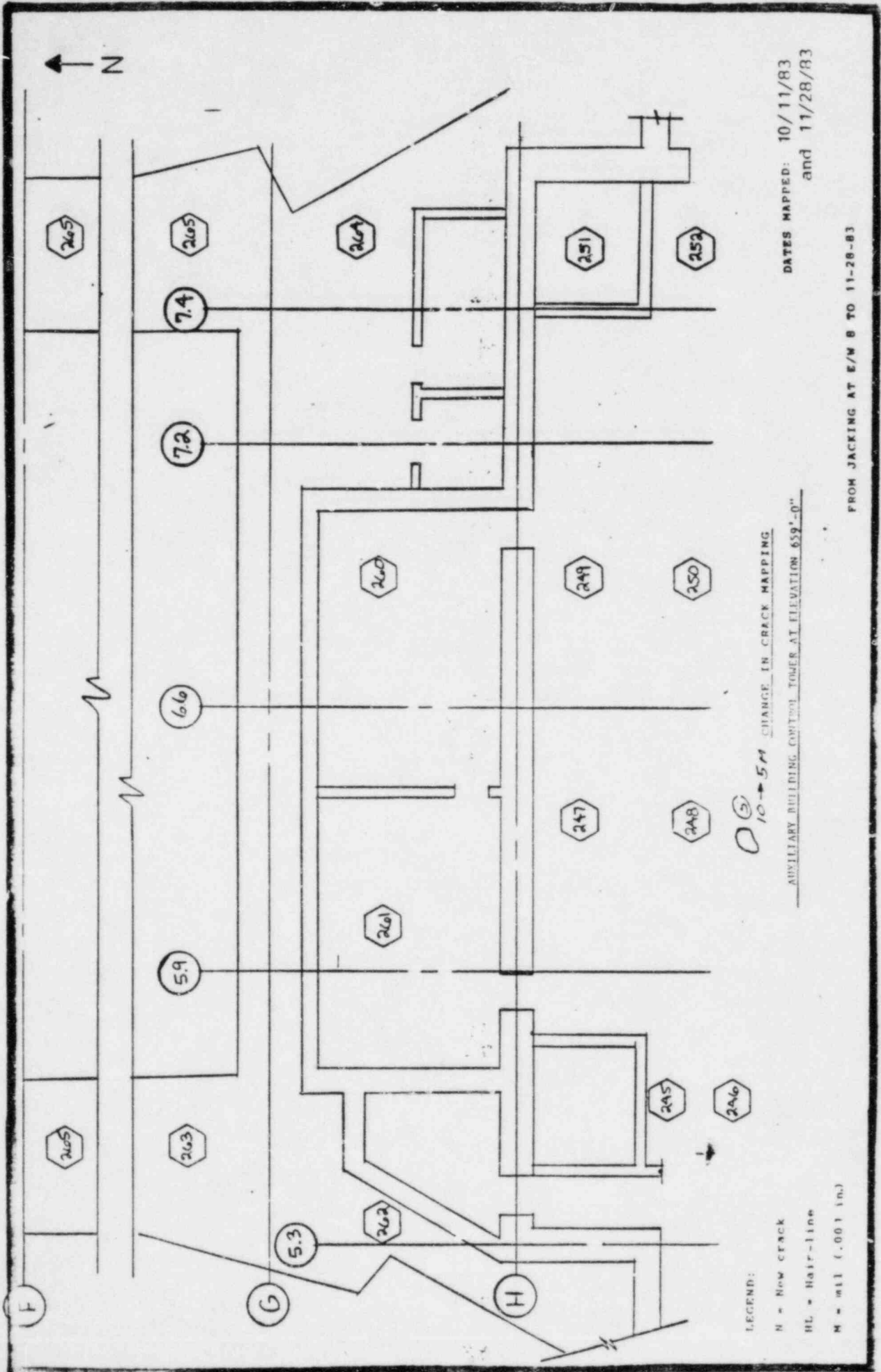


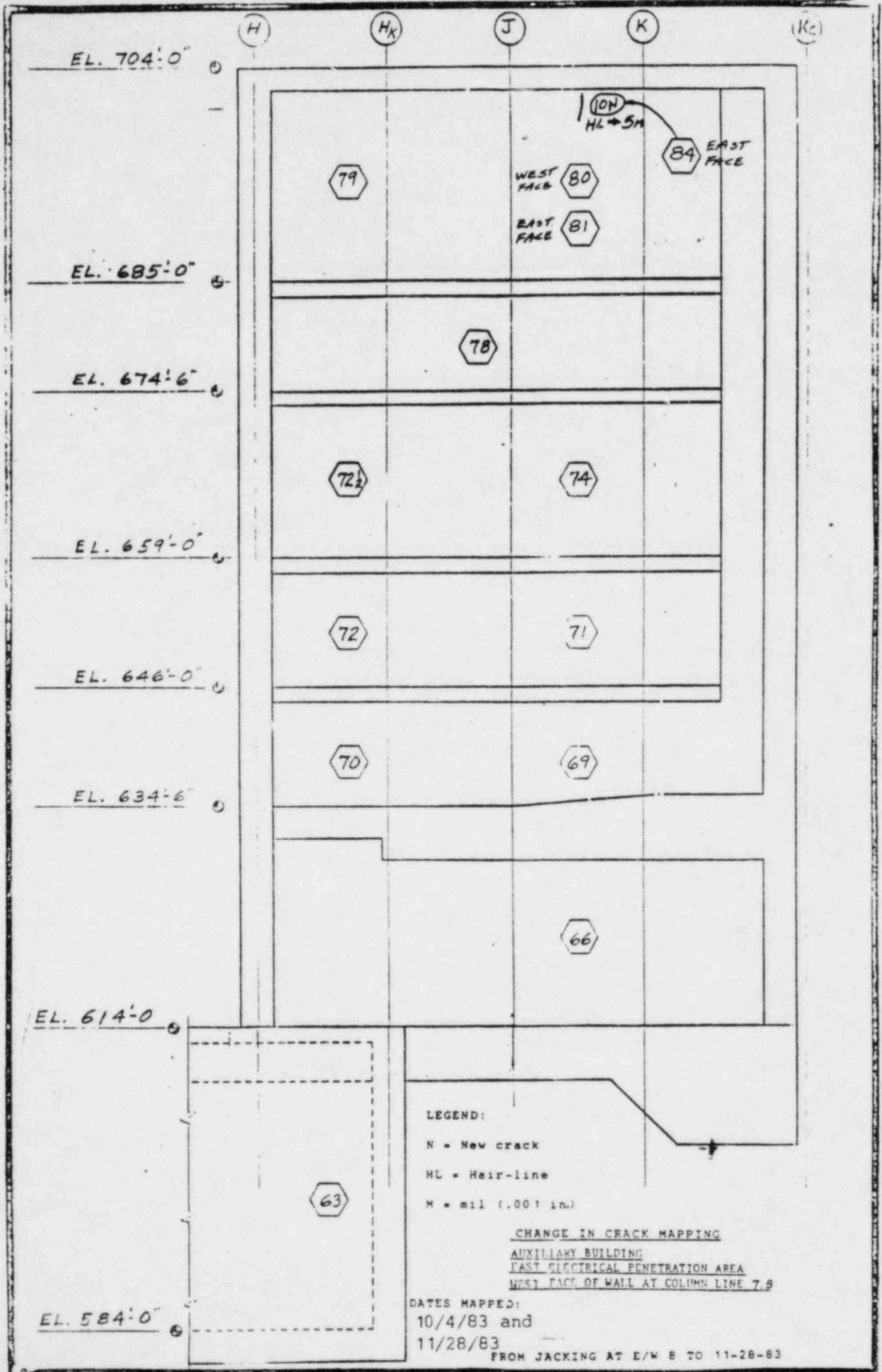
DATES MAPPED: 10/11/83 and 11/28/83

CHANGE IN CRACK MAPPING
AUXILIARY BUILDING CONTROL TOWER AT ELEVATION 646'-0"

FROM JACKING AT E/W 8 TO 11-28-83

LEGEND:
 N = New crack
 HL = Hair-line
 M = mill (.001 in.)





LOCATION	AREA	CRACK I.D. NO	CRACK MEASUREMENTS (1 MIL=.001 in.)						EVALUATION
			WIDTH CHANGE AFTER INITIAL JACKING (MILS)			WIDTH CHANGE AFTER REJACKING (MILS)			
			FROM	TO	> 5 MILS	FROM	TO	> 5 MILS	
West EPA Slab @ 628' 6"	146	9N	N	HL	No				Within Tolerance.
West EPA slab @ 659' 0"	238	*3	5	5	Yes				Crack #3 in area 238 is in floor topping with poorly defined worn off edges which could have lead to measurement dispersion. All other cracks within tolerance.
	238	*13N	N	HL	No				
	239	*1	15	10	No	10	5	No	
	239	*6	7.5	5	No				
	242	*8	15	10	No				
West EPA Slab @ 674' 6"	282	1	7.5	5	No				Within Tolerance.
West EPA North face of wall @ Col. Line K 614'-0" to 659'-0"	151	1	10	15	No				Both cracks within tolerance. Cracks were reexamined and traces of paint within the crack indicated that it had formed before underpinning operation.
	154	3	5	7.5	No	7.5	5	No	
	203	*1N	N	HL	No				
	203	*2N	N	HL	No				
	203	*3N	N	HL	No				
	203	*4N	N	HL	No				
	204	*1N	N	HL	No				
204	*2N	N	HL	No					
South face of wall.	339	6	7.5	5	No				Within Tolerance.
East EPA Slab @ 659'-0"	268	*1	HL	5	No				Crack #2 in area 271 is in floor topping with poorly defined worn off edges which could have lead to measurement dispersion. All other cracks within tolerance.
		*3	HL	5	No	5	10	No	
	271	*22N	N	HL	No				
		*2	7.5	15	Yes				
East EPA Slab @ 674' 6"	312	1	10	Crazing	N/A	10	5	No	Cracks were noted as crazing when mapped after initial jacking. Valves from 7/28/83 to 11/28/83 were within tolerance.
		11	10	Crazing	N/A	10	7.5	No	
East EPA North face of wall @ Col. Line K 614'-0" to 659'-0"	187	2N	N	HL	No				Both cracks within tolerance.
	139	1N	N	HL	No				
Control Tower West face of wall @ Col. Line 7.8	66	2N	N	HL	No				All cracks within tolerance.
		3N	N	HL	No				
	70	14	7.5	5	No				

SUMMARY OF AUXILIARY BUILDING CRACK CHANGES

LOCATION	AREA	CRACK I.D. NO.	CRACK MEASUREMENTS (1 MIL=.001 in)						EVALUATION
			WIDTH CHANGE AFTER INITIAL JACKING (MILS)			WIDTH CHANGE AFTER REJACKING (MILS)			
			FROM	TO	5 MILS	FROM	TO	5 MILS	
Control Tower East face of Wall @ Col. Line 7.8	84	10N -11N	N N	HL HL	No No	HL	5	No	Both cracks within tolerance.
Control Tower Slab @614'-0"	128	5 12 14	5 10 7.5	10 5 5	No No No	5 5 5	10 7.5	No No No	Crack #12 in area 129 is in floor topping with poorly defined worn off edges which could have lead to measurement dispersion. All other cracks within tolerance.
	129	9 12	7.5 10	5 5	No No	5 5	7.5 15	No Yes	
Control tower Slab @646'-0"	221A	8	5	7.5	No	7.5	5	No	Within Tolerance.
Control tower Slab @659'-0"	248	5	12.5	10	No	10	5	No	Within Tolerance.
Aux. Bldg. Slab @646'-0"	219 220	1N 2N 1N 2N 3N	N N N N N	HL HL 5 HL HL	No No No No No	5	HL	No	All cracks within tolerance.
Aux. Bldg. Slab @659'-0"	260 261	4N 3	N 10	HL 5	No No				Both cracks within tolerance.
Aux. Bldg. Wall @Col. Line 7.4 & 7.8	30	3	N	5	No				Within Tolerance.
Aux. Bldg. Wall @Col. Line 5.3 & 5.6	25 24	*1 *2	7.5 10	10 12.5	No No				Both cracks within tolerance.

SUMMARY OF AUXILIARY BUILDING CRACK CHANGES

Attachment E
Page 2 of 3

* Inspected by Dr. A. E. Fiorato (CTL) and Dr. Mete Sozen (Univ. of Ill)

Ken/Boz



**Consumers
Power
Company**

J A Mooney
Executive Manager
Midland Project Office

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0774

December 6, 1983

Mr J J Harrison
Midland Project Section
U S Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

PRINCIPAL STAFF			
✓ RA	1/3	DPRP	
D/RA		DE	
A/RA		DRMSP	
✓ RC	1/1	DRMA	
PAO		SCS	✓
SGA		ML	
File		File	

orig + 3

MIDLAND ENERGY CENTER GWO 7020
CONCURRENCE FOR ADDITIONAL JACKING LOADS FOR THE EAST/8 GRILLAGE
File: 0485.16 UFI: 42*05*22*04 Serial: CSC-7063
12*32

In the above referenced letter, it was clarified that 160% of the specified load is planned to be jacked, in 5% increments (over the locked off load) into grillage 8 (EPA jacks) prior to completing the excavation for grillage 5. The letter also stated that the load in grillage (EPA Jacks) will be reduced to the specified load (800 tons) as the load at grillage at 2 is applied.

At the time of the letter, the jacking load in grillage 8 (EPA jacks) had been locked off at 125% of specified load. (Percentages expressed hereafter are percentages of specified load.) In a September 29, 1983 telecon, Dr. R. Landsman informed CPCo not to institute additional reserve capacity load above 125% without NRC concurrence.

On November 15, 1983, CPCo indicated in a conference call with the NRC (Dr. Landsman, J. Kane and others) that it would be necessary to increase the jacking loads for east 8 grillage to maintain the building elevation. East and West 8 grillage jacking and building elevation history was discussed. It was mentioned that with the NRC restriction on jacking additional reserve capacity load, frequent reworking of the grillages may be necessary to comply with the design specification. It was explained that in one instance of reworking of east 8 grillage, the lift-off loads experienced were 131.3% for the X jacks, 133.5% for the Y jacks and 145.4% for the Z jacks. (The X jacks support the Turbine Building, and the Y and Z jacks support the EPA.)

In a November 28, 1983 conference call with the NRC (Dr. Landsman and J. Kane), CPCo again requested permission to increase the jacking lock off loads for the east 8 grillage. Mr. Gould of Mergentime explained that the previously agreed limitation on lock off loads (X=110%, Y=125%, Z=125%) is hindering our ability to maintain the Auxiliary Building elevation. Specifically, the east 8 grillage had been recently reworked twice over the Thanksgiving Holiday with the overall effect of losing building elevation.

OC1283-0000A-CN01

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DEC 12 1983

Mr. Gould indicated that the current adjusted jack loads for the east 8 grillage were X=115%, Y=141.7% and Z=149%. Mr. Gould indicated that the frequent re-jacking on the east side may be due to smaller than necessary lock off loads. The triggering mechanism for the re-jacking is related to the structure reaching a downward movement of 0.010 inch in a 48 hour period, as specified in the construction procedure. CPCo recommended the following actions:

1. Maintain current jack loads (X=115%, Y=141.7%, Z=149%) for the east 8 grillage/pier until the acceptance criteria of 10 m ls in 48 hours is satisfied.
2. After the acceptance criteria is met, reduce the E8 grillage/pier loads to X=115%, Y=135%, Z=135% and then lock off X, Y and Z jacks.

Mr. Kane and Dr. Landsman indicated they concurred with the recommended actions. This letter serves as documentation for the agreement on the recommended action.

It was also indicated by Mr. Kane that he would like to resolve the issue in total through the following steps:

1. CPCo will complete its' evaluation of crack mapping and other data to determine the effects of jacking loads on the Auxiliary Building. Upon completion of this evaluation, CPCo will provide in writing, the conclusions of the effects of higher jacking loads on the Auxiliary Building to the NRC by December 9, 1983.
2. A meeting is tentatively scheduled for the week of December 19, 1983 (later changed to January 4, 1984 through January 6, 1984), to completely resolve the outstanding issues relative to increasing jacking loads. Discussions will include data and other information required to resolve the matter of jacking loads.

Although permission has been received to increase lock off loads for the East 8 grillage as outlined above, it should be recognized that the increased jacking loads presently authorized may not necessarily be sufficient to maintain the building elevation. If the jacking loads are not deemed sufficient due to unanticipated conditions, we may be requesting your concurrence for higher jacking loads. (It should be pointed out here that the grillage at 8 including pier and foundation capacity has been designed for 2000T load which provides for any unanticipated conditions.) We thank you for your cooperation on this matter.

Amooney
JAM/RMW/klw