J A Mooney
Executive Manager
Midland Project Office

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

May 25, 1984

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

MIDLAND ENERGY CENTER
MIDLAND DOCKET NOS. 50-329, 50-330
AUXILIARY BUILDING MOVEMENT GUIDELINE FOR
TEMPORARY UNDERPINNING
FILE 0485.16 SERIAL CSC-7809

As a result of our April 4-6, 1984 meeting, a guideline relative to building movement and jacking has been developed for the Auxiliary Building underpinning. We believe the approach outlined in our new guideline is responsive to the NRC concerns and suggestions.

Figures 7-2 (A&B) and 7-3 (A&B), provided during the April 4-6, 1984 meeting, were based on a straight line representation of the survey data and have been revised based on smooth curve representations of the survey data. The guidelines utilize the smooth curve representations.

We seek your concurrence on the proposed Auxiliary Building guideline entitled "Guidelines for Building Movements during Temporary Underpinning".

If you deem a meeting appropriate to resolve your questions and comments, please contact us regarding the logistics of the meeting.

JAM/RMW/klw

attachment

CC DSHood, USNRC
JGKeppler, Regional Administrator
RJCook, Resident Inspector
JKane, USNRC
FRinaldi, USNRC
GAHarstead, Harstead Engineering
SPoulous, GEO-Tech Engineering
RSamuels, C,S&A, Inc.
CHerrick, Franklin Research Center

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

Letter Serial CSC-7809 Dated May 25, 1984

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 Auxiliary Building Movement Guideline for Temporary Underpinning.

CONSUMERS POWER COMPANY

By JA Mooney
J A Mooney
Executive Manager

Sworn and subscribed before me this 30th day of May, 1984.

Patricia A Puffer
Notary Public
Bay County, MI

My Commission Expires 3-4-86

COM 151853
F05287

MIDLAND
AUXILIARY BUILDING

GUIDELINES FOR BUILDING MOVEMENTS DURING TEMPORARY UNDERPINNING

1. PURPOSE
To establish guidelines relative to building movement and jacking to be utilized during the Auxiliary Building temporary underpinning.

2. DESCRIPTION
The vertical movement of the southern edge of Control Tower relative to the main building after subtracting the rigid body movement is known as Δ_1.

The vertical movement of an EPA (Electrical Penetration Area) end relative to the Control Tower after subtracting the rigid body movement is known as Δ_2.

Figure 1 shows a combined plot of Δ_1 and Δ_2. The Δ_2 at the end of West EPA is plotted on the first vertical axis. The next two vertical axes represent the Δ_1s at the south-west and south-east corners of the Control Tower. The fourth vertical axis represents the Δ_2 at the end of East EPA.

The horizontal axis ($\Delta_1 = 0$) represents the reference plane of the main Auxiliary Building. The changes in relative movement (Δ_1 and Δ_2) during the period of June 1978 through August 1982 have been measured by an optical survey and they are plotted in Figure 1. The changes are the following:

Δ_1 at the south-west corner of CT = 0.090"

Δ_1 at the south-east corner of CT = 0.210"

Δ_2 at the end of West EPA = 0.060"

Δ_2 at the end of East EPA = 0.320"

Positive values represent downward movement.

3. CAPABILITY
Analyses were carried out using conservative assumptions to determine the building capabilities to tolerate movements. The results of the analyses indicate that the following changes in Δ_1 and Δ_2 can take place from the start of underpinning (August, 1982). (the reinforcing strain is limited to 2/3 of the strain at initiation of yield and/or shear stress in concrete is limited to $3\sqrt{f'_c}$.)

Control Tower: Δ_1 (UP) = 0.650"

Δ_1 (DOWN) = 0.560"

EPA: Δ_2 (UP) = 0.700"

Δ_2 (DOWN) = 0.180"

The calculations for Δ_1 (up) and Δ_2 (up) were reviewed by the NRC during the April, 1984 meeting at the Midland jobsite. The calculations for Δ_1 (down) were reviewed during the July, 1982 audit in Ann Arbor. The calculations for Δ_2 (down) were also available in July 1982.

4. GUIDELINE

NRC presented a concept for movement limits during the April 4-6, 1984 meeting at the Midland Jobsite. Essentially the concept is as follows:

- The EPA's would be rotated toward the plane of the Control Tower corners (See A-A, Figure 2)
- The Control Tower corners would be rotated toward a plane parallel to the reference plane of the Main Aux. (See B-B, Fig. 1)
- The Control Tower corners would be raised toward the plane of the main Auxiliary Building (Line B-B, Fig. 1)

The NRC had indicated that as a result of time dependent effects (creep, shrinkage, etc), all of the movements cannot be recovered completely.

CPCo has reviewed this concept in light of the building capability, and the calculated instantaneous elastic movements of the building during underpinning, and proposes the following conservative guidelines for movements and jacking. Following these guidelines will ensure that there will not be any overstressing to the Auxiliary Building during the temporary underpinning.

I. JACKING

(a) Proceed with the underpinning according to the established sequence (specified in Project Documents) except for the application of reserve capacity loads (RCL) which is described below:

(i) RCL's have been introduced at the E8 and W8 (E/W8) grillages
(ii) RCL will not be introduced at W5 grillage during initial jacking in advance of adjacent excavations since existing Δ_2-west is relatively small
(iii) RCL will be introduced at the E5 grillage which would aid in reducing the existing magnitude of Δ_2-east
(iv) RCL will be introduced at CT1/12 and CT3/10 piers. Introducing the RCL into both Control Tower corners would improve both of the existing Δ_1 values, and minimize the increases of the Δ_2 east and west. Introduction of RCL on the east side only would improve Δ_1 east but would cause a larger increase in Δ_2 east.

The reserve capacity loads introduced at the grillages at E/W8 and E5 will be removed during the initial jacking of the grillages at E/W2. Also the reserve capacity loads at CT1/12 and CT3/10 piers will be removed during initial jacking of the subsequent CT piers.

Reserve capacity load (RCL) is a temporary load applied at a pier in excess of the specified load in order to compensate for loss of support due to adjacent excavations.

(b) If necessary, additional loads (RCL's) above the specified load may be introduced at any pier/grillage location as required in order to arrest any undesirable trends or to maintain the building movements within the limits listed in Section III.

As a minimum, each pier/grillage jack support system will have the specified load applied and the maximum load to be applied will not exceed the jack support system capacity.

II. BUILDING MOVEMENT LIMITS

(a) EAST EPA RELATIVE MOVEMENT LIMITS (FIGURE 2) -
The lower bound of the east EPA relative movement will be 370 mils in 90', the length of the EPA. The upper bound will be 0 mils in 90'. The relative movement as of August, 1982 was 320 mils in 90'.

(b) WEST EPA RELATIVE MOVEMENT LIMITS (FIGURE 2) -
The lower bound of the west EPA relative movement will be 100 mils in 90' and the upper bound will be -100 mils in 90'. The relative movement as of August, 1982 was 60 mils in 90'.

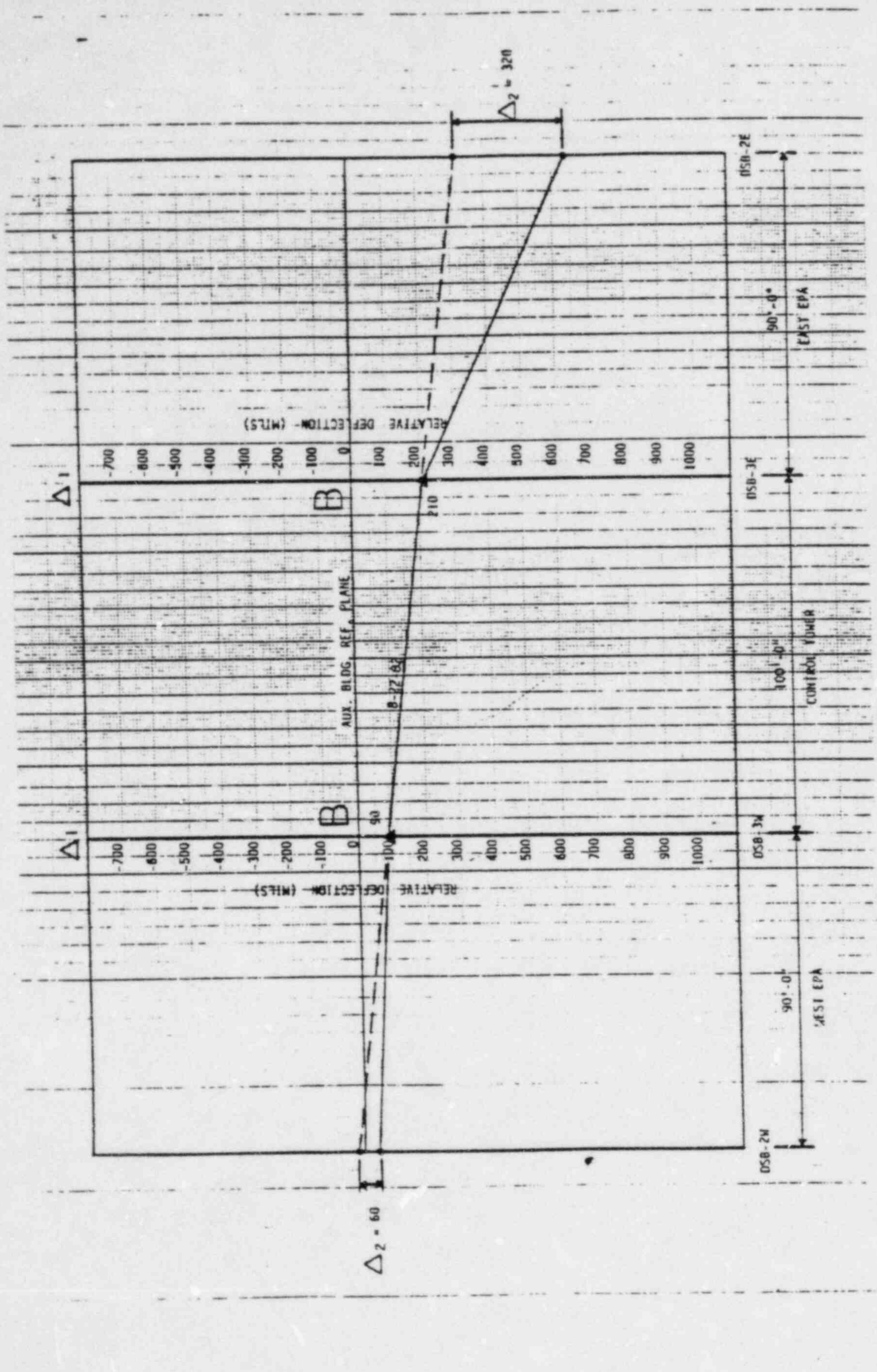
(c) CONTROL TOWER RELATIVE MOVEMENT LIMITS (FIGURE 3 and Figure 5) -
Limit the downward relative movement (Δ_1) of the Control Tower to be less than 200 mils with respect to the August, 1982 values. Also, limit the upward relative movement (Δ_1) of the Control Tower to be less than 250 mils with respect to the August, 1982 values.

(d) CONTROL TOWER ROTATIONAL MOVEMENT LIMITS (FIGURE 4) -
Limit the rotation of Control Tower to be within 50 mils in 100' and -170 mils in 100', the length of the Control Tower. The rotation as of August, 1982 is -120 mils in 100'.

$$\text{Rotation} = \frac{(\Delta_1)\ \text{SW corner} - (\Delta_1)\ \text{SE corner}}{100'}$$

5. CONCLUSIONS
The suggested guidelines for building movement and jacking meet the intent and concerns of the NRC. These guidelines will minimize the possibility of overstressing to the building. Based on the past behavior of the structure and analytical work performed for further temporary underpinning operations, CPCo believes that these limits and guidelines can be met. However, exceeding these limits cannot be completely ruled out due to the thermal movements and overall soil settlements, etc. Should such an unlikely situation develop, CPCo will take measures to bring the building within the suggested limits, if possible, and at the same time keep the NRC appraised.

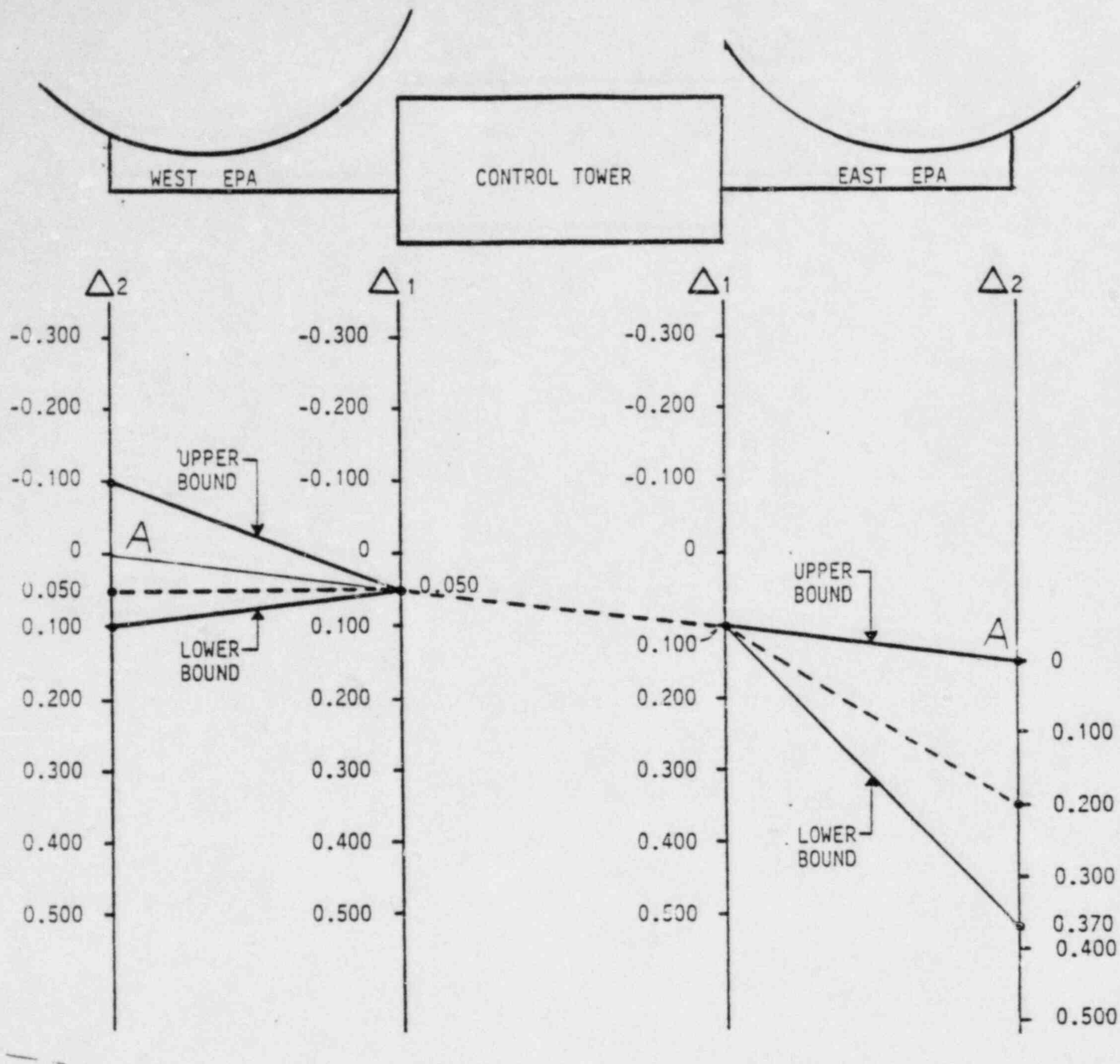
MABC/JK



NOTE: VALUES ARE FROM SMOOTH CURVE REPRESENTATIONS OF SURVEY DATA, REF. CALC. DQ-132(Q).R2

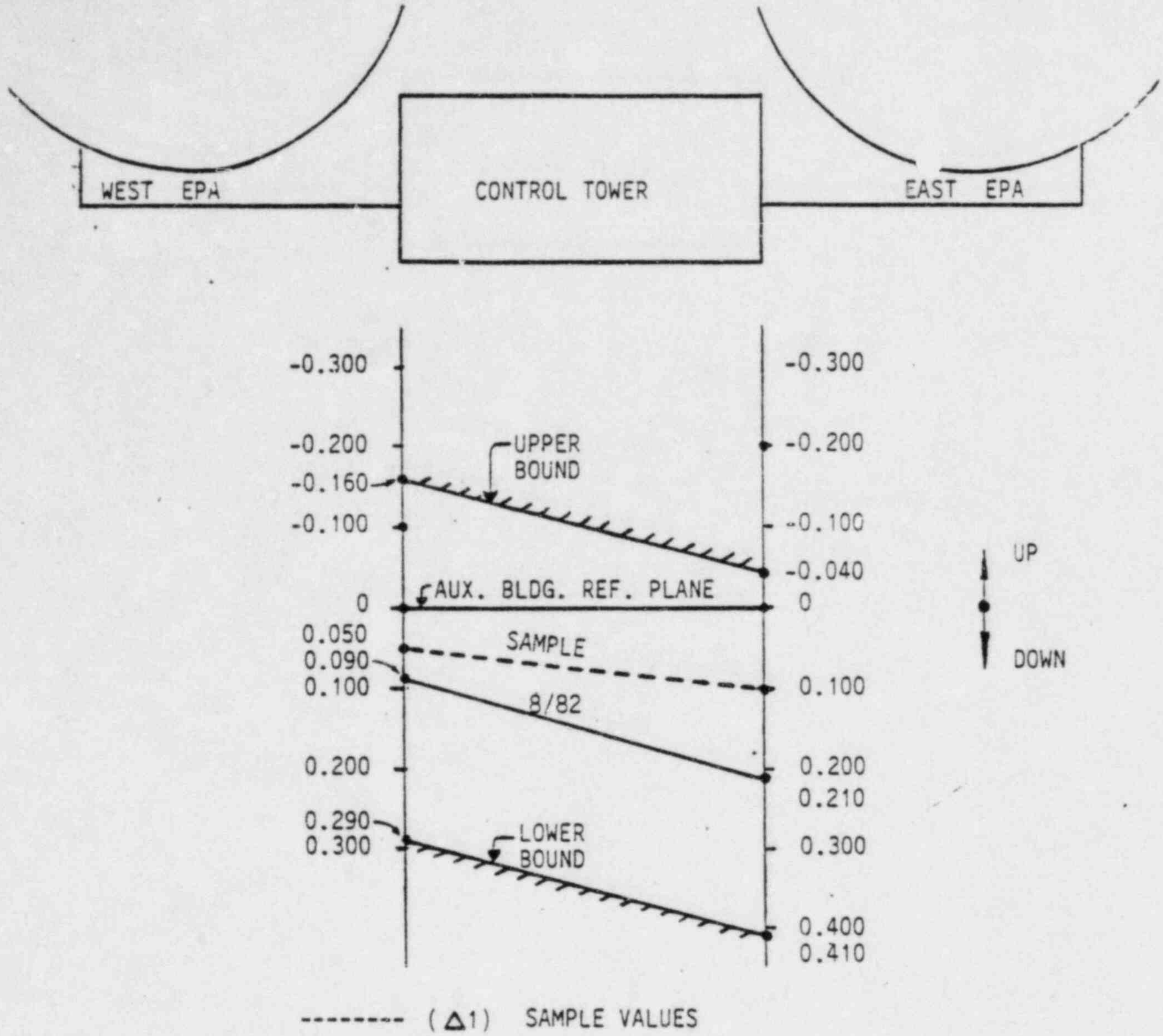
AUXILIARY BUILDING RELATIVE DISPLACEMENTS ON 8-22-82

FIGURE 1



EAST & WEST EPA RELATIVE MOVEMENT LIMITS (Δ2)

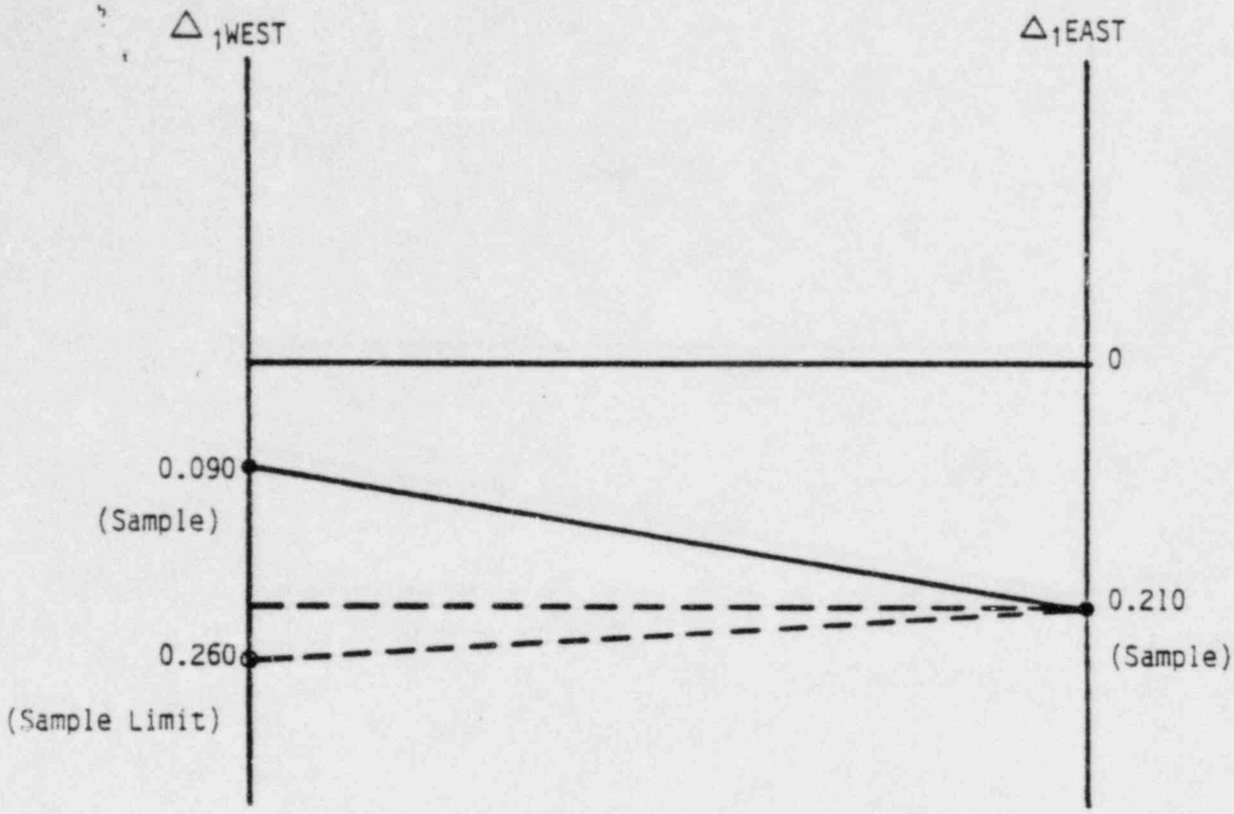
FIGURE 2



CONTROL TOWER RELATIVE MOVEMENT LIMITS ($\Delta 1$)

FIGURE 3

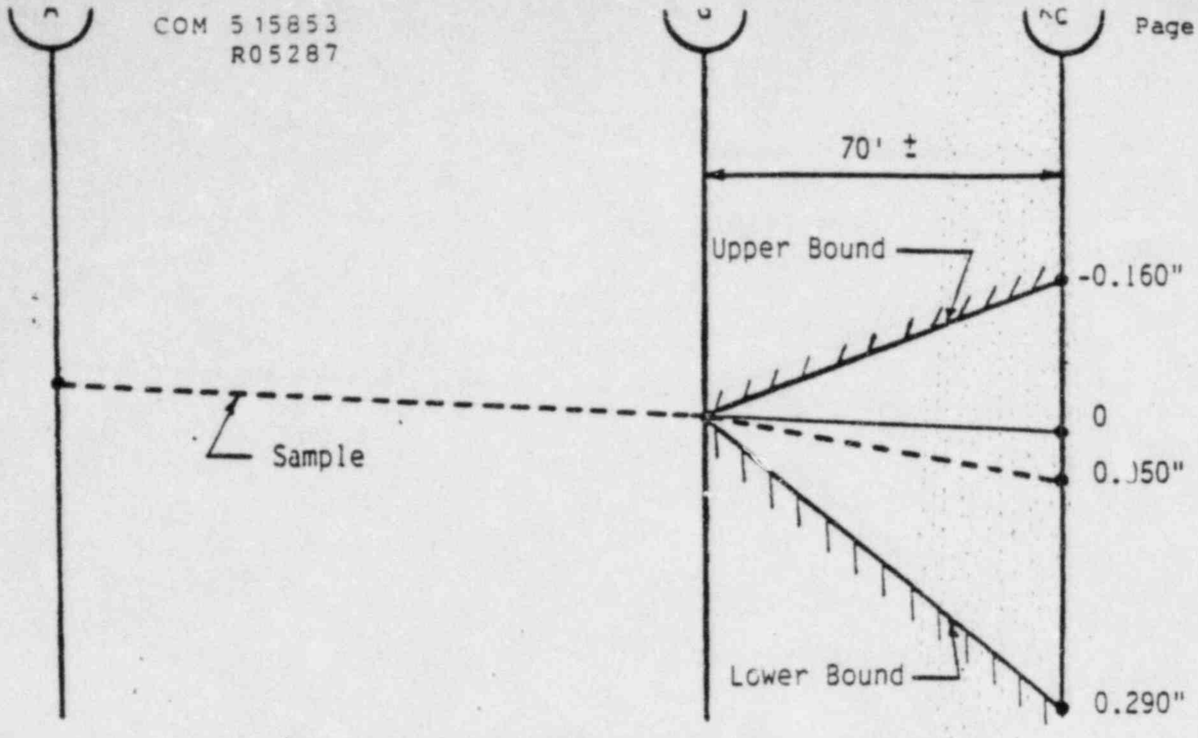
$$-.170 \leq \Delta_1 WEST - \Delta_1 EAST \leq +.050$$



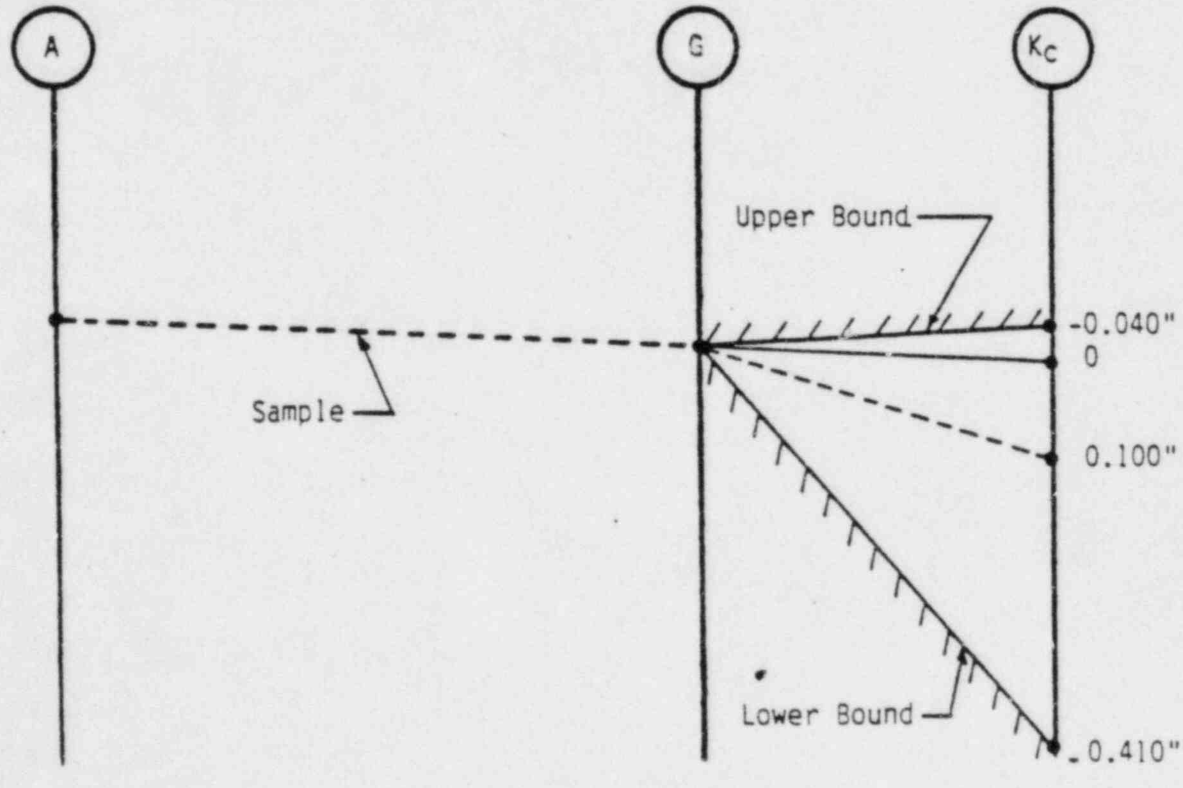
$$\Delta_1 WEST - \Delta_1 EAST = 0.260 - 0.210 = 0.050.$$

CONTROL TOWER ROTATIONAL
MOVEMENT LIMITS

FIGURE 4

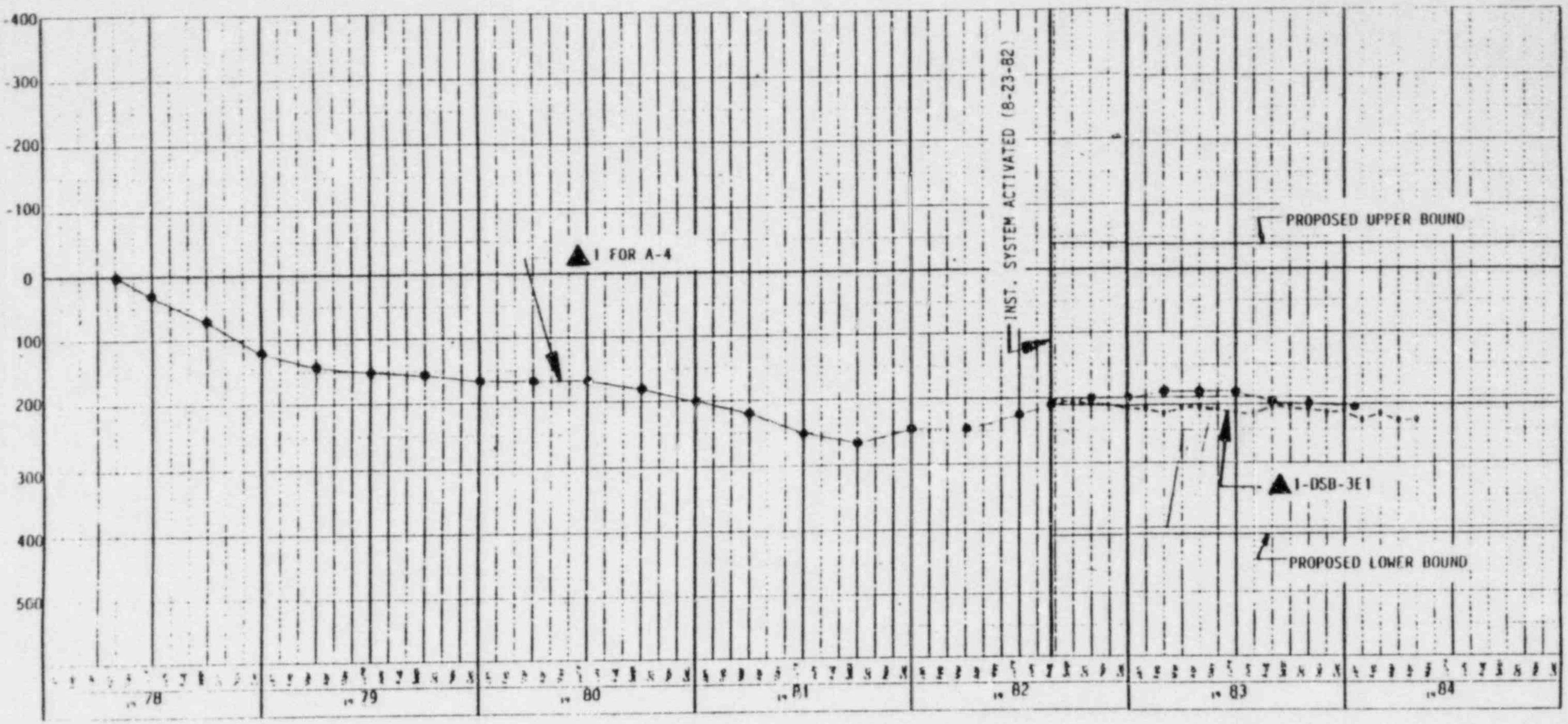


(a) Δl At South-West Corner Of Control Tower



(b) Δl At South-East Corner Of Control Tower

FIGURE 5 CONTROL TOWER RELATIVE MOVEMENTS Δ_l (N-S VIEW)



-400
-300
-200
-100
0
100
200
300
400
500
78
79
80
81
82
83
84
1 FOR A-4
INST. SYSTEM ACTIVATED (8-23-82)
PROPOSED UPPER BOUND
1-DSB-3E1
PROPOSED LOWER BOUND

FIGURE: 7-2A

K-E

46 3650

46 3650

COM 515853
R05287

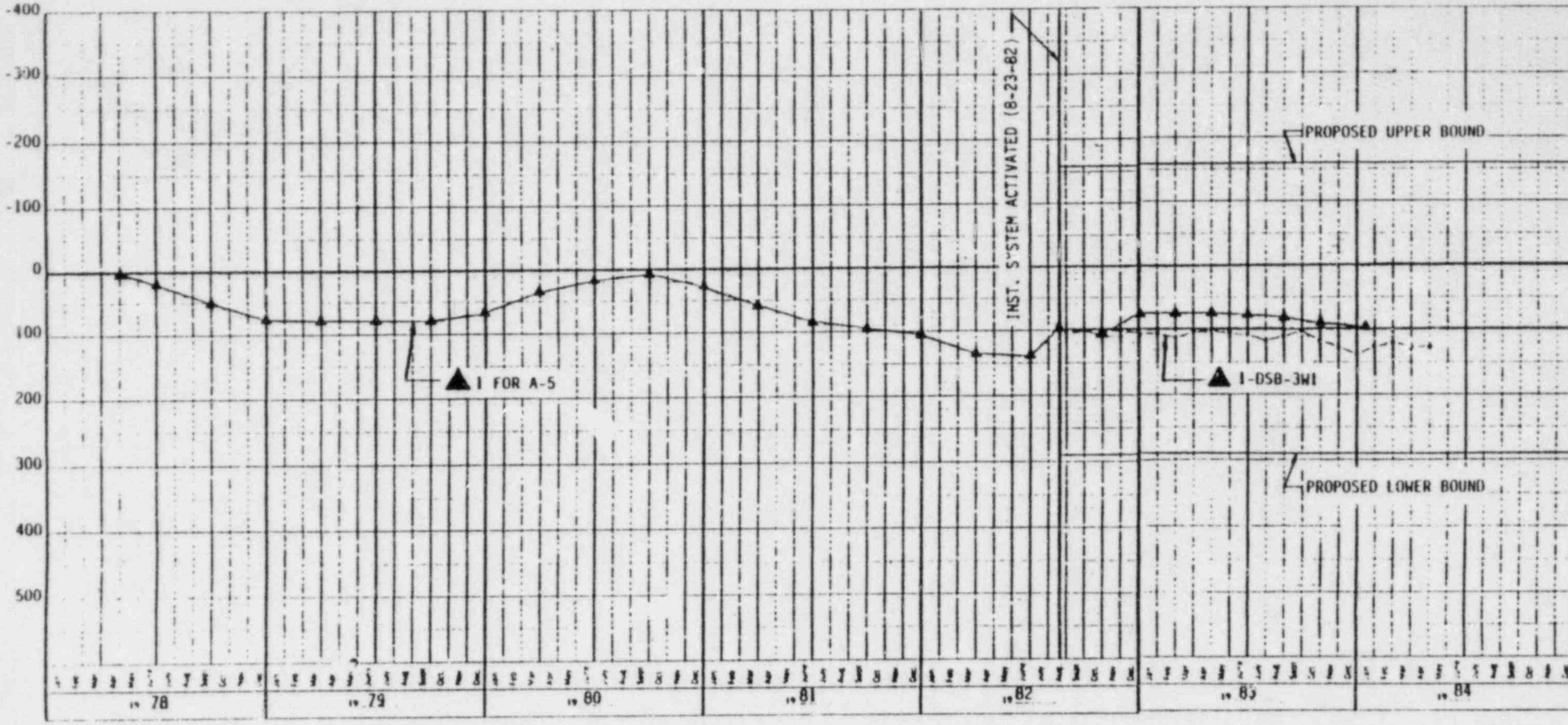


FIGURE: 7-2B

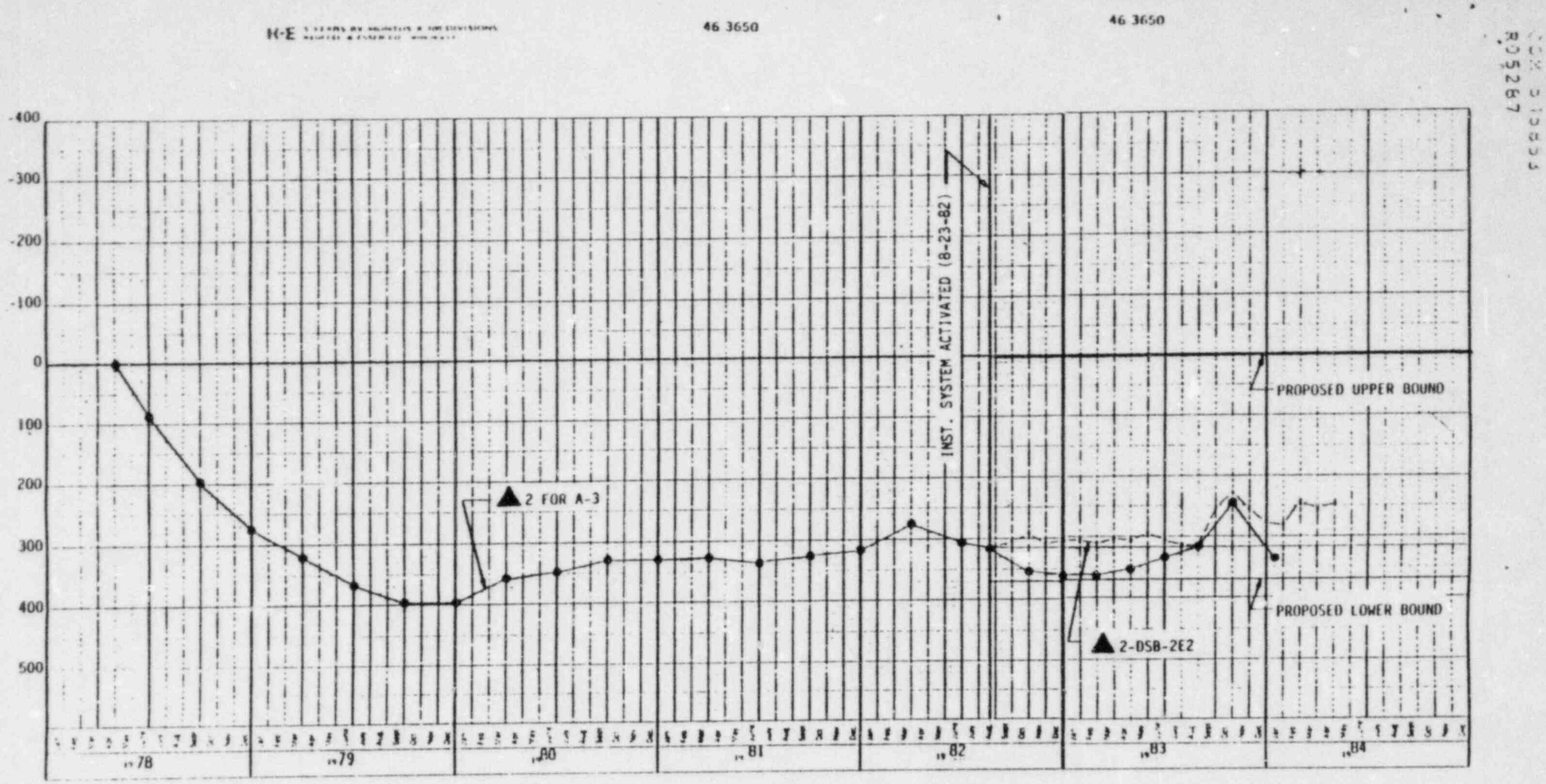
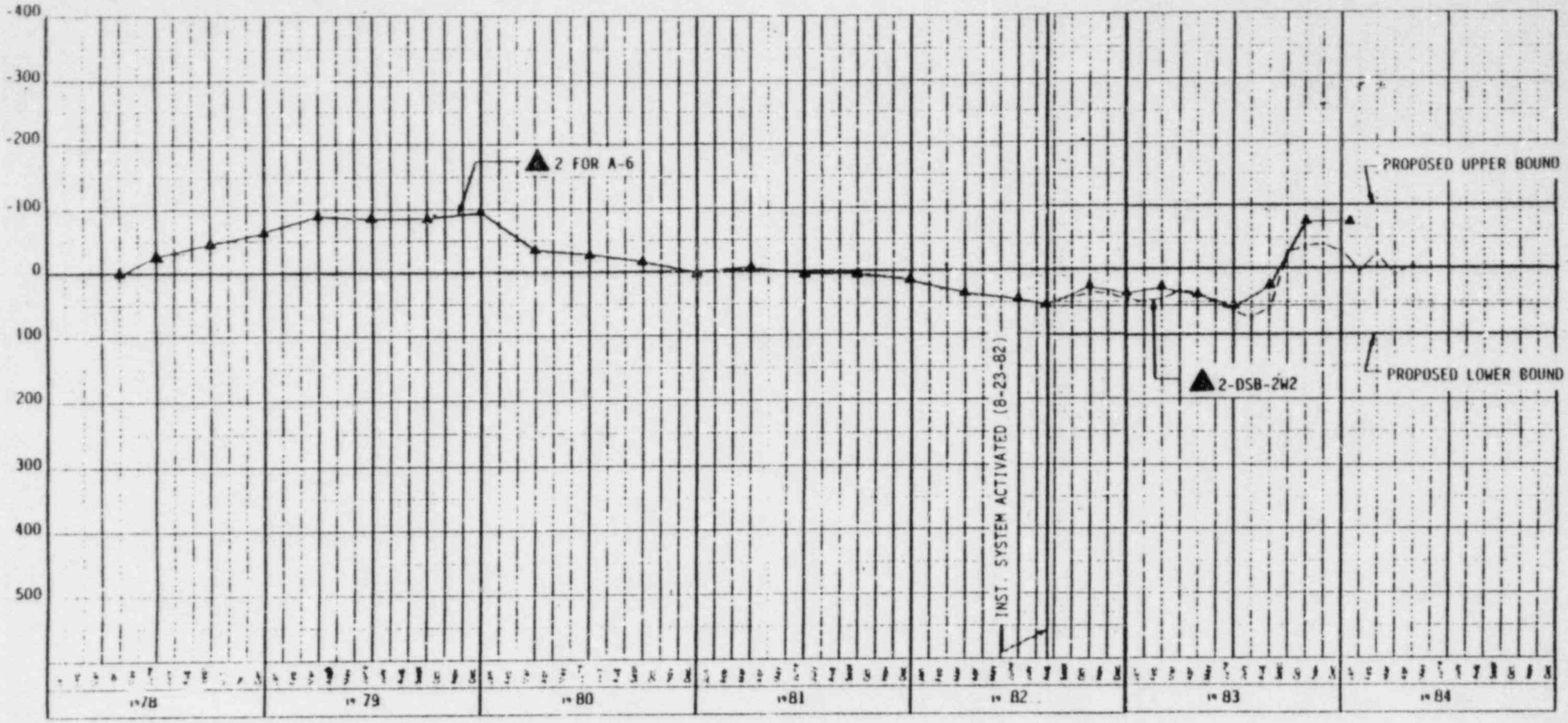

46 3650
46 3650
-400
-300
-200
-100
0
100
200
300
400
500
INST. SYSTEM ACTIVATED (8-23-82)
PROPOSED UPPER BOUND
PROPOSED LOWER BOUND
2 FOR A-3
2-DSB-2E2
78
79
80
81
82
83
84

FIGURE: 7-3A



-400
-300
-200
-100
0
100
200
300
400
500
2 FOR A-6
INST. SYSTEM ACTIVATED (8-23-82)
2-DSB-2W2
PROPOSED UPPER BOUND
PROPOSED LOWER BOUND

FIGURE: 7-3B

5-D Underpinning

ANALYSIS OF CURRENT AND FUTURE QUALITY ACTIVITIES WITH REGARD TO REMEDIAL SOILS WORK

At the April 26, 1982 SALP meeting Region Administrator, Mr J G Keppler, expressed concern that his staff had informally characterized the ongoing soils and foundation work as only minimally acceptable. Mr Keppler asked CP Co's management to comment on its impression of this characterization and to provide its suggestion as to how this assessment could be improved.

The following consists of a brief analysis of what Consumers Power perceives to be the basis for this informal characterization and a description of some of the current organizational and programmatic features of the soils activities that lead us to conclude that prospects are excellent for the satisfactory execution of the remaining soils and foundation work.

The soils-related activities at the Midland job site are currently at a relatively low level pending completion of the NRC staff's technical review and release, by the NRC, of the major portion of the remedial work still to be undertaken. The work that has been done thus far in 1982 is concentrated in two areas. First, a significant number of wells have been drilled at the site, as part of the plant dewatering systems, as part of the freeze wall associated with the auxiliary building underpinning activity and to support the site drawdown tests. Second, the major contractor for the auxiliary building underpinning work was mobilized; the initial work on the access shaft was completed; and, in parallel the detailed underpinning construction planning and continuing technical review with the NRC staff of subsequent work was carried out. Very little work in the other remedial soils areas has been accomplished during this period.

In responding to Mr Keppler's comments at the SALP meeting, we believe that the basis for the staff's informal negative comments regarding the current soils quality assurance activities can be traced to one specific area of concern and one more broadly-based general concern. A discussion of each of these follows.

A specific area of work which may have been of concern to the staff, and one of immediate concern to Consumers, relates to the controls on the drilling and excavation activities that have been recently carried out. Because the number of NCR's that had been written in this specific area and the severity of the most recent occurrence (drilling into an electrical duct bank), the Company concluded that even with the formal controls that were previously in place, additional controls were required. As a result on April 28, the Company issued a stop work on all drilling. (This Consumers Power stop work direction preceded the ASLB Order of April 30, 1982.) As of May 12, the stop work order had not been removed. nor will it be until a new detailed drilling and excavation control procedure has been fully reviewed and accepted by Consumers Power Company. While there had been other corrective action taken prior to the CP Co stop work order, the Company is confident that the comprehensive revisions to the prior control procedures on drilling and excavation will preclude errors of the type recently experienced, and will assure that future drilling and excavating work will be carried out in a satisfactory and controlled manner.

The general and considerably more significant area of inferred NRC concern can only be identified as the lack of timely agreement between the Company and the NRC on the specific quality assurance coverage requirements to be imposed on the remedial soils work, particularly those to be imposed on the underpinning work. The lack of timely resolution of this issue, the apparent misunderstanding regarding the Company's commitments, and the contentious atmosphere at the March 10, 1982 meeting on this subject and at the subsequent inspection undoubtedly contributed to the negative rating informally expressed by the staff.

When the auxiliary building underpinning work started with the first partial NRC release for construction of the vertical access shaft, CP Co presented a special quality assurance plan encompassing, in our opinion, appropriate portions of the underpinning work. This plan was initially presented to the staff at a meeting in Region III headquarters on January 12, 1982 and documented in a letter dated January 7, 1982. While the initial staff response to the plan appeared to be favorable, no official NRC conclusion was expressed. It became evident during the time between January and early March that at least one individual within the NRC staff believed that an extensive modification of the program coverage under the QA plan, MPQP-1, should be required. This preference for expanded NRC requirements became an NRC staff working level position, formally expressed to the Company at the meeting on March 10, 1982. As a result of that meeting, the NRC Region III inspector apparently concluded that Consumers had committed to fully accepting the NRC Staff position that essentially all to-go underpinning work should be Q-listed, unless exceptions are agreed upon. The NRC's meeting minutes reflect no such commitment. In fact, no commitment was made. This misunderstanding, and others arising out of follow-up discussions with the staff, has apparently affected Region III's feelings toward our soils quality assurance program and personnel. It is, therefore, not surprising that the NRC Region III staff considers the quality assurance activities in the soils and foundation area to be in need of improvement based on its recent experience. (It should also be noted that the NRC SALP Board held its second and final meeting on March 23, 1982.) The Company also agrees that it is extremely difficult to avoid regulatory difficulties unless both parties have a common understanding and agreement as to the scope of applicable requirements. The major issue with regard to QA program coverage was resolved at the management level meeting held on March 30, 1982 in Glen Ellyn and documented by the April 5, 1982 letter of J W Cook to J G Keppler, in which the Company agreed to "Q" list essentially all of the to-go underpinning work. However, the staff has still not formally acknowledged its concurrence with that letter. This concurrence would be of significant assistance in documenting the conclusion of the staff's review of program requirements and permitting the redirection of resources from program definition to successful program execution.

Resolution of the concerns noted above will make a significant contribution to the remaining soils work. In addition, the following considerations should provide added confidence that excellent results will be obtained in the remaining soils construction activities.

Dedication of a high quality professional staff to the underpinning and other soils work is of paramount importance to its successful completion. Because of the complexity and importance of the underpinning work as the dominant factor in the soils remedial program, a mini-project of dedicated groups has been set up to focus attention on the soils activities, with particular emphasis on the underpinning. The technical qualifications of the individuals staffing these activities emphasize previous related experience. At the site, specific underpinning groups have been formed within Bechtel construction, Bechtel quality control and MPQAD, all staffed with individuals having significant applicable technical experience and academic credentials. Both Bechtel resident engineering and Bechtel engineering in Ann Arbor have dedicated remedial soils groups. The onsite resident engineering office will have four geotechnical engineers and at least two structural engineers dedicated to supporting the field activities. Consumers Power Company home-office soils activities are currently staffed with two experienced geotechnical engineers and several experienced structural engineers who have been active in the design reviews and prior licensing evaluations and who will continue to follow the soils remedial work throughout the duration of the construction. The overall Consumers Power Company project management of soils is also organized as a mini-project, and the senior Consumers Power Company individual has had significant nuclear power plant experience at the project manager level.

In addition to the on-staff individuals for Consumers Power Company, Bechtel and the major subcontractors, significant consulting resources are also integrated into the soils work. The design consulting firm for the auxiliary building underpinning has a staff man onsite to coordinate with his home office personnel. All the major consultants will be asked to periodically review the job progress as the underpinning work proceeds.

To assist some of the technical specialists in fully understanding all of the quality requirements on the job, some additions to the staff are also planned. The Bechtel underpinning construction group leader, who oversees and interacts with the underpinning subcontractors, will have a quality consultant on his staff to assist him in any and all quality-related matters. It is also anticipated that the underpinning quality control organization will be augmented to enhance its breadth of leadership.

We believe that the NRC themselves can significantly assist in the successful completion of the underpinning and other soils remedial activities by expanding the presence of their lead inspector on the site as the work progresses. Specific steps to facilitate this NRC interaction were agreed upon, as documented in the April 5, 1982 letter referenced above, and complemented by day-to-day working agreements.

A second area which should significantly assist in the successful completion of the remedial soils work, particularly the underpinning activities, is the degree of design completion prior to the work entering the major construction phase. Because of the extent and thoroughness of the NRC staff review, there is a more complete design for the underpinning activities than is normally in place for other construction activities. Essential completion of the calculations for the underpinning work before the major construction phase begins will minimize the kind of major design changes that can occur in nuclear plant structural design process because of calculation revisions. There will, of course, be design changes as the work progresses, but the degree of calculation completeness reached prior to initial drawing release will significantly contribute to the stability and success of the construction process.

In addition to the degree of completeness in the underpinning design activity, the interface review called for by the quality assurance plan for the underpinning activity, MPQP-1, is also substantial. These reviews will also contribute to both the validity of the design and the general understanding of design requirements and quality attributes by all persons participating in the underpinning activities. In addition, MPQP-1 directly inserted quality assurance (and through quality assurance, quality control) comments into the design review cycle, a significant requirement above and beyond the quality assurance program for the balance of the plant.

The number of procedural controls that have been or are being instituted for this work should also engender confidence that the critical underpinning activities will be satisfactorily controlled. Judging from the work to date, there will be more than 50 specific work procedures developed for the underpinning work. MPQP-1 calls for integration of inspection hold points directly in these construction work procedures. As a result of these steps, the procedural controls for the underpinning work will be more extensive than those for any other activities, with the possible exception of NSSS primary loop activities, covered by the QA program for the balance of the project. The extent of the construction procedures automatically increases the scope of the training activities and of the inspection plans which are developed based on the specific work procedures.

Finally, as a result of the extensive discussions with the NRC staff regarding the coverage of the "Q" program, MPQP-1 is being applied to essentially all of the underpinning work still to be done. While this application may or may not be completely consistent with a strict definition of what is "safety-related," it should lend added assurance that the work in total, and the safety-related work in particular, will be carried out successfully.

In light of the foregoing, it is hoped that the Region III management can gain an appreciation of Consumers Power Company's perception of recent events and that both the Region III management and staff can develop added confidence that the to-go soils work, particularly the extensive underpinning activities, can and will be carried out up to the expectations of both the applicant and the NRC.

Table 1 (Continued)

Ø = 0.90 for reinforced steel in direct tension

Ø = 0.90 for welded or mechanical splices of reinforcing steel

2. Unity load factor is shown for P_L. An alternative load factor to be considered in all load combinations is the load factor associated with dead load (D) in that loading combination.

For load combinations 23-26:

Maximum allowable stress in bending and tension is 0.9 F_y. Maximum allowable stress in shear is 0.5 F_y.

For these load combinations, the maximum allowable stress except for local areas that do not affect overall stability is limited to 0.9 F_y for bending, bearing, and tension and 0.5 F_y for shear. The time phasing between loadings is used where applicable to satisfy the above equations.

Structural components subjected to postulated impulse loads and/or impact effects are designed in accordance with BC-TOP-9-A, Rev 2, using ductility ratios not exceeding 10.

Structural members subjected to missile and pipe break loads are designed in accordance with Bechtel's BC-TOP-9-A, Rev 2, and Bechtel's BN-TOP-2, Rev 2.

James W Cook
Vice President - Projects, Engineering and Construction

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-0453

August 26, 1981

Harold R Denton, Director
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND PROJECT
DOCKET NOS 50-329, 50-330
SOILS SETTLEMENT REMEDIAL ACTION
FOR THE SERVICE WATER PUMP STRUCTURE (SWPS)
FILE: 0485.16, B3.0.8 SERIAL: 13738
REFERENCES: JWCOOK TO HRDENTON, SERIAL 11625 DATED MARCH 23, 1981.
ENCLOSURES: MIDLAND UNITS 1 AND 2 - TECHNICAL REPORT ON UNDERPINNING THE SERVICE WATER PUMP STRUCTURE.

In the referenced correspondence of March 23, 1981 we advised the NRC of the underpinning concept for the overhanging portion of the service water pump structure which is a full length wall extending into the natural till material. This full length wall concept was adopted to replace the original remedial action, a driven pile support concept, as a result of the increased seismic requirements imposed by the staff. We are forwarding thirty (30) copies of the enclosed report entitled "Technical Report on Underpinning the Service Water Pump Structure" which describes the design and construction requirements of this SWPS remedial action.

The design and construction criteria contained in the attached report has been written to provide the NRC with information which substantially exceeds the construction permit level of detail. Included in this report are the following types of information: (1) drawings showing the underpinning scheme and a description of the construction sequence for this scheme; (2) dewatering for construction; (3) the design and acceptance criteria for the underpinning scheme, including load combinations, bearing pressures, structural stresses, and seismic loads; (4) applicable codes; and (5) scope of the quality assurance requirements.

The proposed service water structure remedial underpinning is approximately a 4-foot thick, reinforced concrete wall that is approximately 30 feet high with a flared base at the north wall and is constructed to act as a continuous member under the perimeter of that portion of the structure founded on backfill material. In addition, a predetermined jacking force will be applied to the full perimeter of the SWPS overhang during construction to provide adequate load transfer from the structure to the underpinning wall.

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3pp

While we believe that the enclosed report provides sufficient information to permit the NRC to review and provide its concurrence with the proposed underpinning scheme, we suggest that a technical review meeting be held during the week of August 31, 1981 to respond to any outstanding NRC concerns. Please contact us to establish a mutually agreeable day for this meeting.

Your expeditious review and approval would be most appreciated to support the hearings and construction of the remedial work.

James W. Cook

JWC/RLT/cr

CC Atomic Safety & Licensing Appeal Board, w/o
Atomic Safety & Licensing Board Panel, w/o
Charles Bechhoefer, Esq, w/o
MMCherry, Esq, w/o
RJCook, Midland Resident Inspector, w/o
Dr FPCowan, w/o
RSDecker, w/o
NRC Docketing Service Section, w/a
SGadler, w/o
RWHuston, Washington, w/a
JDKane, NRC w/a
FJKelley, Esq, w/o
WHMarshall, w/o
MIMiller, Esq, w/a
WOtto, US Army Corps of Engineers, w/a
WDPaton, Esq, w/o
MSinclair, w/o
BStamiris, w/o
HSingh, US Army Corps of Engineers, w/a

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BCC RCBauman/TRThiruvengadam, P-14-400, w/o
WRBird, P-14-418A, w/a
JEBrunner, M-1079, w/a
GSKeeley, P-14-113B, w/a
DBMiller, Midland, w/a
NRamanujam, P-14-100, w/a
TJSullivan/DMBudzik, P-24-517, w/o
RLTeuteberg, P-24-513, w/a
ALBoos, Bechtel, w/a
Dr AJHendron, Bechtel Consultant, w/a
DFJudd, B&W, w/o
Dr Ralph B Peck, Becthel Consultant, w/a
SSAfifi, Becthel, w/a
JARutgers, Bechtel, w/a
WJCloutier, P-24-611, w/a
KLRazdan, P-13-220, w/a

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TECHNICAL REPORT ON UNDERPINNING
THE SERVICE WATER PUMP STRUCTURE
FOR
MIDLAND PLANT UNITS 1 AND 2
CONSUMERS POWER COMPANY
DOCKET NUMBERS 50-329 AND 50-330

AUGUST 25, 1981

TECHNICAL REPORT ON UNDERPINNING
THE SERVICE WATER PUMP STRUCTURE

TABLE OF CONTENTS

MIDLAND PLANT UNITS 1 AND 2

TECHNICAL REPORT ON UNDERPINNING

THE SERVICE WATER PUMP STRUCTURE

1.0 INTRODUCTION

This report describes the design and construction requirements of the remedial action for the service water pump structure (SWPS) necessitated by the settlement potential of the plant fill underlying the structure.

2.0 PRESENT CONDITION

The SWPS is a two level, rectangular, reinforced concrete structure. Below el 617', it measures 86 feet by 71 feet 11 inches; above el 617' it measures 106 feet by 86 feet. The maximum overall height is 69 feet [See Figures 1 and 2 (FSAR Figures 3.8-56 and 3.8-57)].

The structure was designed to be supported by the two foundation slabs, one at el 587'-0" and the other at el 617'-0". The lower slab rests on undisturbed natural material and the upper slab rests on fill material placed during construction in 1977.

After discovering settlement of the fill under the diesel generator building, an investigation of the plant fill revealed some questionable areas under the upper base slab, el 617'-0", of the SWPS.

3.0 REMEDIAL ACTION

For the part of the structure resting on plant fill, a continuous underpinning wall, resting on undisturbed natural material, is provided to support the structure adequately under all design load conditions. The underpinning wall provides the necessary vertical and horizontal support to the affected part of the structure. To ensure adequate load transfer, the underpinned structure is jacked from the underpinning walls (Refer to Figure 3).

4.0 DESIGN FEATURES

The proposed underpinning is a 4-foot thick, reinforced concrete wall that is 30 feet high and is constructed to act as a continuous member under the perimeter of the structure overhang. The entire wall is founded on undisturbed natural material. The base of the north underpinning wall is belled out to a 6-foot thickness to limit bearing pressures to the allowable values, whereas the bases of the east and west side walls are 4 feet wide. The allowable bearing pressures for the undisturbed natural material are based on safety factors of 2 for dynamic loading and 3 for static loading.

A predetermined jacking force is applied to the overhang perimeter to provide adequate load transfer from the structure to the underpinning.

The connection between the underpinning wall and the existing structure is made by 2-inch diameter rock bolts at the vertical interfaces and 2-3/4-inch diameter anchor bolt assemblies at the horizontal interfaces (Refer to Figures 4 and 5). The connectors are designed to transfer shear and tension forces to the underpinned wall. The connectors are not subject to stresses during the jacking procedures because the rock bolts have not yet been installed and the anchor bolts have not been tightened (Refer to Subsection 5.3.2). After the underpinning wall is connected to the existing structure, the connectors are stressed by loads applied to the underpinned structure.

5.0 CONSTRUCTION

The construction procedures discussed in this report are recommended for underpinning the SWPS. If subcontractor recommendations result in improved procedures, they will be incorporated. For details of construction and the construction procedures, refer to Figures 4 and 5.

5.1 DEWATERING

To construct the underpinning, the SWPS site is dewatered: The groundwater level is lowered to el 587 (approximately) by using temporary dewatering wells. These wells will be sealed after the underpinning wall is completed. The acceptance criteria for the dewatering system require that the system produces an effluent that has less than 10 parts per million of soil particles larger than 0.05 millimeters.

5.2 BUILDING POST-TENSIONING

Construction site dewatering removes the buoyancy force on the overhang portion of the structure, resulting in additional loading on the overhang. To compensate for this additional loading of the overhang, a temporary post-tensioning system applies a compressive force to the upper part of the building along each north-south wall. This post-tensioning allows the additional force to be transferred from the overhang by beam action to the adjoining walls which rest on undisturbed natural material (Refer to Figure 6). The post-tensioning system is removed after the initial jacking loads are applied.

5.3 CONSTRUCTION PROCEDURES

The underpinning is constructed as individual piers tied together by threaded reinforcing bar couplers and shear keys to form a continuous wall. Refer to details and procedures in Figures 4 and 5.

5.3.1 Initial Construction Activities

To preserve the structural integrity of the building, the underpinning wall is constructed in small sections (piers) from tunnels which are advanced simultaneously from access shafts located at the northeast and northwest corners of the building. The tunnels initially extend only far enough to construct an approximately 30-foot deep, 5 foot by 4 foot, sheeted pit at each corner of the overhang. The pit is hand dug. The shear strength of the subgrade soil is assessed with a Corps of Engineers cone penetrometer, model CN-973. Under a maximum force of 150 pounds, the cone should not penetrate the surface more than 1/2 inch. After the subgrade is inspected and approved by a geotechnical engineer, reinforcement, subgrade settlement monitoring instrumentation, and anchor bolt assemblies to tie the pier to the underside of the slab, are installed. The pier is then cast with concrete pumped from the access shaft. After at least 48 hours of curing, an initial jacking load is applied to the overhang from jacks placed on the pier top. To ensure adequate support to the building, the tunnel is not advanced to the next stage until the pier is jacked.

Simultaneously with applying the jacking force, the tunnels are advanced to the location of the next pier, which is constructed in a similar manner to the first pier. The piers are tied together with threaded reinforcing bar couplers and shear keys to form a continuous underpinning wall. The threaded reinforcing bar couplers (see Detail 1, Figure 5) conform to the requirements of Section III, Division 2 of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, 1980 Edition, 1980 and 1981 Summer Addenda. The tensile strength of the splice system is not less than 125% of the specified minimum yield strength of the spliced bar.

A settlement monitoring program for the top and base of each pier begins immediately after pier construction. Instruments accurate to 0.001 inch are installed before the initial jacking is applied. The information from the monitoring program is used to evaluate the time required to dissipate shrinkage and creep of the concrete and creep of the undisturbed natural material. The rate of settlement decreases with time. At the proper point on the settlement-time curve (as determined by the geotechnical engineer), the final jacking operations (as described below) begins.

5.3.2 Final Jacking Stage

After Piers 10 (Figure 4) are constructed, the underpinning wall has progressed to within 6 feet of the vertical interfaces with the existing structure, and the final jacking load is applied. Settlements caused by this load are monitored. When the geotechnical engineer judges that the settlement rate has decreased to a proper value, the load is transferred from the jacks to wedges positioned between the top of the piers and the underside of the overhang, and the jacks are removed. Piers 11 are poured, encasing rock anchors that were previously drilled into the vertical face of the existing structure and thereby connecting the underpinning wall to the vertical face of the existing stucture (Refer to Detail 5, Figure 5). The space between the top of the underpinning wall and the underside of the base slab is filled with nonshrink grout, and previously placed anchor bolt assemblies (which tie the top of the piers to the foundation slab) are tightened (Refer to Detail 7, Figure 4). The underpinning wall is connected to the structure at both the vertical and horizontal interfaces.

5.3.3 Completion of the Underpinning Wall

The tunnel is backfilled with lean concrete beginning at the vertical interface and at the north wall. The completion of the tunnel backfilling terminates at the locations of Piers 12. These piers are then constructed, completing the underpinning wall.

6.0 MONITORING REQUIREMENTS

During construction, the underpinning of the existing structure is monitored for settlement and crack propogation. The long-term surveillance program of the building after the construction of the underpinning is being evaluated.

6.1 SETTLEMENTS

The elevations of settlement markers attached to the structure are measured in accordance with a schedule based on construction procedures. Expected building movements during underpinning operations are small. These movements are recorded, and those exceeding 1/4 inch will be evaluated and reported to the NRC.

6.2 CRACKS

Monitoring of existing or new cracks appearing during the underpinning construction is scheduled. Because of the sequencing of construction procedures, it is not anticipated that existing cracks will significantly widen or new cracks will appear. However, any new structural cracks or changes in existing structural crack widths exceeding 0.010 inch will be evaluated and reported to the NRC.

7.0 ANALYSIS AND DESIGN

The SWPS was originally designed in accordance with FSAR requirements for Seismic Category I structures. A preliminary analysis of the underpinned structure was made which complied with these FSAR requirements, and added a jacking load to the load combinations. The seismic loads used in this analysis were extrapolated from the seismic loading from a previous underpinning design based on piles. When the final seismic loads become available, they will be incorporated in the final design.

In the final design, seismically induced forces and instructure response spectra of the structure are generated in accordance with FSAR Section 3.7. The revised model portrays the structural behavior including the effects of the underpinning and associated foundation modification.

The mathematical seismic model and a description of the soil-structure interaction coefficients to be used in the seismic analysis will be submitted to the NRC in September 1981.

The static structural analysis uses an analytical model capable of representing the structure behavior. The interface between the existing structure and the underpinning wall is modeled to transfer direct loads without providing rotational restraint. The soil media are represented by springs of appropriate stiffness at the base of the structure. The detailed analysis will be performed by conventional methods such as beam theory and/or plate theory or by using the computer program Bechtel Structural Analysis Program (BSAP). For details of the BSAP computer program see FSAR Subsection 3.8.3.4.

7.1 STRUCTURE BEHAVIOR

The vertical loads of the structure are transmitted to the foundation medium through the existing base slab at el 587'-0" and the underpinning wall bearing area. The lateral forces due to seismic and tornado loads are resisted by the shear walls in the structure. These lateral loads are transferred to the foundation medium by the combined action of the base slab at el 587'-0" and the underpinning wall bearing area. To ensure this action, the underpinning walls are connected to the existing structure by rock anchors and anchor bolts capable of transferring all direct loads. This connection is a pinned connection that is consistent with the analysis method.

7.2 DESIGN CRITERIA AND APPLICABLE CODES

The underpinned structure is designed as a Seismic Category I structure. The design complies with the requirements of ACI 318-71 and the 1969 edition of the AISC.

7.3 LOADS AND LOAD COMBINATIONS

The underpinning structure rests entirely on undisturbed natural material. The preliminary analysis of the underpinned structure utilizes the same load combinations used in the original design. However, each load combination is modified by adding the jacking load (P_L). For each loading combination, the jacking load was evaluated with two load factors: a value of 1.0, and the load factor associated with the dead load for that load combination.

For the design of the underpinning and the connections to the existing structure, the safe shutdown earthquake (SSE) forces were increased by 50% to provide for a possible future increase in this loading. The 50% increase was applied to the seismic response of the structure corresponding to the analytical model with the mean soil properties. The existing structure was checked for a 0.12g SSE.

The long-term settlement of the underpinning wall after it is connected to the existing structure will be calculated. The calculation is based on properties of the supporting soil. The long-term settlement effects will be considered in the final analysis of the structure. To provide for these effects, the final analysis is governed by four additional load combinations. These load combinations are discussed in the response to Question 15 of the NRC Requests Regarding Plant Fill (September 1979) and were used in the diesel generator building reanalysis. The load combinations are modified by the addition of the jacking load.

Table 1 lists 26 load combinations, modified for jacking loads. For the preliminary analysis of the underpinned SWPS, the following load combination was most critical:

$$U = 1.0D + 1.0L + 1.0E' + 1.0T_o + 1.25H_o + 1.0R + P_L$$

where

D = dead loads

L = live loads

E' = safe shutdown earthquake

T_o = thermal effects during normal operating conditions

H_o = force on structure due to thermal expansion of pipes under operating conditions

R = local force or pressure on structure or penetration caused by rupture of any one pipe

P_L = load on structure due to jacking preload

In addition to this load combination, the underpinned structure was checked for stability using the load combinations specified in FSAR Subsection 3.8.6.3.4.

A complete analysis of the underpinned structure, using all applicable load combinations, will be made when the final seismic loads become available.

7.4 STRUCTURAL ACCEPTANCE CRITERIA

The acceptance criterion for analyzing the underpinned structure is in accordance with FSAR Subsection 3.8.6.5.

8.0 QUALITY ASSURANCE REQUIREMENT

This project work is a combination of Q- and non-Q-listed work. The construction of the permanent structures such as the underpinning wall and the connectors are Q-listed, as well as any other activity or structure necessary to protect the SWPS. Construction of temporary structures such as the access shafts and tunnels is non-Q-listed. A detailed quality plan shall be prepared by the subcontractor to identify those specific activities which are required to have a safety "Q" quality program applied along with the major quality program elements for these activities. This quality plan shall be approved by Bechtel and Consumers Power Company prior to the start of any Q-listed work.

9.0 ADDITIONAL NRC REQUIREMENTS

For information purposes, an analysis of the critical sections of the underpinned structure will be made conforming to the provisions of ACI 349-76 as supplemented by NRC Regulatory Guide 1.142.

TABLE 1

LOAD EQUATIONS FOR THE SERVICE WATER PUMP STRUCTURE MODIFIED TO INCLUDE PRELOAD

Responses to NRC Requests Regarding Plant Fill, Question 15

a. Normal Operating Condition

$$U = 1.05D + 1.28L + 1.05T + P_L \qquad (1)$$

$$U = 1.4D + 1.4T + P_L \qquad (2)$$

b. Severe Environmental Condition

$$U = 1.0D + 1.0L + 1.0W + 1.0T + P_L \qquad (3)$$

$$U = 1.0D + 1.0L + 1.0E + 1.0T + P_L \qquad (4)$$

Loading Under Normal Conditions

a. Concrete

$$U = 1.4D + 1.7L + P_L \qquad (5)$$

$$U = 1.25\ (D + L + H_o + E) + 1.0T_o + P_L \qquad (6)$$

$$U = 1.25\ (D + L + H + W) + 1.0T_o + P_L \qquad (7)$$

$$U = 0.9D + 1.25\ (H + E) + 1.0T_o + P_L \qquad (8)$$

$$U = 0.9D + 1.25\ (H + W) + 1.0T_o + P_L \qquad (9)$$

For ductile moment resisting concrete frames and for shear walls

$$U = 1.4\ (D + L + E) + 1.0T_o + 1.25H_o + P_L \qquad (10)$$

$$U = 0.9D + 1.25E + 1.0T_o + 1.25H_o + P_L \qquad (11)$$

Structural Elements Carrying Mainly Earthquake Forces, Such as Equipment Supports

$$U = 1.0D + 1.0L + 1.8E + 1.0T_o + 1.25H_o + P_L \qquad (12)$$

b. Structural Steel

$$D + L + P_L \text{ (stress limit } = f_s) \qquad (13)$$

$$D + L + T_o + H_o + E + P_L \text{ (stress limit } = 1.25f_s) \qquad (14)$$

Table 1 (Continued)

$$D + L + T_o + H_o + W + P_L \text{ (stress limit} = 1.33f_s) \quad (15)$$

In addition, for structural elements carrying mainly earthquake forces, such as struts and bracing:

$$D + L + T_o + H_o + E + P_L \text{ (stress limit} = f_s) \quad (16)$$

Loading Under Accident Conditions

a. Concrete

$$U = 1.05D + 1.05L + 1.25E + 1.0T_A + 1.0H_A + 1.0R + P_L \quad (17)$$

$$U = 0.95D + 1.25E + 1.0T_A + 1.0H_A + 1.0R + P_L \quad (18)$$

$$U = 1.0D + 1.0L + 1.0E' + 1.0T_o + 1.25H_o + 1.0R + P_L \quad (19)$$

$$U = 1.0D + 1.0L + 1.0E' + 1.0T_A + 1.0H_A + 1.0R + P_L \quad (20)$$

$$U = 1.0D + 1.0L + 1.0B + 1.0T_o + 1.25H_o + P_L \quad (21)$$

$$U = 1.0D + 1.0L + 1.0T_o + 1.25H_o + 1.0W' + P_L \quad (22)$$

b. Structural Steel

$$D + L + R + T_o + H_o + E' + P_L \text{ (stress limit} = 1.5f_s) \quad (23)$$

$$D + L + R + T_A + H_A + E' + P_L \text{ (stress limit} = 1.5f_s) \quad (24)$$

$$D + L + B + T_o + H_o + P_L \text{ (stress limit} = 1.5f_s) \quad (25)$$

$$D + L + T_o + H_o + W' + P_L \text{ (stress limit} = 1.5f_s) \quad (26)$$

where

U = required strength to resist design loads or their related internal moments and forces

For the ultimate load capacity of a concrete section, U is calculated in accordance with ACI 318-71.

F_y = specified minimum yield strength for structural steel

f_s = allowable stress for structural steel; f is calculated in accordance with the AISC Code, 1963 Edition for design calculations initiated prior to February 1, 1973.

f is calculated in accordance with the AISC Code, 1969 Edition, with Supplements, 1, 2, and 3 for design calculations initiated after February 1, 1973.

Table 1 (Continued)

D = dead loads

L = live loads

P_L = load on structure due to jacking preload

R = local force or pressure on structure or penetration caused by rupture of any one pipe

T_o = thermal effects during normal operating conditons

H_o = force on structure due to thermal expansion of pipes under operating conditions

T_A = total thermal effects which may occur during a design accident other than H_A

H_A = force on structure due to thermal expansion of pipes under accident condition

E = operating basis earthquake (OBE)

E' = safe shutdown earthquake load (SSE)

B = hydrostatic forces due to the postulated maximum flood (PMF) elevation of 635.5 feet

W = design wind load

W' = tornado wind loads, including missile effects and differential pressure

$\emptyset$ = capacity reduction factor

The capacity reduction factor ($\emptyset$) provides for the possibility that small adverse variations in material strengths, workmanship, dimensions, control, and degree of supervision, although individually within required tolerances and the limits of good practice, occasionally may combine to result in undercapacity.

NOTES:

1. In the load equations, the following factors are used:

   $\emptyset$ = 0.90 for reinforced concrete in flexure

   $\emptyset$ = 0.75 for spirally reinforced concrete compression members

   $\emptyset$ = 0.70 for tied compression members

   $\emptyset$ = 0.90 for fabricated structural steel

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

FEB 2 2 1984

ocket Nos.: 50-329
and 50-330 OM, OL

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 and 2

SUBJECT: SUMMARY OF FEBRUARY 2-5, 1982 MEETING AND AUDIT ON AUXILIARY BUILDING UNDERPINNING

On February 2-5, 1982, the NRC Staff and its consultants met in Ann Arbor, Michigan with Consumer Power Company, Bechtel and their consultants to discuss and audit preparations for underpinning the southern portion of the auxiliary building. Discussions also included underground utilities, the diesel generator building and the service water pump structure.

Enclosure 1 is a summary of this meeting and audit.

The first three columns of Enclosure 2 provide a listing of review issues that were to be audited and were provided by the NRC staff at the start of the audit. The last column of Enclosure 2 was added after the audit and indicates the resolutions reached during the audit on the identified review issues.

Darl Hood, Project Manager
Licensing Branch No. 4
Division of Licensing

Enclosure:
As stated

cc: ee next page

8402280618

MIDLAND

Mr. J. W. Cook
Vice President
Consumers Power Company
1945 West Parnall Road
Jackson, Michigan 49201

cc: Michael I. Miller, Esq.
Ronald G. Zamarin, Esq.
Alan S. Farnell, Esq.
Isham, Lincoln & Beale
Suite 4200
1 First National Plaza
Chicago, Illinois 60603

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

Ms. Mary Sinclair
5711 Summerset Drive
Midland, Michigan 48640

Stewart H. Freeman
Assistant Attorney General
State of Michigan Environmental Protection Division
720 Law Building
Lansing, Michigan 48913

Mr. Wendell Marshall
Route 10
Midland, Michigan 48640

Mr. Roger W. Huston
Suite 220
7910 Woodmont Avenue
Bethesda, Maryland 20814

Mr. R. B. Borsum
Nuclear Power Generation Division
Babcock & Wilcox
7910 Woodmont Avenue, Suite 220
Bethesda, Maryland 20814

Cherry & Flynn
Suite 3700
Three First National Plaza
Chicago, Illinois 60602

Mr. Don van Farrowe, Chief
Division of Radiological Health
Department of Public Health
P.O. Box 33035
Lansing, Michigan 48909

William J. Scanlon, Esq.
2034 Pauline Boulevard
Ann Arbor, Michigan 48103

U.S. Nuclear Regulatory Commission
Resident Inspectors Office
Route 7
Midland, Michigan 48640

Ms. Barbara Stamiris
5795 N. River
Freeland, Michigan 48623

Mr. Paul A. Perry, Secretary
Consumers Power Company
212 W. Michigan Avenue
Jackson, Michigan 49201

Mr. Walt Apley
c/o Mr. Max Clausen
Battelle Pacific North West Labs (PNWL)
Battelle Blvd.
SIGMA IV Building
Richland, Washington 99352

Mr. I. Charak, Manager
NRC Assistance Project
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

James G. Keppler, Regional Administrato
U.S. Nuclear Regulatory Commission, Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Mr. Steve Gadler
2120 Carter Avenue
St. Paul, Minnesota 55108

cc: Commander, Naval Surface Weapons Center
ATTN: P. C. Huang
White Oak
Silver Spring, Maryland 20910

Mr. L. J. Auge, Manager
Facility Design Engineering
Energy Technology Engineering Center
P.O. Box 1449
Canoga Park, California 91304

Mr. Neil Gehring
U.S. Corps of Engineers
NCEED - T
7th Floor
477 Michigan Avenue
Detroit, Michigan 48226

Charles Bechhoefer, Esq.
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. Ralph S. Decker
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. Frederick P. Cowan
Apt. B-125
6125 N. Verde Trail
Boca Raton, Florida 33433

Jerry Harbour, Esq.
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Geotechnical Engineers, Inc.
ATTN: Dr. Steve J. Poulos
1017 Main Street
Winchester, Massachusetts 01890

ENCLOSURE 1

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

MEETING NOTES NO. 1600

MIDLAND PLANT UNITS 1 AND 2

CONSUMERS POWER COMPANY

BECHTEL JOB 7220

DATE: February 2 through 5, 1982

PLACE: Bechtel Ann Arbor Office

SUBJECT: Nuclear Regulatory Commission Audit - Midland Auxiliary Building Underpinning

ATTENDEES:

Nuclear Regulatory Commission	Consumers Power Company	NRC Consultants	Bechtel
D.S. Hood	D. Budzik	G. Harstead	S. Afifi
J.D. Kane	J.K. Meisenheimer	P. Huang*	J. Anderson
F. Rinaldi	K. Razdan	S. Poulos*	T. Bell*
	T. Thiruvengadam	R. Samuels*	T. Chipman*
		H. Singh	M. DasGupta*
			B. Dhar
			S. Lo*
			N. Rawson
			G. Robers*
			S. Rys
			N. Swanberg
			G. Tuveson
			V. Verma
			[illegible]. Zarega*

Other	Bechtel Consultants
M. Sinclair*	D. Bartlett
	E. Burke

*Part-time

REFERENCE: CPCo letter, Serial 16246, J.W. Cook to H.R. Denton, 3/10/82

PURPOSE: To enable the NRC to perform an audit of the design and calculations for the temporary support system during underpinning and construction condition analysis for the auxiliary building

(Note: The audit is to satisfy Special Licensing Condition 5 of Table A.20 of the NRC testimony submitted for the auxiliary building underpinning as part of the soils public hearings. Satisfaction of these conditions will permit removal of soil from beneath the auxiliary building and installation of temporary supporting systems.)

PRINCIPAL AGREEMENTS:

1) D. Bartlett presented a discussion of the construction sequence for installing the temporary support system for the auxiliary building. This system utilizes steel grillage beams supported on concrete piers and steel columns to support the electrical penetration areas, piers, and control tower. The control tower piers will eventually be incorporated into the permanent underpinning system. Viewgraphs used by D. Bartlett are included as Attachment 1.

2) M. DasGupta presented the analysis of the existing structure for the temporary support condition. The analysis considers the staged removal of soil from beneath the structure and the replacement of support by piers and steel beams with hydraulic jacks. Viewgraphs used by M. DasGupta are included as Attachment 2.

3) N. Rawson provided a presentation on the design of the temporary support system. The presentation included details of the grillage beams supported on concrete piers and steel columns for support of the electrical penetration area, struts and bracing for lateral support of the turbine building and control tower piers, and access drifts below the turbine building. It was agreed to provide a method of protecting the face of drifts if left exposed for long periods of time (see the referenced letter). Viewgraphs used by N. Rawson are included as Attachment 3.

4) S. Lo presented the construction and design details of the temporary post-tensioning system which was installed at the roof connections between the electrical penetration areas and the control tower. This system was installed to resist forces induced into these connections resulting from loss of buoyancy during dewatering. Viewgraphs used by S. Lo are included as Attachment 4.

5) For the auxiliary building, design calculations for the temporary support system and construction condition of the existing structure were reviewed by the NRC staff. Discussions were also held regarding underground utilities and tanks, diesel generator building, and service water pump structure (SWPS). Outstanding items from this review and discussions are listed below in the action items.

ACTION ITEMS:

Responsibility		Action	Date Due	Status
Bechtel	1)	Perform calculations to verify passive resistance of soil for lateral forces at truss to pier connection	3/16/82	Calculations revised
Bechtel	2)	Provide justification in the calculations for lateral soil spring constants (sand and clay) for beam on elastic foundation analysis of control tower piers	3/16/82	Calculations revised
Bechtel	3)	Use unreduced value for concrete modulus in calculations for differential settlement effects	2/26/82	Calculations* revised
Bechtel	4)	Perform calculations to verify that the gap between the turbine building and auxiliary building will accommodate settlement and seismic movements		Discussed in 2/26/82 meeting at Bethesda, MD
Bechtel	5)	Perform an analysis of the construction condition with soil removed from the tip of the electrical penetration area assuming a subgrade modulus of 70 ksf under the main part of the auxiliary building	2/26/82	Results provided 2/26/82
NRC	6)	Review pier instrumentation	2/26/82	Comments provided
Bechtel	7)	Provide acceptance criteria for building movements during Phases II and III	2/26/82	Provided at 2/26/82 meeting at Bethesda, MD

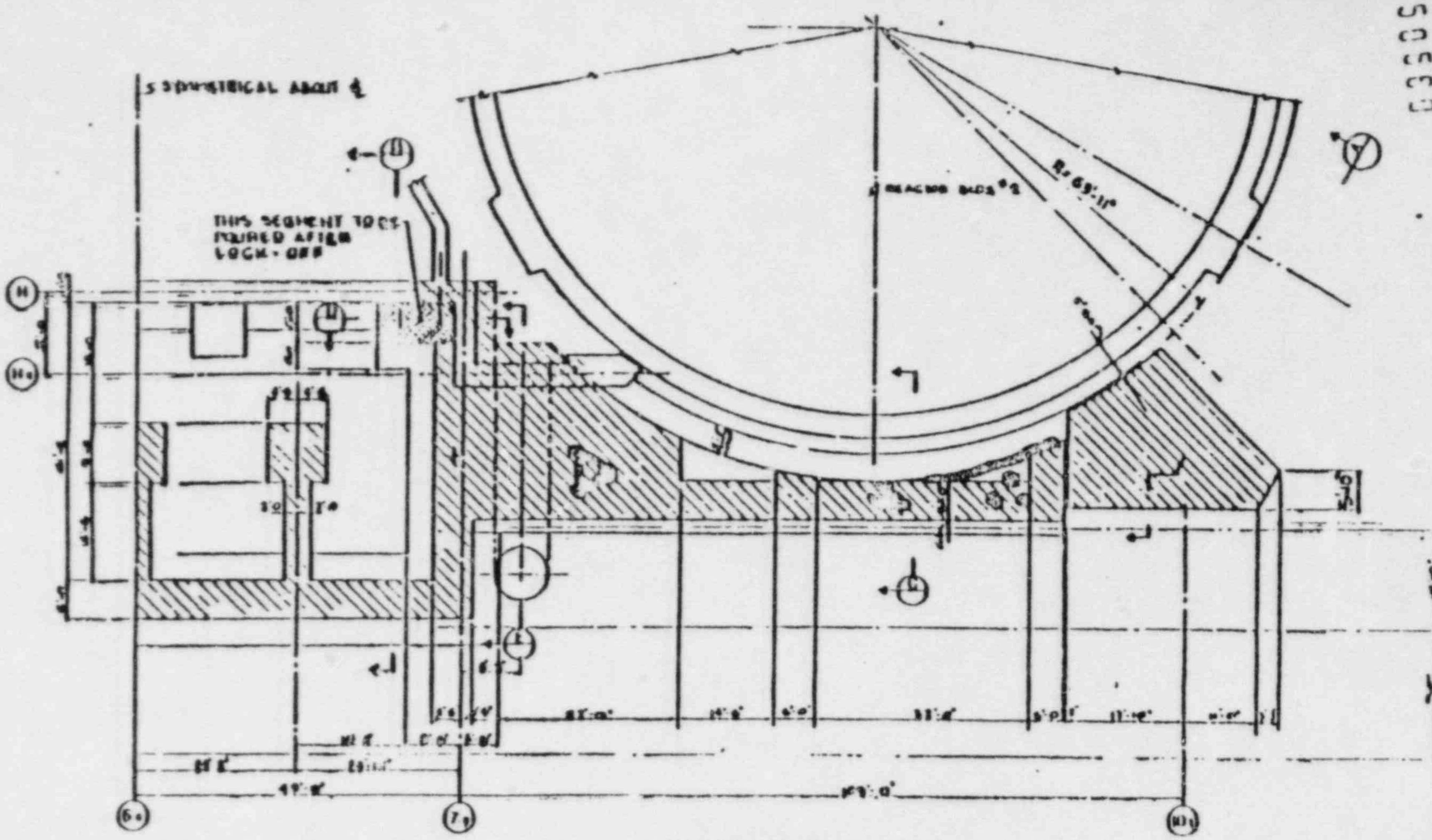
*Results to be submitted to the NRC soon

Bechtel Associates Professional Corporation

Responsibility		Action	Date Due	Status
Bechtel	8)	Provide jacking procedures and criteria for Phase III	2/26/82	Provided at 2/26/82 meeting at Bethesda, MD
NRC	9)	Review cracking criteria in auxiliary building report on cracking effects	2/26/82	Comments provided
Bechtel	10)	Provide maximum and minimum jacking loads for Phase III	2/26/82	Provided at 2/26/82 meeting at Bethesda, MD
Bechtel	11)	Include post-tensioning forces in SWPS construction condition analysis	3/16/82	Calculation revised and results discussed during SWPS audit
CPCo	12)	Consider additional finite element analyses of the diesel generator building for the effects of cracking	2/26/82	Position provided at 2/26/82 meeting

5/12/9

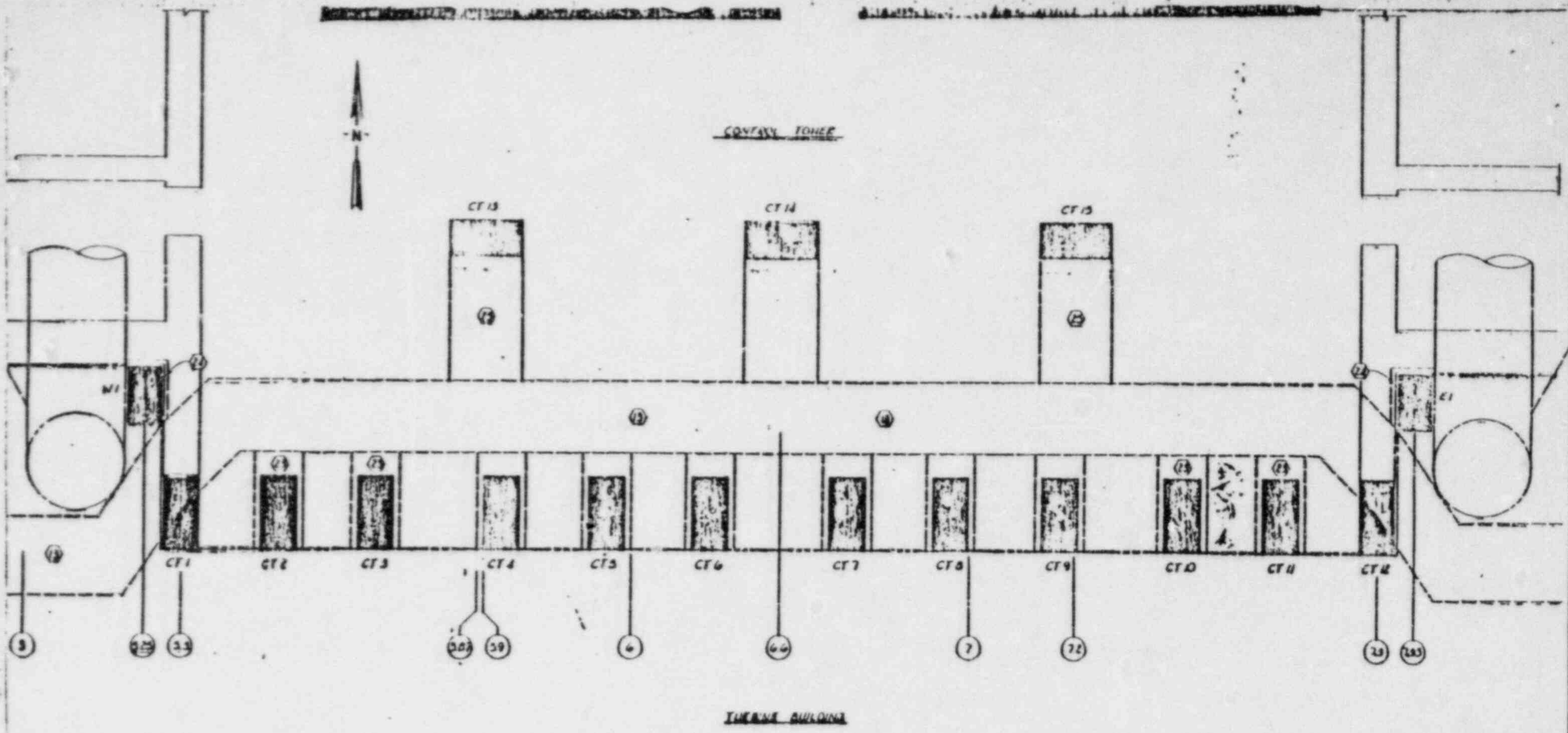
Attachments:
1. Construction Sequence
2. Construction Condition Analysis
3. Temporary Support System
4. Temporary Post-Tensioning System



PLAN AT EL. 603'-0"

UNDERPINNING PLAN AT EL 603'

FIG AUX-22



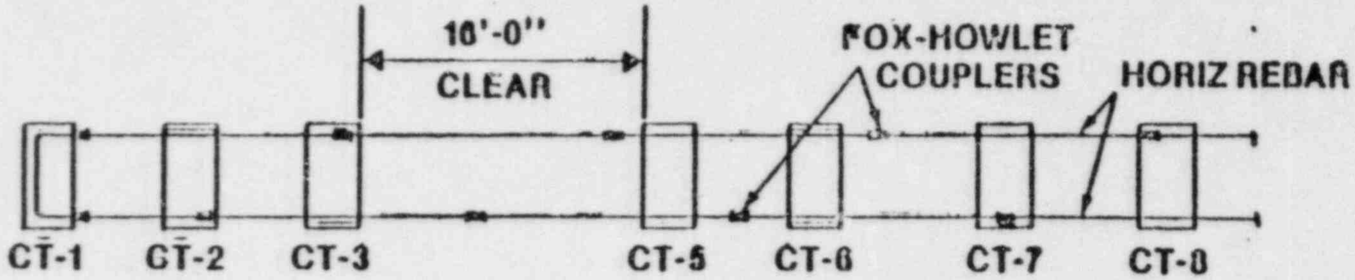
CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2

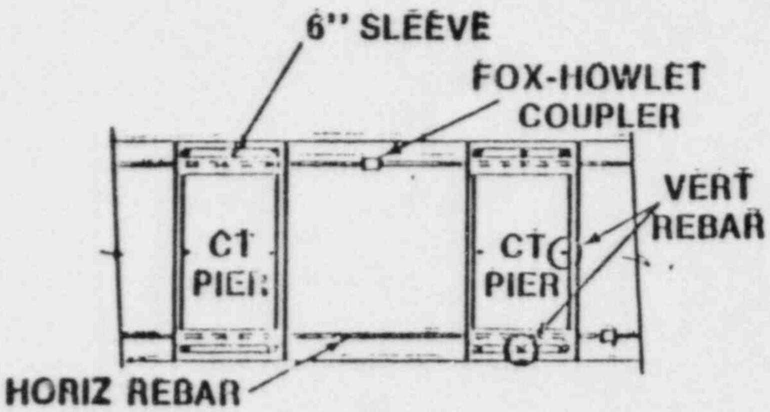
UNDERPINNING AUXILIARY BUILDING

CONSTRUCTION SCHEMATIC 3

2

PLAN - CONTROL TOWER
METHOD TO INSTALL HORIZONTAL REINFORCEMENT

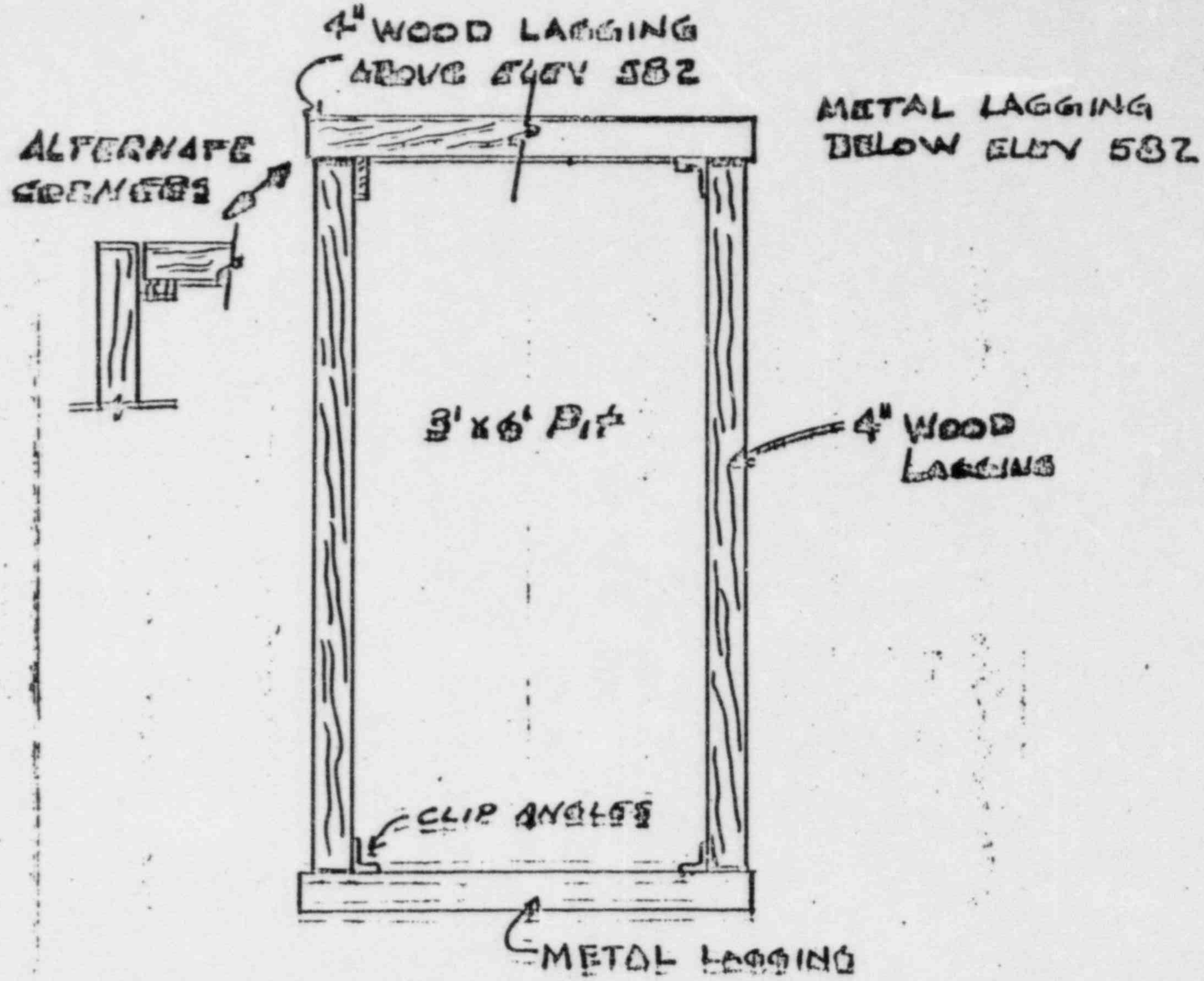




ENLARGED PLAN VIEW

NOTE:

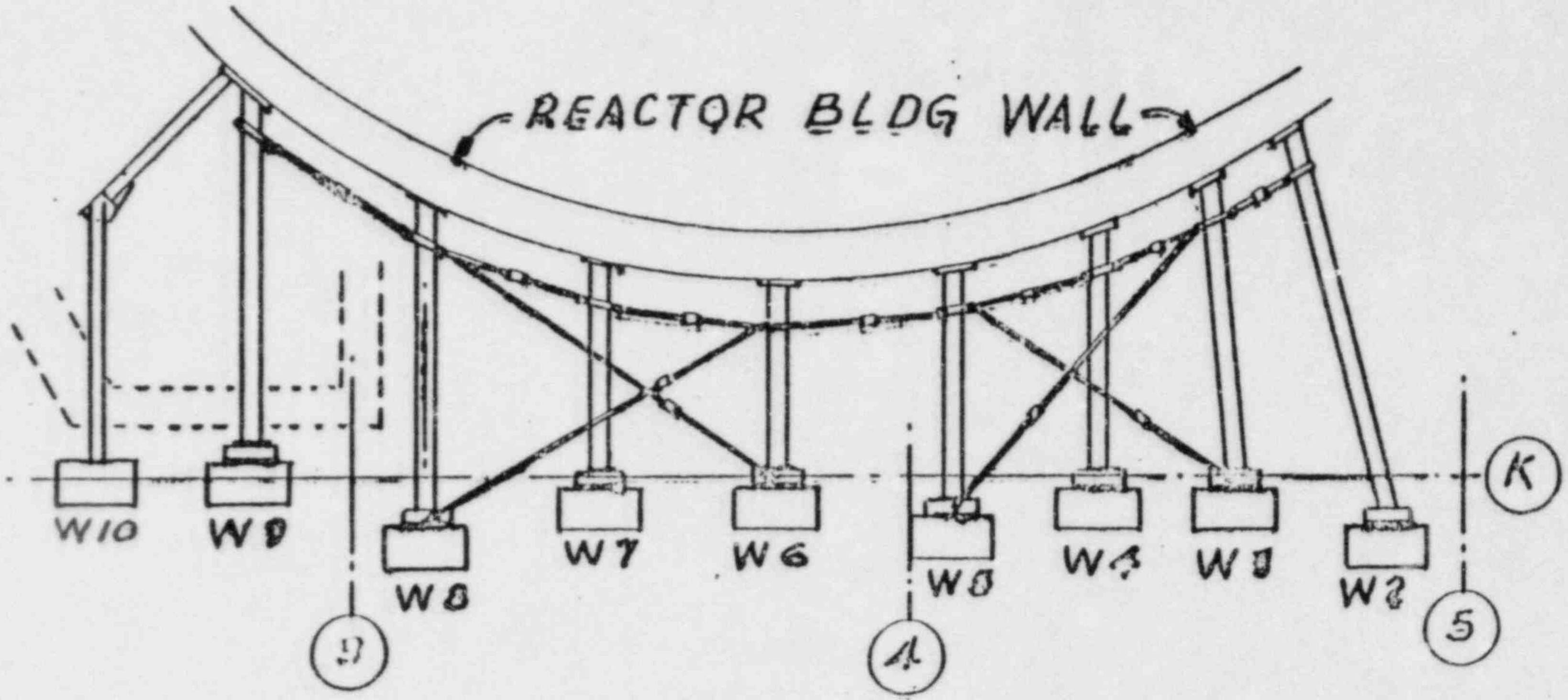
REINFORCING BARS INSTALLED IN 15'-0" LENGTHS WITH FOX-HOWLETT COUPLERS AT STAGGERED LOCATIONS

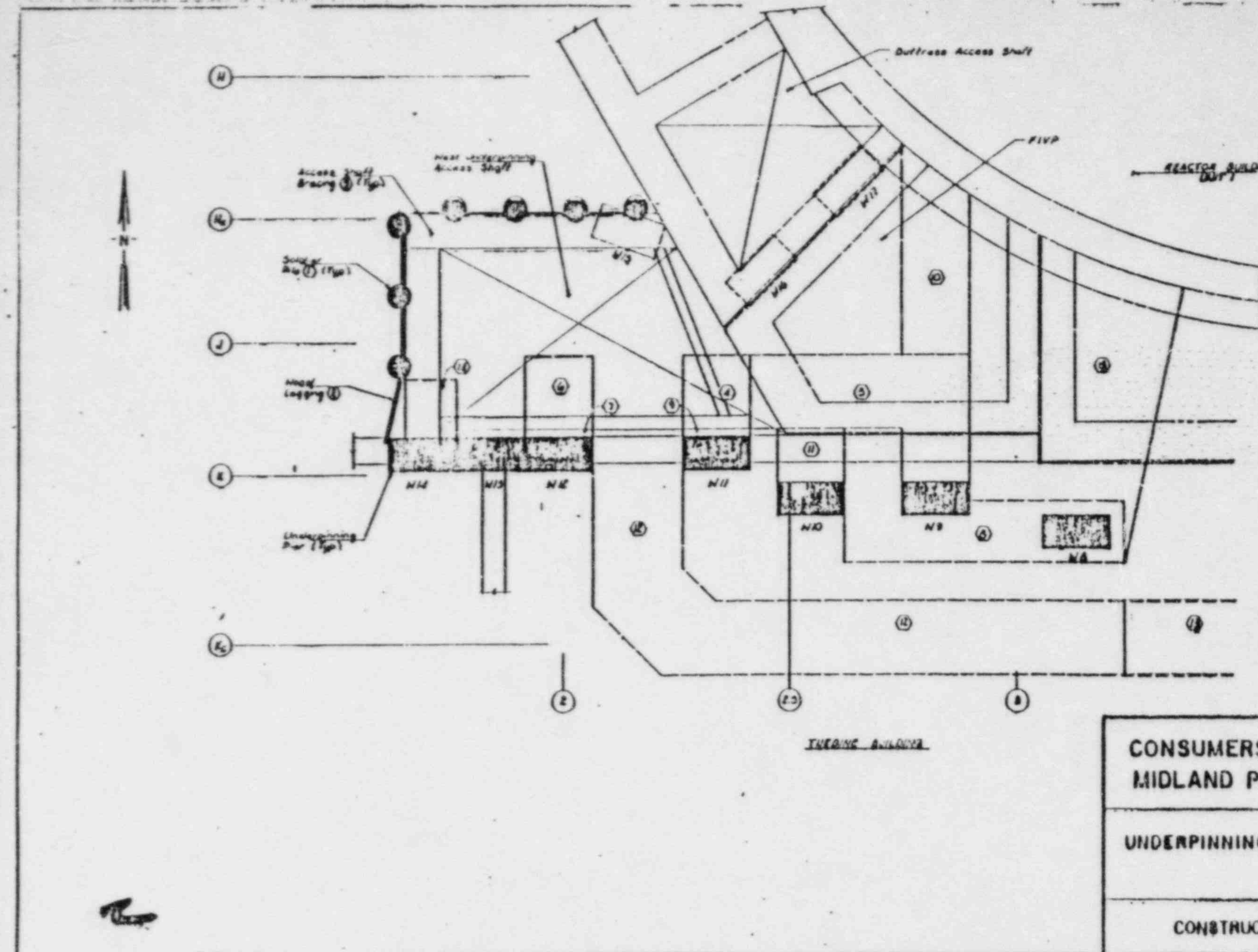


PLAN VIEW OF
CONTROL TOWER PIT LAGGING

4

PLAN- STRUT BRACING



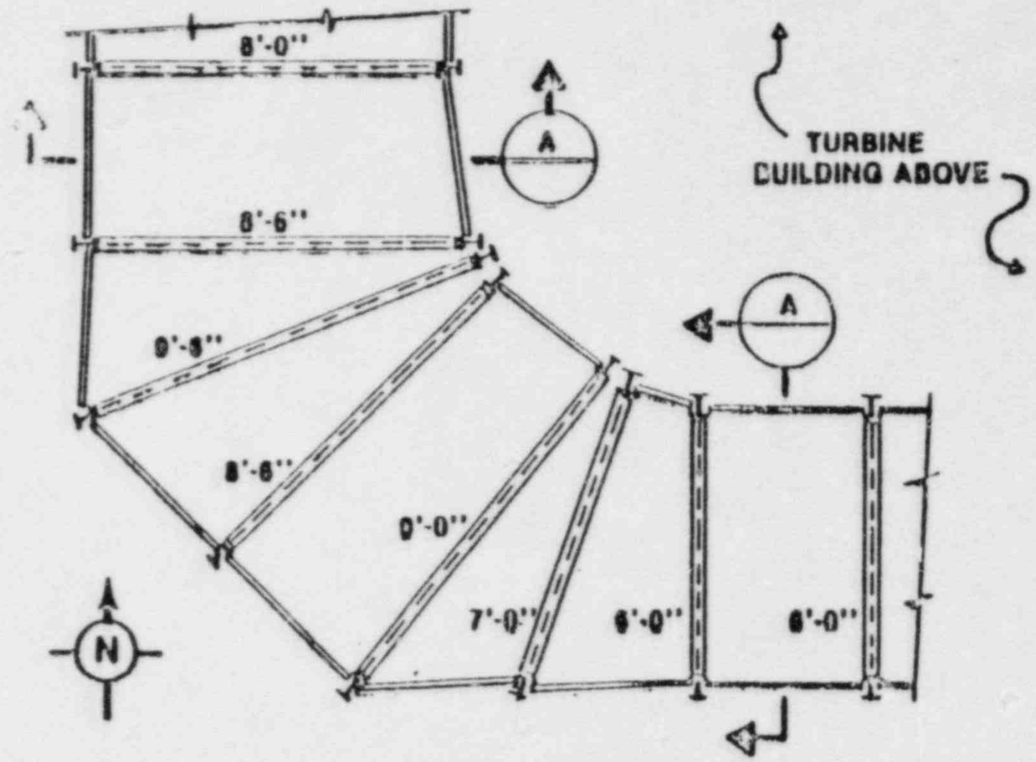


CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2

UNDERPINNING AUXILIARY BUILDING

CONSTRUCTION SCHEMATIC 1

PARTIAL PLAN - ACCESS DRIFT



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1-12-82

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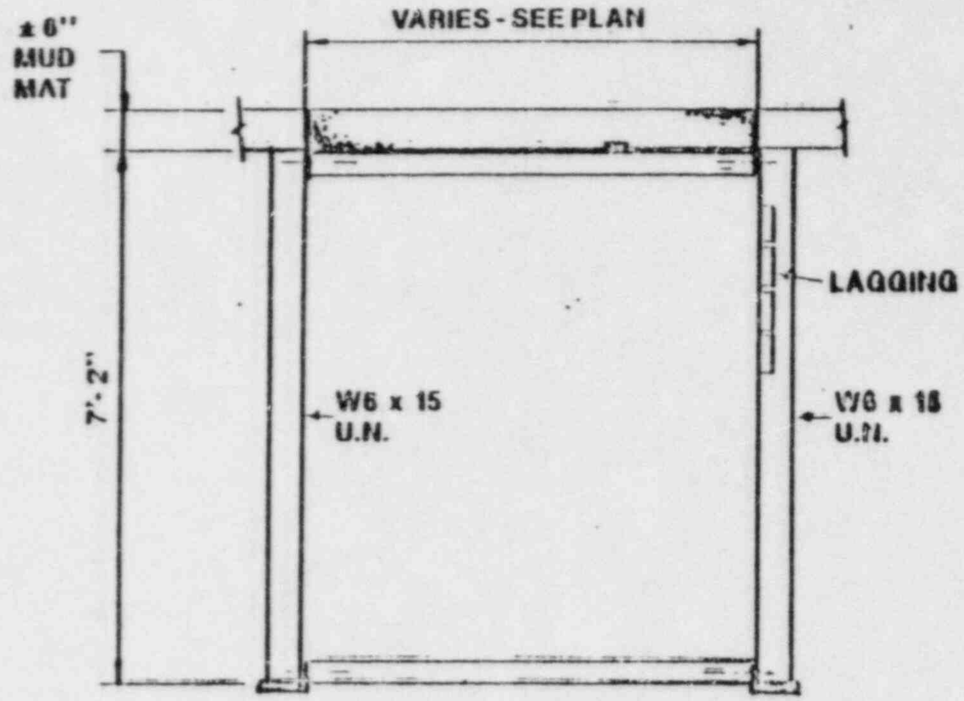
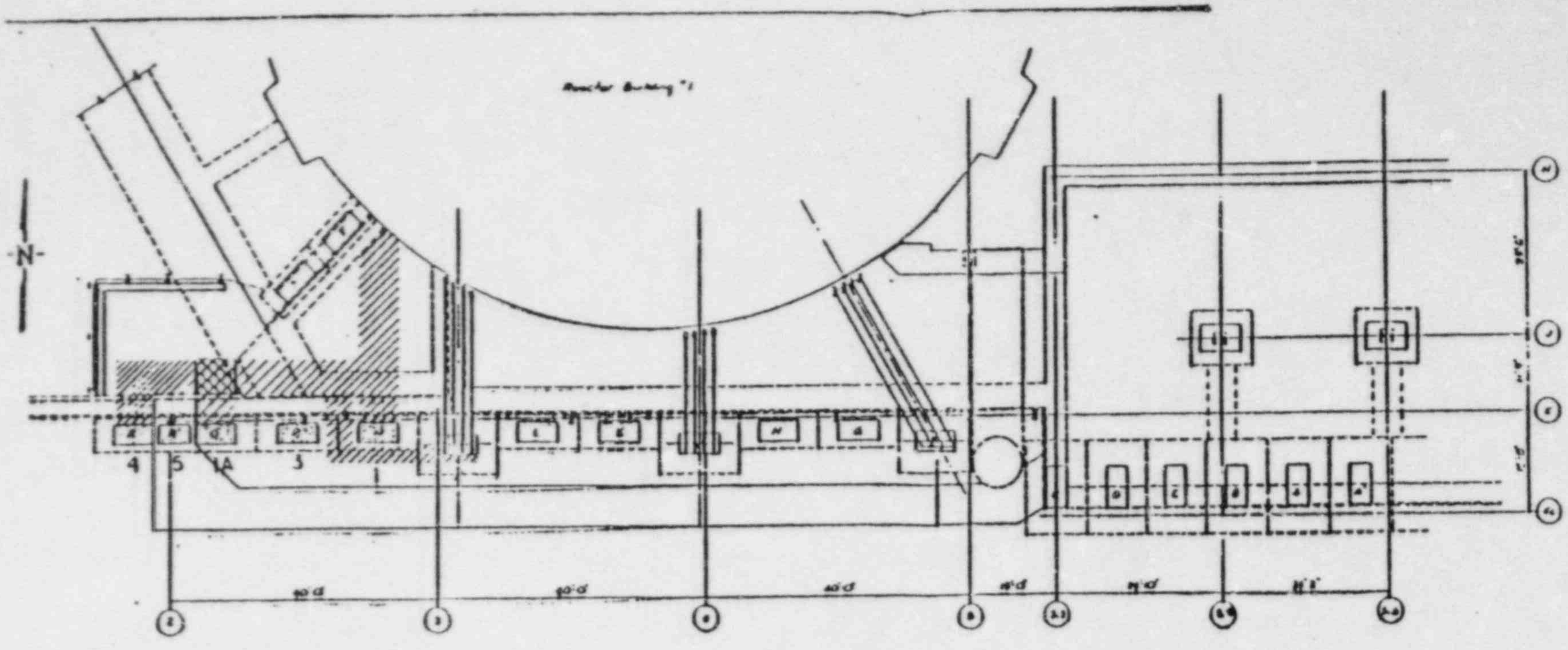
7

TYPICAL ACCESS DRIFT FRAME



SECTION A

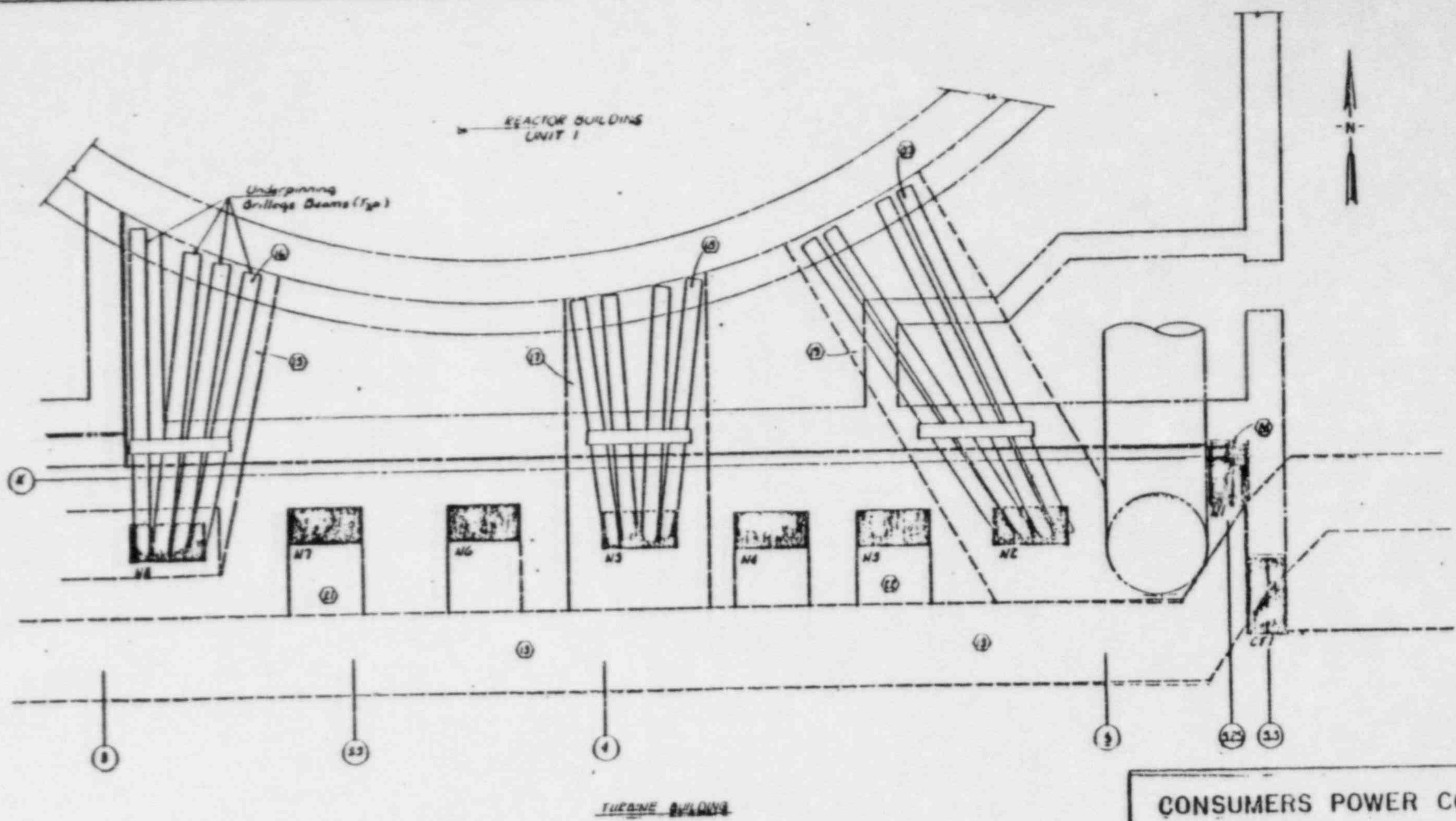


GENERAL PLAN
(WEST SIDE)

CONSUMERS POWER COMPAN
MIDLAND PLANT UNITS 1 & 2

CONCEPT DRAWING
UNDERPINNING AUXILIARY BUILDI
GENERAL PLAN

APPENDIX C FIGURE 1

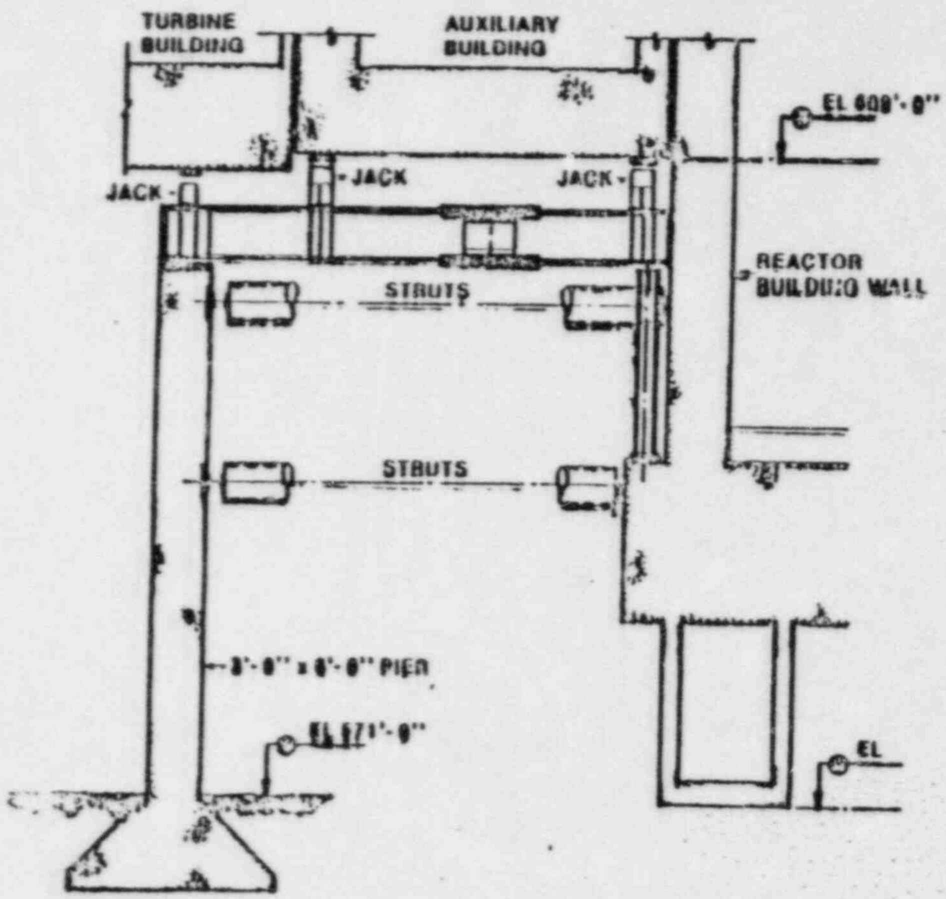


CONSUMERS POWER COMPAN
MIDLAND PLANT UNITS 1 & 2

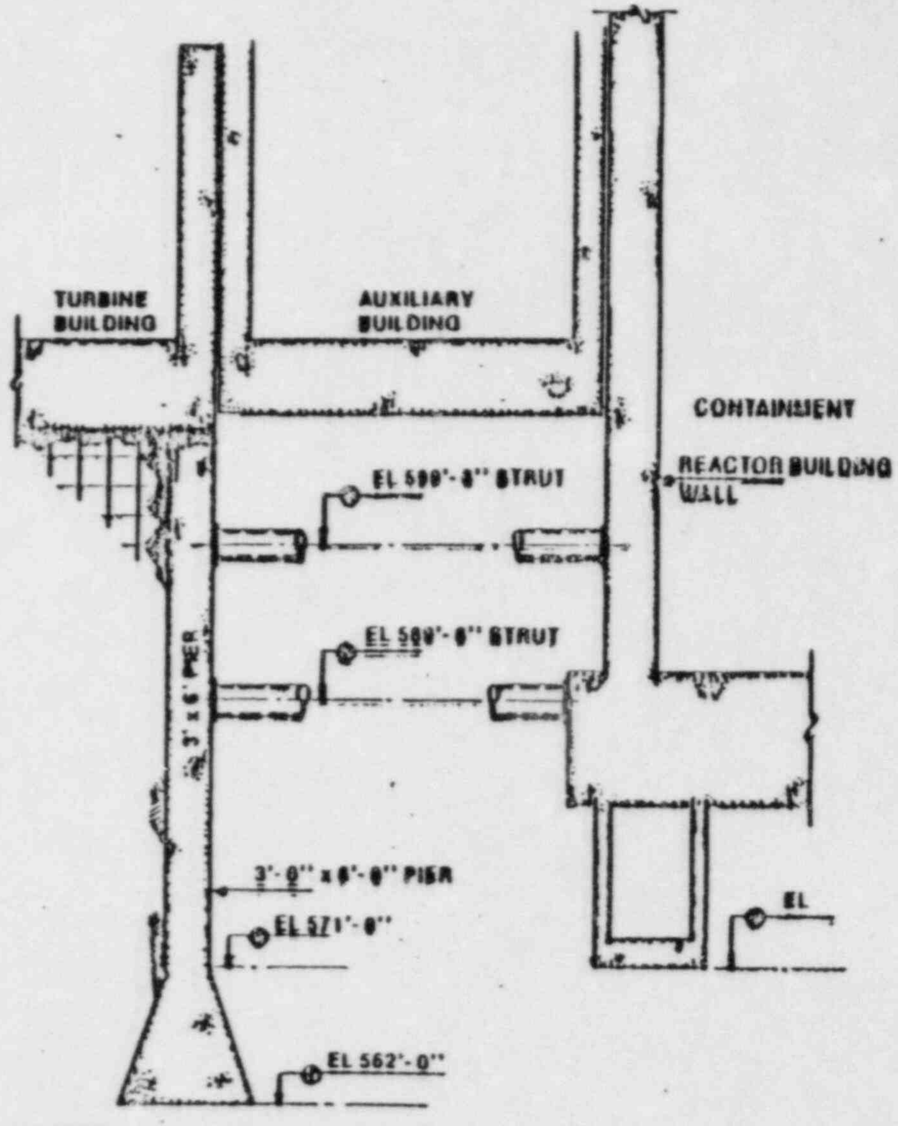
UNDERPINNING AUXILIARY BUILDI

CONSTRUCTION SCHEMATIC 2

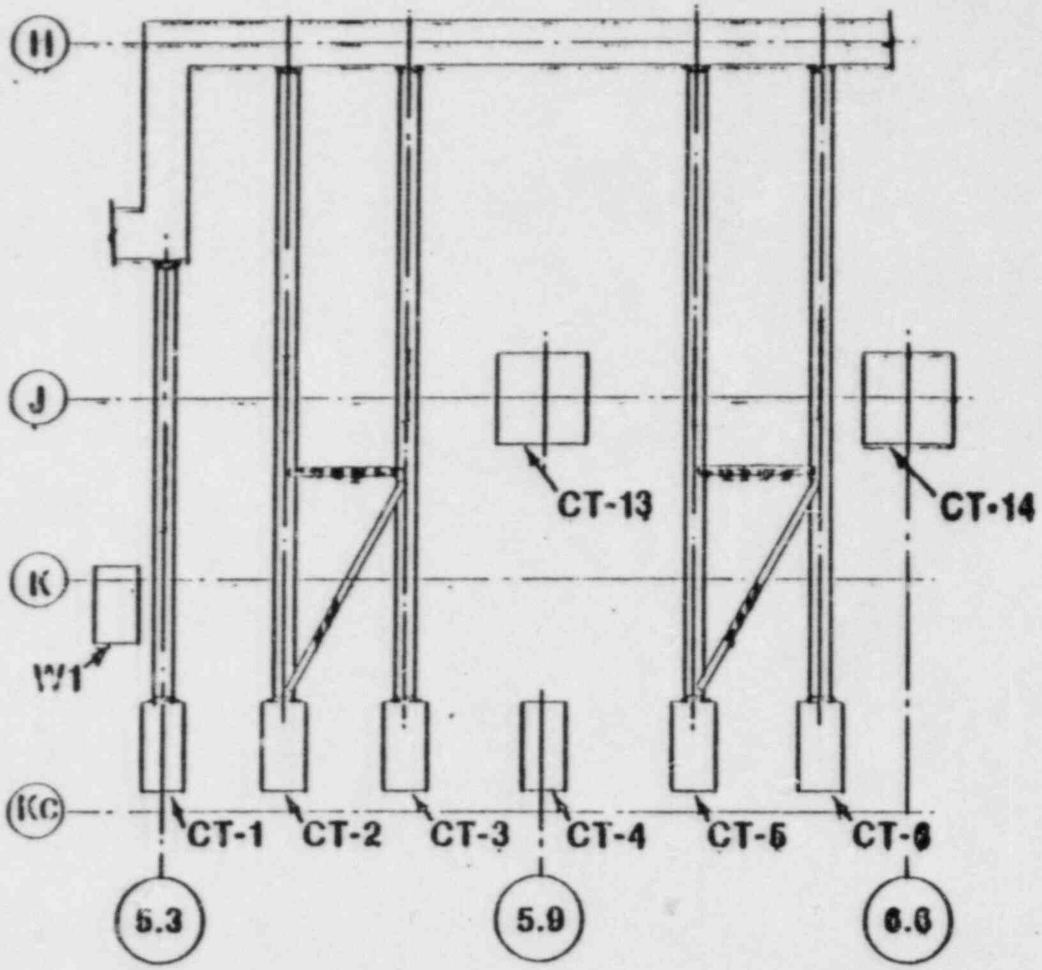
SECTION AT UNDERPINNING GRILLAGE



PIER BRACING



PLAN - CONTROL TOWER
PIERS AND STRUTS



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/27/82

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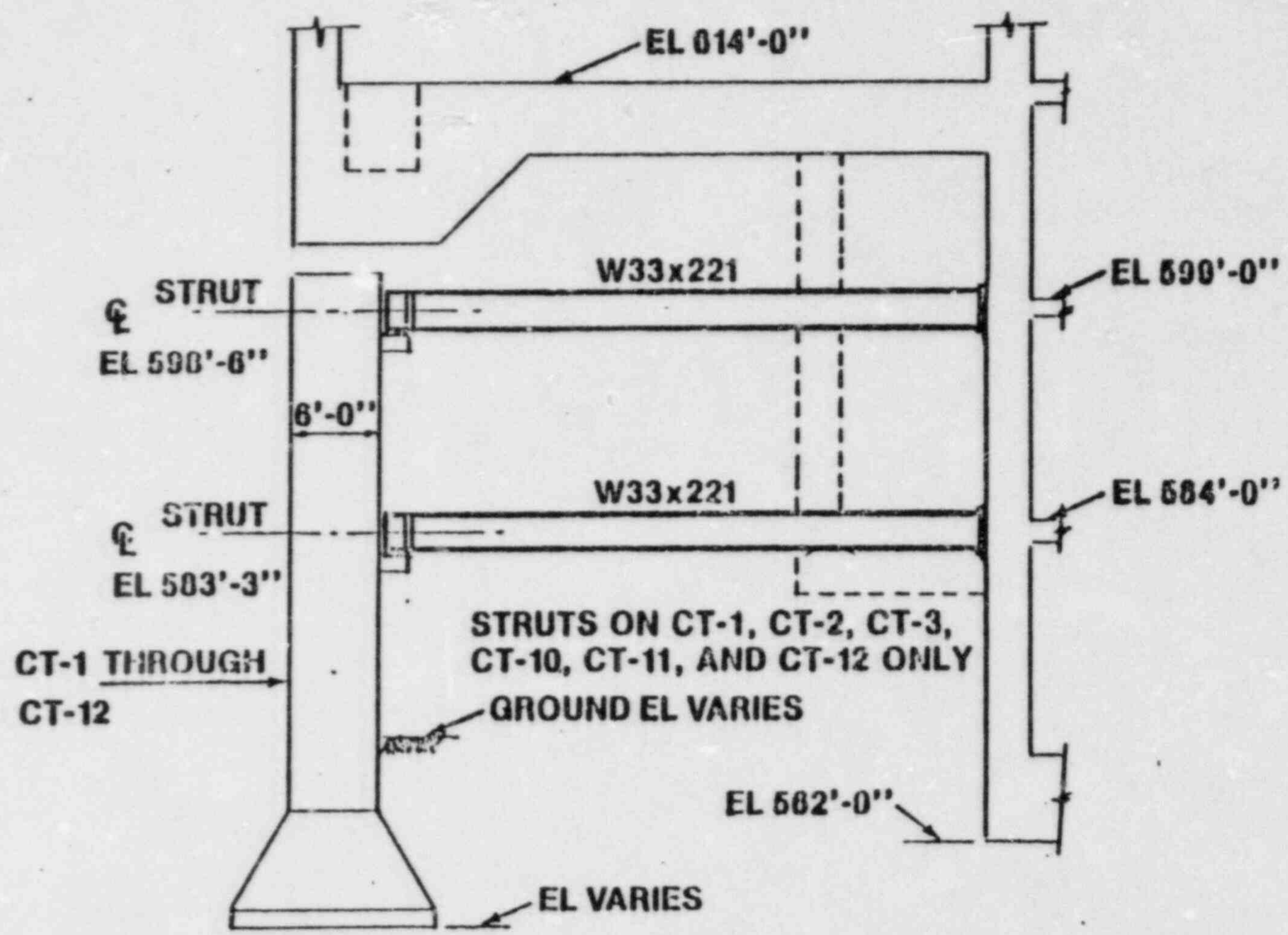
SECTION - CONTROL TOWER
PIERS AND STRUTS



SECTION R-R

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION
ANALYSIS

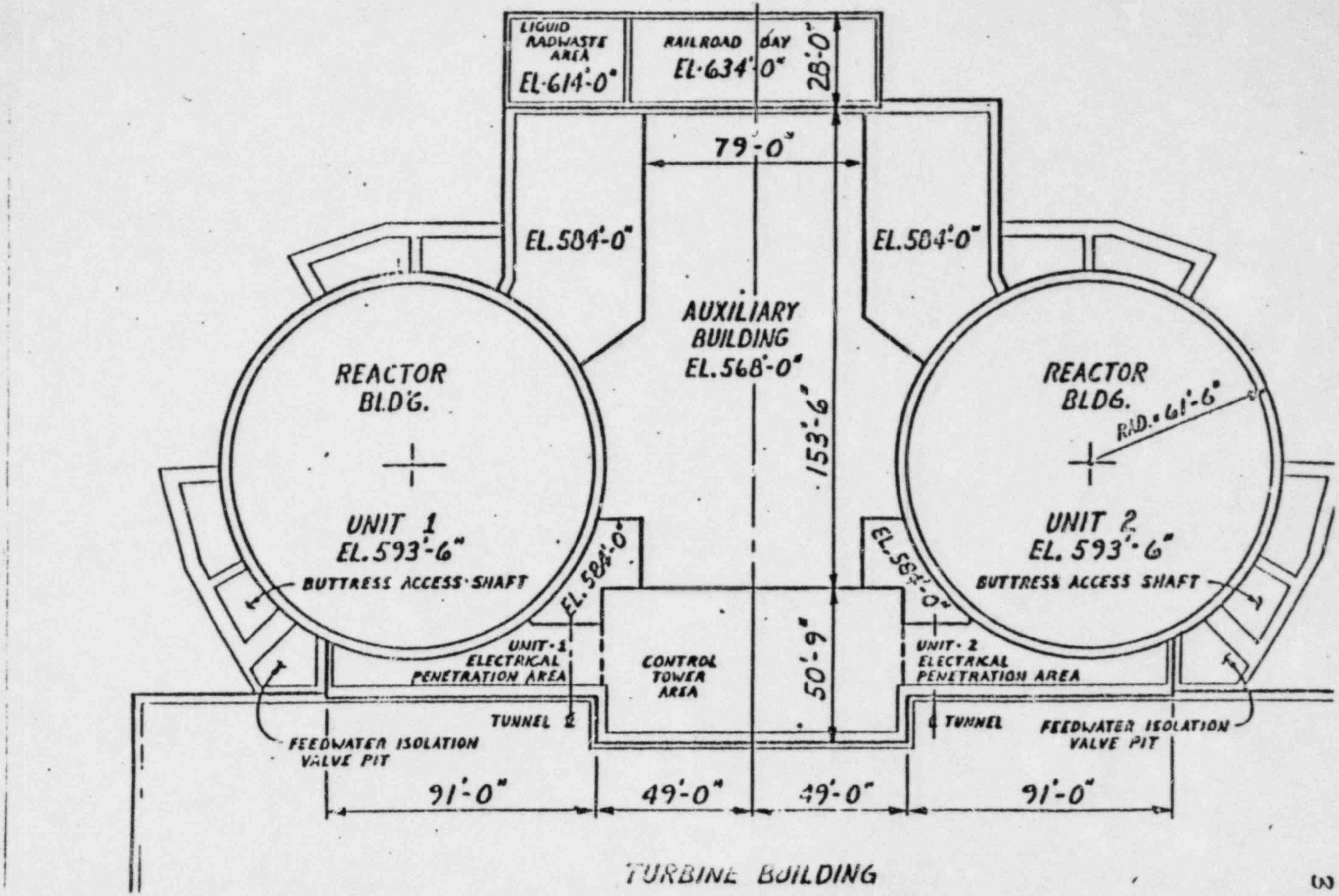
- PURPOSE - TO VERIFY THAT THE STRESSES IN THE STRUCTURE ARE ACCEPTABLE ACCORDING TO DESIGN CRITERIA

- ANALYSIS CLOSELY FOLLOWS CONSTRUCTION SEQUENCES

- CONSTRUCTION SEQUENCES SIMULATED WITH CONSERVATIVE ASSUMPTIONS

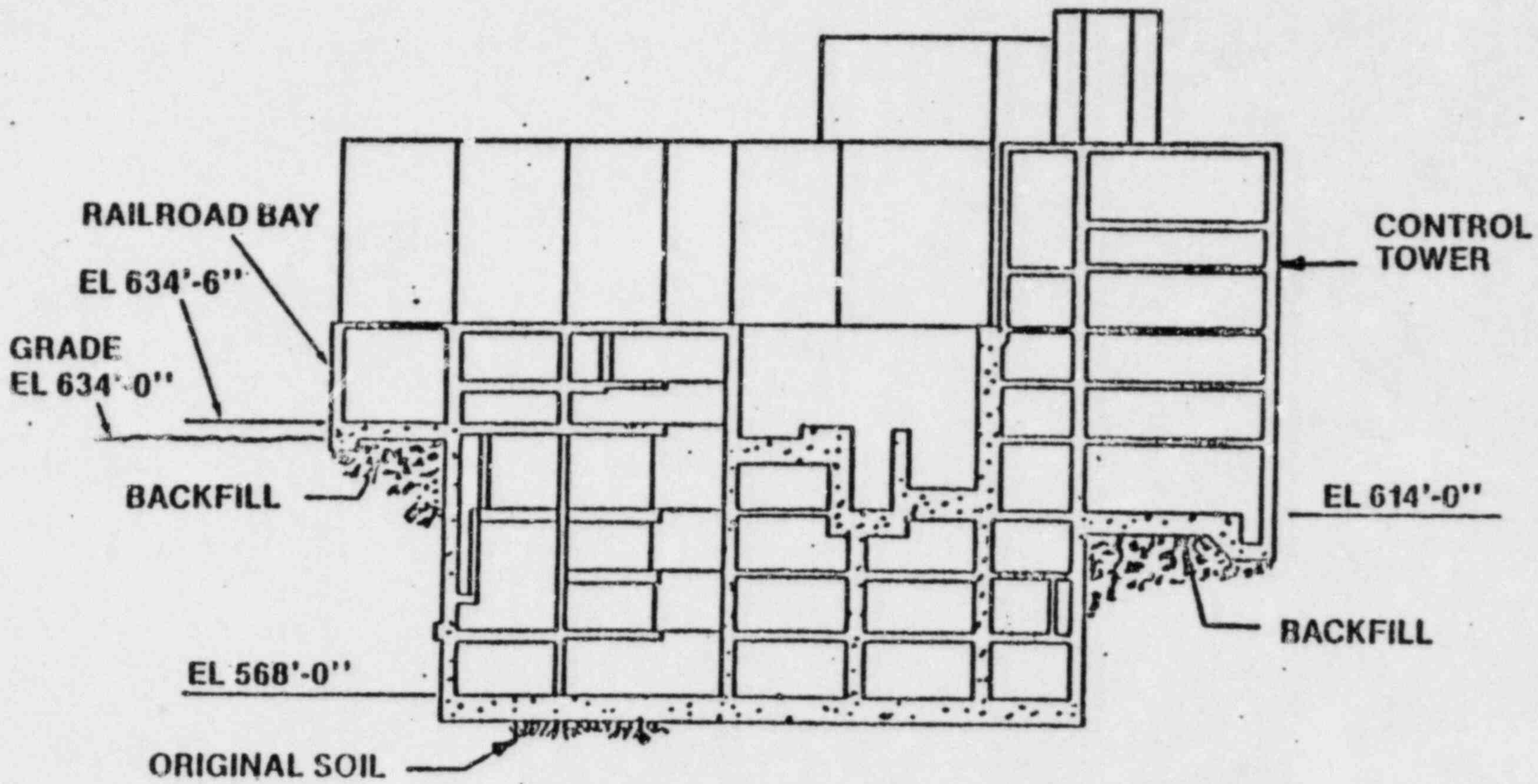
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS

- ANALYTICAL MODEL
- LOADS
- ALLOWABLE STRESS
- BASE LINE
  EXISTING CONDITION WITH BEST ESTIMATED SUPPORT FROM BACKFILL
- INCORPORATE ESTIMATED UNDERPINNING FOR MAJOR CONSTRUCTION STAGES IN MODEL AND EVALUATE CHANGE IN STRESS
- INCORPORATE PROGRESSIVE JACKING
- FINAL STAGE - STRUCTURE ON TEMPORARY SUPPORT
- SOIL PRESSURES
- AREAS FOR MONITORING



2
LIQUID RADWASTE AREA
EL·614'-0"
RAILROAD BAY
EL·634'-0"
28'-0"
79'-0"
EL.584'-0"
EL.584'-0"
AUXILIARY BUILDING
EL.568'-0"
REACTOR BLD'G.
REACTOR BLDG.
RAD.=61'-6"
153'-6"
UNIT 1
EL.593'-6"
UNIT 2
EL. 593'-6"
EL.584'-0"
EL.584'-0"
BUTTRESS ACCESS·SHAFT
BUTTRESS ACCESS SHAFT
UNIT·1 ELECTRICAL PENETRATION AREA
CONTROL TOWER AREA
50'-9"
UNIT·2 ELECTRICAL PENETRATION AREA
TUNNEL ℄
℄ TUNNEL
FEEDWATER ISOLATION VALVE PIT
FEEDWATER ISOLATION VALVE PIT
91'-0"
49'-0"
49'-0"
91'-0"
TURBINE BUILDING
3

AUXILIARY BUILDING
TYPICAL SECTION
(Looking East)



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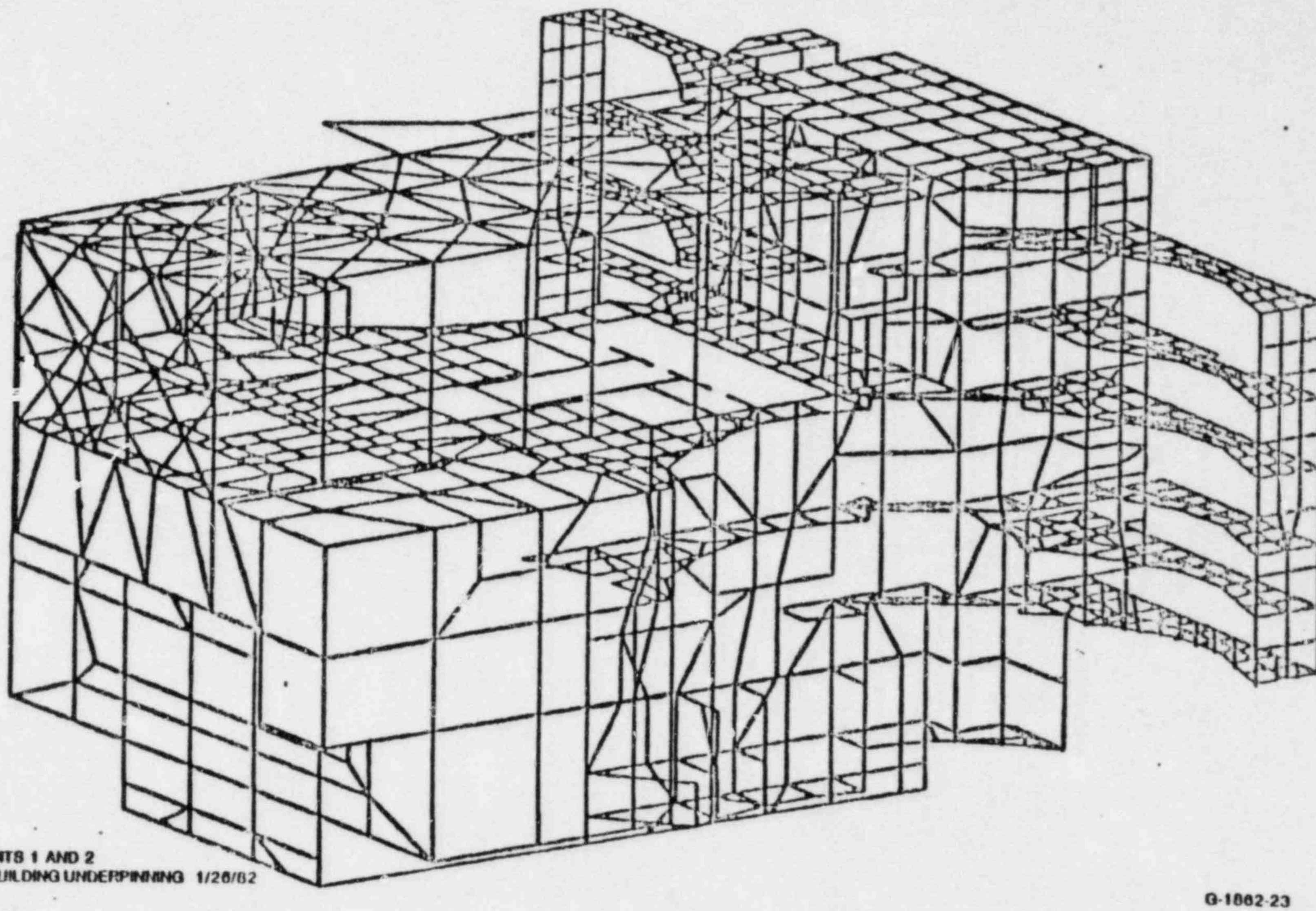
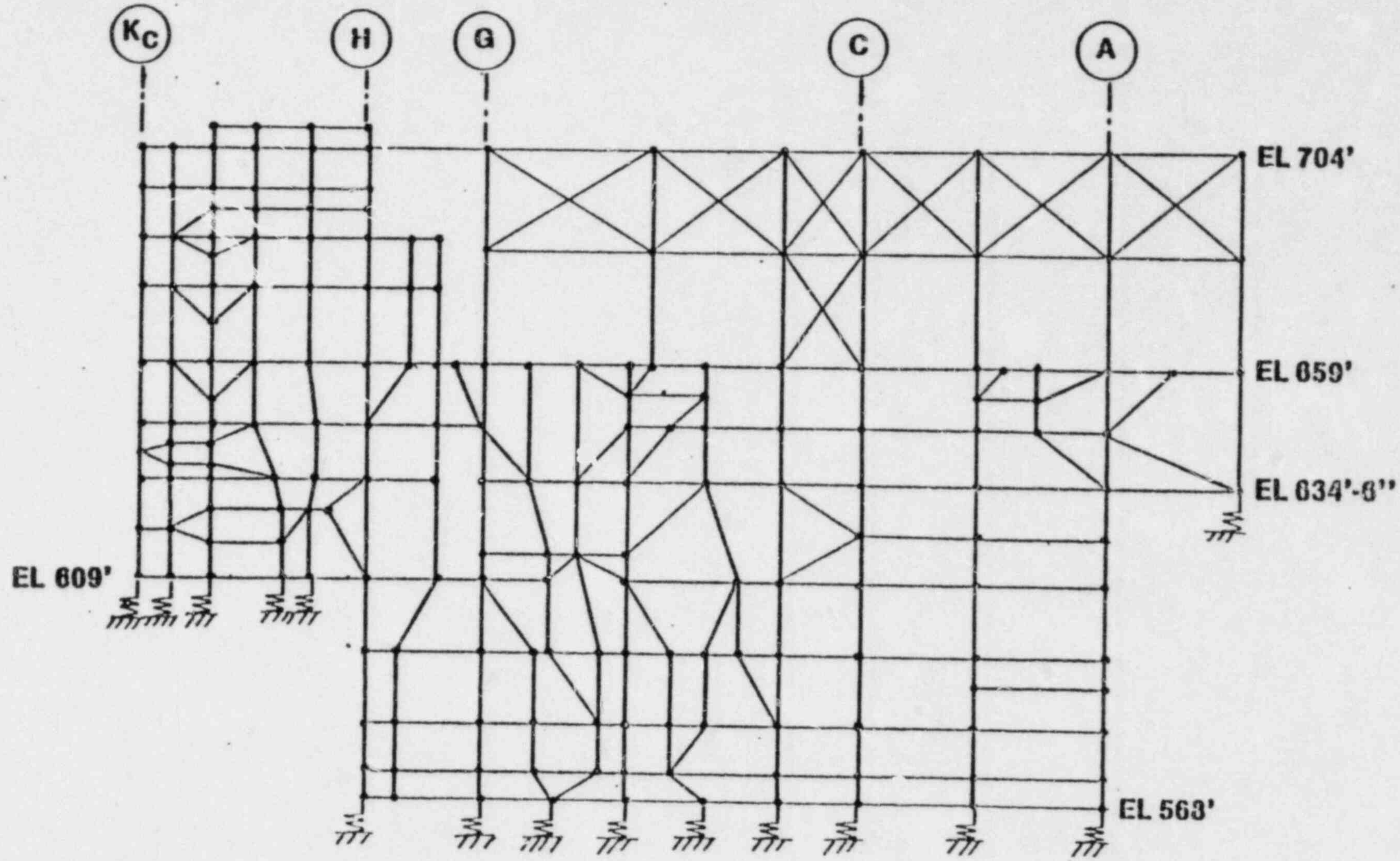
AUXILIARY BUILDING UNDERPINNING
ISOMETRIC VIEW OF MODEL



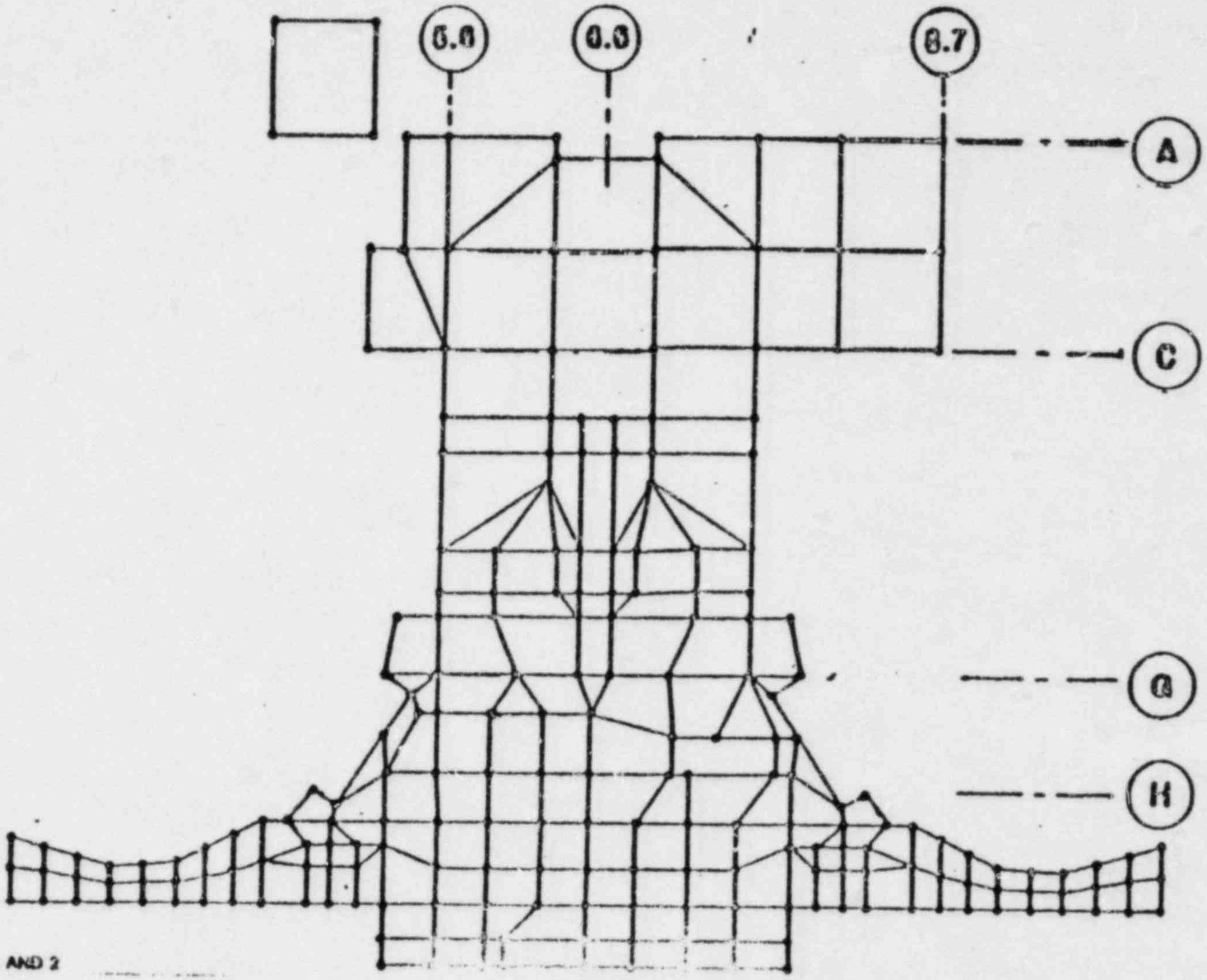
MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/26/82

G-1862-23

AUXILIARY BUILDING UNDERPINNING
NODAL MESH AT COLUMN LINE 5.6
ELEVATION VIEW



AUXILIARY BUILDING UNDERPINNING
NODAL MESH AT ELEVATION 614'
PLAN VIEW



AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS
FINITE ELEMENT MODEL

- USE BSAP CE 800
- NO. OF NODES = 2,800
- NO. OF ELEMENTS, INCLUDE BEAMS, PLATES AND TRUSS = 4,000
- BOUNDARY ELEMENTS = 402
- MESH SOUTH OF G-LINE IS FINER THAN MESH NORTH OF G-LINE
- STEEL BEAMS BELOW SLABS NOT MODELED
- OUT OF PLANE BENDING FOR SLABS ANALYZED SEPARATELY

AUXILIARY BUILDING UNDERPINNING

EXISTING STRUCTURE ANALYSIS

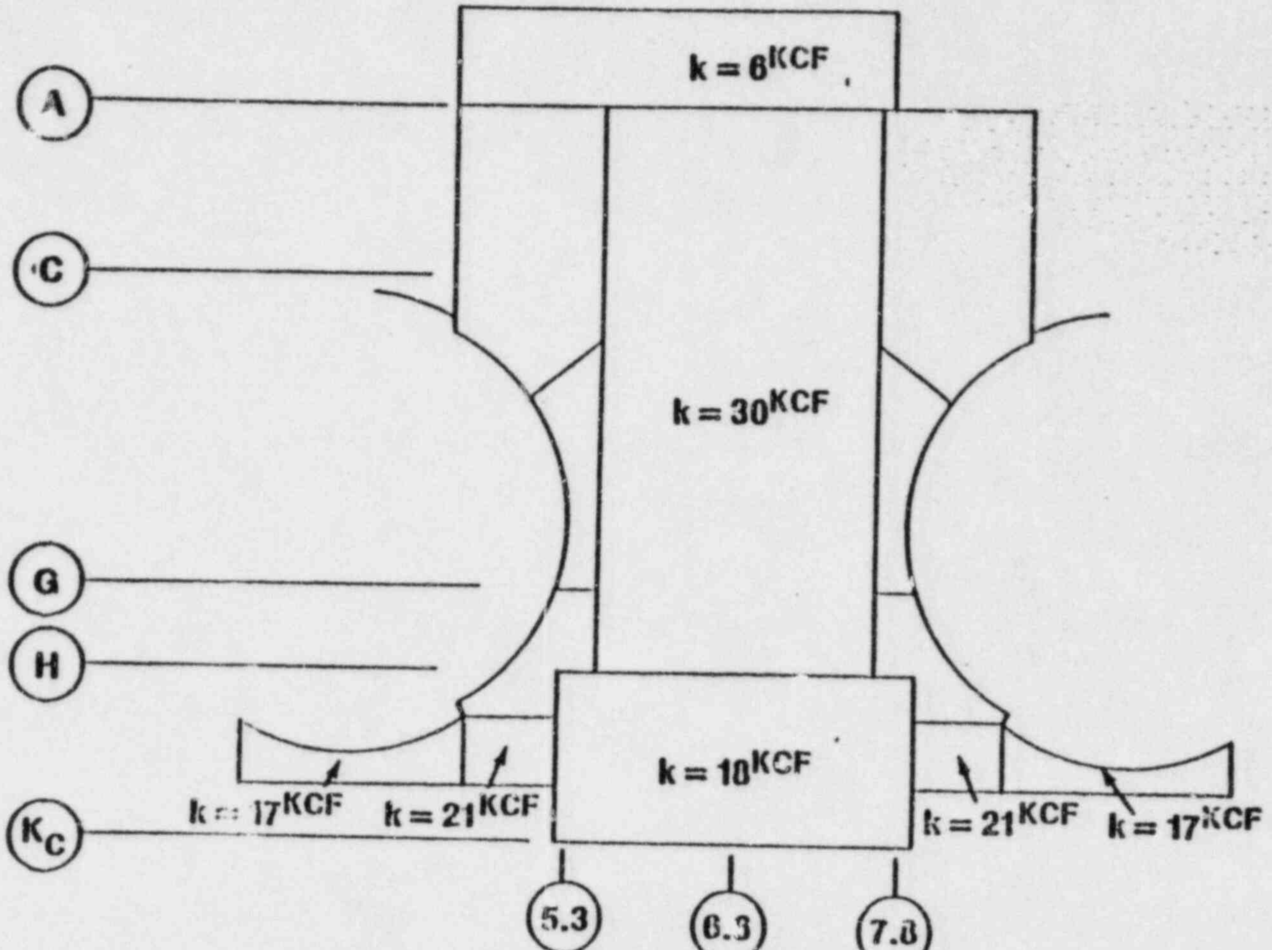
- MODEL BOUNDARY CONDITIONS REPRESENTED AS NODAL SPRINGS

- NODAL SPRINGS = SOIL SUBGRADE MODULUS x CONTRIBUTORY AREA

- SUBGRADE MODULUS VALUES COMPUTED BY GEOTECH AND SUBMITTED TO NRC

9

AUXILIARY BUILDING UNDERPINNING
EXISTING SOIL SPRINGS UNDER AUXILIARY BUILDING



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/26/82

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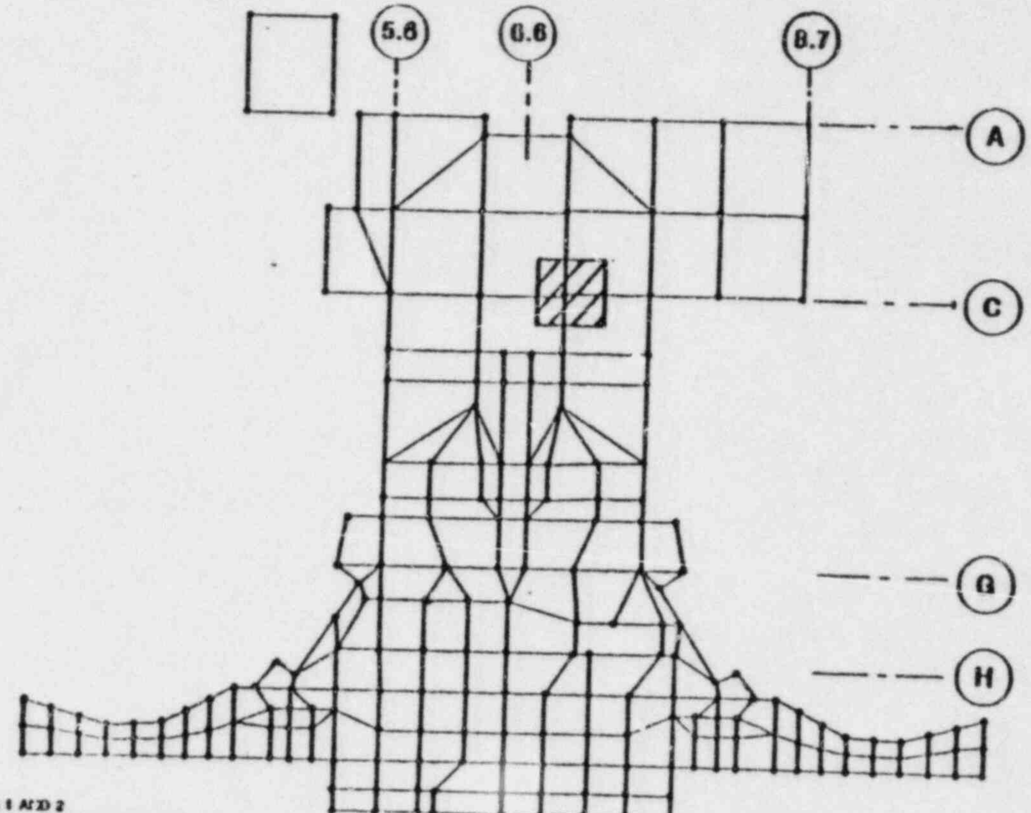
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
NODAL SPRINGS



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/29/82

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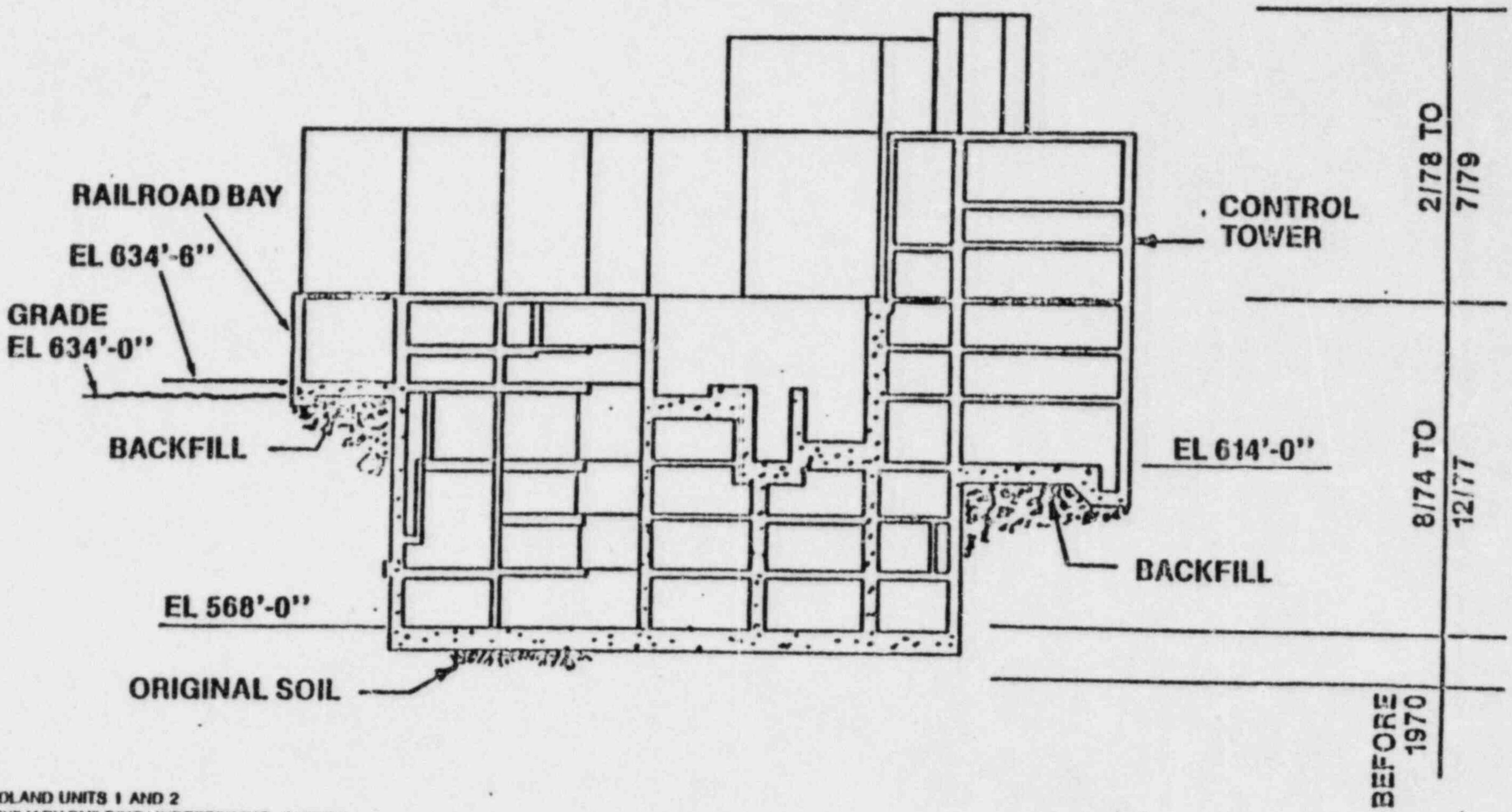
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS

- DEAD WEIGHT OF STRUCTURE
- WEIGHT OF BLOCKWALLS
- EQUIPMENT LOADS
- 25 PERCENT LIVE LOAD ON FLOORS
- JACKING LOAD (progressive)

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS
ALLOWABLE STRESSES AND LOAD FACTORS

- BASED ON ACI 318-71
- AISC, SEVENTH EDITION
- RESULTS FROM COMPUTER MULTIPLIED BY FACTOR 1.43 TO CORRESPOND TO 1.4D + 1.7L
- CONSERVATIVE ESTIMATE DL= 90% OF TOTAL LOAD
  LL= 10% OF TOTAL LOAD
- 1.4D + 1.7L
  $= 0.9 \times 1.4 + 0.1 \times 1.7$
  $= 1.26 + 0.17$
  $= 1.43$
  (weighted load factor)

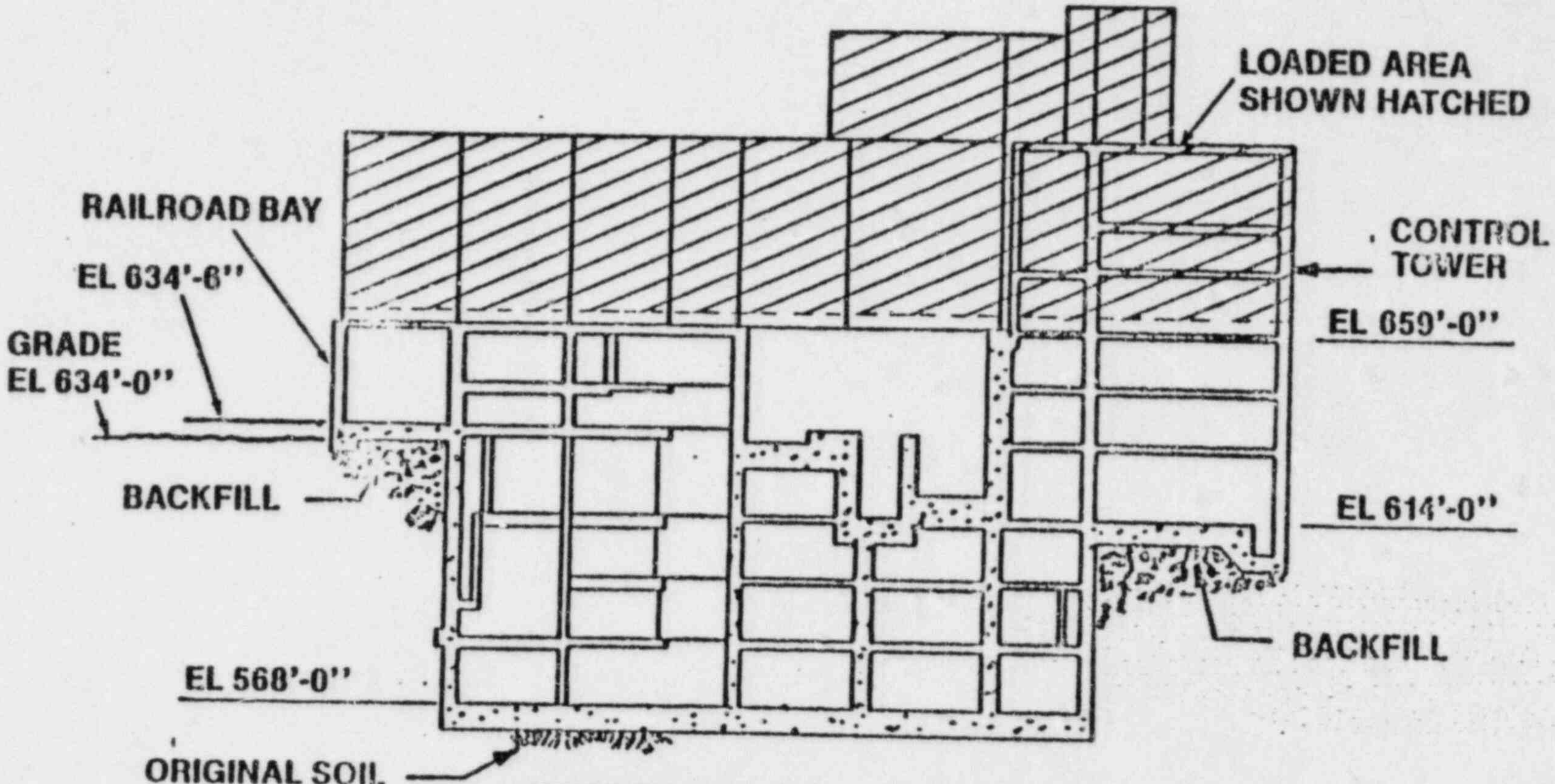
AUXILIARY BUILDING UNDERPINNING
TYPICAL SECTION
(Looking East)



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/26/82

G-1555-07

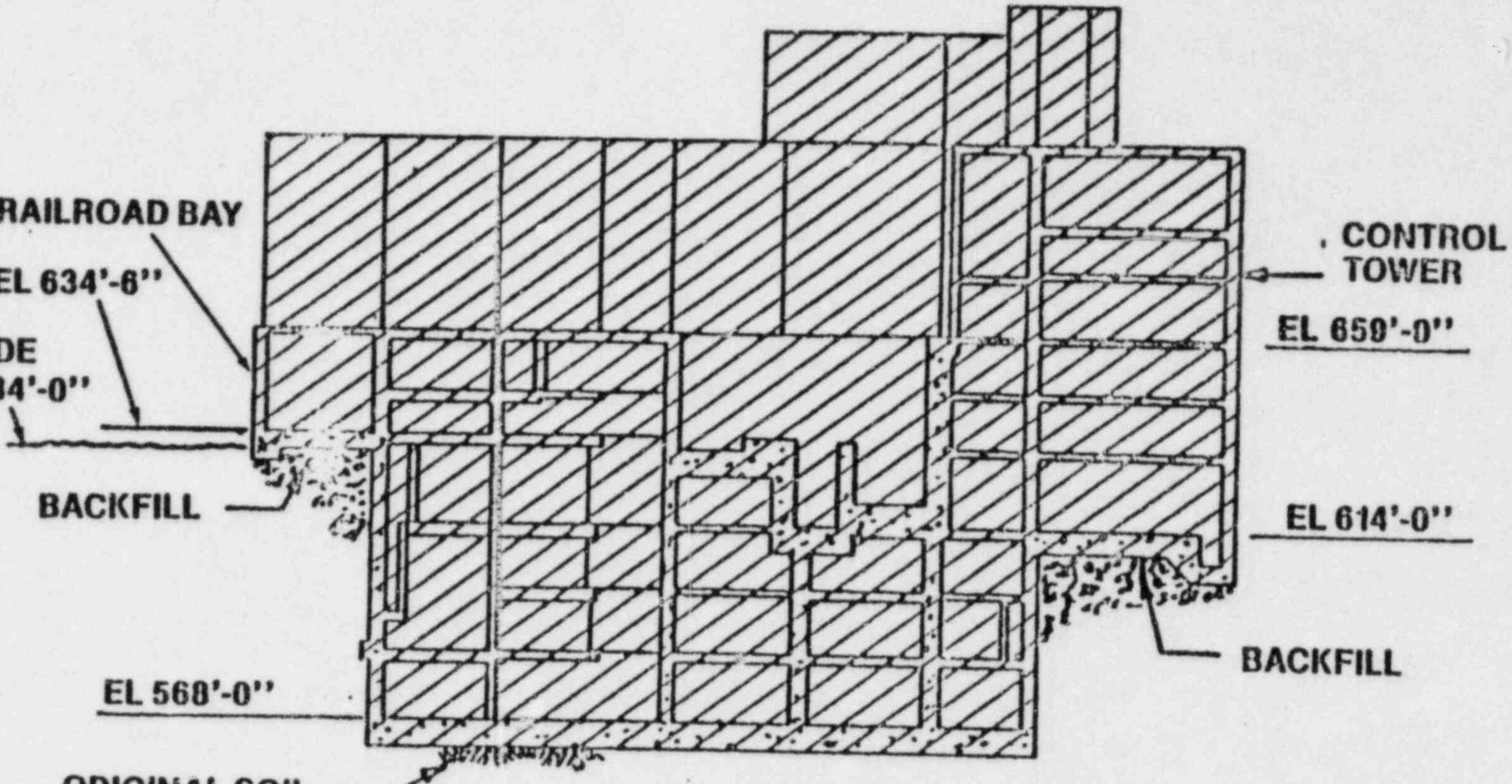
AUXILIARY BUILDING UNDERPINNING
TYPICAL SECTION
(Looking East)



EXISTING STRESS ANALYSIS

LOADING CONDITION FOR EL 659'-0" AND ABOVE

AUXILIARY BUILDING UNDERPINNING
TYPICAL SECTION
(Looking East)



EXISTING STRESSES BELOW EL 659'-0"

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AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS

- EXISTING STRESS DETERMINATION
- TWO MODELS USED TO REPRESENT CONSTRUCTION PROGRESS
- LOADING CONDITION - EL 659' AND ABOVE
- LOADING BELOW EL 659'
- REDUCED MODULUS OF CONCRETE = $\frac{Ec}{1.8}$

  IN ACCORDANCE WITH ARTICLE 9.5.2.3 (ACI 318-71) TO ACCOUNT FOR CREEP AND SHRINKAGE IN CONCRETE

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS

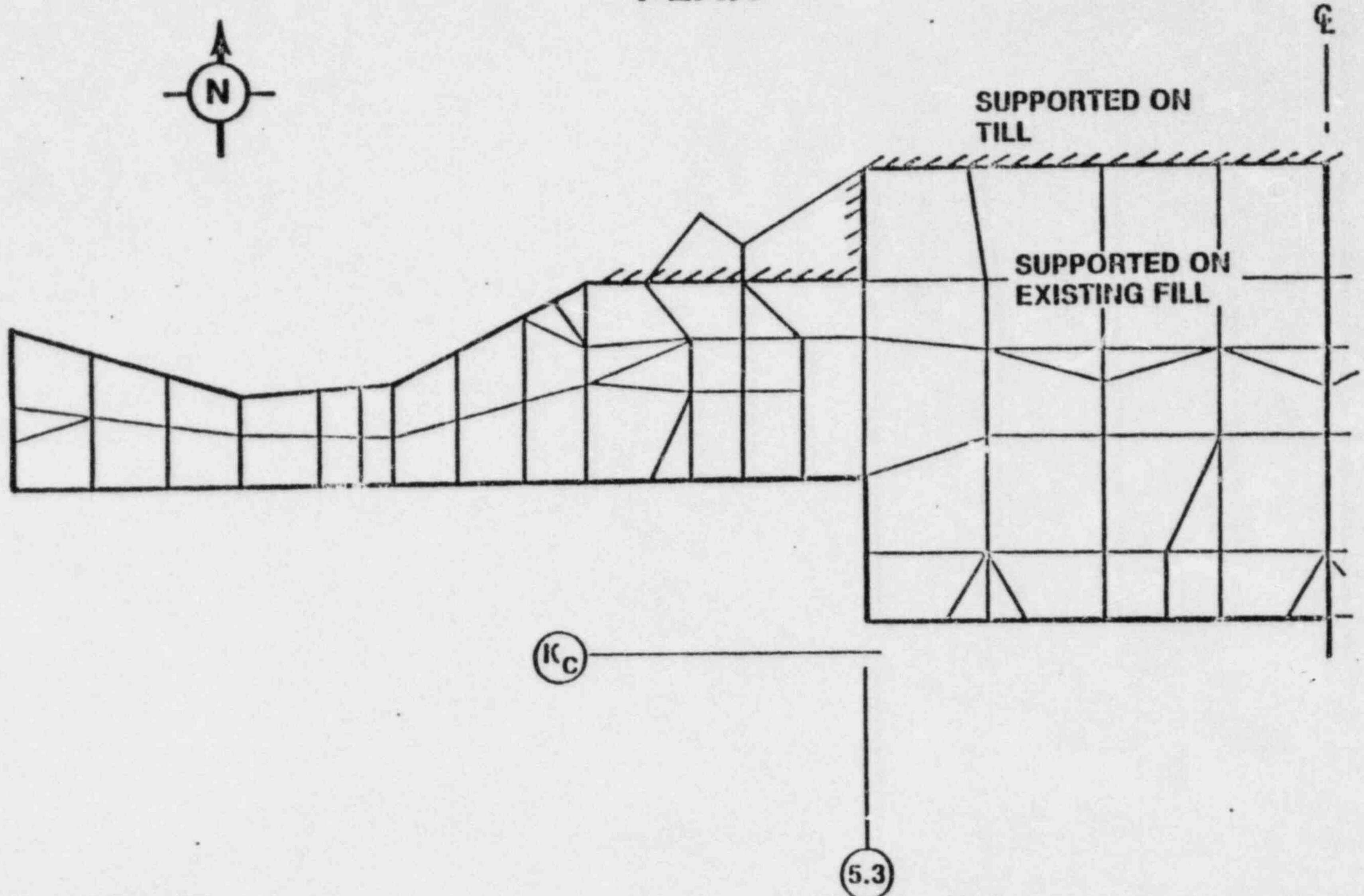
- EXISTING STRESS VALUES
  MAXIMUM TENSION = 30 K/FT

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS

- TEMPORARY CONDITION

- Ec VALUE IN ACCORDANCE WITH ARTICLE 8.3.1 OF ACI 318-71

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION AREA PLAN



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/20/82

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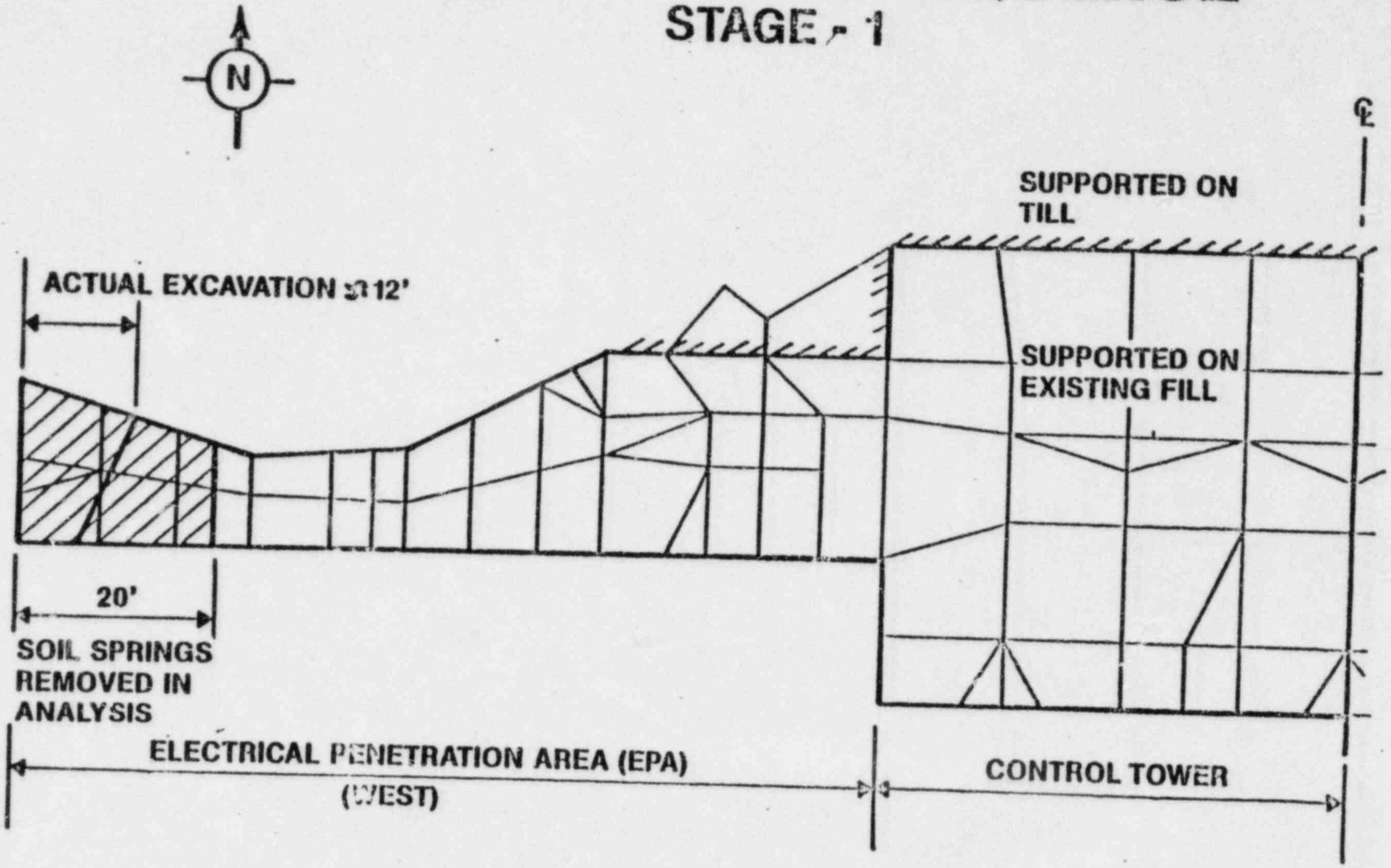
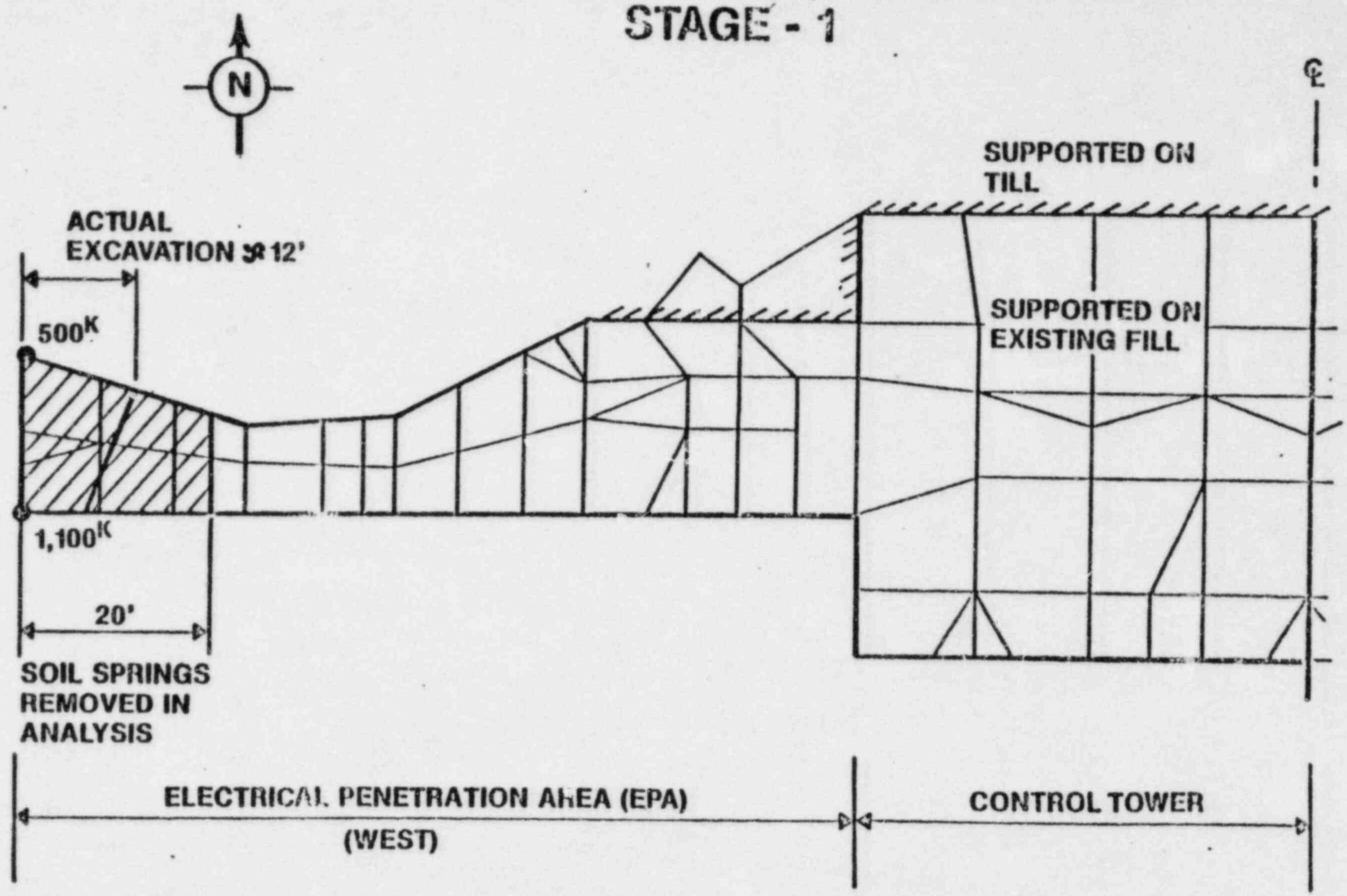
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION SEQUENCE
STAGE - 1



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/26/82

G-1862-21

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION SEQUENCE
STAGE - 1



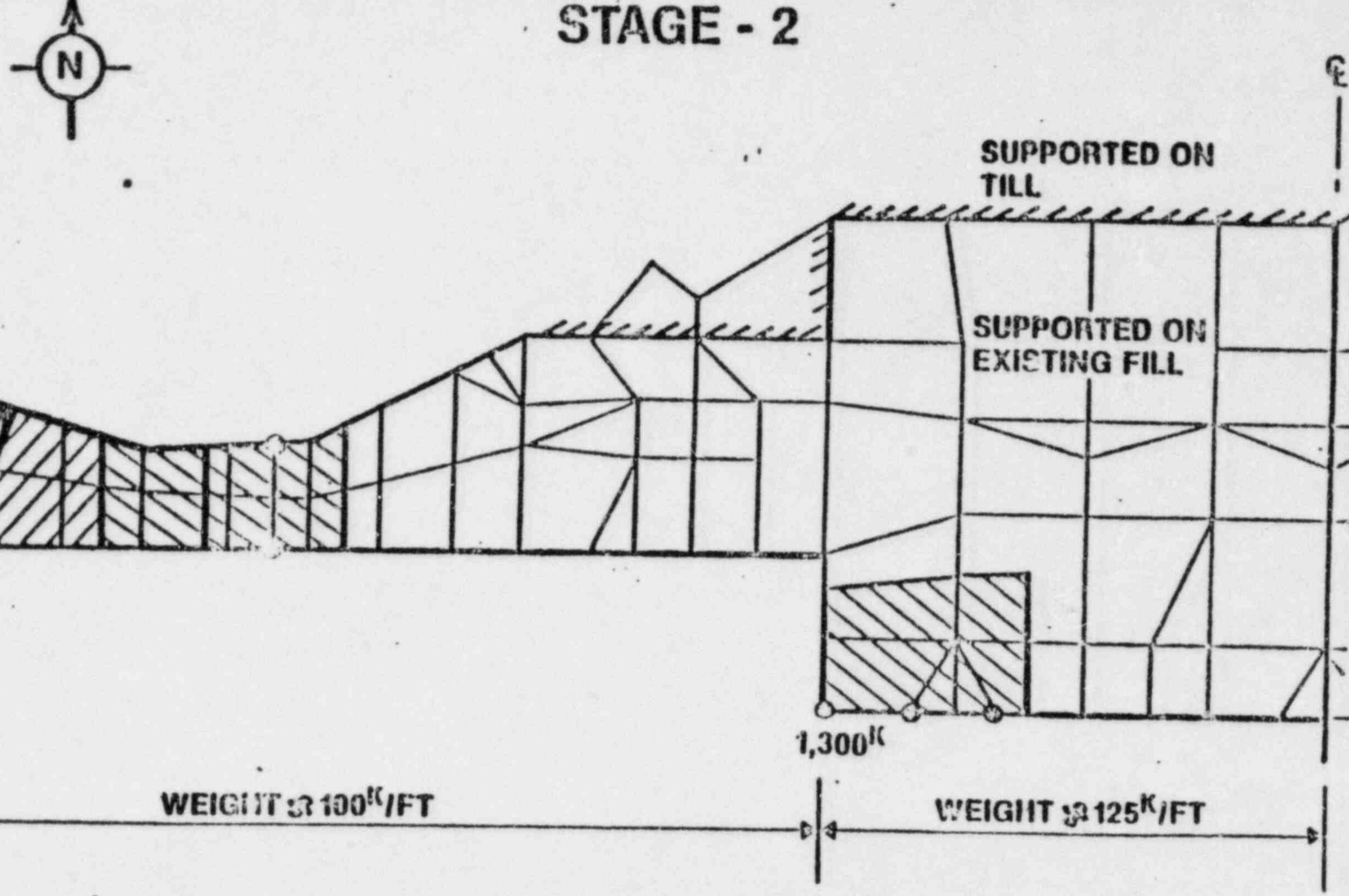
MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/20/82

G-1882-22

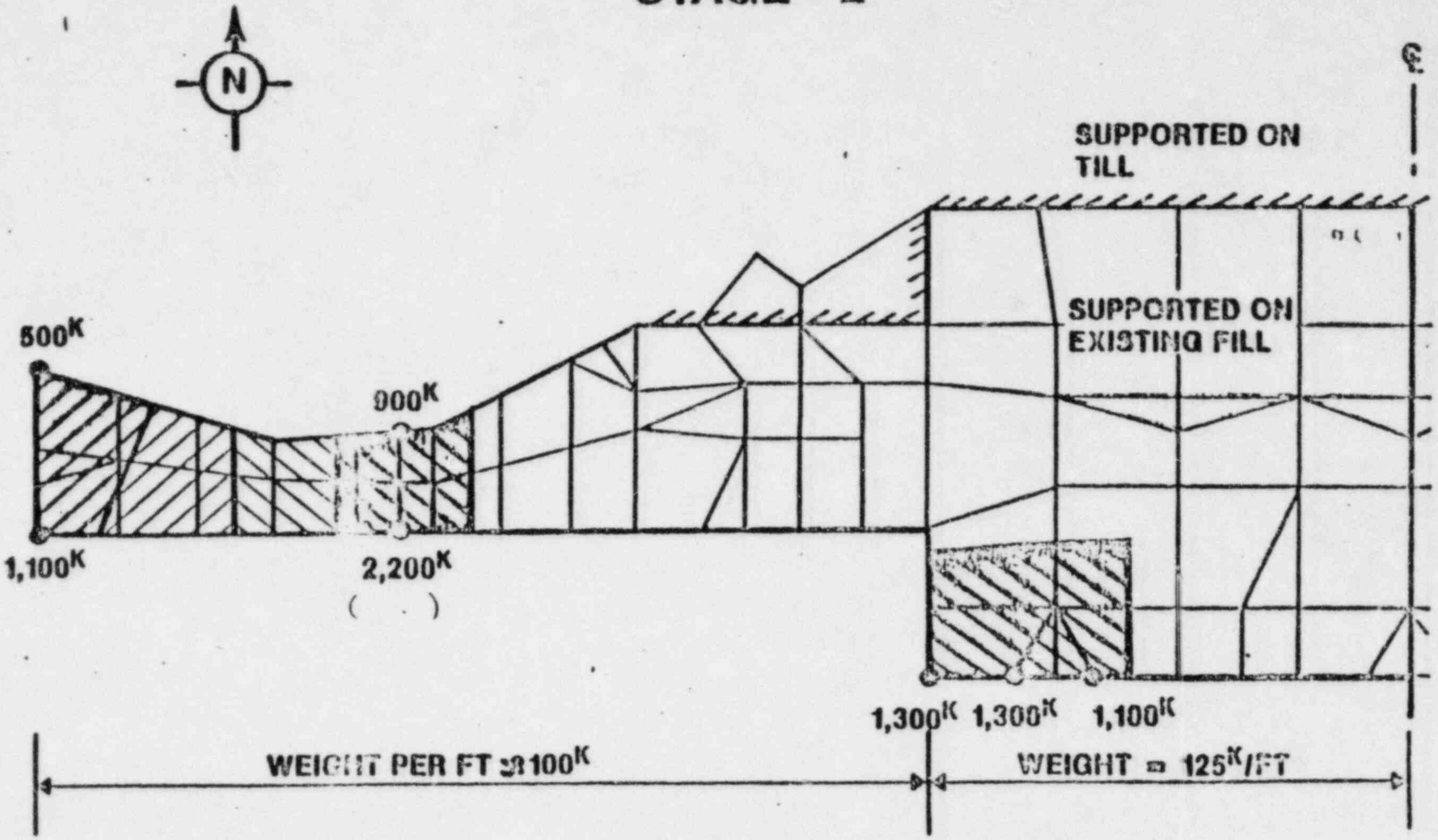
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
MAXIMUM STRESS (Tension)
CONSTRUCTION STAGE 1

	Existing Stress	Change in Stress	Total Stress
• DUE TO SOIL REMOVAL	30 K/FT	7 K/FT	37 K/FT
• DUE TO SOIL REMOVAL AND JACKING	30 K/FT	-2 K/FT	28 K/FT

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION SEQUENCE
STAGE - 2



AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION SEQUENCE
STAGE - 2



MIDLAND UNITS 1 AND 2

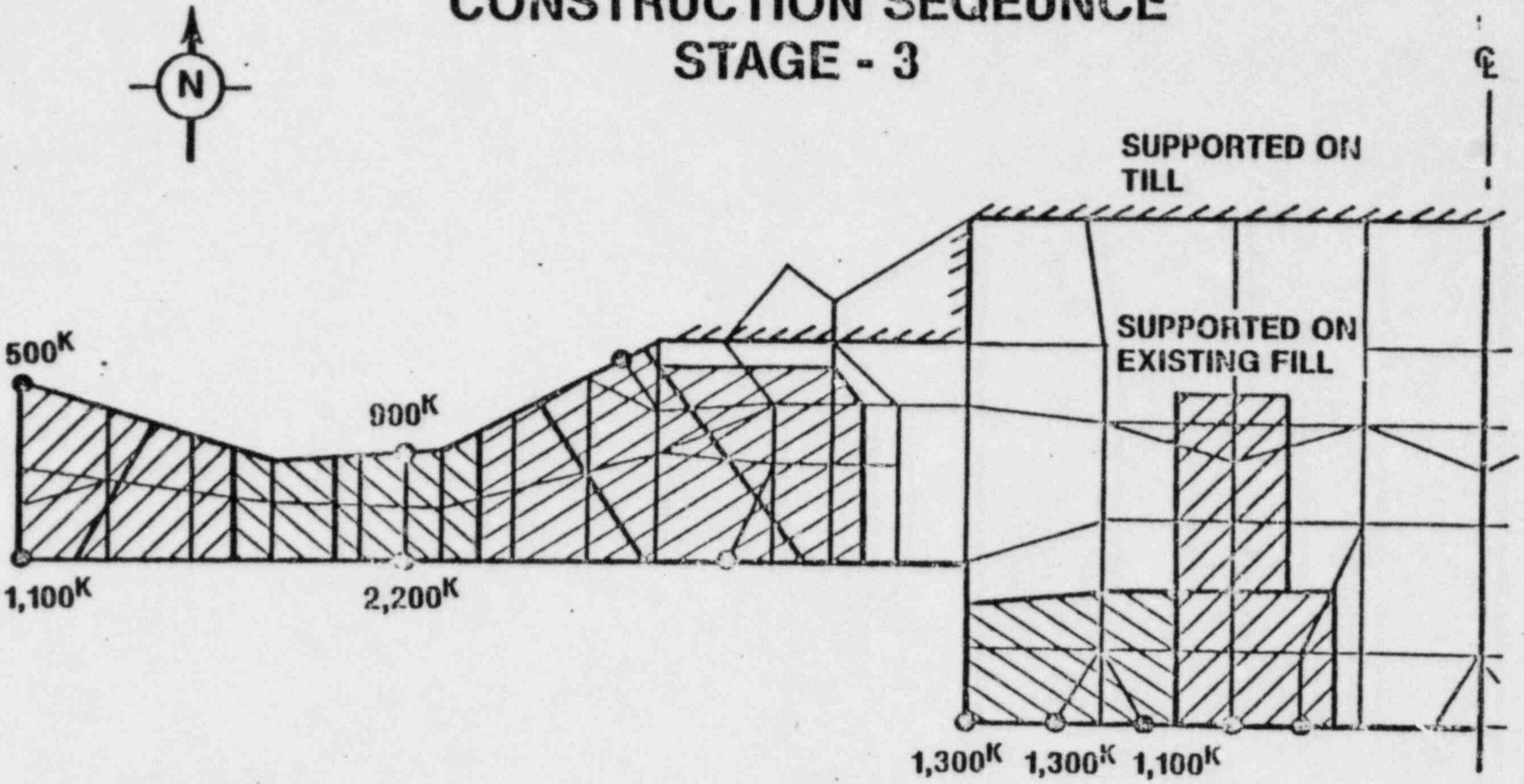
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
MAXIMUM STRESS (Tension)
CONSTRUCTION STAGE 2

	Existing Stress	Change in Stress	Total Stress
o DUE TO SOIL REMOVAL	30 K/FT	1 K/FT	31 K/FT
o DUE TO SOIL REMOVAL AND JACKING	30 K/FT	-65 K/FT	-35 K/FT

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS

CONSTRUCTION SEQEUNCE

STAGE - 3



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING

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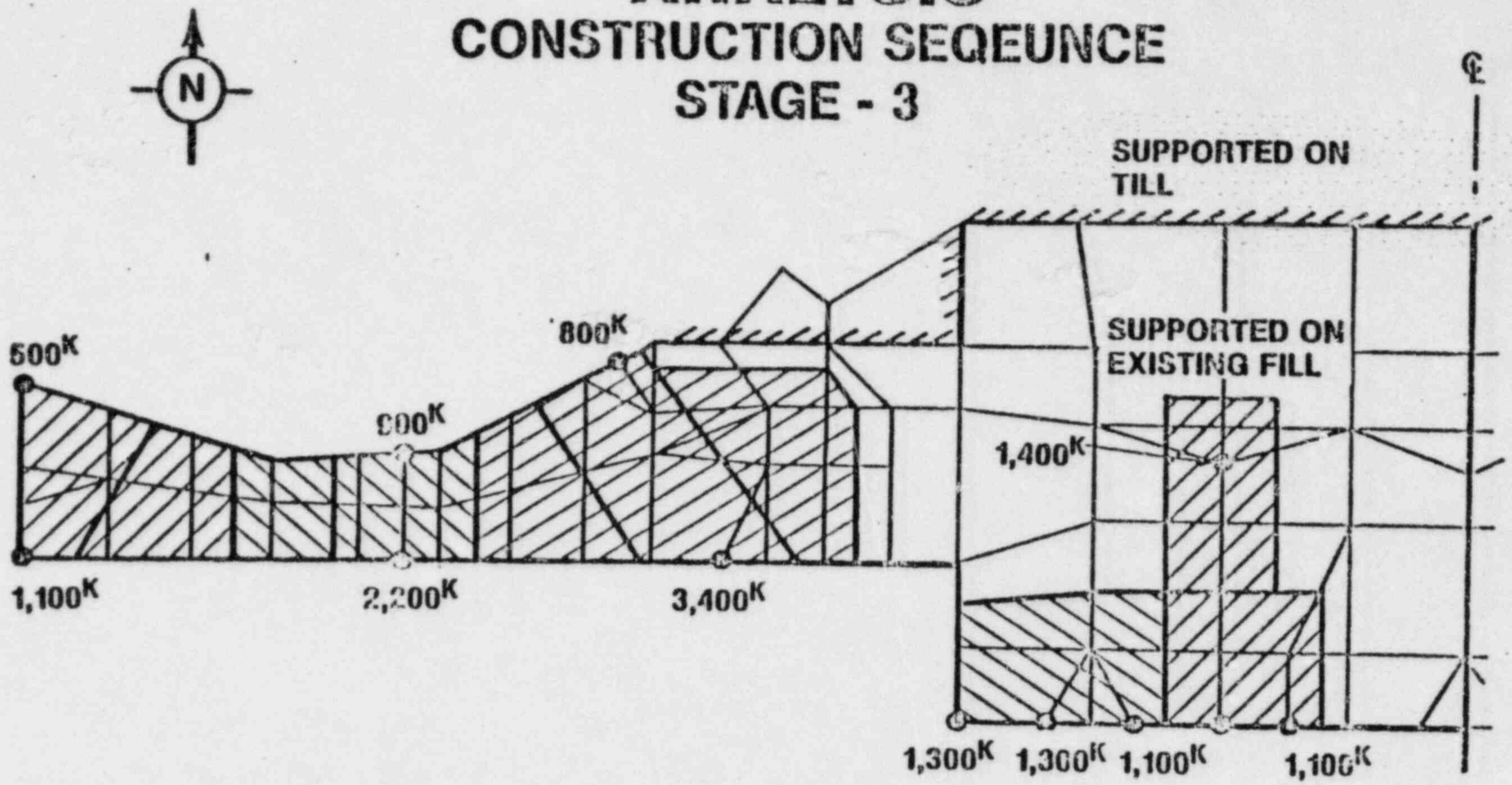
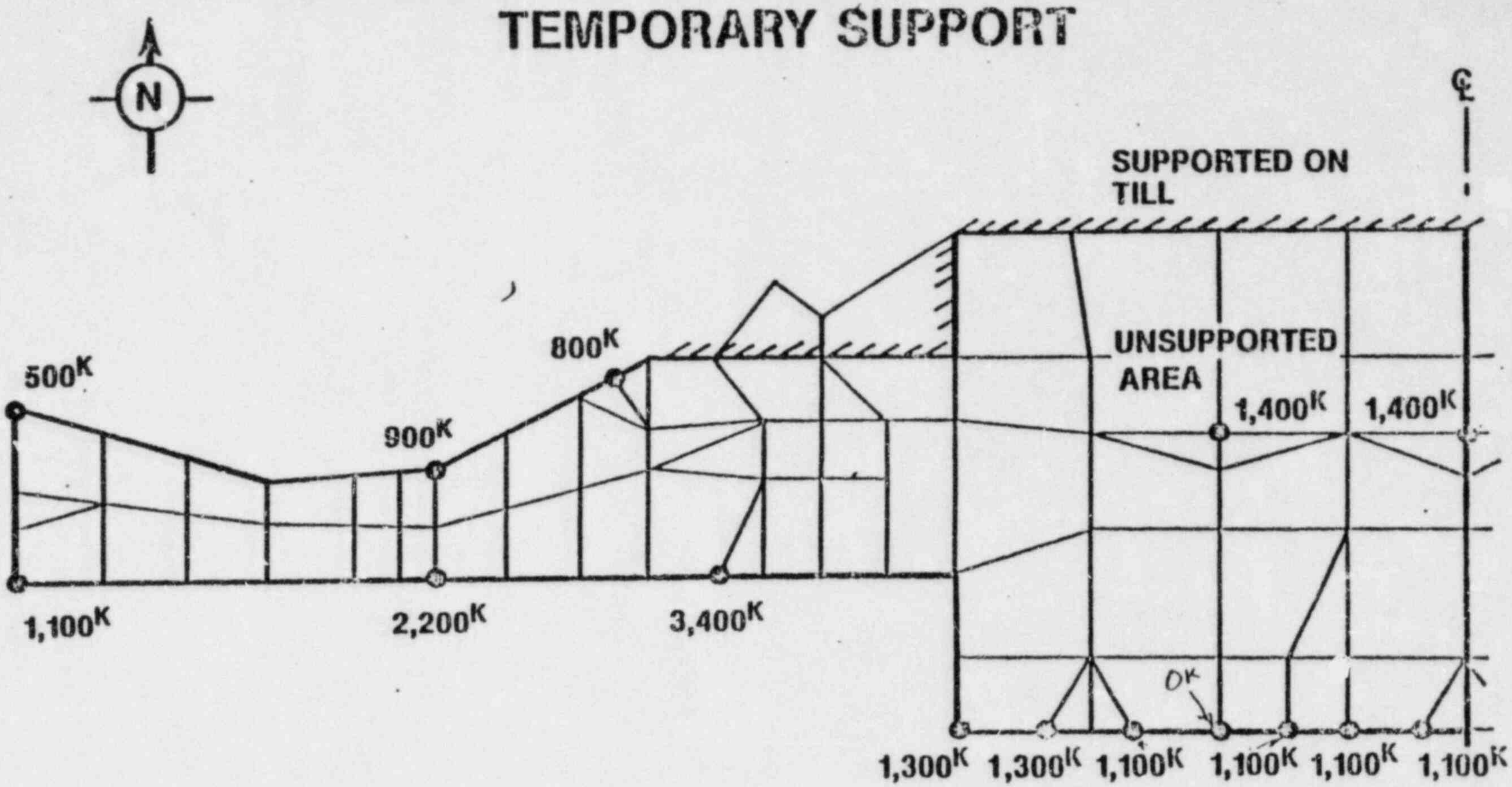
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
CONSTRUCTION SEQEUNCE
STAGE - 3



AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
MAXIMUM STRESS (Tension)
CONSTRUCTION STAGE 3

	Existing Stress	Change in Stress	Total Stress
• DUE TO SOIL REMOVAL	30 K/FT	-20 K/FT	10 K/FT
• DUE TO SOIL REMOVAL AND JACKING	30 K/FT	-95 K/FT	-65 K/FT

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION SEQUENCE
TEMPORARY SUPPORT



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/26/82

G-1862-17

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
FINAL CONSTRUCTION STAGE

EXISTING STRESS = 30 K/FT

CHANGE IN STRESS = -65 K/FT

TOTAL STRESS = -35 K/FT

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS

MAXIMUM LOADS IN HIGHLY STRESSED AREAS

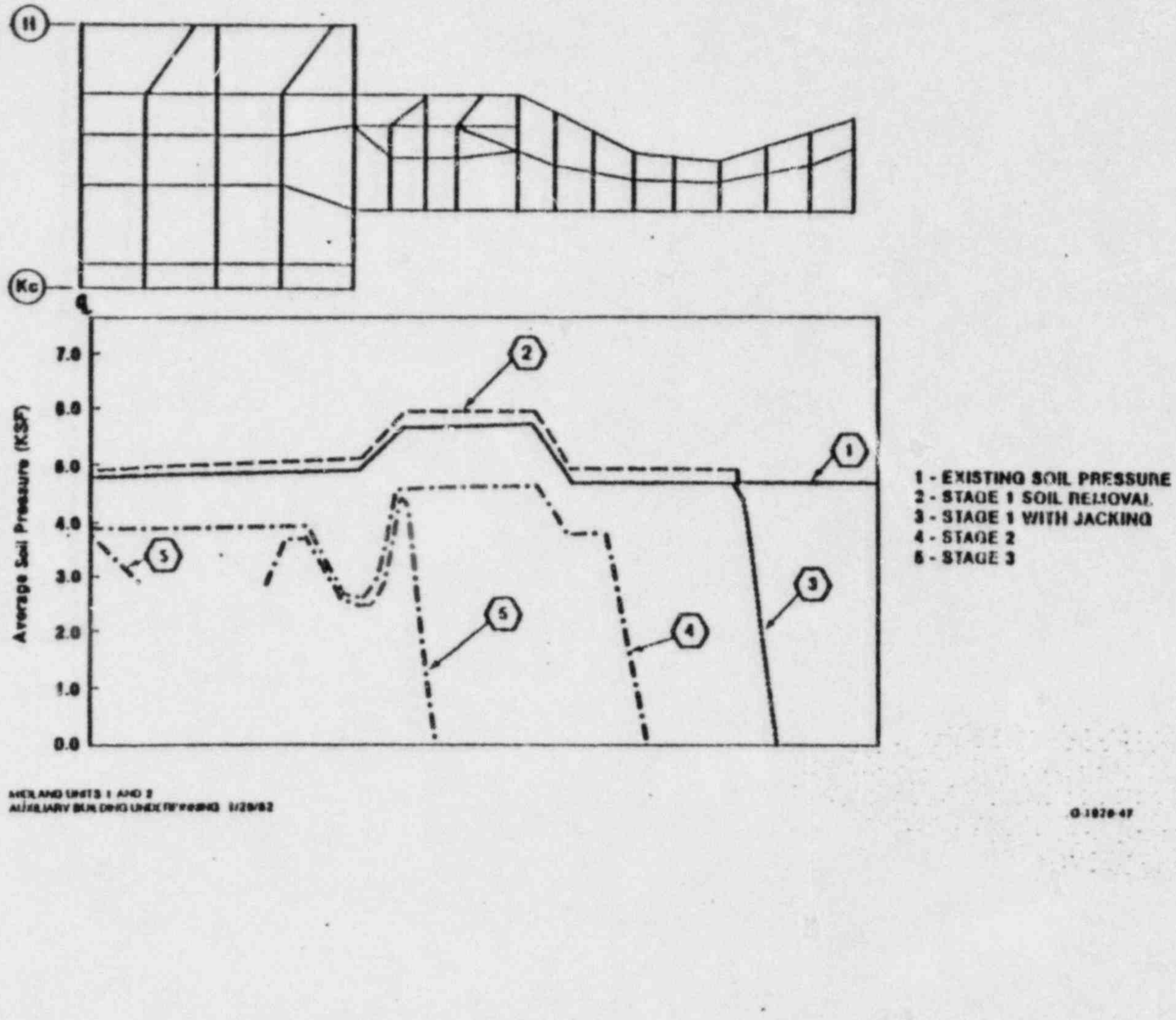
MAXIMUM TENSION

Location	Capacity	Existing Load	Stage 1 Constr	Stage2 Constr	Stage 3 Constr	Final Constr
Slab At El 659' (local area)	321K	258K	318K	260K	86K	Compression
Wall Below El 659' Between G and H	830K	333K	411K	351K	147K	Compression

MAXIMUM SHEAR

Location	Capacity	Existing Load	Stage 1 Constr	Stage2 Constr	Stage 3 Constr	Final Constr
Wall Below El 659' Between G and H	290K	38K	76K	63K	98K	132K

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS
SOIL PRESSURES (KSF)



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/20/82

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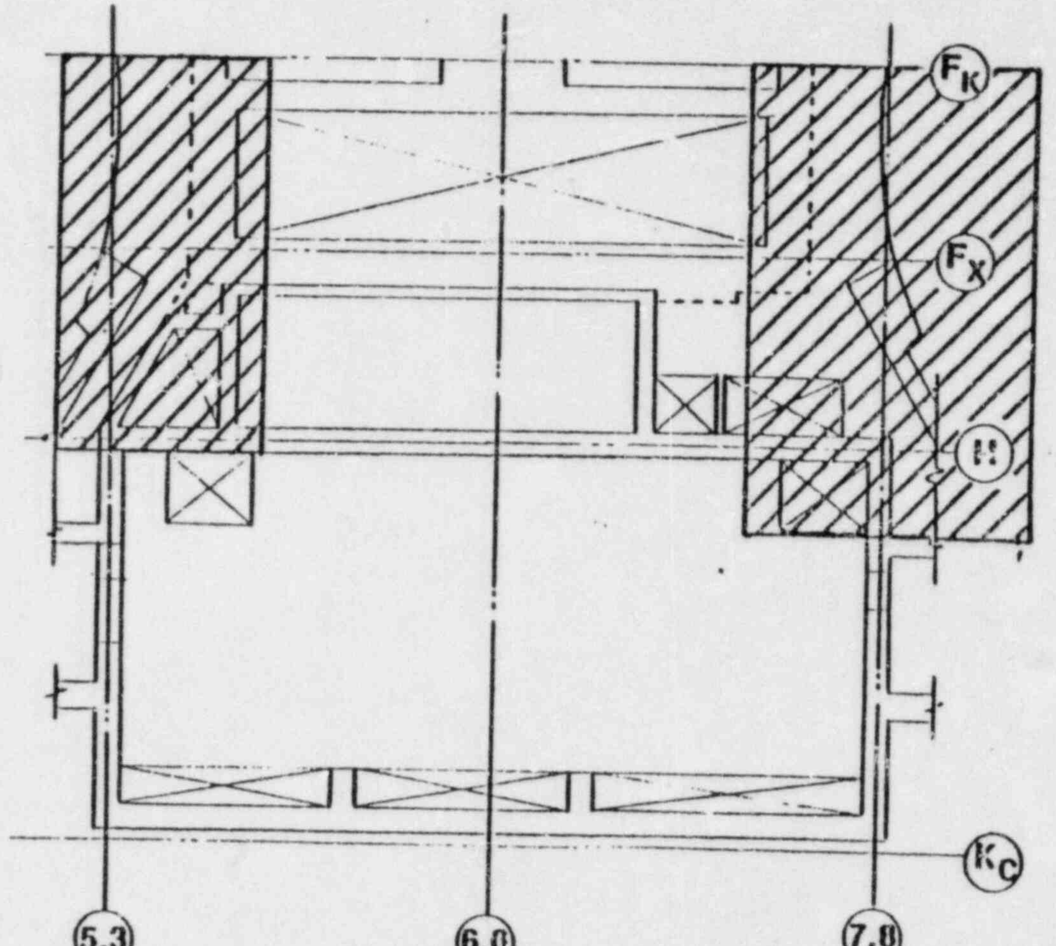
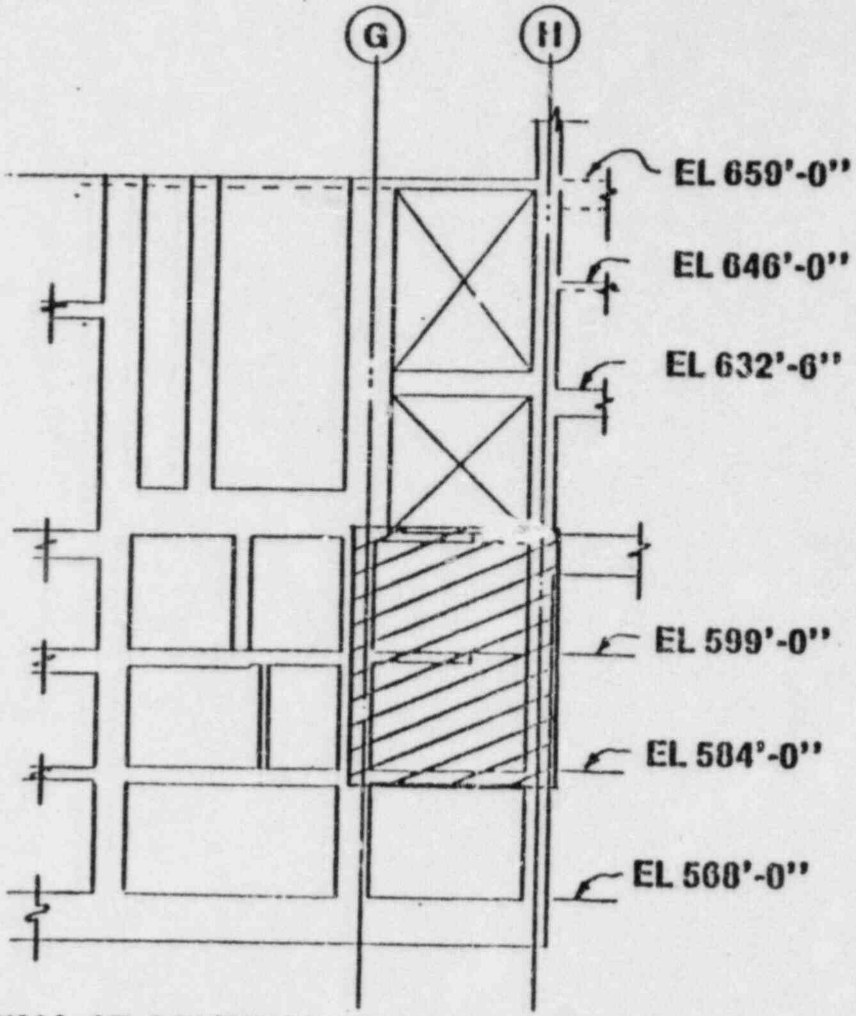
AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS

AREAS FOR CRACK MONITORING



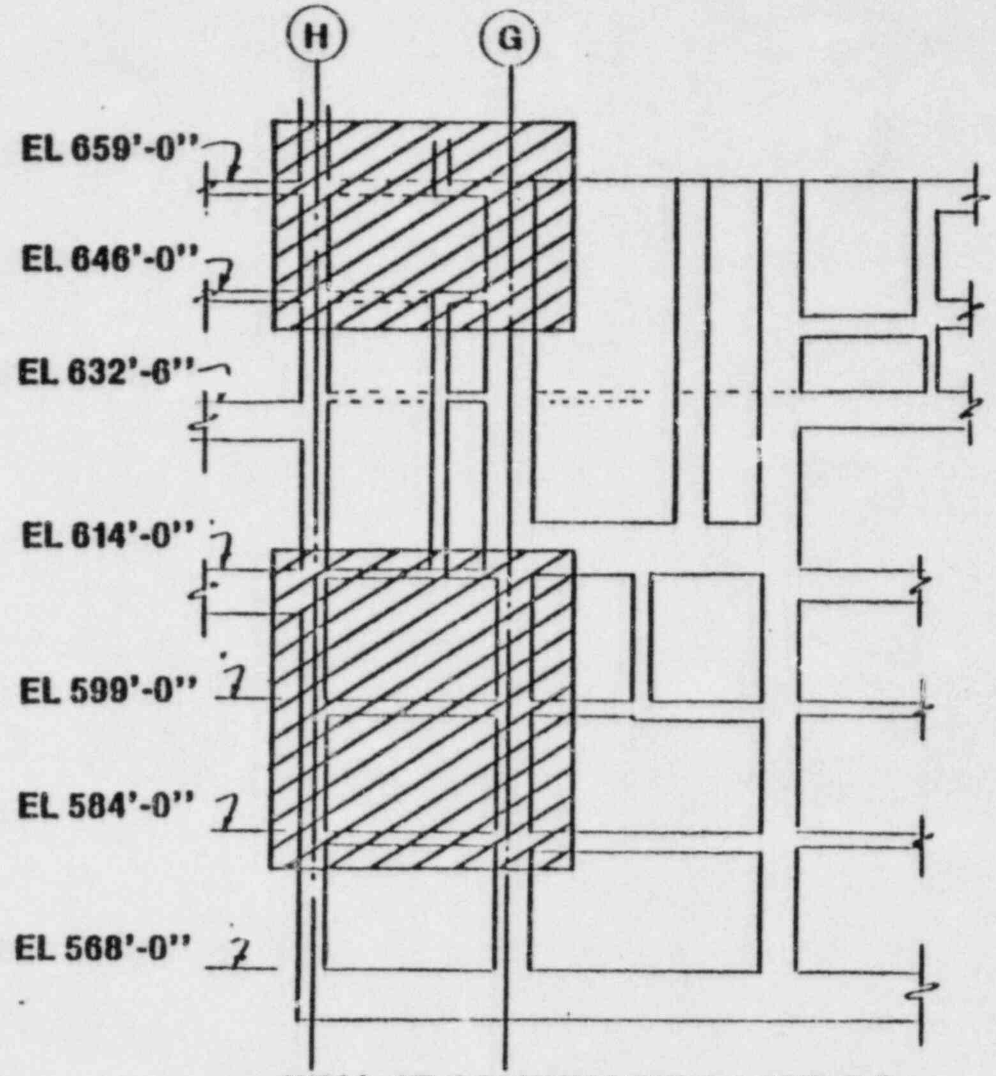
PLAN AT EL 659'-0"

AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
AREAS FOR CRACK MONITORING



WALL AT COLUMN LINE 7.4 AND 7.8

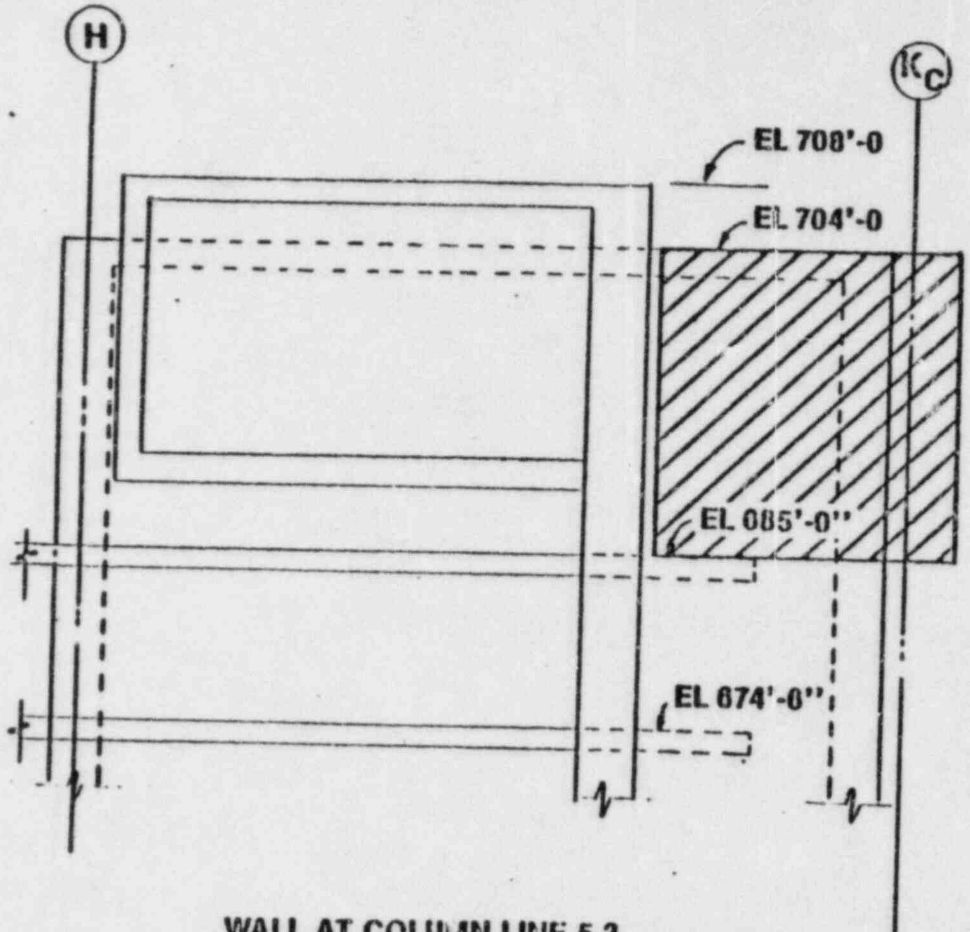
AUXILIARY BUILDING UNDERPINNING
CONSTRUCTION CONDITION ANALYSIS
AREAS FOR CRACK MONITORING



WALL AT COLUMN LINE 5.3 AND 5.6

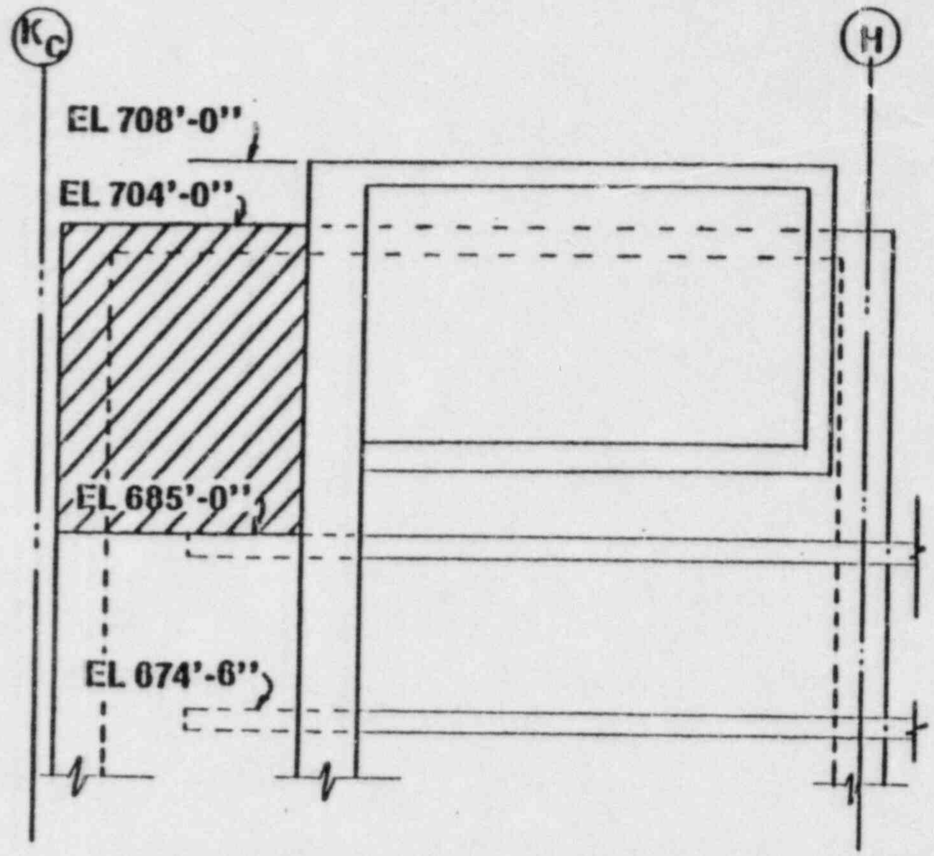
AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS

AREAS FOR CRACK MONITORING



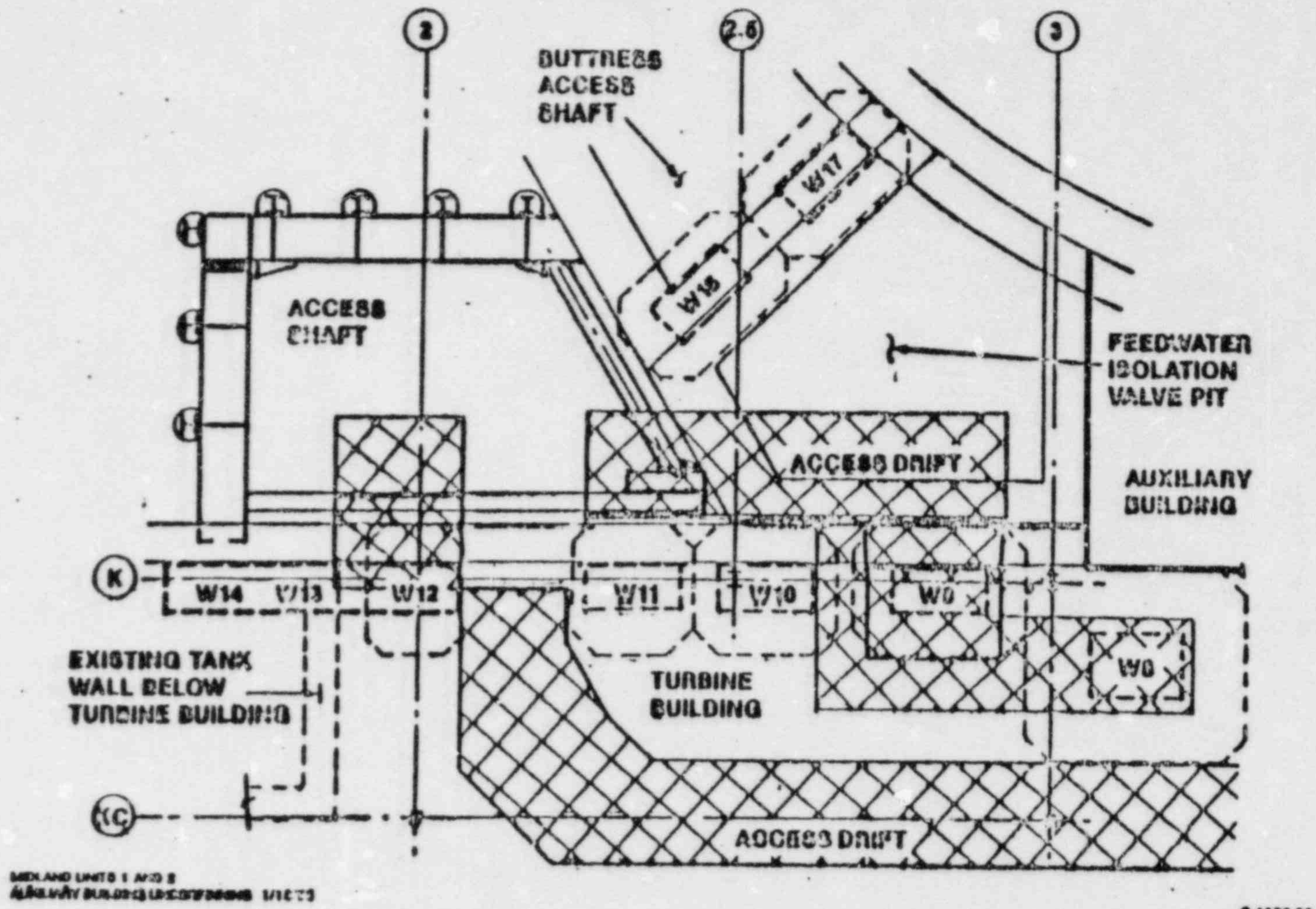
WALL AT COLUMN LINE 5.3

AUXILIARY BUILDING UNDERPINNING CONSTRUCTION CONDITION ANALYSIS
AREAS FOR CRACK MONITORING

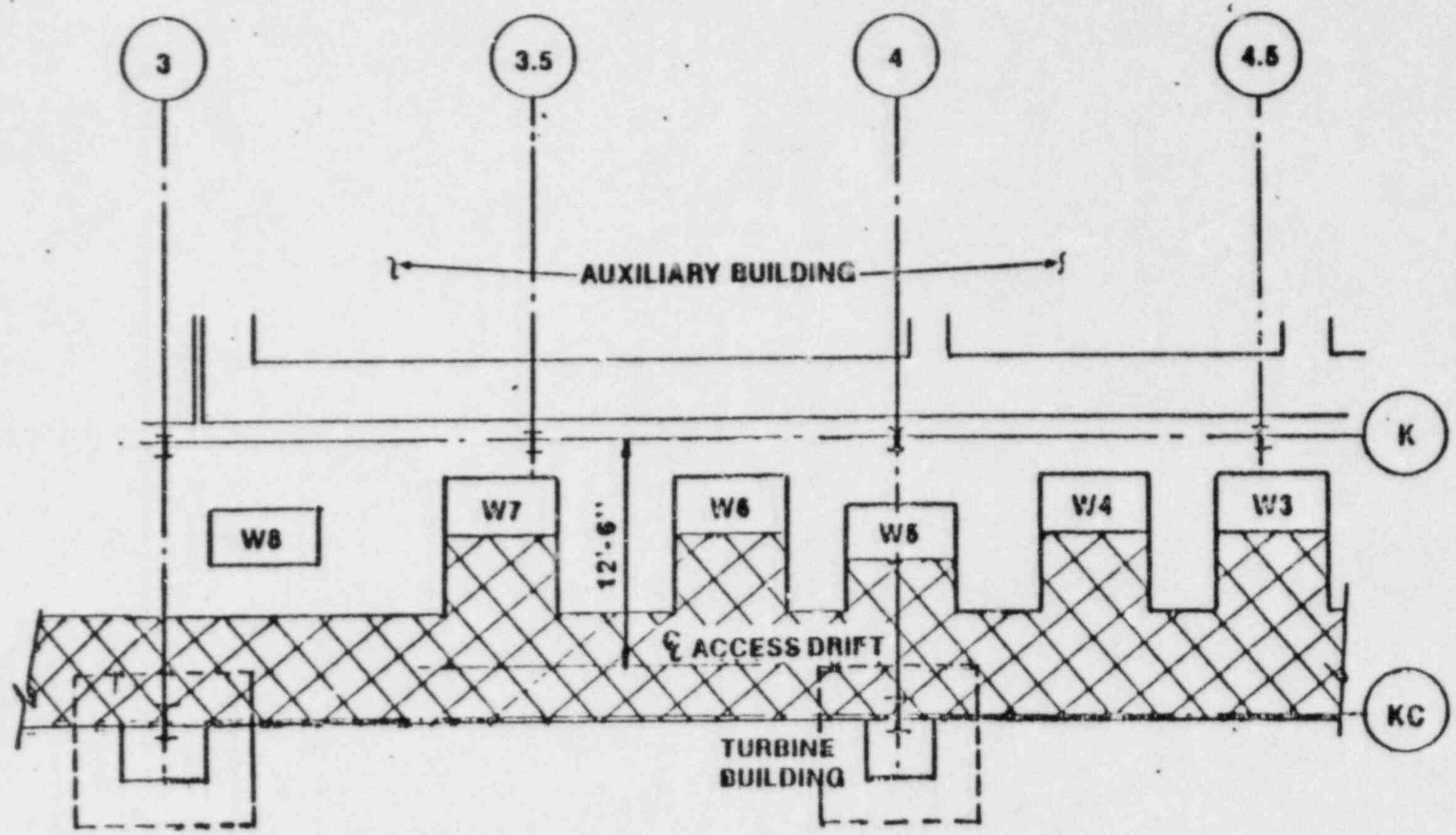


WALL AT COLUMN LINE 7.8

PLAN - ACCESS SHAFT AND ACCESS DRIFT



PARTIAL PLAN OF ACCESS DRIFT



MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1 12 82

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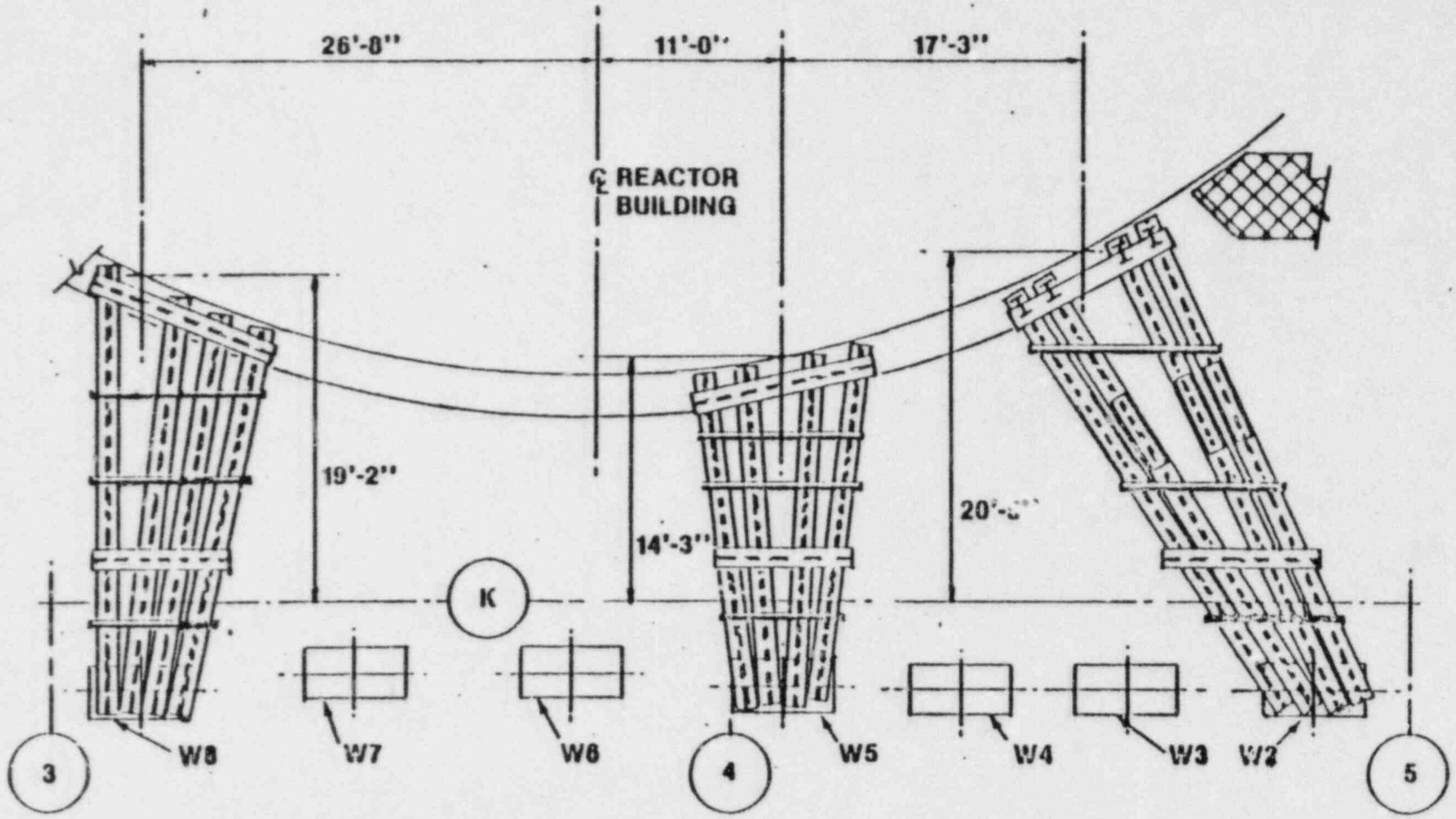
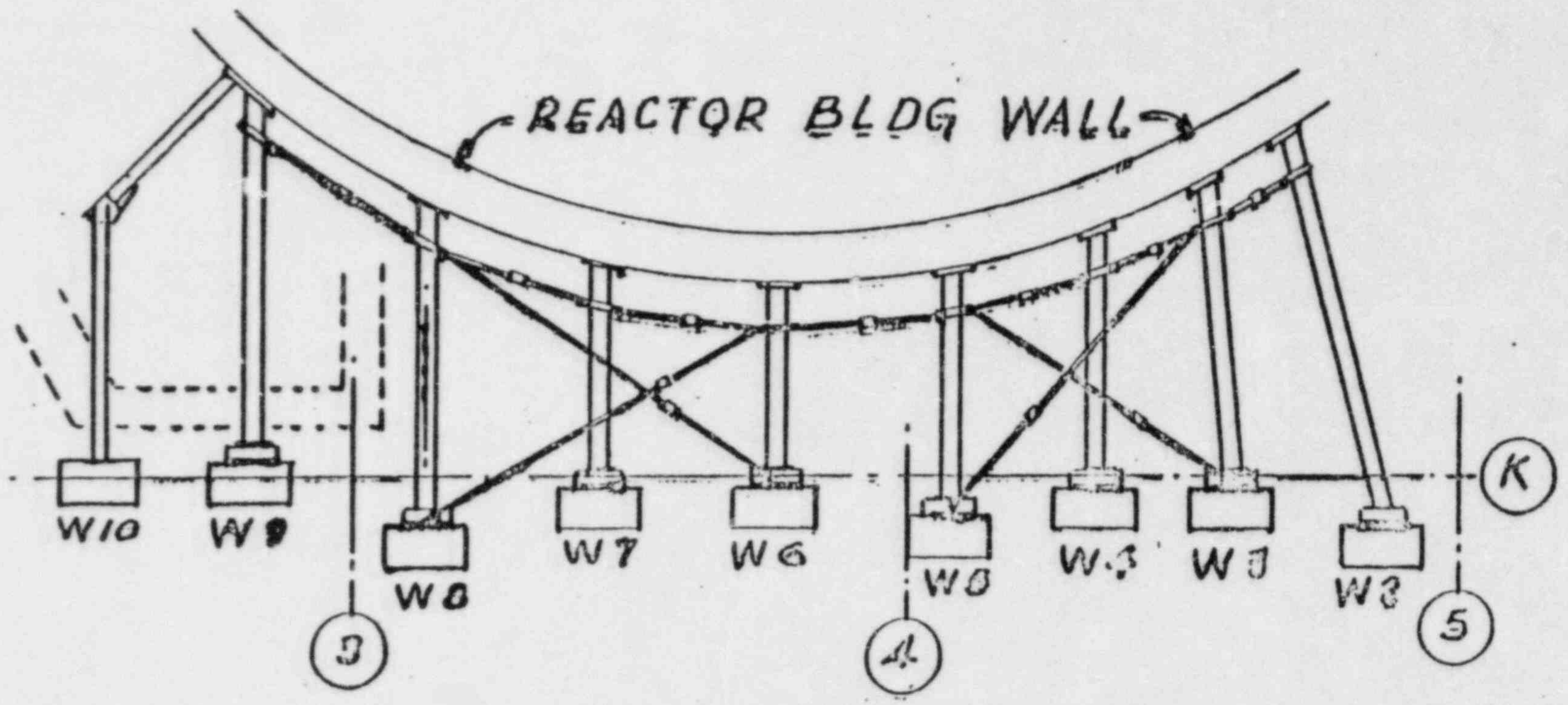
PLAN - UNDERPINNING GRILLAGE



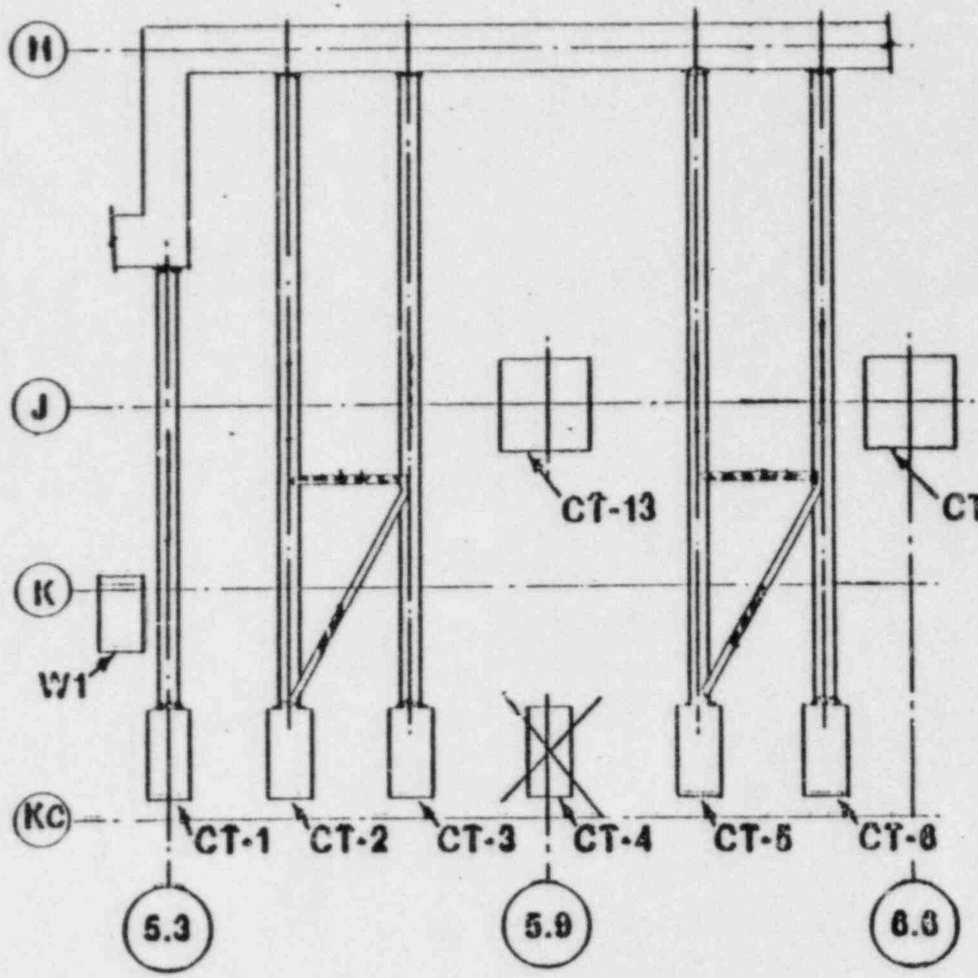
MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/27/82

G-1020-17

PLAN- STRUT BRACING



PLAN - CONTROL TOWER
PIERS AND STRUTS
(CT-4 & CT-9 DELETED)

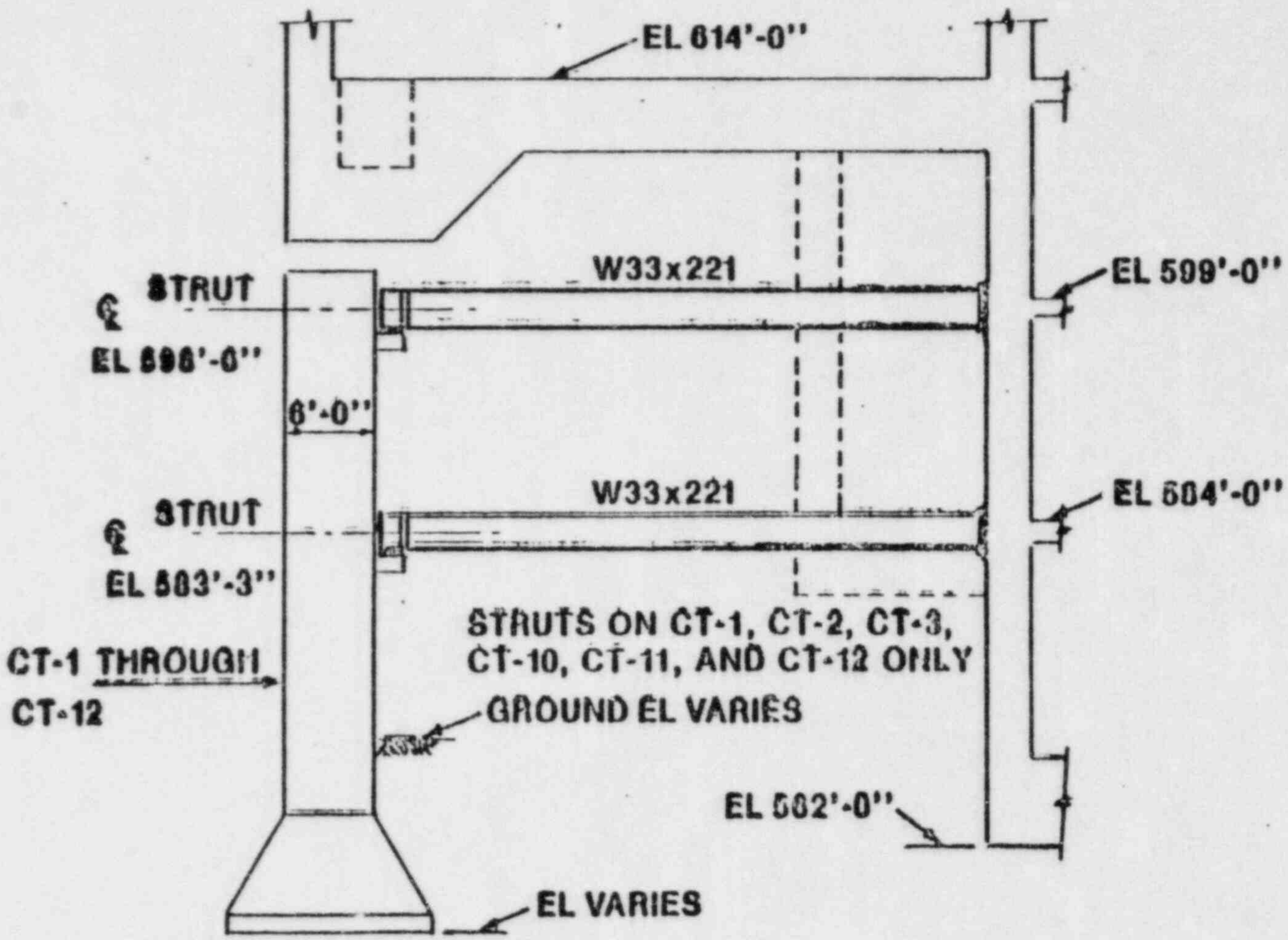


MIDLAND UNITS 1 AND 2
AUXILIARY BUILDING UNDERPINNING 1/27/82

G-1929-21

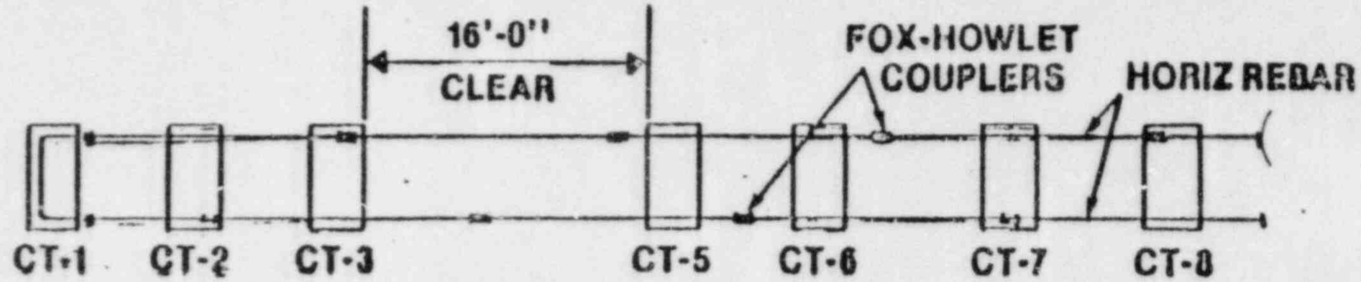
5

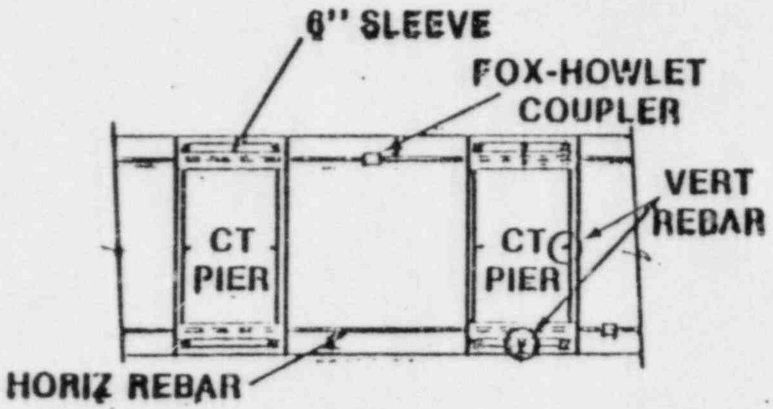
SECTION - CONTROL TOWER
PIERS AND STRUTS



SECTION R-R

PLAN - CONTROL TOWER
METHOD TO INSTALL HORIZONTAL REINFORCEMENT



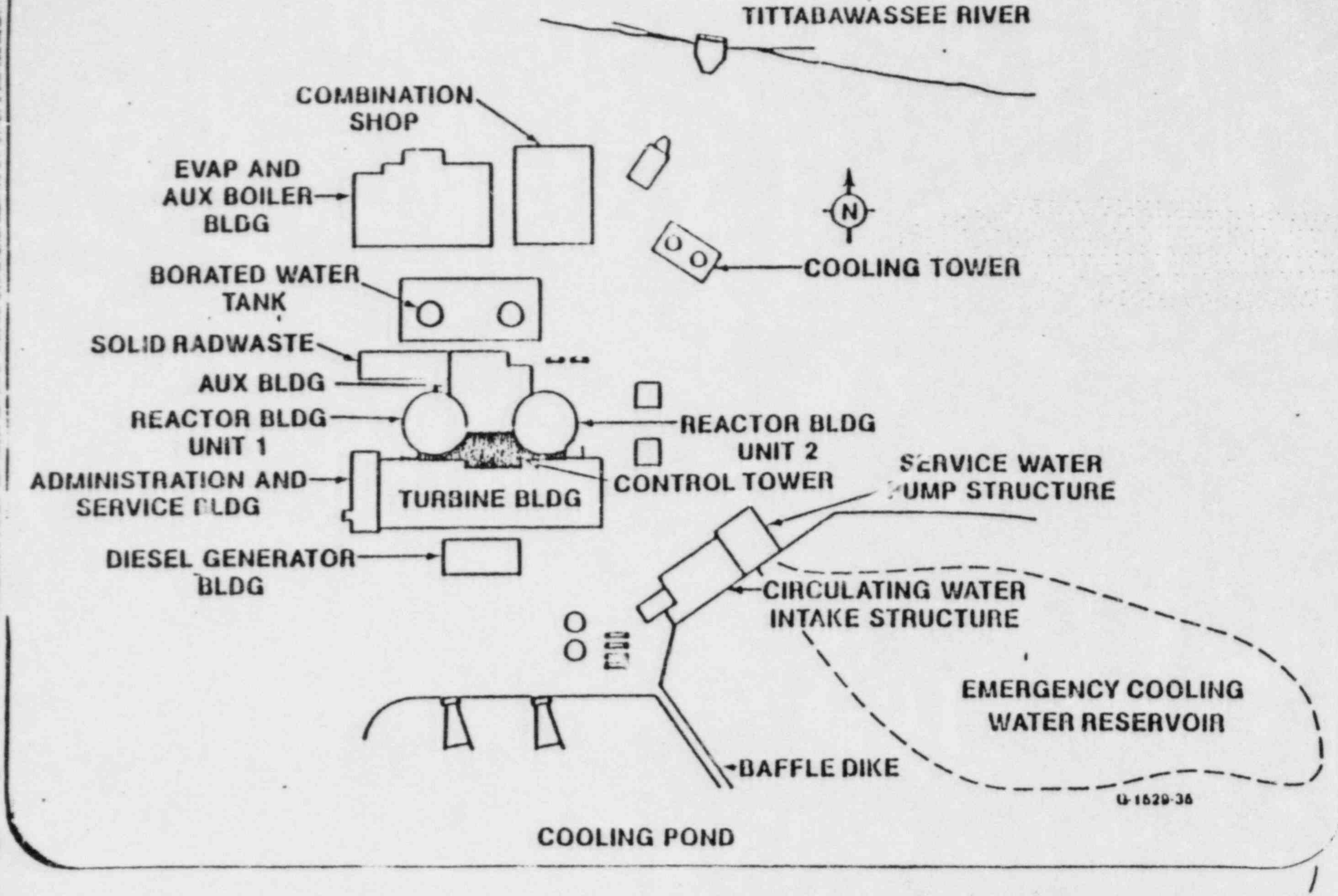


ENLARGED PLAN VIEW

NOTE:

REINFORCING BARS
INSTALLED IN 16'-0" LENGTHS
WITH FOX-HOWLETT COUPLERS
AT STAGGERED LOCATIONS

MIDLAND SITE PLAN

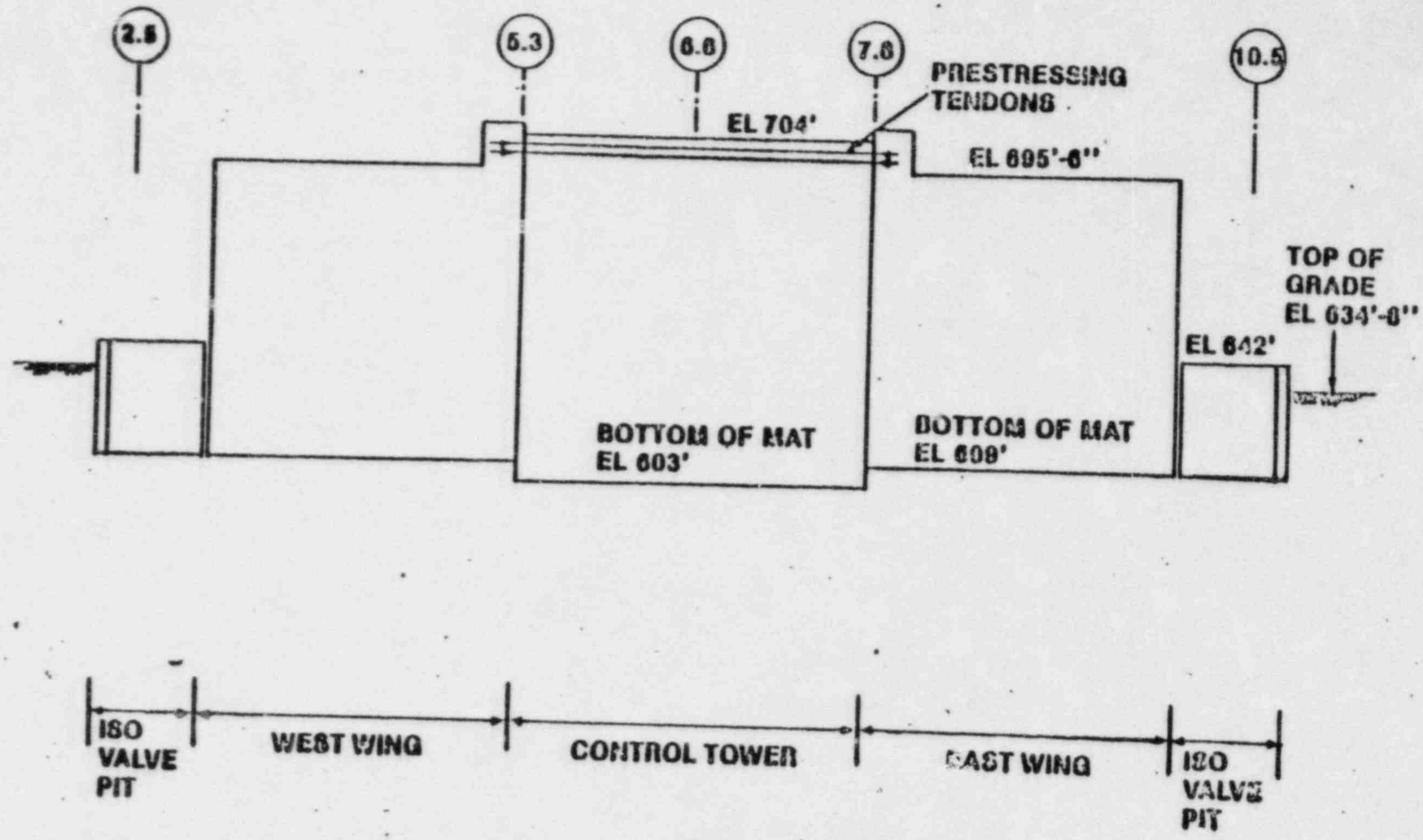


AUXILIARY BUILDING PRESTRESSING TENDON

FUNCTION

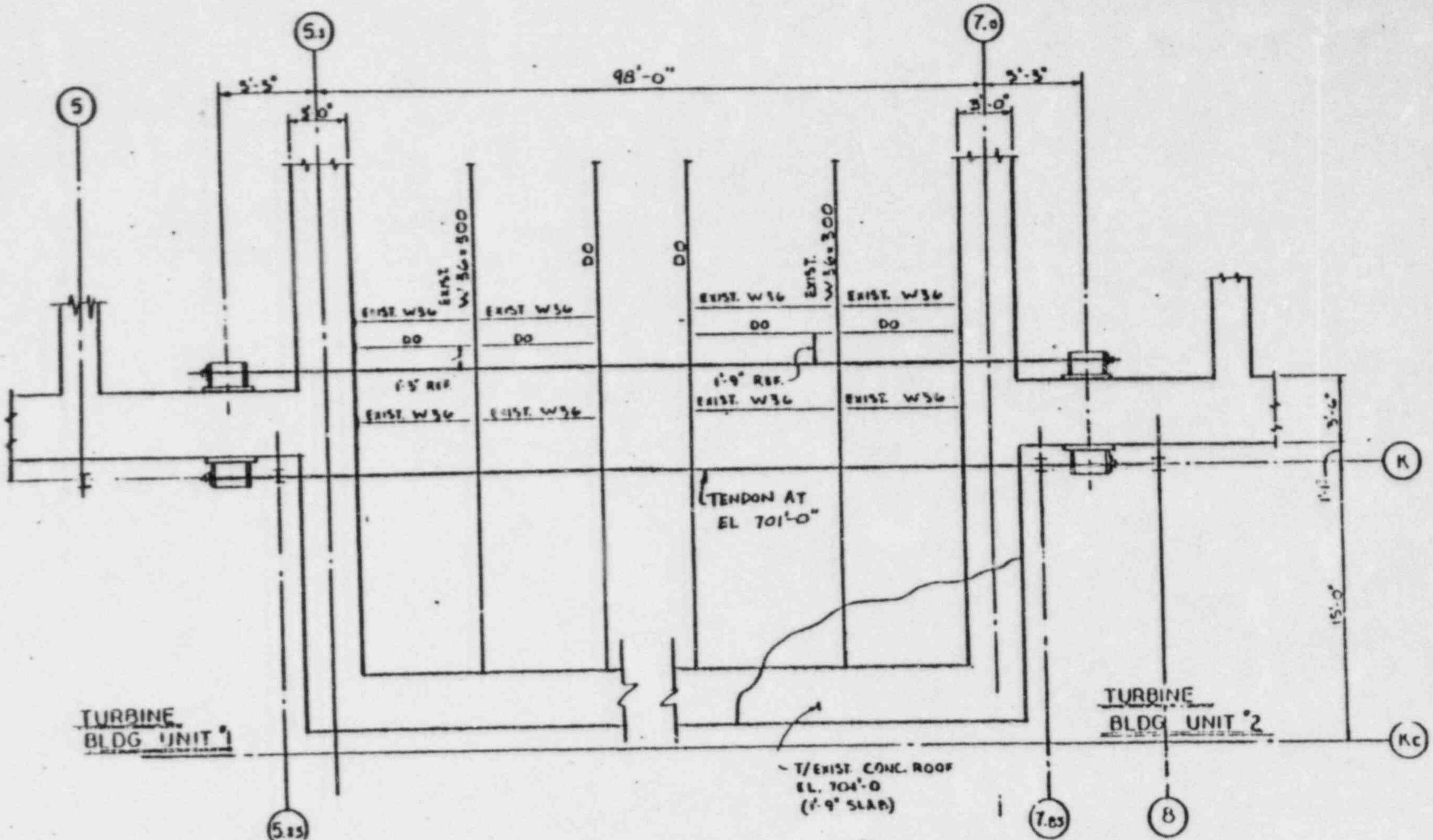
- TO PROVIDE RESERVE CAPACITY FOR EPA AND CONTROL TOWER CONNECTION AT EL. 704

AUXILIARY BUILDING UNDERPINNING
ELEVATION VIEW AT K_C LINE



3

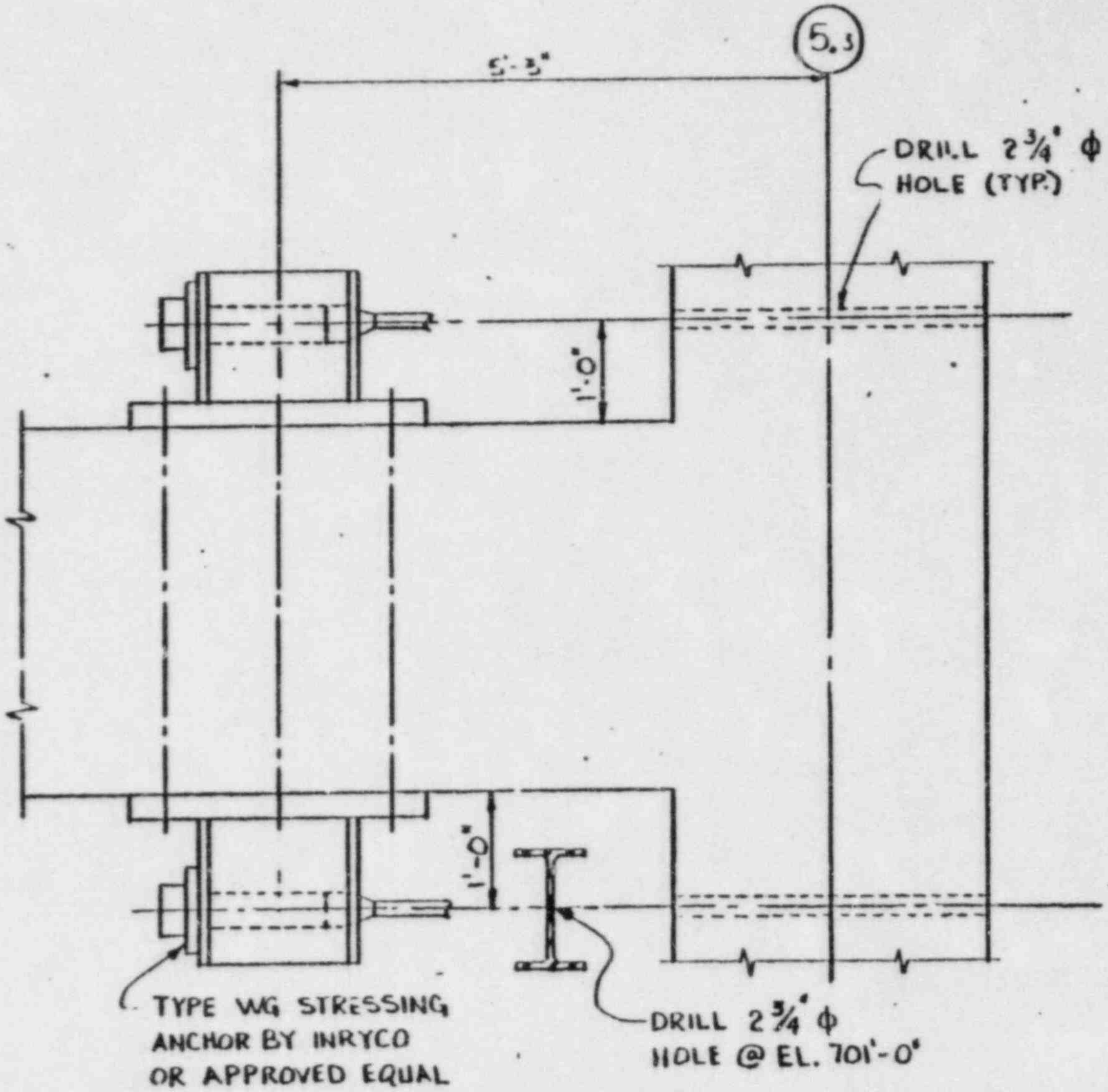
AUXILIARY BUILDING PRESTRESSING TENDON



LOCATION PLAN

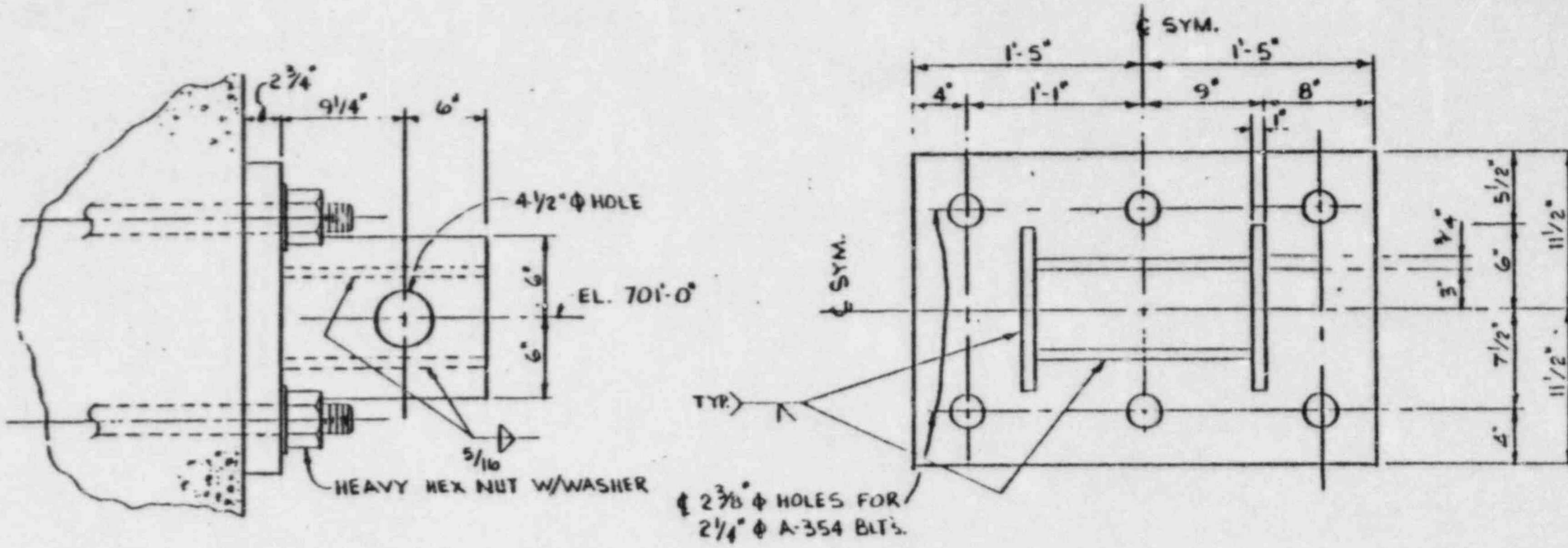
4

AUXILIARY BUILDING PRESTRESSING TENDON



CONNECTION DETAIL

AUXILIARY BUILDING PRESTRESSING TENDON



SUPPORT BRACKET DETAIL

AUXILIARY BUILDING PRESTRESSING TENDON

MATERIAL

- CONA MULTISTRAND SYSTEM MANUFACTURED BY INRYCO
- 2 TENDONS OF 10-½" DIAMETER STRANDS EACH
- ULTIMATE STRENGTH OF 270 Ksi

AUXILIARY BUILDING PRESTRESSING TENDON

DESIGN CONDITION

- BASED ON PRELIMINARY ANALYSIS OF EPA ONLY

- EPA TREATED AS A CANTILEVER WITH LIMITED SOIL SUPPORT OF 3 Ksf

  (CURRENT ANALYSIS INDICATED SOIL PRESSURE OF 5 Ksf UNDER EPA)

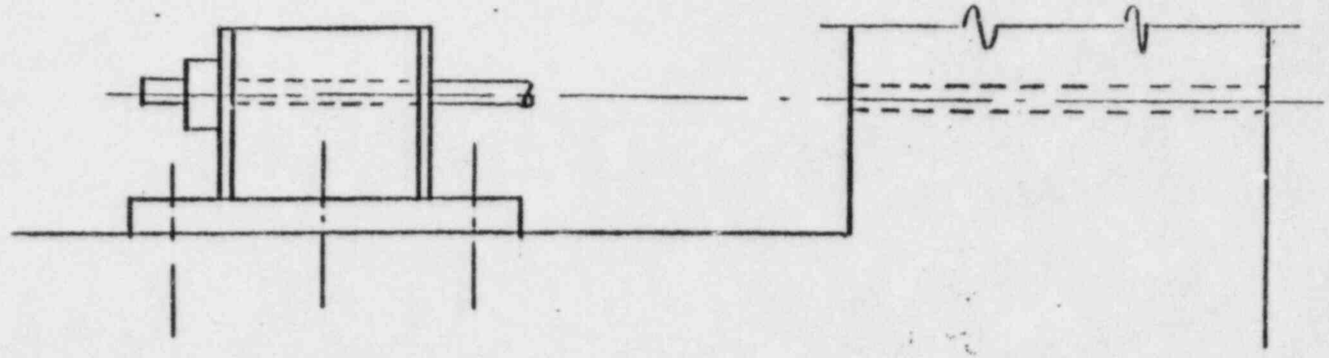
- TO PROVIDE TENSILE CAPACITY OF 616 KIps FOR CONTROL TOWER ROOF

AUXILIARY BUILDING PRESTRESSING TENDON

INSTALLATION PROCEDURE

- SINGLE END STRESSING SIMULTANEOUSLY FOR BOTH TENDONS FROM UNIT 1 SIDE
- STRANDS STRESSED INDIVIDUALLY FOR EACH TENDON
- LOCKED OFF EACH STRAND AT 189 Ksi
- RECHECK AND ADJUST LOCKED OFF STRESS AFTER ALL STRANDS ARE TENSIONED

AUXILIARY BUILDING PRESTRESSING TENDON



EXISTING BRACKET CONDITION

AUXILIARY BUILDING PRESTRESSING TENDON

AS BUILT CONDITION

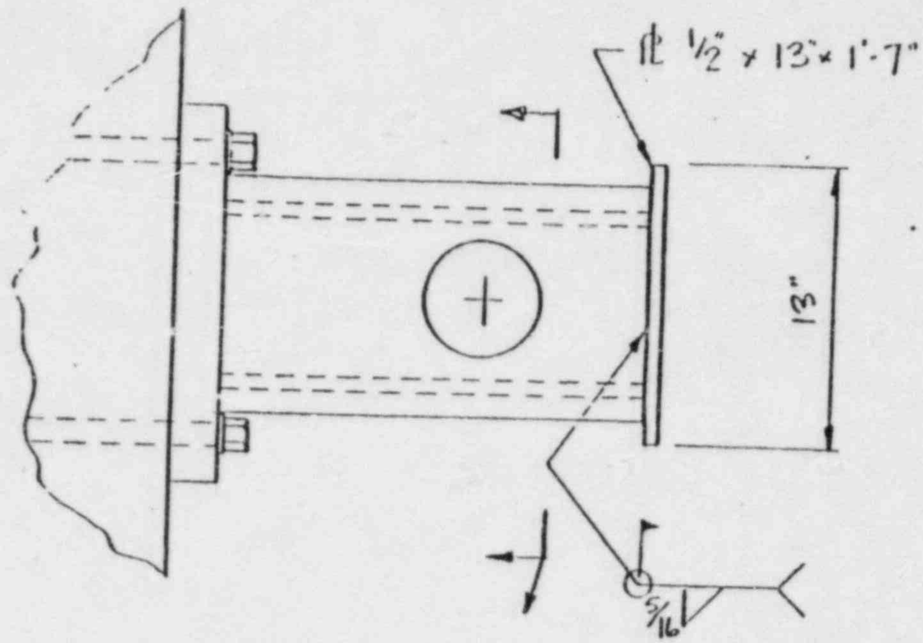
- BEARING PLATE UNDER ANCHOR HEAD OMITTED
- NO UNUSUAL DISTORSION OF BRACKET OBSERVED
- CAPACITY OF BRACKET IS 470 Kips BASED ON LIMIT ANALYSIS
- FACTOR OF SAFETY AGAINST BRACKET FAILURE IS 1.5

AUXILIARY BUILDING PRESTRESSING TENDON

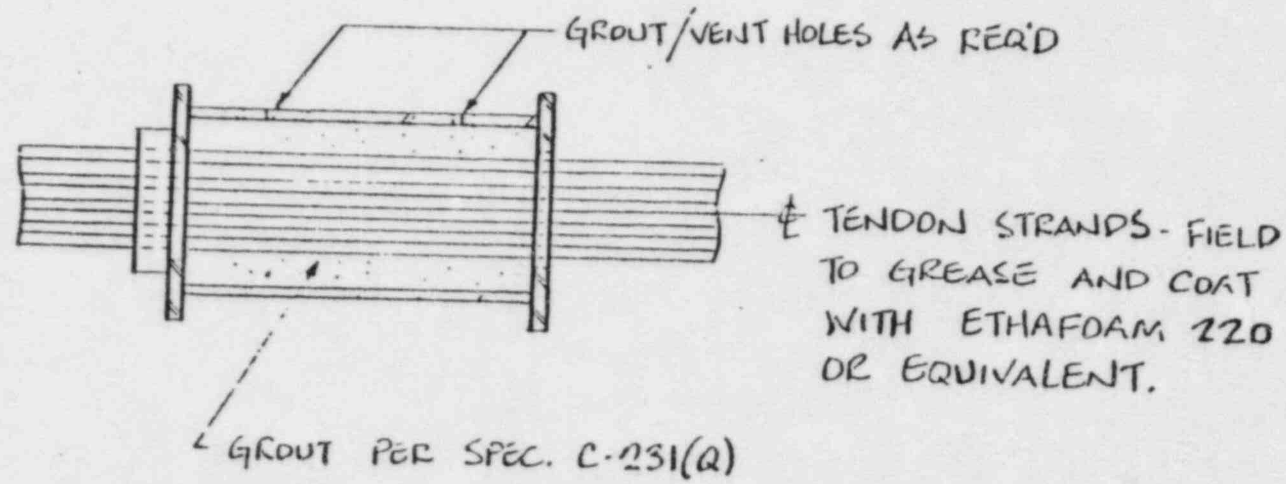
FUTURE ACTIONS

- GROUT SPACE IN BRACKET BETWEEN WEB PLATES AND FLANGE PLATES BEFORE UNDERMINING AUXILIARY BUILDING EPA

- CHECK TENDON LOAD BY LIFT OFF



℄ 1/2" x 13" x 1'-7"
13"
5/16



GROUT/VENT HOLES AS REQ'D
℄ TENDON STRANDS - FIELD TO GREASE AND COAT WITH ETHAFOAM 220 OR EQUIVALENT.
GROUT PER SPEC. C-231(Q)

AAO-520 6/76

ENCLOSURE 2

J. Kane
HGEB

Subject: Design Issues to be Audited by HGEB at February 3-5, 1982 Audit in Ann Arbor, Michigan

License Condition No.	Review Issue	Documentation Anticipated to be Presented to HGEB	Design Audit Feb. 3-5, 1982
5a	Auxiliary Building Temporary Support System During Underpinning (EPA and Control Tower)	Plan and sectional views showing the locations in the structures and on the foundation bearing layer where temporary underpinning loads have resulted in the largest stresses. Drawings should indicate assumed exc. conditions at the various stages of construction.	Information was provided in Dasgupta presentation and handouts, but results are impacted by the requested sensitivity study on soil spring constant variations.
		Calculations that provide the magnitude of the above stresses.	Checked by SEB
		Calculations providing the factors of safety against bearing failure.	Provided in Dasgupta Presentation
5b	Auxiliary Building Temporary Support System During Underpinning (EPA & Control Tower)	Sketches showing deformation measuring instruments attached at top of pier at the selected locations.	Provided by Bob Adler. NRC needs to review
		Description of frequency of readings to be required.	Provided on drawing entitled "Instrumentation Matrix"
		Identification of the ALLOWABLE movements, strains or stresses at the selected monitoring locations and CALCULATIONS which are the basis for those allowable movements. What are crack monitoring plans?	Criteria given for FIVP piping. Tolerance criteria on movements is still required for both Phase II and P' se III instrumentation.
		Criteria to be followed for READJUSTING jacking load (?Settlement).	Criteria on jacking is controlled by both settlement and stress considerations CPC to provide drawings, procedures and criteria to NRC on Feb. 26, 1982.

Encl. 2

License Condition No.	Review Issue	Documentation Anticipated to be Presented to HGEB	Design Audit Feb. 3-5, 1982
5b (continued)		This is ALLOWABLE movements. What valves (limiting) of movement or cracking or stress will require re-evaluation and stopping of underpinning? How established? Provide the time interval (maximum) between observing limiting movement or stress and time for action (re-evaluation or stopping).	Tolerance criteria will identify both an action level and a stopping level. CPC still needs to address crack propagation. NRC needs to review criteria on cracking provided in Auxil. Bldg. report and be prepared to discuss at Feb. 25, 1982.
5c	NRC Testimony (11/20/81) Attachment 21, Q.6	Previous discussions have resolved this issue.	Previously resolved.
5c	Attachment 21, Q.7	Provide explanation on how measured jacking load and pier settlement will be used in NAV-FAC DM-7, Fig. 11-9 to establish equivalent soil modulus.	By knowing the shape, embedment, deflection — Fig. 11-9 is used to establish coefficient which permits modulus to be computed. Issue is resolved.
5c	Attachment 21, Q.17	Provide CALCULATIONS which determined the magnitude of the test load for temporary support pier. What part of this load is due to Turbine Bldg. and what part is due to EPA? (Is this a location of large stress which has been covered in Lic. Cond. 5a?)	@ Pier W5, the Turbine Bldg load is 878^k. Total load is 2513^k (maximum).
5c	Attachment 21, Q.18	Does previous discussion under license condition 5b on ALLOWABLE movements cover Q.18?	Refer to status of 5b.
5c	Attachment 21, Q.19	Question has been adequately addressed including discussions at last audit of Jan. 18-20, 1982.	Previously Resolved.

1D¹⁰

OCR H-77

Consumers Power Company

ORAL COMMUNICATIONS RECORD

PROJECTS, ENGINEERING AND CONSTRUCTION - QUALITY ASSURANCE DEPARTMENT

QA5-0

CHRON. FILE NO 2.15

PAGE 1 OF 1

DATE OF COMMUNICATION December 30, 1982

QA-PEAC PERSONNEL PARTICIPATING HPLeonard, CPCo-MPQAD

TIME OF COMMUNICATION 11:51 am

OTHER PARTY(S) RWarnick, USNRC

PREPARED BY HPLeonard

PROJECTS AND/OR SUBJECTS DISCUSSED MIDLAND ENERGY CENTER - HVAC SUBCONTRACT 7220-M-151, WITHDRAWAL OF "POTENTIAL" 10CFR50.55(e) REPORT

SUMMARY OF CONVERSATION Mr. Leonard called Mr. Warnick to withdraw the "potential" 10CFR50.55(e) report which had been made on December 1, 1982 (refer to Oral Communications Record H-67). Mr. Leonard stated that the condition of HVAC welding had been judged to be not reportable. However, due to the extensive effort planned to requalify welding procedures and recertify welders, CPCo deemed it prudent to initiate a Safety Concern and Reportability Evaluation (SCRE) to continue to track this issue in the event new evidence prompted additional consideration of reportability.

Mr. Warnick stated he would relay this information to Mr. Wayne Shafer, USNRC.

HPL/ksa

CC: JGBalazer DBMiller
WRBird GEParker
JEBrunner DStahl, Isham, Lincoln and Beale
JWCook RAWells
MADietrich JLZimmerman

D10

Audit of Zack Oct 11-14, 82 — 11/2/82 RC

Local

Preliminary Findings — Report not finalized yet.

Audit to Training Documentation —

~~No major~~ ~~Affirmed major findings~~

~~[illegible]~~

approx 25% ~~[illegible]~~ quality items accepted.

Zack has project field eng on site PE - mechanical.

upgraded other staff -

Mandatory 100% overinspection of all welder qualification as per approved plan - one min. criteria is the inspector must ~~[illegible]~~ be (MPQAD) certified by AWS

MPQAD approves every qualified weld ~~[illegible]~~

14A.1.39 SURVEILLANCE AND RADIATION SPECIMEN HANDLING TEST

1. Purpose

To verify the operation of the surveillance specimen handling equipment | 30

2. Prerequisites

2.1 Core support assembly installed

2.2 Reactor vessel head and plenum assembly removed

3. Test Method

3.1 Install surveillance and radiation specimen capsules and closure and holddown assemblies in all holder tubes in accordance with established procedures. | 30

3.2 Remove all closure and holddown assemblies and surveillance and radiation specimen capsules from holder tube and place in storage container in accordance with established procedures. | 30

4. Acceptance Criteria

THE ~~All~~ surveillance and radiation specimen handling equipment ~~performs its design functions.~~ INSTALLS AND REMOVES THE SURVEILLANCE AND RADIATION SPECIMEN CAPSULES. | 30

Came about as result of MPQAD

audit of Photon Lab.

(2)

14A.1.38 STUD TENSIONING AND HANDLING EQUIPMENT TEST

1. Purpose

   1.1 To test the equipment provided for handling reactor vessel closure head studs, alignment studs, stud nuts, and stud tensioners

   1.2 To perform field checkout of the stud tensioner and the stud handling tools

2. Prerequisites

   2.1 Reactor vessel head is installed.

   2.2 Stud tensioners have been inspected and calibrated according to the equipment instruction manual. Tensioners are accessible for testing.

   2.3 Reactor vessel closure head studs, nuts, and handling tools are clean and accessible for checkout.

3. Test Method 30

   3.1 Install/remove reactor vessel closure head studs and nuts utilizing associated handling equipment and stud tensioners in accordance with established procedures.

   3.2 Install/remove stud tensioners using associated handling equipment in accordance with established procedures.

4. Acceptance Criteria

~~Equipment provided for handling reactor vessel closure head studs, alignment studs, stud nuts, and stud tensioners performs its design functions.~~

THE REACTOR VESSEL CLOSURE HEAD STUDS, ALIGNMENT STUDS, STUD NUTS, AND STUD TENSIONERS ARE INSTALLED AND REMOVED USING THE HANDLING EQUIPMENT AND PROCEDURES DESCRIBED IN M1.1-45. 11

THE REACTOR VESSEL CLOSURE STUDS ARE TENSIONED AND DETENSIONED USING THE STUD TENSIONERS AND PROCEDURES AS DESCRIBED IN M1.1-45. (ALSO CATALOGUED AS B&W DOCUMENT # 01-280-02)

Consumers
Power
Company

Midland Project: P.O. Box 1963, Midland, Michigan 48640 · Area Code 517 631-0951

August 14, 1980

Mr L A Dreisbach
Bechtel Power Corp
PO Box 2167
Midland, MI 48640

MIDLAND PROJECT - CONDITION OF RELEASE FOR ZACK CO
File 2.10 Serial 245FQA80

As a requirement for the resumption of safety related work, the following conditions and commitments must be met.

The three items below, which developed from the material certification audit (M-01-14-0) conducted August 7-11, 1980 by Consumers Power, must be transmitted to Zack and Zack directed to comply with them.

1. There is to be no fabrication or installation of material for which there are unsigned material certifications. Any material found during the course of work that has unsigned material certifications is to be identified as nonconforming and segregated.

2. There is to be no fabrication or installation of material that is not as specified in Section 5.0 of Specification M-151A, including the proper year or edition of any standards referenced, unless Contractor (Bechtel) approval is obtained as required. Any material found during the course of work that is not as specified is to be identified as nonconforming and segregated.

3. Any material received from Chicago that is represented by unsigned material certifications or is not material as specified in Section 5.0 of Specification M-151A is to be identified as nonconforming and segregated from acceptable materials.

These conditions are to be met pending satisfactory resolution of the audit finding and unresolved item from the material certification audit.

~~Additionally~~, there is to be no MGAW welding of A-36 or A-572, Grade 50, material less than 10 gauge with .035" diameter weld wire pending qualification of procedure WPS-1 for the .035" weld wire. An alternative to the qualification is to clarify Section 5.2 of Procedure WPS-1 to delineate on which materials the different diameters of weld wire may be used. This item is to be addressed by September 5, 1980. ~~Zack is to be notified of this commitment~~.

FOR DRKeating
J L Corley
Site QA Superintendent

JLC/DRK

CC WRBird
JWCook
TCCooke
WJCreel
LHCurtis
LEDavis
MFDeWitt
MED'Haem
CLEichstaedt
JWLillywhite
DBMiller
EDNewman
JARutgers