Commonwealth Edison
One First National Plaza, Chicago, Illinois
Address Reply to: Post Office Box 767
Chicago, Illinois 60690

November 13, 1981

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Station Units 1 and 2
Braidwood Station Units 1 and 2
NRC Docket Nos. 50-454/455 and
50-456/457

Dear Mr. Denton:

This is to provide responses to the Action Items resulting from the Byron/Braidwood Structural Design Audit conducted on October 20 through October 23, 1981.

Attachment A to this letter contains our response to the Action Items.

Some of these responses are answers to formal questions from the NRC Staff regarding the Byron/Braidwood FSAR. These items will be incorporated into the Byron/Braidwood FSAR in a future amendment. Fifteen (15) copies are provided now for your early review and approval. One (1) signed original and fifty-nine (59) copies of this letter are provided.

Please address questions regarding these matters to this office.

Very truly yours,

for T. R. Tramm
Nuclear Licensing Administrator

Attachment

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ATTACHMENT A

List of Byron/Braidwood Structural Design Audit Action Items Addressed

Action Item 1 (Response to Q130.18)

Action Item 2 (Response to Q130.19)

Action Item 3 (Revised Response to Q130.20, plus additional information)

Action Item 4A

Action Item 4C

Action Item 7 (Response to Q130.38)

Action Item 8

Action Item 12 (Response to Q130.21)

Action Item 13

Action Item 21 (Revised Response to Q130.49)

Action Item 26 (Figures for Q130.42 Response)

Action Item 27 (Response to Q130.53)

Action Item 30

Structural Design Audit

October 1981

ACTION ITEM 1: Response to Question 130.18

QUESTION 130.18

"Your response to Question 130.1 requires further explanation. In Section 3.7.2.11 of the FSAR you stated that the torsional response was accounted for in horizontal building model. Furthermore, you stated in the same section, that the torsional effects were considered insignificant and was not included in the design of Byron/Braidwood structures. The present technical position of the Regulatory staff requires that the accidental torsion, minimum of 5 percent of the base dimension, be included in the design of structure in addition to that which result from the actual geometry of the building. Discuss the rationale of neglecting torsional effects in design of structures and compare, in quantitative terms, the conservatism inherent in the structural design with that which would have resulted if the requirements of the staff were implemented."

RESPONSE

The staff position concerning accidental torsion will be implemented for the Byron/Braidwood Category I structures other than the auxiliary fuel-handling building. The Byron/Braidwood auxiliary fuel-handling building is a Category I structure interconnected with the turbine building which is a non-Category I structure.

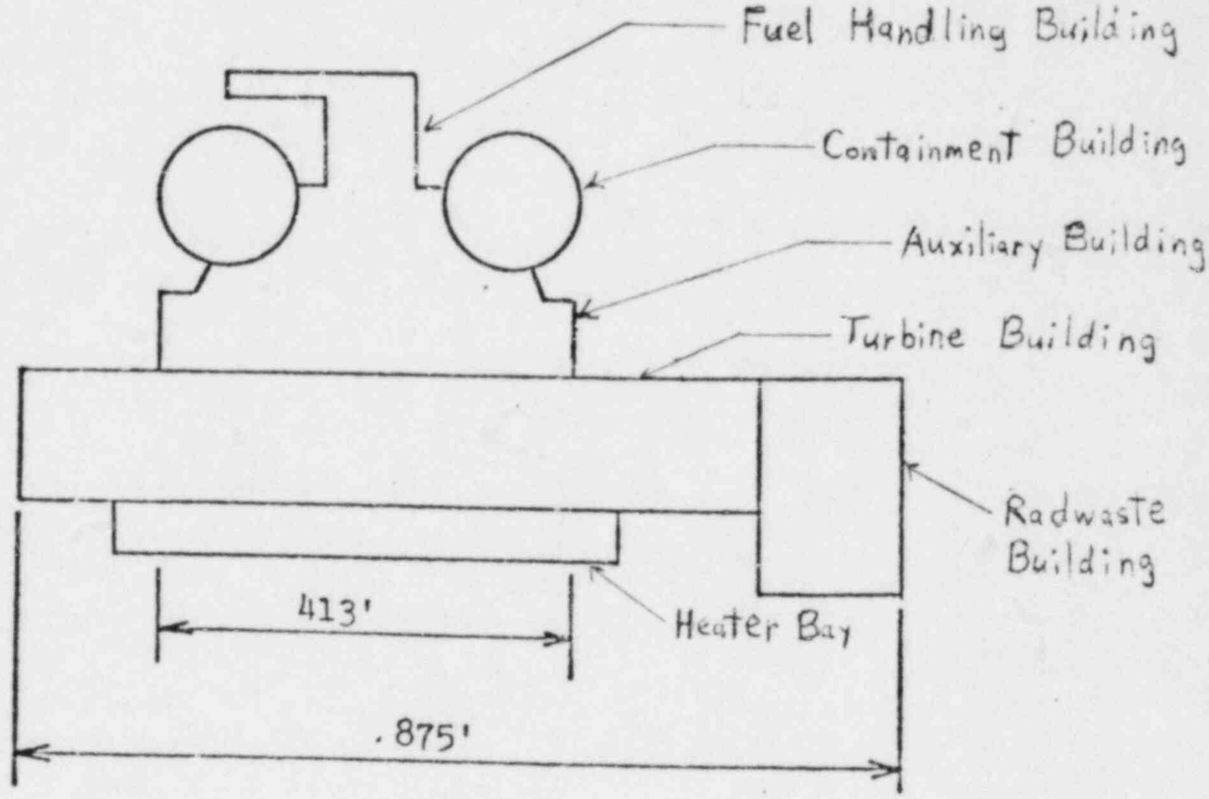
The Byron/Braidwood plant layout of the auxiliary fuel-handling turbine buildings is shown in Figure Q130.18-1. Major slabs are continuous throughout both Category I and non-Category I buildings; the maximum building dimension is 875 feet. However. the auxiliary buildings, with a maximum length of 413 feet, provides the main shear resisting components.

The horizontal seismic models include the large eccentricities corresponding to the distribution of mass and stiffness for this structure. The eccentricities between the mass centroid for a slab and the center of rigidity of its supporting shear walls results in an average torsional moment of 8% of the maximum building dimension times the story shear for the three major slabs in the Byron plant. Similarly, an average torsional moment of 11% occurs in the Braidwood plant. The amount of torsion considered in the design of the Byron/Braidwood auxiliary fuel-handling turbine building is considerably larger than the 5% minimum required by UBC. It is unlikely that these eccentricities would increase significantly due to any changes other than major changes to the plant structure since the weight of the permanent structural elements accounts for a

Action Item 1/FSAR Question 130.18 (Cont'd)

substantial percentage of the total mass. Since the plant construction to date is approximately 90% complete, such a change is not feasible, therefore, it is not appropriate to include arbitrary torsion greater than what already exists as a result of actual eccentricities in the auxiliary fuel-handling turbine building.

However, the shear walls of the auxiliary fuel-handling building have been reassessed by considering an additional 5% of the design shear force. When using the actual material strengths, the reassessment has shown that all walls maintain stress levels within the design basis allowables.



Byron / Braidwood
FSAR
Figure 130.18-1
Plant Layout

Q130.18-3

Action Item 2: Response to Q130.19

QUESTION 130.19

"Your response to Question 130.7 indicated that in some cases, namely for steam generator upper lateral support and for RPV decoupling criteria used are not in conformance with Standard Review Plan Section (SRP) 3.7.2.II.3.b. In order to demonstrate that the decoupling criteria are adequate you are requested to compare the results of decoupling using the criteria stated in response to Question 130.7 with those which would be obtained had the criteria contained in the SRP been used and include results of this comparison in an appropriate section of the FSAR."

RESPONSE

The frequency and mass ratios of the steam generator upper lateral support and the reactor pressure vessel using the criteria in SRP Section 3.7.2.II.3.b, have been recalculated. Results show that the steam generator upper lateral support conforms to the criterion set forth in the SRP (R_m = 0.09; R_f = 1.3).

The mass and frequency ratios for the RPV do not meet the SRP criteria for decoupling.

The adequacy of the decoupling criteria used for the reactor pressure vessel is demonstrated by performing a response spectrum analysis and comparing the design basis forces with the forces from a model containing the RPV coupled to the containment inner structure in accordance with the SRP. The member forces of the coupled model are lower than the design basis model, ranging from 14% to 62% with an average change of 35%.

In addition, Westinghouse has performed a time history analysis using their equipment models coupled to the Sargent & Lundy inner structure model. This analysis has shown that the resulting forces (the reactions of the NSSS supports) were lower than the forces obtained from a response spectrum analysis.

Structural Design Audit
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ACTION ITEM 3: Revised Response to Question 130.20

QUESTION 130.20

"With reference to your response to Question 130.8 relate the criteria used to ensure the adequate number of masses or degrees of freedom against those contained in the SRP, Section 3.7.2-II.1.a.(4). In your response quantitatively compare the two criteria and assess conservatism of the FSAR design."

RESPONSE

An adequate number of masses and degrees of freedom were considered in the dynamic modeling to determine the response of Category I and applicable non-Category I structures. The criteria used, as described in Question 130.8, is in compliance with SRP Section 3.7.2-II.1.a.(4).

Containment Shell And Internal Structures

The dynamic characteristics for the containment structure stick models indicate the number of dynamic degrees of freedom meet the guidelines set forth in SRP Section 3.7.2-II.1.a.(4). In the horizontal model of the containment shell, there are four modes with frequencies less than 33 cps and 26 dynamic degrees of freedom. In the vertical model, there is one mode with a frequency less than 33 cps and 13 dynamic degrees of freedom. In the horizontal model of the containment internal structure, there are eight modes with frequencies less than 33 cps and 60 dynamic degrees of freedom. In the vertical model, there are also eight modes with frequencies less than 33 cps and 27 dynamic degrees of freedom.

Shear Structure System

The mass point locations for the shear structure system type models are described in Subsection 3.7.2.3.3. The behavior of a shear structure eliminates certain degrees of freedom. Due to the predominance of shear deformation expected for horizontal excitation of a structure with shear walls connected to rigid concrete slabs, vertical translation and rotations about horizontal axes will be negligible.

Similarly for the vertical model, only vertical translation is expected to exist for vertical excitation.

Additional degrees of freedom will not significantly affect the response of the shear structure. Additional mass joints located at midstory, for instance, for the sole purposes of obtaining more degrees of freedom will not affect the response because the mass of the shear wall is much less than the mass which would be lumped at the slab.

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

Information Relating to Action Item 3

Reference: Telephone Conversation Between
R. Lipinski (NRC) and
R. J. Netzel (S&L),
October 29, 1981

Attached are the computer results for two cable tray supports, H016 & H023, using the OBE response spectra. The results show the supports are designed within the design basis allowable and the members selected for the enveloped design spectra are not changed as noted on page 33 of the output attached.

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```
BYR439100*1PF$(O).DATA
        PROJ BYR/BRA 439100 DWG 0-3071 AUX (OBE) EL 477-00
        CABLE TRAY SUPPORT
             AISI                45.                33.0    1.0526      1.0       1.0
               16          0          16
        HORIZONTAL  SPECTRA (OBE) AT EL 477'-00
              0.000      0.375
              0.042      0.375
              0.058      0.710
              0.070      0.710
              0.073      0.635
              0.092      0.635
              0.105      0.680
              0.140      1.550
              0.166      1.550
              0.180      1.300
              0.235      1.300
              0.625      0.320
              0.750      0.320
              0.810      0.270
              1.050      0.270
              2.000      0.135
        VERTICAL    SPECTRA (OBE) AT EL 477'-00
              0.000      0.300
              0.037      0.300
              0.060      0.460
              0.067      0.460
              0.097      1.800
              0.135      1.800
              0.150      1.300
              0.170      1.300
              0.190      2.100
              0.240      2.100
              0.250      1.770
              0.310      1.770
              0.475      0.300
              1.250      0.105
              1.450      0.105
              2.000      0.065
        *ADD.P     P.UNISTRUT
            3 160 3071                  1F681 416486              8  86   134          N

          3 16 1 24  6  465     78     2 24  6  466  6  78     3 24  6  468     78
            12 230 3071                 OF111 393                 5  78   136          N

         12 23 1 24  75 468     100


*ASG.A OPS$*097ABSOLUTES. .
FAC WARNING        040200004000


*ADD.PL OPS$*097ABSOLUTES.SEI097131230 .


*ASG.T    10.,F30///400
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MEMBER PHYSICAL PROPERTIES

HORIZONTAL MEMBERS

NUMBER	NAME/SIZE	AREA	I(X-X)	S(X-X)	I(Y-Y)	S(Y-Y)
1	P1000	.555	.186	.203	.239	.294
2	P5500	.725	.520	.389	.337	.415
3	P5000	.896	1.094	.625	.436	.537
4	P1001	1.110	.930	.572	.478	.588
5	P5501	1.450	2.799	1.148	.674	.830
6	TS2X2	1.590	.766	.766	.766	.766
7	P5001	1.792	6.215	1.912	.807	1.074
8	TS3X3	2.590	3.160	2.100	3.160	2.100
9	TS4X4	3.540	8.000	4.000	8.000	4.000

VERTICAL MEMBERS

NUMBER	NAME/SIZE	AREA	I(X-X)	S(X-X)	I(Y-Y)	S(Y-Y)
1	P1000	.555	.186	.203	.239	.294
2	P5500	.725	.520	.389	.337	.415
3	P5000	.896	1.094	.625	.436	.537
4	P1001	1.110	.930	.572	.478	.588
5	P5501	1.450	2.799	1.148	.674	.830
6	TS2X2	1.590	.766	.766	.766	.766
7	P5001	1.792	6.215	1.212	.807	1.074
8	TS3X3	2.590	3.160	2.100	3.160	2.100
9	TS4X4	3.540	8.000	4.000	8.000	4.000

DIAGONAL MEMBERS

NUMBER	NAME/SIZE	AREA	I(X-X)	S(X-X)	I(Y-Y)	S(Y-Y)
1	P1000	.555	.000	.203	.000	.294
2	P5500	.725	.000	.389	.000	.415
3	P5000	.896	.000	.625	.000	.537

LONGITUDINAL BRACING MEMBERS

NUMBER	NAME/SIZE	AREA	I(X-X)	S(X-X)	I(Y-Y)	S(Y-Y)	RMIN
1	L21/2X21/2	2.250	1.230	.000	1.230	.000	.739

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```
INPUT VALUE OF K IS    .00
  3 H- 16 0 3071  416  8- 8.6    1  240  60  465-   .0  78 N
                       13.4      2  240  60  466- 6.0  78
                                 3  240  60  468-   .0  78
HANGER NO. =    16 HANGER TYPE =      3 ELEVATION, Z (FT-IN) = 465-   .00
A = 41.60 B = 82.00 C =104.60 D = 18.00 E = 18.00 F =    .00 G =    .00 H =    .00 J = 12.00 K =  8.00
L =    .00 M =    .00 N =    .00 P = 48.00 Q =    .00 R =    .00 T =    .00 U =    .00 V =    .00 W =   .00
REVISION NO = N

INPUT VALUE OF K IS    .00
 12 H- 23 0 3071  333  5- 7.8    1  240  75  468-   .0 100 N
                       13.6      0    0   0    0-   .0   0
**** W A R N I N G *****
     P,Q,R ARE NOT PROPERLY CHOSEN OR INPUT
HANGER NO. =    23 HANGER TYPE =     12 ELEVATION, Z (FT-IN) = 468-   .00
A = 39.30 B = 81.40 C = 67.80 D =    .00 E =    .00 F =    .00 G =    .00 H =    .00 J =    .00 K =   .00
L =    .00 M =    .00 N =    .00 P =    .00 Q =    .00 R =    .00 T =    .00 U =    .00 V =    .00 W =   .00
REVISION NO = N
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BEGIN FINAL DESIGN H016
DWG 0-3071

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*****HANGER NO. =    16     HANGER TYPE =    3  *****

MEMBER SIZES        H      TS2X2    6           V      TS3X3    8           D      P1000    1

PROJ... 09100 DWG 0-3071 AUX (OBE) EL 477-00

PLAN...

NUMBER ...INTS = 10

NUMBER OF MEMBERS = 12

NUMBER OF SUPPORTS =  2

NUMBER OF LUMPED WEIGHTS =  8

ELASTIC MODULUS =       29500.00

POISSON'S RATIO =  .30

NUMBER OF MODES TO BE CONSIDERED =  1

JOINT COORDINATES
```

NO	X	Y	
1	.0000	5684.6000	.0000
2	41.6000	5697.9999	.0000
3	.0000	5672.6000	.0000
4	41.6000	5624.0000	.0000
5	.0000	5616.0000	.0000
6	41.6000	5616.0000	.0000
7	.0000	5598.0000	.0000
8	41.6000	5598.0000	.0000
9	.0000	5580.0000	.0000
10	41.6000	5580.0000	.0000

MEMBER INCIDENCES AND PROPERTIES

NO	JA	JB	A	I	D	T	E	NU	SHAPE FACTOR
1	1	3	2.590	3.160	.000	.000	29500.000	.300	.000
2	2	4	2.590	3.160	.000	.000	29500.000	.300	.000
3	3	4	.555	.000	.000	.000	29500.000	.300	.000
4	3	5	2.590	3.160	.000	.000	29500.000	.300	.000
5	4	6	2.590	3.160	.000	.000	29500.000	.300	.000
6	5	6	1.590	.766	.000	.000	29500.000	.300	.000
7	5	7	2.590	3.160	.000	.000	29500.000	.300	.000
8	6	8	2.590	3.160	.000	.000	29500.000	.300	.000
9	7	8	1.590	.766	.000	.000	29500.000	.300	.000
10	7	9	2.590	3.160	.000	.000	29500.000	.300	.000
11	8	10	2.590	3.160	.000	.000	29500.000	.300	.000
12	9	10	1.590	.766	.000	.000	29500.000	.300	.000

SUPPORT RESTRAINTS

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	1	1	1
2	1	1	1

LUMPED MASSES

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	.2140-04	.2140-04	.1000-04
2	.8033-04	.8033-04	.1000-04
3	.7822-04	.7822-04	.2584-05
4	.9096-04	.9096-04	.2584-05
5	.8264-03	.8264-03	.2584-05
6	.7131-03	.7131-03	.2584-05
7	.7897-03	.7897-03	.2584-05
8	.7226-03	.7226-03	.2584-05
9	.7726-03	.7726-03	.2584-05
10	.7055-03	.7055-03	.2584-05

NO. OF DEGREES OF FREEDOM = 24

SUPPORT RESTRAINTS

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	1	1	1
2	1	1	1
3	1	0	0
4	1	0	0
5	1	0	0
6	1	0	0
7	1	0	0
8	1	0	0
9	1	0	0
10	1	0	0

DEFAULT VALUE OF K=1.20 HAS BEEN USED IN KL/R

MEMBER 1 KL/R = 13.04
INTERACTION COEFFICIENT FOR MEMBER 1 END A = .298 DYNAMIC
MEMBER 2 KL/R = 80.39

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SARGENT & LUNDY

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MEMBER  3 KL/R =  76.77
MEMBER  4 KL/R =  61.49
MEMBER  5 KL/R =   8.69
MEMBER  6 KL/R =  71.92
INTERACTION COEFFICIENT FOR MEMBER  6 END A = .457 DYNAMIC
INTERACTION COEFFICIENT FOR MEMBER  6 END B = .492 DYNAMIC
MEMBER  7 KL/R =  19.56
MEMBER  8 KL/R =  19.56
MEMBER  9 KL/R =  71.92
MEMBER 10 KL/R =  19.56
MEMBER 11 KL/R =  19.56
MEMBER 12 KL/R =  71.92
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HORIZONTAL AND VERTICAL DEFLECTIONS AT EACH NODE

NODE	HORIZ DEFN (IN)	VERT DEFN (IN)
1	.000	.000
2	.000	.000
3	.005	-.000
4	.019	-.001
5	.033	-.001
6	.072	-.001
7	.059	-.001
8	.059	-.001
9	.083	-.001
10	.083	-.001

PERIODS OF STRUCTURE ALONG
LATERAL DIRECTION = .0998
VERTICAL DIRECTION= .0039

MEMBER END FORCES IN INCH-KIP UNITS
1. LATERAL SEISMIC 2. VERTICAL SEISMIC 3. DEAD LOAD 4. LATERAL SRV 5. VERTICAL SRV

MEMBER	AXIAL	SHEAR	MOMENT	AXIAL	SHEAR	MOMENT
1						
	.204+01	.114+01	.113+02	.204+01	.114+01	.242+01
	.287+00	.211-02	.640-01	.284+00	.211-02	.387-01
	-.956+00	-.703-02	-.213+00	.947+00	.703-02	.129+00
2						
	.205+01	.968-01	.172+01	.205+01	.968-01	.544+01
	.268+00	.211-02	.594-01	.252+00	.211-02	.967-01
	-.894+00	.703-02	.198+00	.839+00	-.703-02	.322+00
3						
	.193+01	.000	.000	.193+01	.000	.000
	.170-02	.982-03	.105-01	.309-02	.982-03	.105-01
	.565-02	.327-02	.349-01	-.133-01	.327-02	-.349-01
4						
	.573+00	.114+00	.242+01	.573+00	.114+00	.404+01

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	.285+00	.396-02	.492-01	.272+00	.396-02	.175+00
	-.950+00	-.132-01	-.164+00	.908+00	.132-01	-.583+00
5						
	.583+00	.115+01	.544+01	.583+00	.115+01	.376+01
	.248+00	.396-02	.862-01	.246+00	.396-02	.118+00
	-.827+00	.132-01	-.287+00	.821+00	-.132-01	.393+00
6						
	.772+00	.194+00	.377+01	.970+00	.194+00	.429+01
	.495-01	.885-01	.753+00	.495-01	.792-01	.721+00
	.162+00	.295+00	.251+01	-.162+00	.264+00	-.240+01
7						
	.377+00	.658+00	.781+01	.377+00	.658+00	.403+01
	.184+00	.524 01	.578+00	.180+00	.524-01	.366+00
	-.613+00	-.175+00	-.193+01	.600+00	.175+00	-.122+01
8						
	.384+00	.180+00	.529+00	.384+00	.180+00	.271+01
	.167+00	.524-01	.603+00	.163+00	.524-01	.341+00
	-.557+00	.175+00	.201+01	.544+00	-.175+00	.114+01
9						
	.450+00	.205+00	.432+01	.972-01	.205+00	.422+01
	.107-01	.881-01	.769+00	.107-01	.795-01	.754+00
	.357-01	.294+00	.256+01	-.357-01	.265+00	-.251+01
10						
	.169+00	.208+00	.295+00	.169+00	.208+00	.345+01
	.919-01	.631-01	.404+00	.879-01	.631-01	.733+00
	-.306+00	-.210+00	-.135+01	.293+00	.210+00	-.244+01
11						
	.172+00	.277+00	.151+01	.172+00	.277+00	.347+01
	.837-01	.631-01	.413+00	.797-01	.631-01	.723+00
	-.279+00	.210+00	.138+01	.266+00	-.210+00	.241+01
12						
	.209+00	.166+00	.345+01	.277+00	.166+00	.347+01
	.631-01	.879-01	.733+00	.631-01	.797-01	.723+00
	-.210+00	.293+00	.244+01	.210+00	.266+00	-.241+01

END OF SUPPORT
HANGER NO --- 16
HANGER TYPE --- 3

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2	.5749-04	.5749-04	.1000-04
3	.8283-03	.8283-03	.2584-05
4	.1045-02	.1045-02	.2584-05

NO. OF DEGREES OF FREEDOM = 6

SUPPORT RESTRAINTS

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	1	1	1
2	1	1	1
3	1	0	0
4	1	0	0

DEFAULT VALUE OF K=1.20 HAS BEEN USED IN KL/R

MEMBER 1 KL/R = 117.22
INTERACTION COEFFICIENT FOR MEMBER 1 END A =1.385 DYNAMIC
INADEQUATE MEMBER NUMBER 1
MEMBER 3 KL/R = 33.94

*****HANGER NO. = 23 HANGER TYPE = 12 *****

BEGIN FINAL DESIGN H023
DWG 0-3071

MEMBER SIZES H P5501 5 V P5001 7

PROJ BYR/BRA 409100 DWG 0-3071 AUX (OBE) EL 477-00

PLANE FRAME

NUMBER OF JOINTS = 4

NUMBER OF MEMBERS = 3

NUMBER OF SUPPORTS = 2

NUMBER OF LUMPED WEIGHTS = 2

ELASTIC MODULUS = 29500.00

POISSON'S RATIO = .30

NUMBER OF MODES TO BE CONSIDERED = 1

JOINT COORDINATES

NO	X	Y	
1	.0000	5683.8000	.0000
2	39.3000	5697.4000	.0000
3	.0000	5616.0000	.0000
4	39.3000	5616.0000	.0000

MEMBER INCIDENCES AND PROPERTIES

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NO	JA	JB	A	I	D	T	E	MU	SHAPE FACTOR
1	1	3	1.792	6.215	.000	.000	29500.000	.300	.000
2	2	4	1.792	6.215	.000	.000	29500.000	.300	.000
3	3	4	1.450	2.799	.000	.000	29500.000	.300	.000

SUPPORT RESTRAINTS

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	1	1	1
2	1	1	1

LUMPED MASSES

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	.5458-04	.5458-04	.1000-04
2	.6352-04	.6352-04	.1000-04
3	.8333-03	.8333-03	.2584-05
4	.1051-02	.1051-02	.2584-05

NO. OF DEGREES OF FREEDOM = 6

SUPPORT RESTRAINTS

JOINT	X-DISPLACEMENT	Y-DISPLACEMENT	Z-ROTATION
1	1	1	1
2	1	1	1
3	1	0	0
4	1	0	0

DEFAULT VALUE OF K=1.20 HAS BEEN USED IN KL/R

MEMBER 1 KL/R = 43.69
INTERACTION COEFFICIENT FOR MEMBER 1 END A = .338 DYNAMIC
MEMBER 2 KL/R = 52.45
MEMBER 3 KL/R = 33.94
INTERACTION COEFFICIENT FOR MEMBER 3 END A = .443 DYNAMIC

HORIZONTAL AND VERTICAL DEFLECTIONS AT EACH NODE

NODE	HORIZ DEFN (IN)	VERT DEFN (IN)
1	.000	.000
2	.000	.000
3	.067	-.001
4	.067	-.001

PERIODS OF STRUCTURE ALONG
LATERAL DIRECTION = .1011
VERTICAL DIRECTION= .0079

MEMBER END FORCES IN INCH-KIP UNITS
1. LATERAL SEISMIC 2. VERTICAL SEISMIC 3. DEAD LOAD 4. LATERAL SRV 5. VERTICAL SRV

MEMBER	AXIAL	SHEAR	MOMENT	AXIAL	SHEAR	MOMENT
1						
	.376+00	.293+00	.119+02	.376+00	.293+00	.791+01
	.100+00	.121-01	.246+00	.900-01	.121-01	.577+00
	-.334+00	-.405-01	-.818+00	.300+00	.405-01	-.192+01
2						
	.376+00	.193+00	.893+01	.376+00	.193+00	.679+01
	.130+00	.121-01	.349+00	.117+00	.121-01	.639+00
	-.433+00	.405-01	.116+01	.391+00	-.405-01	.213+01
3						
	.293+00	.374+00	.791+01	.193+00	.374+00	.679+01
	.121-01	.900-01	.577+00	.121-01	.117+00	.639+00
	-.405-01	.300+00	.192+01	.405-01	.391+00	-.213+01

END OF SUPPORT
HANGER NO --- 23
HANGER TYPE --- 12

****

3306

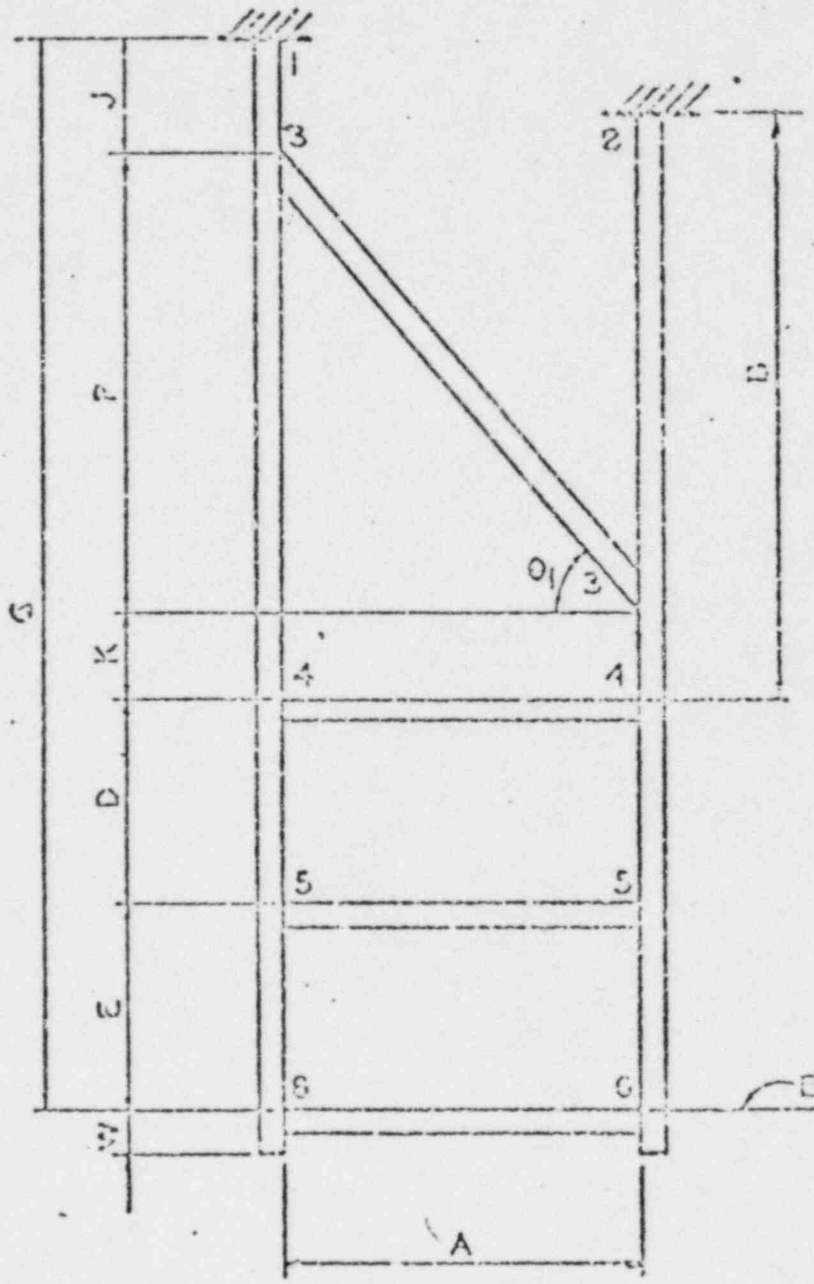
HANG NO.	TYPE NO.	ELEV.	Z	B / C	A / M	D / N	E / P	F / Q	G / R	H / T	J / U	K / V	L / W	/-THETA-/ (1) / (3)	(2) / (4)	MEMBER SIZE HORI VERT / DIAG	WT. LBS.	REMARKS	REV
H 16	3H	465-	.0	82.0	38.6	18.0	18.0	.0	.0	.0	12.0	8.0	.0	50.0	.0	TS2X2 TS3X3	230		N
				104.6	.0	.0	48.6	.0	.0	.0	.0	.0	7.0	.0	.0	P1000			
H 23	12H	468-	.0	81.4	32.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	P5501 P5001	92		N
				67.8	.0	.0	.0	.0	.0	.0	.0	.0	12.0	.0	.0				

ENVELOPED DESIGN

H016: HORIZ: TS 2X2X¼ TYPE 3H
VERT: TS 3X3 X ¼
DIAG: P1000

H023: HORIZ: P5501 TYPE 12H
VERT: P5001

3306



Byron/Braidwood Stations

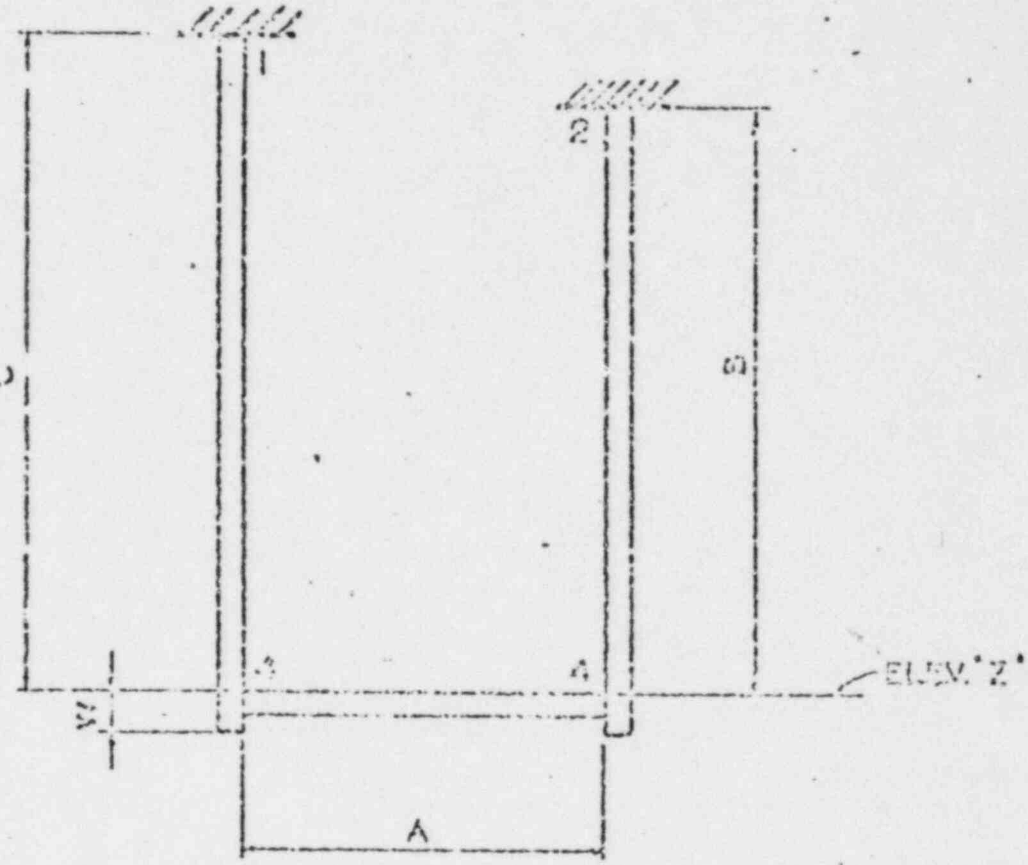
Information Relating to SEB Audit Action Item 3.

SEISMIC CATEGORY I
ELECTRICAL EQUIPMENT HANGER
TYPE 3H

[illegible] 3-15-79

NOTE

F[illegible] [illegible] FOR FABRICATION. ERECTION OF HANGERS AND GENERAL NOTES SEE SARGENT & LUNDY STD-ED-115.0



Byron / Braidwood Stations

Information Relating to SEB Audit Action Item 3

SEISMIC CATEGORY I
ELECTRICAL EQUIPMENT HANGERS
TYPE 12H

NOTE
FOR [illegible] FOR [illegible] CATION A[illegible]
[illegible] AND [illegible]
SEE SARGENT & LUNDY STD-[illegible]-115.0

STD-[illegible]

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

ACTION ITEM 4A: Additional information in response to Question 130.06 (seismic reassessment).

S&L to provide actual stress interaction in reinforced concrete design prior to and after the refinements used for the containment shell and basemat during the reassessment.

	Force Comparison		Stress Level		
Section of Containment	B/B Design Basis	B/B Reassessment Analysis	Design Basis	After Reassessment	Ratio of Actual To Allowable Stress After Reassessment
Wall (40' above Basemat)	27 kips/ft	29 kips/ft	21.3 ksi	22.7 ksi	0.42
Basemat Hoop Direction (R=46.25 ft.)	5579 k-ft/ft	4538 k-ft/ft	56.0 ksi	45.4 ksi	0.84

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

ACTION ITEM 4C:

S&L to respond to NRC with justification for the methodology used for cable tray supports.

RESPONSE

Cable tray supports are designed to the requirements of Standard Review Plan (SRP) Section 3.10, "Seismic Qualification of Category I Instrumentation and Electrical Equipment." In accordance with the requirements of IEEE Standard 344, the supports are analyzed to insure the operability of all electrical systems during and after an earthquake of magnitude equal to either the OBE or SSE. Analysis methods are consistent with the requirements of SRP Section 3.7.

Electrical system operability is assured by maintaining the structural integrity of the cable tray support. The structural integrity of the support is assured through analysis methods employing conventional elastic techniques and the response spectrum method for determining dynamic loads. Members are designed in accordance with the requirements of AISI and AISC Specifications. For the vertical members in the ceiling, mounted hangers which act predominantly in tension, elastic buckling is permitted; buckling under this condition due to dynamic loads will not impair the integrity of the electrical system. All other primary component stresses are limited to within the elastic range under the most severe earthquake loading. This approach is more conservative than the provisions of SRP Section 3.8.4 where stresses are not limited to loss than yield for extreme earthquake loading combinations.

BYRON/BRAIDWOOD

Structural Design Audit

October 1981

ACTION ITEM 7: Revised Response to Question 130.38

"Section 3.8.1.7.3.2 of the FSAR and Appendix A indicate that inservice tendon surveillance program will meet the 'intent' of R.G. 1.35. Such a statement implies that there may be some deviations from the Regulatory Guide. Furthermore, the present position of the Regulatory staff regarding inservice tendon surveillance program is stated in R.G. 1.35, April 1979 and R.G. 1.35.1, April 1979. Specify and justify any deviations in your inservice tendon surveillance program from the provisions of these Regulatory Guides."

RESPONSE

The inservice tendon surveillance program is presented in the Technical Specifications (B/B-FSAR Subsection 16.3/4.6.1.7) and will be changed to conform to the Regulatory staff position per Regulatory Guides 1.35 and 1.35.1, with the exception of the applicable acceptance criteria. The acceptance criteria, Subsection 3.8.1.7.3.2, will be modified as follows.

To ensure structural adequacy of the containment structure, the tendon lift-off stress values shall be equal to or higher than the average design values given below:

Hoop	140 ksi
Vertical	147 ksi
Dome	143 ksi

This acceptance criteria ensures the containment capacity through maintenance of tendon stress design values.

Loss of prestress stems from relaxation in the tendon system and from shrinkage, creep, and elastic shortening of the concrete. In the current state-of-the-art, these phenomena are understood not to mathematical precision but to the extent of conservatively designing for their effects. Therefore, preceise prediction of their magnitude as part of acceptance criterion is not considered practical.

Conservative values of prestress losses were assumed in the design initially so that the actual tendon stress will not fall below the design value at any time in the life of the plant. Tendon lift-off stresses observed during each surveillance will be evaluated to establish the trend of prestress loss and to confirm that the actual tendon stress will be higher than the design value during the succeeding inspection interval, thus ensuring structural adequacy throughout the life of the plant.

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

ACTION ITEM 8

Effect of jerking of the cable in the Crane Analysis.

RESPONSE

The NRC was provied the study performed on the Zimmer project which shows the impact of jerking of the cables of cranes. This study is extended to include the Byron/Braidwood cranes. The attached calculations indicate that the jerking which would occur for the containment polar crane is not significant in the crane design and shows that jerking in the cable of the fuel handling building crane will not occur.

NRC QUESTION

Check the jerking of the crane bridge cable.

Types of cranes:

(1) Fuel Handling Crane
(2) Polar Crane

Fuel Handling Crane

Reference: Calculation 4.1.4.4, pg. 5 of 84

Pull on rope:

OBE and SSE acceleration is less than 1 g, there is no jerking in the cable.

Polar Crane

Reference: Calculation 4.1.5.2, pg. 26

Pull on rope:

For main hoist rope under SSE condition, pull on the rope is greater than the static load on the rope in certain crane bridge position.

Max. force due to SSE = 122.96 kips (SRSS of all thre excitation)
Static load = 101.3 kips (92 kips + 9.3 kips)
(lifted load 20% of crane capacity)

So non-linear behavior of the rope is expected.

Non-linear behavior of the cable rope is studied in the report "Seismic Analysis of Crane Bridge Girders and the Cable" SD-DA report no. 139, November 1974.

The report was based on a study for the Zimmer crane. For the Zimmer crane, the max. SSE force was 155.34 kips for lifted load of 44.0 kips (only vertical exciation was considered).

Response spectra used for Zimmer has max. response of 4.0 g at a frequency of 18 Hz. Damping used was 2%. The report concludes that the total force produces (155.34 kips + 44 kips) 199.34 kips which is less than the maximum tension during operation (44x5 = 220 kips), so the cable is alright. A non-linear behavior study for Byron is not done, but based on Zimmer study, (Zimmer & Byron have similar crane, with respect to dynamic characteristics). The Zimmer crane rope has a max. force of 155-34 kips for lifted load of 44 kips for SSE. The response spectra used has a maximum response of 4.0g. Damping used is 2%.

For Byron, max. lifted load is 92 kips. Response spectra has max. response of 2.4g (at 2% damping) at a frequency of 11.0 Hz. The frequency of the Byron crane is 4.1 Hz for main hook, so the loading peak of 2.4g is not in resonance with the structural frequency.

Considering the non-linear analysis, the maximum force on the rope due to SSE will be approximately, by linear interpolation from non-linear study of Zimmer crane,

$$\frac{155.34}{44} \times 92 \times \frac{2.4}{4.0} = 195 \text{ kips}$$

So total force =(195 kips + 101.3 kips) = 296.3 kips < (5x92) =

460 kips (Max. tension during normal operation)

So the rope will be alright. The increase in force in the rope due to non-linearity = 195 kips - 123 kips = 72 kips. Impact factor = $\frac{195}{123}$ = 1.6.

The 123 kip force is SRSS of all three excitations but the vertical has 99% contribution. Damping used was 4%; for 2% damping the 123 kip value will be higher and increase (72 kip will be smaller).

The increase in force should be carried by the bridge member to the wheels.

The highest wheel load will occur when the trolley is at the end.

Assume distribution only at one end of bridge; load will be divided on eight wheels

Therefore, the increase will be $\frac{72}{8}$ = 9 kips on each wheel.

Max. wheel reaction = 5.53 kips + 58.4 kips = 113.7 kips
(due to SSE vert) (Due to static) (Ref. Calc. 4.1.5.3, pg. 6)

Total = 113.7 kips + 9 kips

122.7 kips < 155.8 kips (max. wheel load based on construction lift ref. P&H drawing 105A 4257)

CONCLUSION

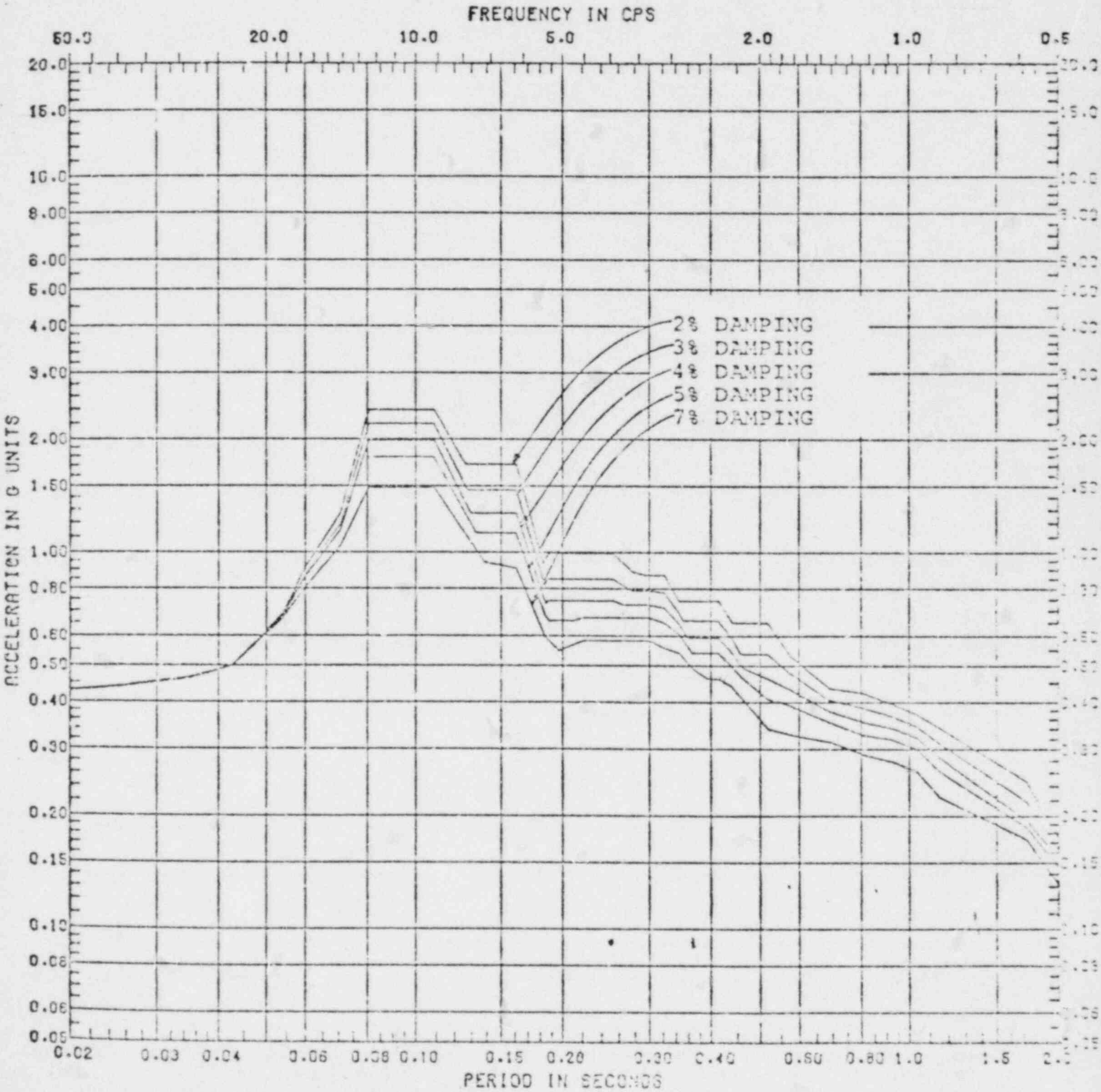
Based on the Zimmer non-linear crane bridge analysis, the pull on the rope for Byron due to SSE is less than the maximum tension during operation and the maximum wheel reaction due to SSE is less than the construction lift condition, so the crane is alright.

SARGENT & LUNDY
ENGINEERS

25 MAY 76
908ZVR

B/B SEB Audit
Action Item 8
Figure 1

Byron/Braidwood
Spectra



VERT RESPONSE SPECTRA SSE

SPECTRA NO. 203-SS-VW

ELEVATION 500'-0"

LOCATION CONTAINMENT BUILDING CRANE SUPPORT

REVISION NO. 4

ACTION ITEM 12: Response to Question 130.21

QUESTION 130.21

"Your response to Question 130.16 indicates that you satisfy the requirements of the ACI-349 Standard regarding design of the containment internal structures and Category I structures other than containments. In your response you also indicated that the Regulatory Guide (R. G.) 1.142 does not apply because Byron/Braidwood (B/B) Plant was docketed prior to December 15, 1978, which is the implementation date for the R. G. 1.142. As it has been pointed out in Question 130.16, if the design criteria used for the B/B Plant are those of ACI-349, they must be used in conjunction with the R. G. 1.142. Otherwise, they must comply with the NRC positions specified in the appropriate sections of the SRP. In any case, your design criteria should comply with those approved by the NRC. Additionally, Appendix A lists R. G. 1.142 as one of the applicable documents which is contrary to your response to Question 130.16.

"Our review indicates that there are several deviations from the position of the Regulatory staff. Few of these deviations are indicated below to serve as examples.

a. Load Combination Equations (FSAR Table 3.8.10) - We noted that the severe environmental conditions should be checked for the loads which contain reduced dead load (load factor 1.2) plus wind or the operating basis earthquake (OBE) (see SRP, Section 3.8.4 load combination equations 2.b' and 3.b'). Your load combination equations do not indicate that these loads have been considered.

b. In Appendix A, p. A1.142-1, you indicated that you take exception from the R. G. 1.142 Positions C.7 and C.9 (in your response to Question 130.16 you stated that R. G. 1.142 does not apply) by taking concrete samples of 6 cylinders per 150 yards of concrete. This is contrary to the Regulatory staff position which is stated in R. G. 1.142, which refers to the R. G. 1.94, endorsing ANSI-45.2.5 1974, which requires that the samples of concrete for compressive strength test be taken every 100 cubic yards of concrete or a minimum of one set/day for each class of concrete.

In view of the above, indicate clearly the compliance with the applicable regulatory criteria and positions contained in the SRP or otherwise, justify your exceptions taken, in sufficient detail, to enable a meaningful review of the FSAR."

ACTION ITEM 12/FSAR Question 130.21 (Cont'd)

RESPONSE

The Applicant is in compliance with Regulatory Guide 1.142 with the following clarifications:

1. Position C.7 requires compliance with ANSI Standard N45.2.5-1974, i.e., two test cylinders per 100 cubic yards of concrete tested at 28 days with a minimum of one test per day for each class of concrete. The Applicant's position is to take six test cylinders per 150 cubic yards of concrete tested in pairs at 7, 28, and 91 days with a minimum of one test per day for each class of concrete. This position is in compliance with ACI-318-71 and ACI-318-77.

   At Byron and Braidwood six standard cylinders for compressive testing were prepared from concrete samples representing every 150 cubic yards of concrete placed in Category I structures other than the containment. These specimens are tested for compressive strength at 7, 28, and 91 days.

   Concrete acceptance is based on the 91 day results; however, the 7 and 28 day results are used for monitoring the compressive strength development ages. Requirements in ACI-318 and ACI-301 are intended to cover commercial structures, in which the total number of samples is small because the total volume of concrete used is also small.

   For the large volume of concrete used in a nuclear power plant, a frequency of "every 150 cu. yd." results in a much higher confidence level and reliability than the "every 100 cu. yd." in ACI-301.

   The onsite concrete batching plant has more production quality control and lends itself to a more consistent product than commercial concrete produced by the ready mix industry. The referenced ACI-301 and ACI-318 requirements have been designed for ready mix industry conditions.

   The frequencies for testing fresh concrete (slump and air content) in ACI-301 and ACI-318 are 100 cubic yards and 150 cubic yards, respectively. For Byron and Braidwood, a frequency of every 50 cubic yards was used for testing slump, air content and temperature, as in Table B of ANSI N45.2.5-1974. In addition, the tightened sampling frequency implemented (testing of every truck) any time the properties of the fresh concrete were out of the allowable limits and the positive actions available to reject individual trucks (Table B.1-5) and to stop production (B.1.10), further reduced the probability that sub-standard concrete was placed.

ACTION ITEM 12/FSAR QUESTION 130.21 (Cont'd)

ACI 349-76, "Code Requirements for Safety-Related Concrete Structures," establishes a compressive strength test frequency of one for every 150 cubic yards of concrete placed for safety-related structures other than the containment.

Section 4.3.1 of ACI 349-76 allows an increase in the number of cubic yards representative of a single test by 50 cubic yards for each 100 psi lower than a standard deviation of 600 psi.

Table CC-5200-1 of the Summer 1981 Addenda of the ASME Boiler and Pressure Vessel Code, Section III, Div. 2 allows a testing frequency of every 200 cubic yards if the average strength of at least the latest 30 consecutive compressive strength test exceeds the specified strength f'_c by an amount expressed as:

$$f_{cr} = f'_c + 1.419 \ (f'_c /8.69).$$

At the Byron/Braidwood Stations, the average compressive strength consistently exceeded this f_{cr} for all the concrete placed.

2. Position C.8 requires minimum pressure testing of embedded piping in accordance with ACI-318-71. The Applicant's position is that all Category I embedded piping is tested in accordance with ASME Section III and all Category II embedded piping is tested in accordance with ANSI B31.1.

3. Position C.9 has been complied with by the Applicant. However, the load factor for R_o used in the ACI combinations 1, 2, and 3 is different than the load factor for R_o given in SRP Section 3.8.3. The load factor used in the FSAR combinations is in compliance with the load factor required by the SRP.

   Load combination equations 2b' and 3b' of SRP Section 3.8.4 have been complied with by equation numbers 6 and 5, respectively of FSAR Table 3.8-10. Note 2 of the FSAR table when applied to equation number 6 of the FSAR reduced this equation to equation 2b' of the SRP with the exception of the load factor for dead load D. The load factor used in the FSAR is higher than the load factor used in the SRP when the seismic load and the dead load are in the same direction. This will result in a more conservative design. If the dead load and seismic load are not in the same direction, the load factor for D is in compliance with position C.11 and ACI-349-76 Section 9.3.3.

   In similar manner, using Note 2 of FSAR Table 3.8-10, equation 3b' can be reduced to equation number 5.

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

ACTION ITEM 13

This item concerns the effect of tangential shear upon the containment design. The NRC requested Sargent & Lundy to investigate the impact of ASME Code Case N250 on the Byron/Braidwood design.

RESPONSE

The design for the tangential shear for Byron/Braidwood is conservative compared to SRP Section 3.8.1. The principle membrane tension is calculated and compared with an allowable concrete stress of $3\sqrt{f_c}$. Steel is provided for tensile stresses greater than this value. The SRP allows $4\sqrt{f_c}$ principle tension in the concrete.

ASME Code Case N250 addresses tangential shear due to seismic loading directly, providing formula for sizing steel in the horizontal and vertical directions specifically due to tangential shear. The application of the code case to the containment wall design only increases stresses in the horizontal steel at the basemat-wall junction (18.7 ksi compared to 9.0 ksi for the Byron/Braidwood design). There are no additional steel stresses to be considered from either the application of the code case or the original Byron/Braidwood design at any other location of the containment wall. Therefore, Code Case N250 does not have an impact on the design.

Byron/Braidwood
Structural Design Audit
October 1981

Action Item 21: Revised Response to Question 130.49

QUESTION 130.49

"It is our understanding that the supply and return routings for the essential service water system is through a turbine room base mat. This issue has been raised by the memorandum from Steven Varga of NRC to Byron Lee dated September 28, 1977. Your response to this letter in FSAR Section 9.2.1.2.3 is not acceptable.

"Since turbine room is not a seismic Category I structure, the integrity and functionality of the essential service water system cannot be assured. The position of the Regulatory staff regarding interaction of non-Category I structures is stated in the SRP Section 3.7.2.II.8. In view of the above, you are requested to demonstrate that your design meets one of the following:

a. That the collapse of the turbine building will not impair the integrity of functionality of the essential service water system, (ESWS).

b. That the turbine building has been designed and constructed to prevent its failure under SSE conditions in such a manner that the margin of safety is equivalent to that of other Category I structures."

RESPONSE

As stated in Subsection 3.7.2.8, we have complied with the Regulatory Staff position regarding interaction of non-Category I structures with Category I structures, as given in SRP Section 3.7.2.II.8.

The design of the turbine building substructure and superstructure used the same SSE loading combinations and design allowables as were used in Category I design. Therefore, the turbine building has the same margin of safety as the Category I structures. The material suppliers and contractors for the construction of the turbine building were the same as for the construction of the Category I structures. The Applicant's construction personnel monitored the construction work and have ensured quality control. The quality of the construction is reflected in the average actual concrete strengths. The design requirement for the concrete compressive strength is 3500 psi. The Byron site was constructed with an average concrete strength of 5265 psi; Braidwood with an average of 5369 psi. These strengths were achieved in both the Category I and Category II structures.

Based on the equivalent margins of safety provided in the design of the turbine building and the Category I structures, and the quality control provided in the construction, the integrity and functionality of the essential service water piping has been assured.

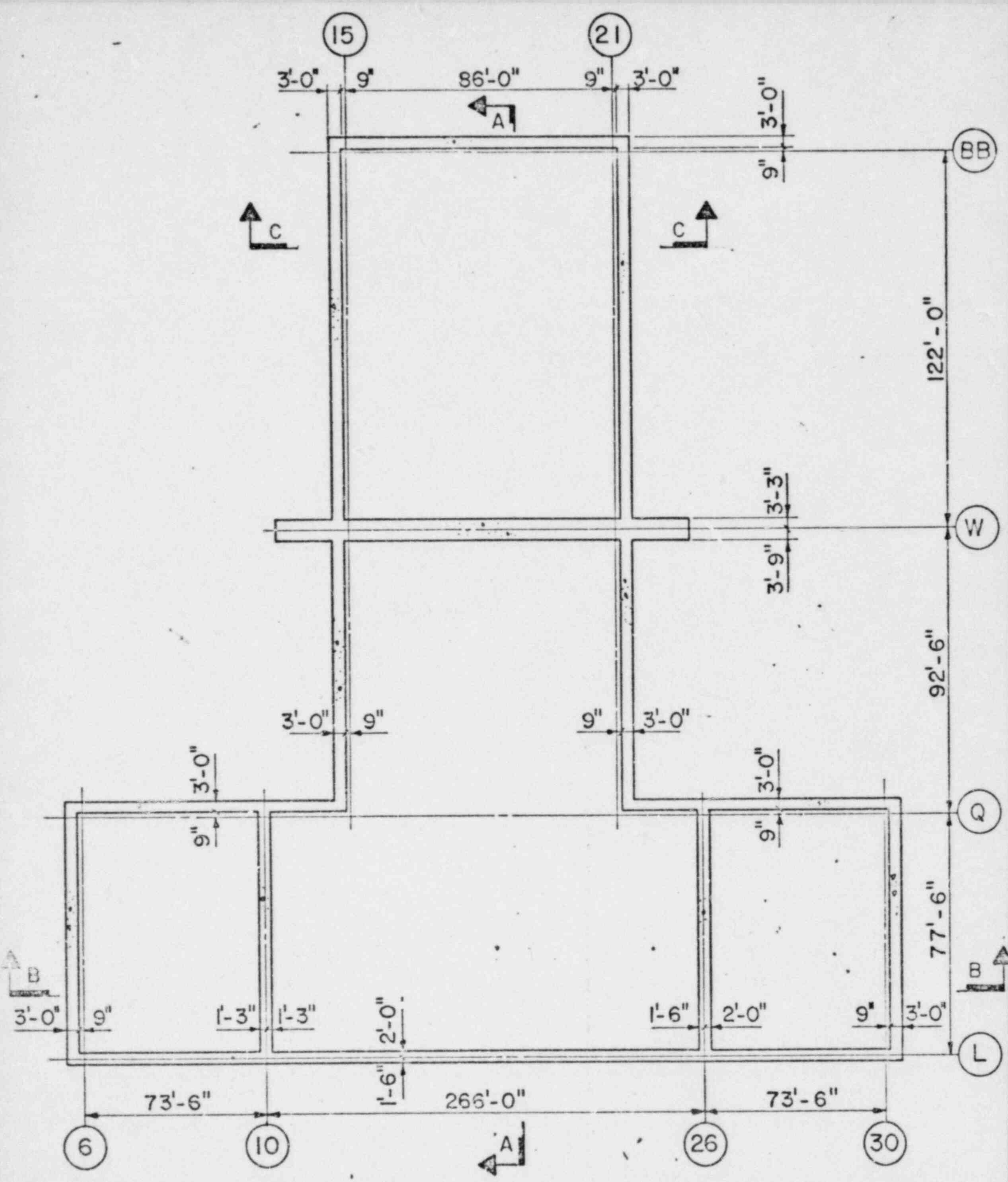
The applicant's and contractor's quality control documentation for the construction of the turbine building basement including the responsible quality control records are available at the plant sites.

Byron/Braidwood
Structural Design Audit
October 1981

Action Item 26: Figures for response to Question 130.42

The attached figures 3.8-57 through 3.8-84 are being issued as supplemental information to the response of Question Number 130.42. All figures will be incorporated into FSAR Section 3.8.

1. Figures 3.8-52 & 53 (Revised) and Figures 3.8-57 & 58 show plans and sections through the Auxiliary/Fuel Handling Building complex.
2. Figures 3.8-59 through 3.8-64 show plans and sections of the Byron River Screen House.
3. Figures 3.8-65 through 3.8-73 show plans and sections of the Essential Service Cooling Tower unique to the Byron Station.
4. Figures 3.8-74 through 3.8-78 show plans and sections of the Braidwood Lake Screen House.
5. Figure 3.8-79 shows the plan and section of the Deep Well Enclosures unique to Byron.
6. Figures 3.8-80 through 3.8-82 show a plan and sections of the Safety Valve Rooms.
7. Figure 3.8-83 & 84 show sections through the Refueling Water Storage Tanks.

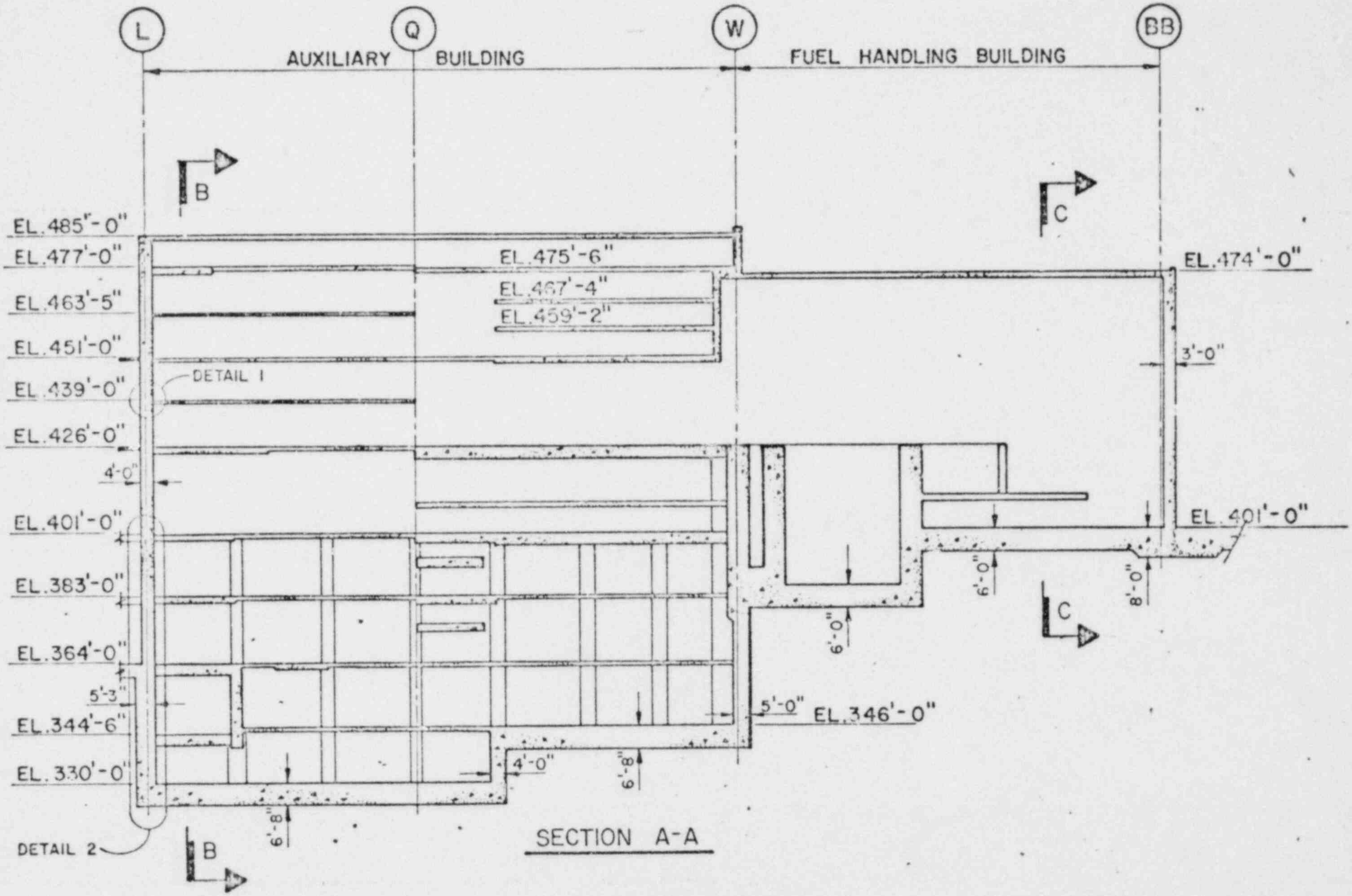


AUXILIARY - FUEL HANDLING BUILDING COMPLEX SHEAR WALLS AT ELEVATION 401'-0"

BYRON → N

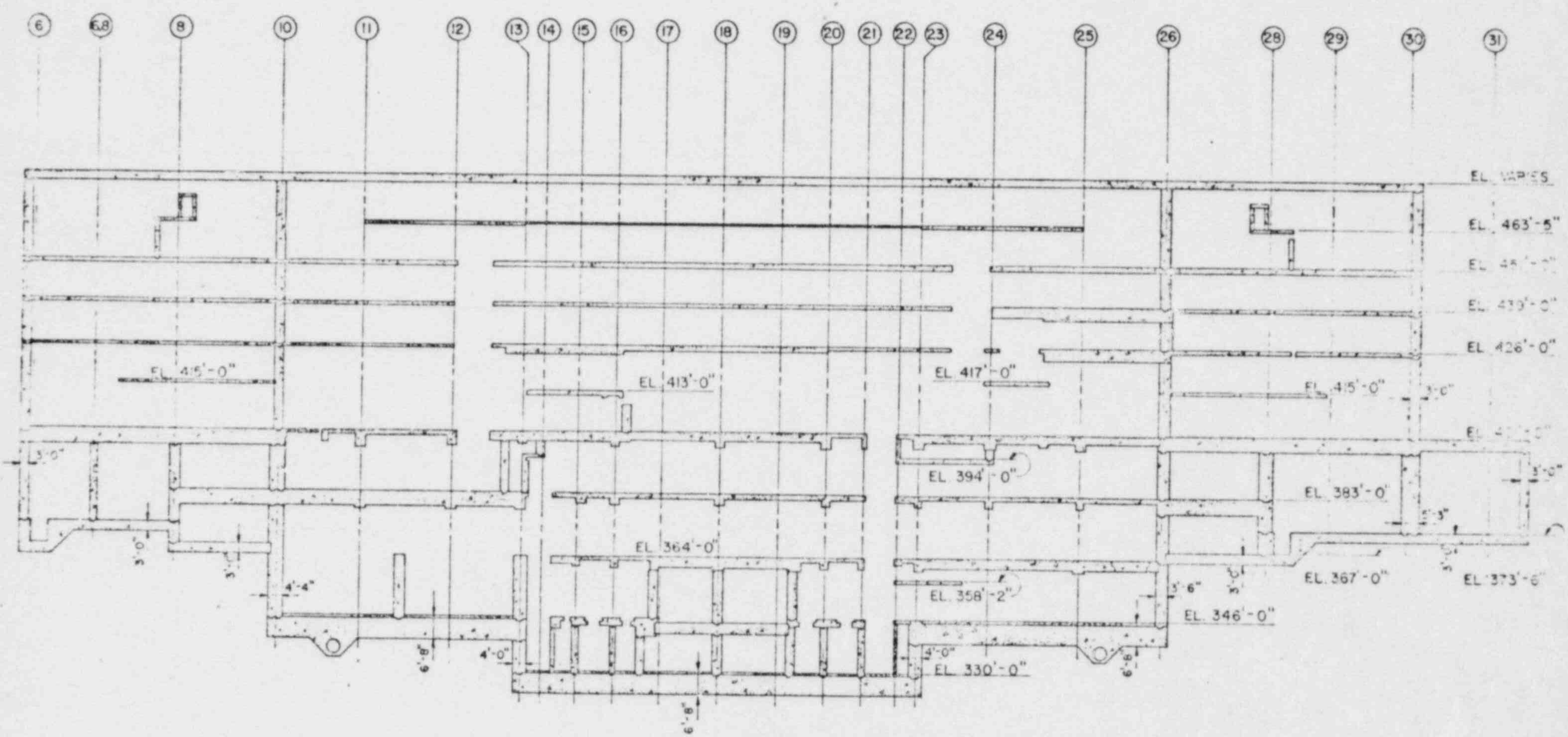
BRAIDWOOD N ←

Figure 3.8-53



SECTION A-A

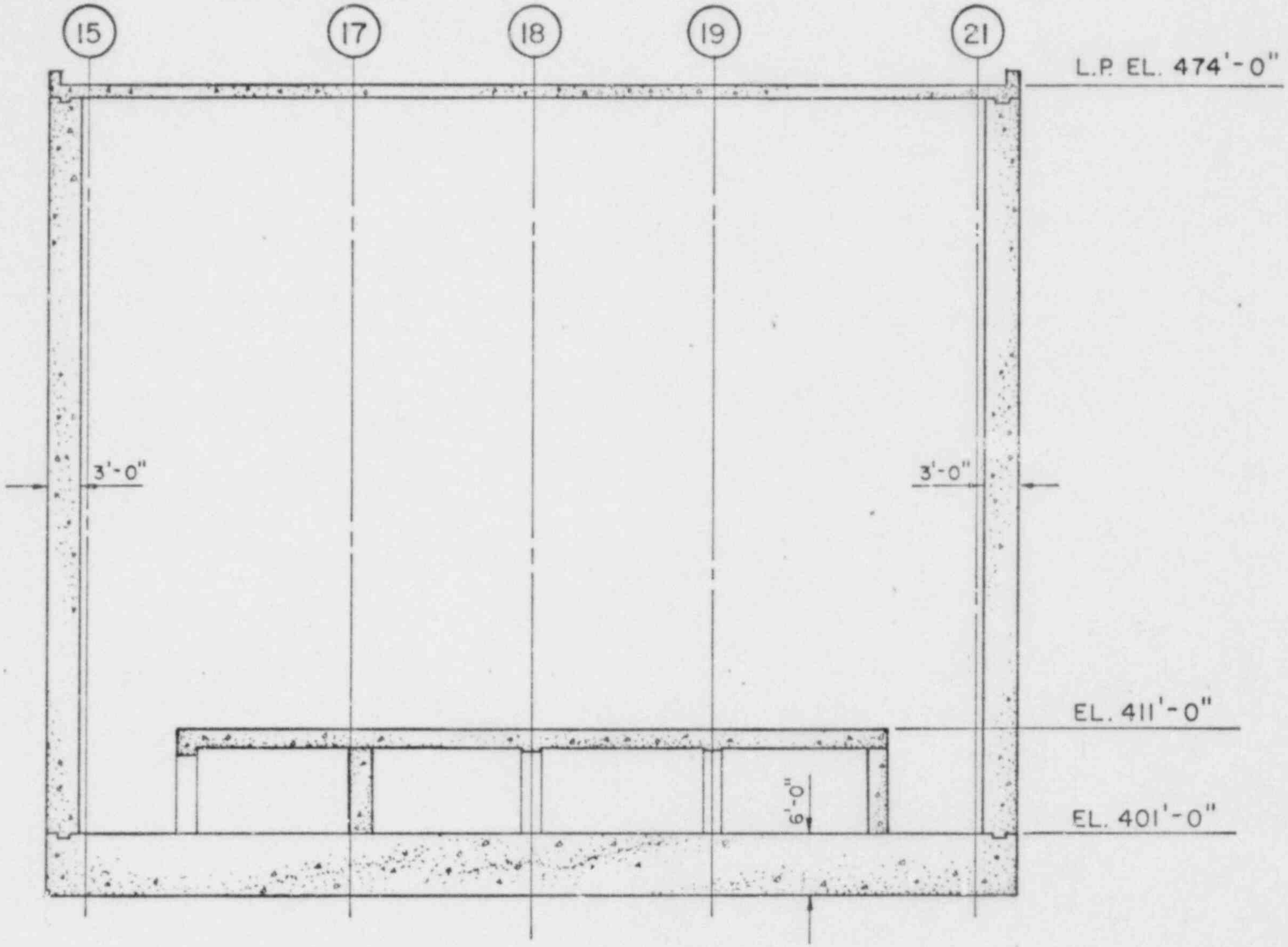
Figure 3.8-53



AUXILIARY BUILDING

SECTION B-B

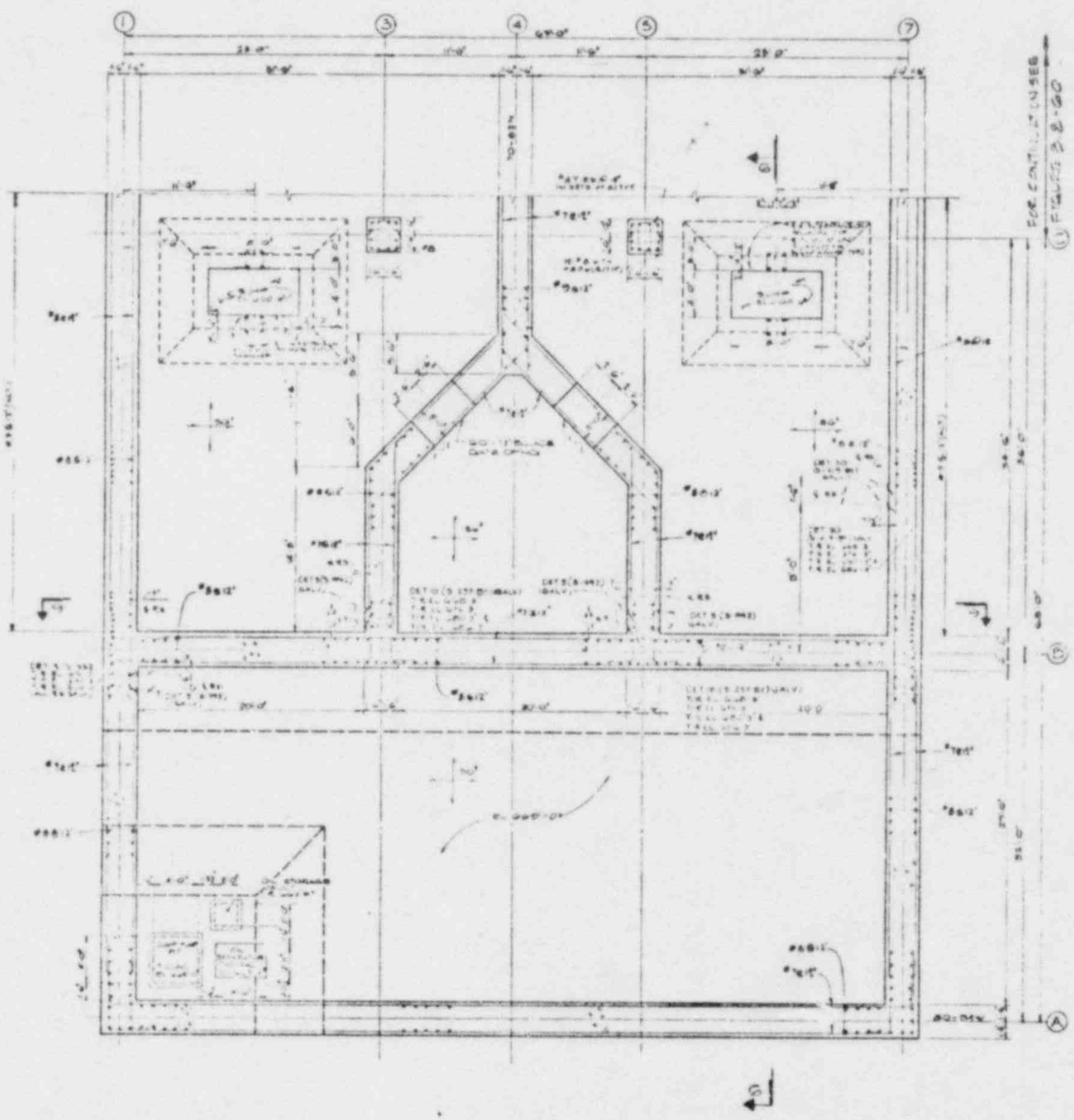
FIGURE 3.8-57



FUEL HANDLING BUILDING

SECTION C-C

FIGURE 3.8-58



RIVER SCREEN HOUSE FOUNDATION PLAN EL 663'-6" (UNLESS NOTED)

FIGURE 3.8-59

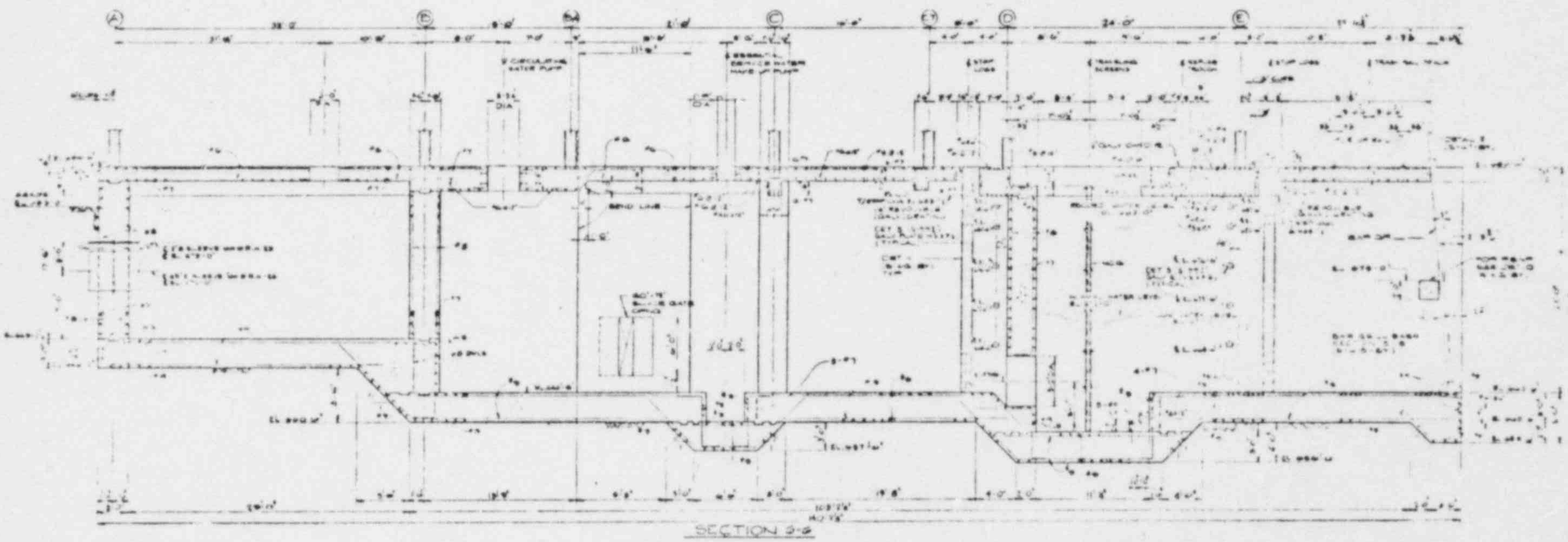
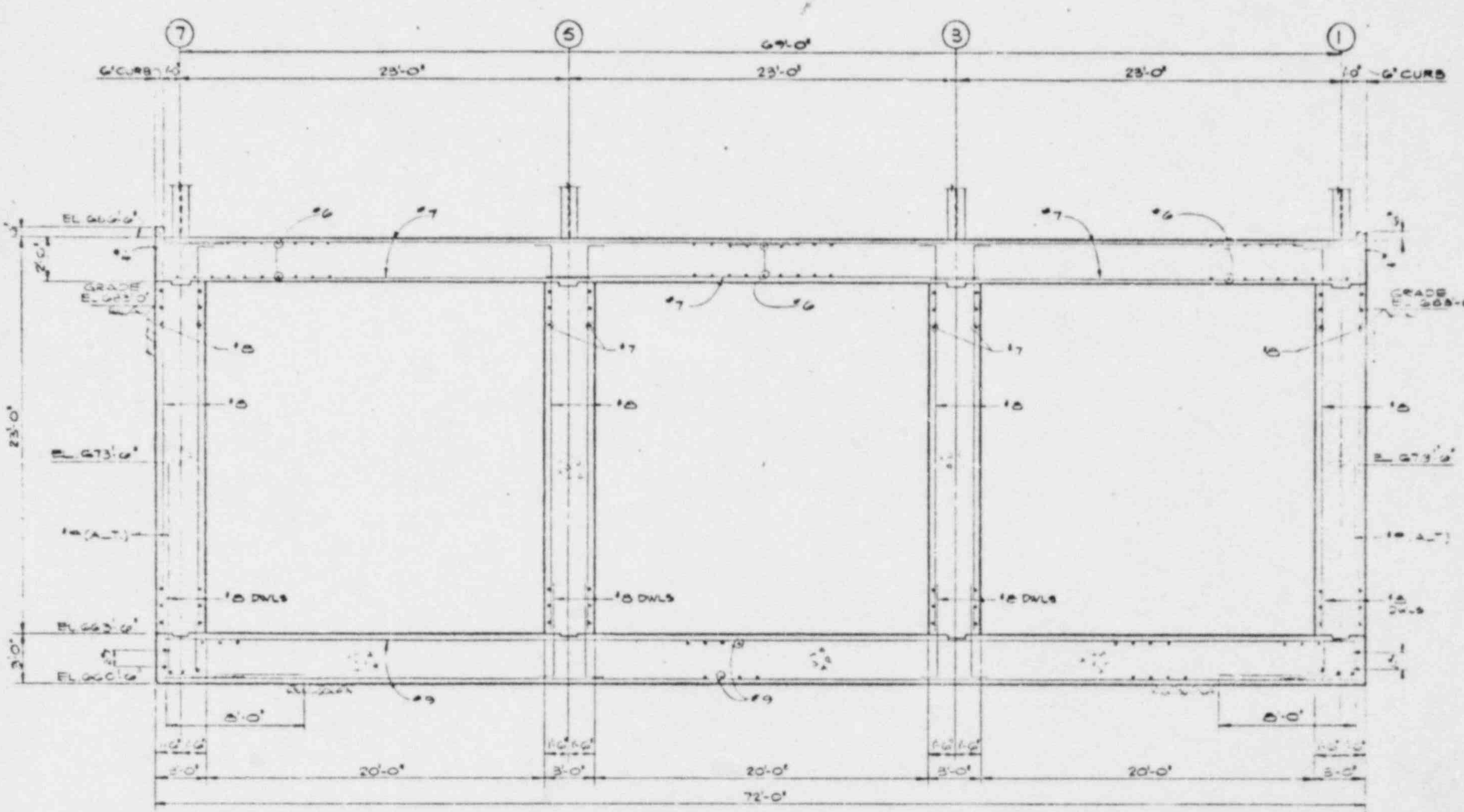
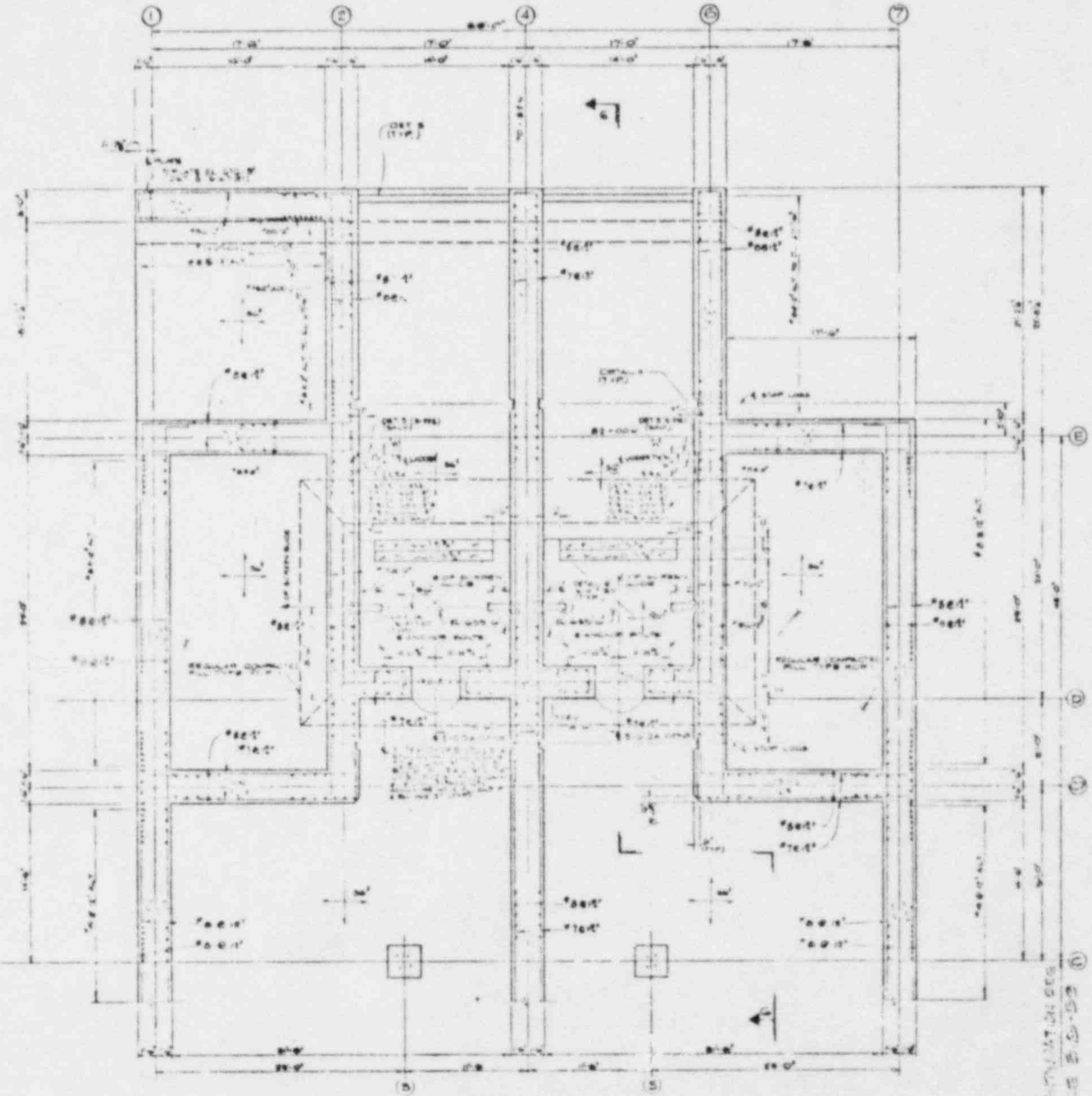


FIGURE 8.8-60



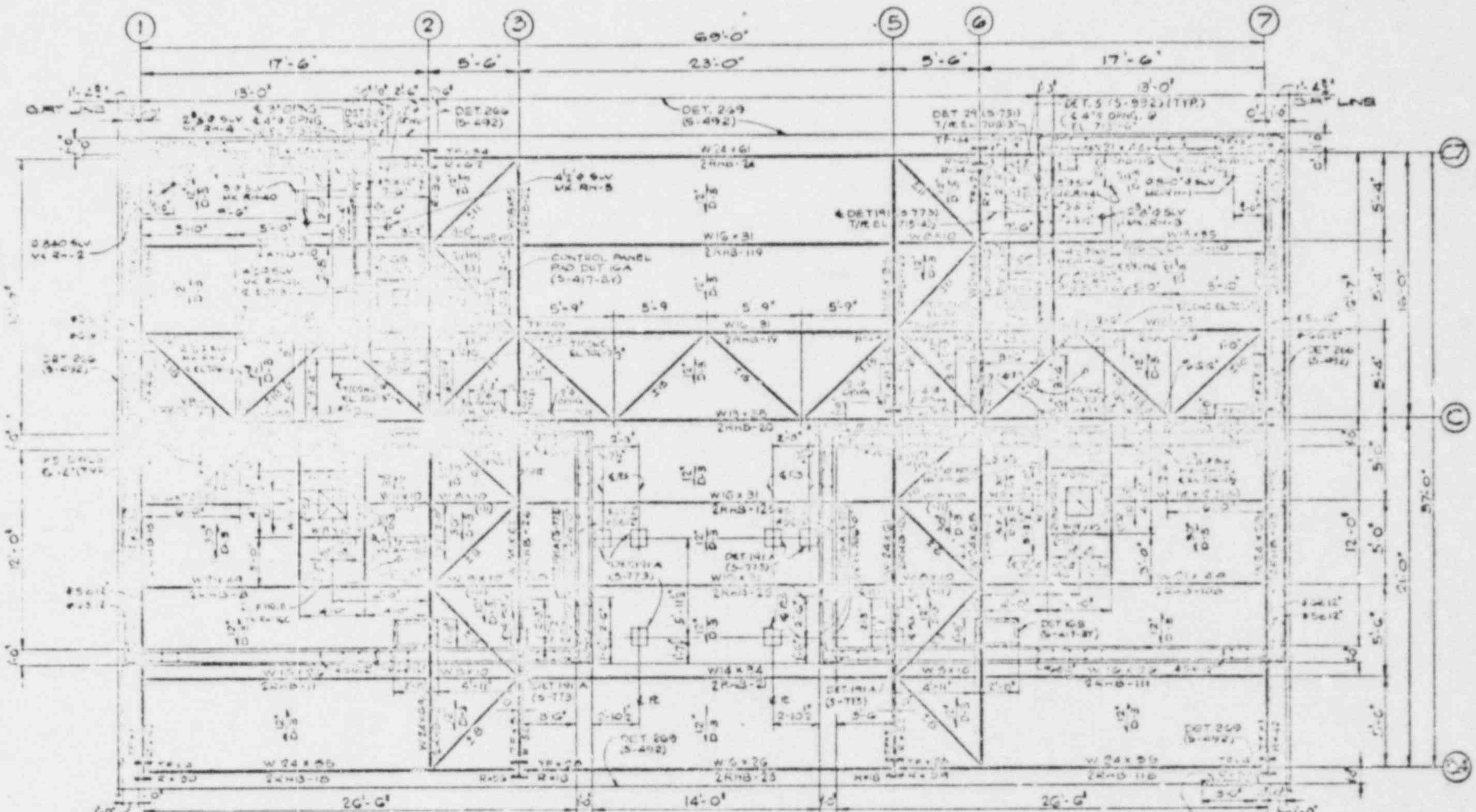
SECTION 9-9

FIGURE 3.8-61



RIVER SCREEN HOUSE FOUNDATION PLAN EL 600'-0" (UNLESS NOTED)

FIGURE 3.8-62

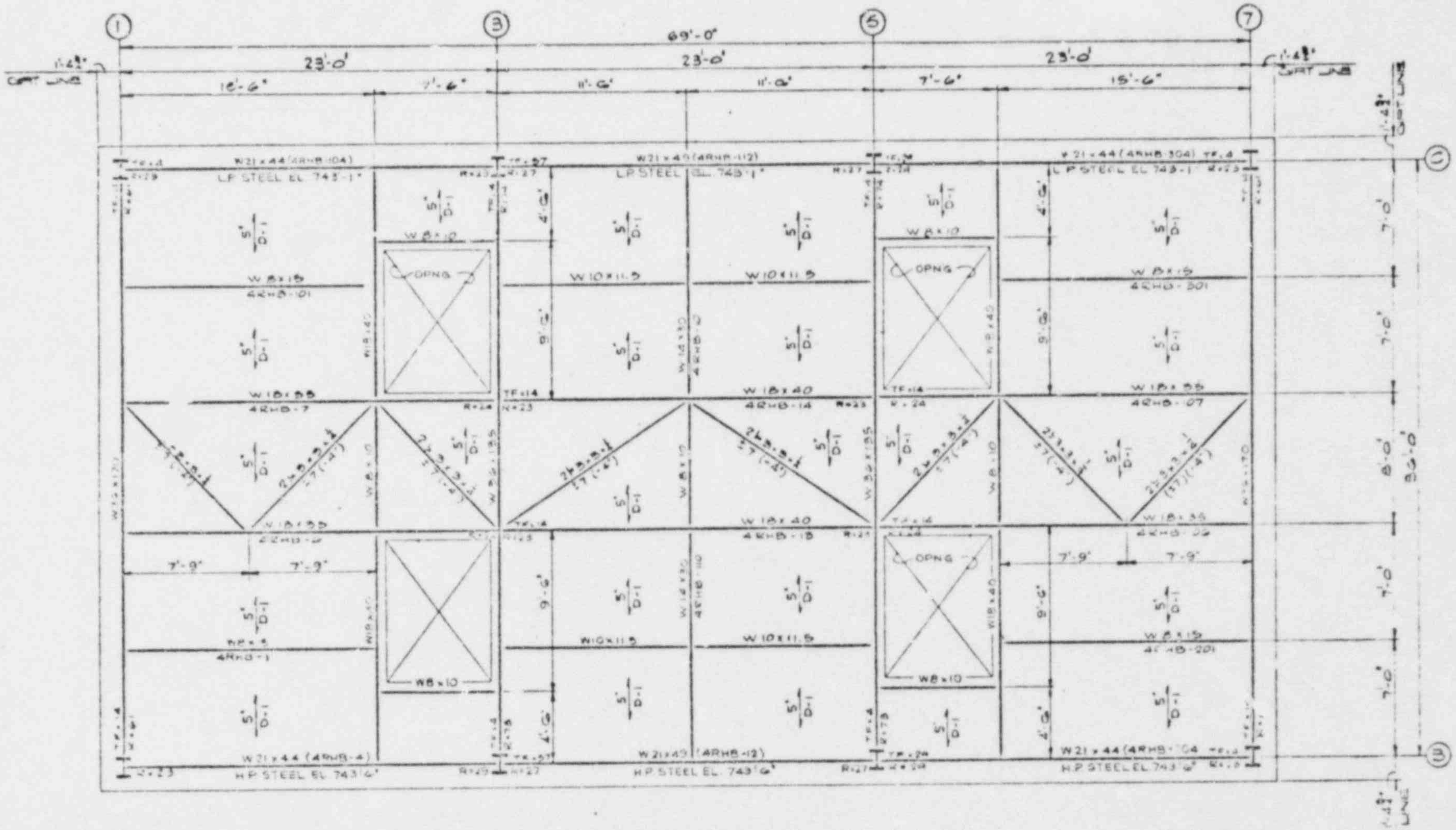


RIVER SCREEN HOUSE FLOOR FRAMING PLAN EL. 702'-0"

TOP OF STEEL EL. 701'-0" (UNLESS NOTED)

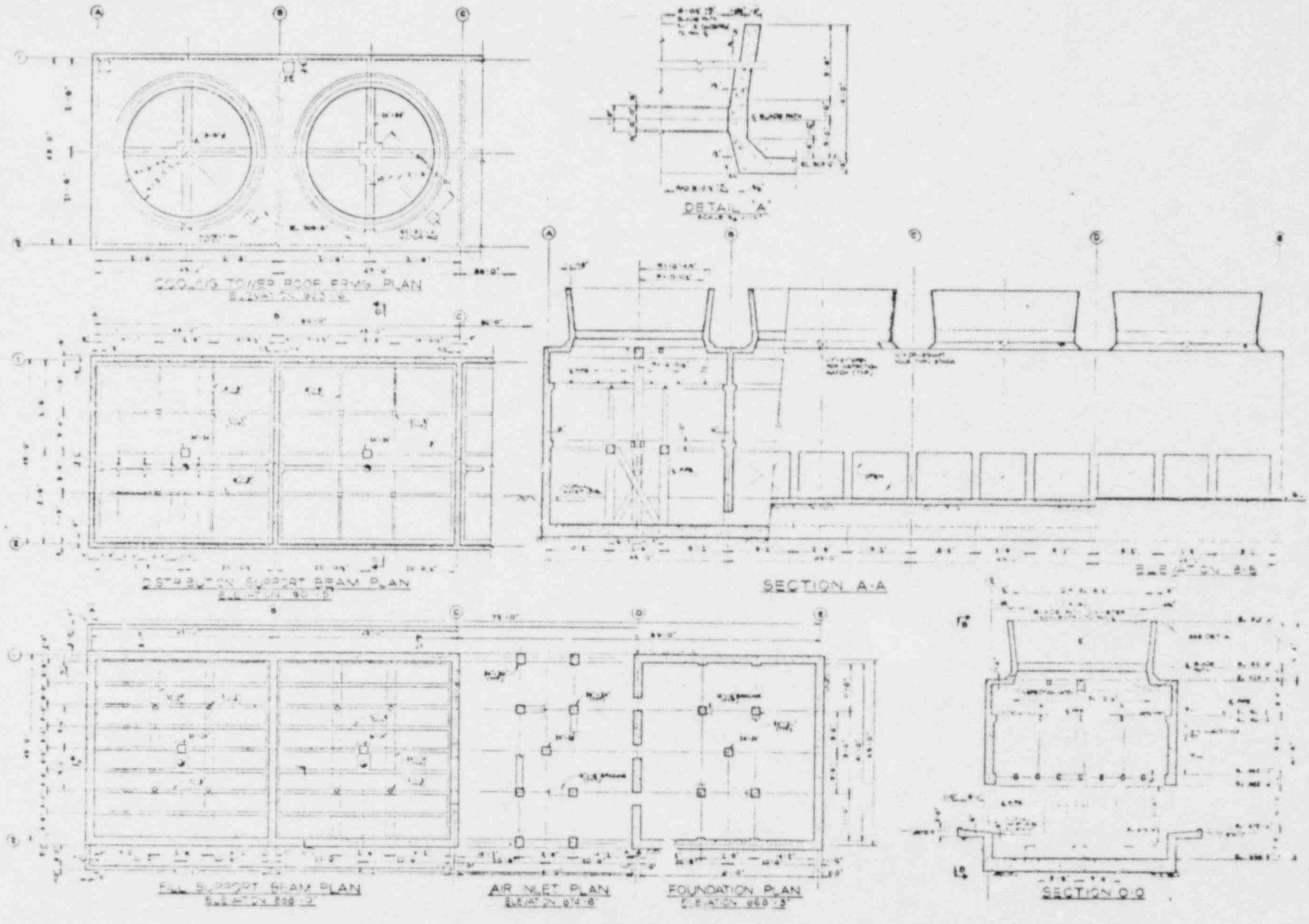
ALL DIAGONAL BRACINGS SHALL BE 2L3x3x¼ (T.O.S. EL. 700'-8" U.N.)

FIGURE 3.8-63



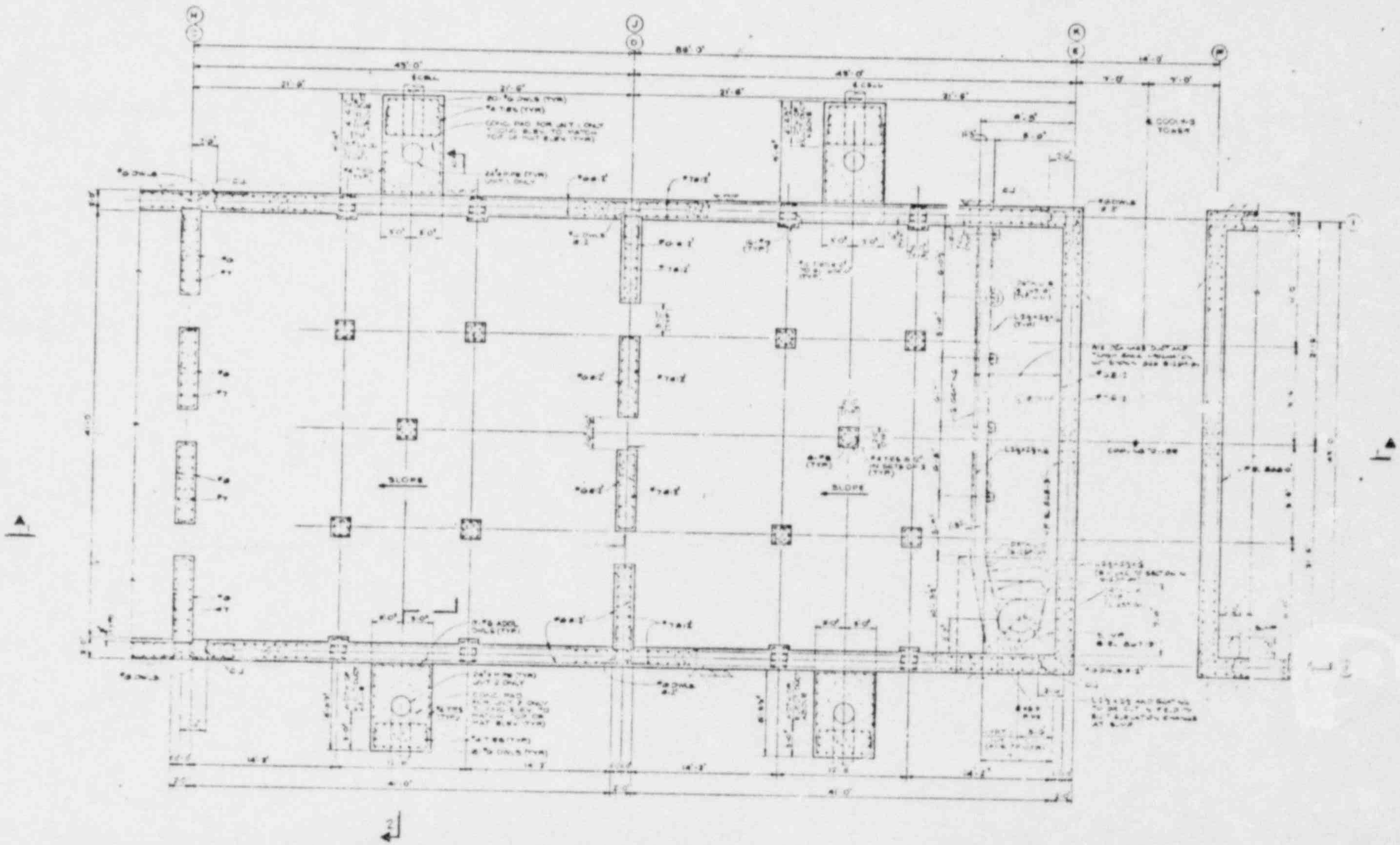
RIVER SCREEN HOUSE ROOF FRAMING PLAN

FIGURE 3.5-64



ESSENTIAL SERVICE COOLING TOWER

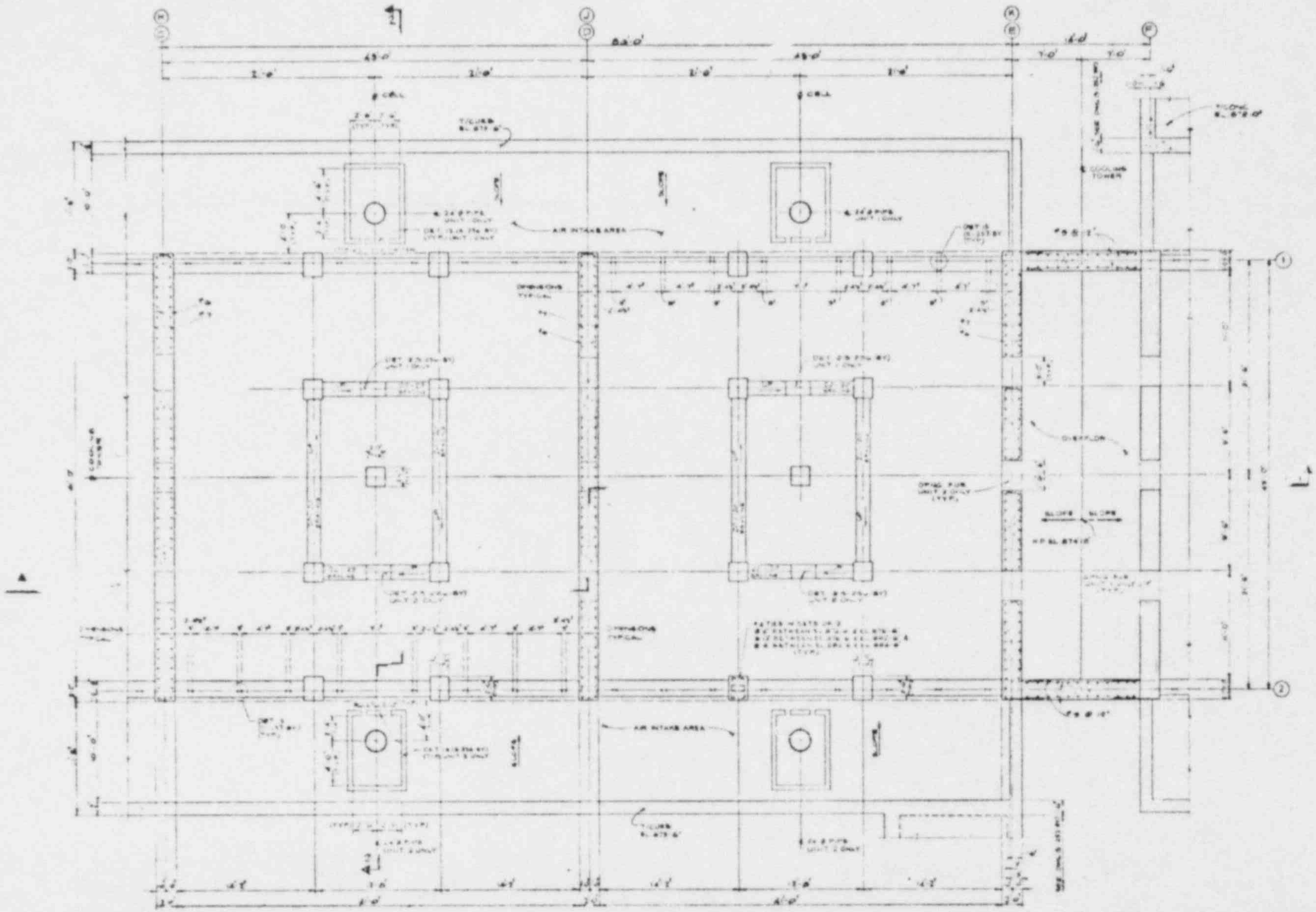
FIGURE 3.8-35



ESSENTIAL SERVICE COOLING TOWER

FOUNDATION PLAN ELEVATION 848'-3"

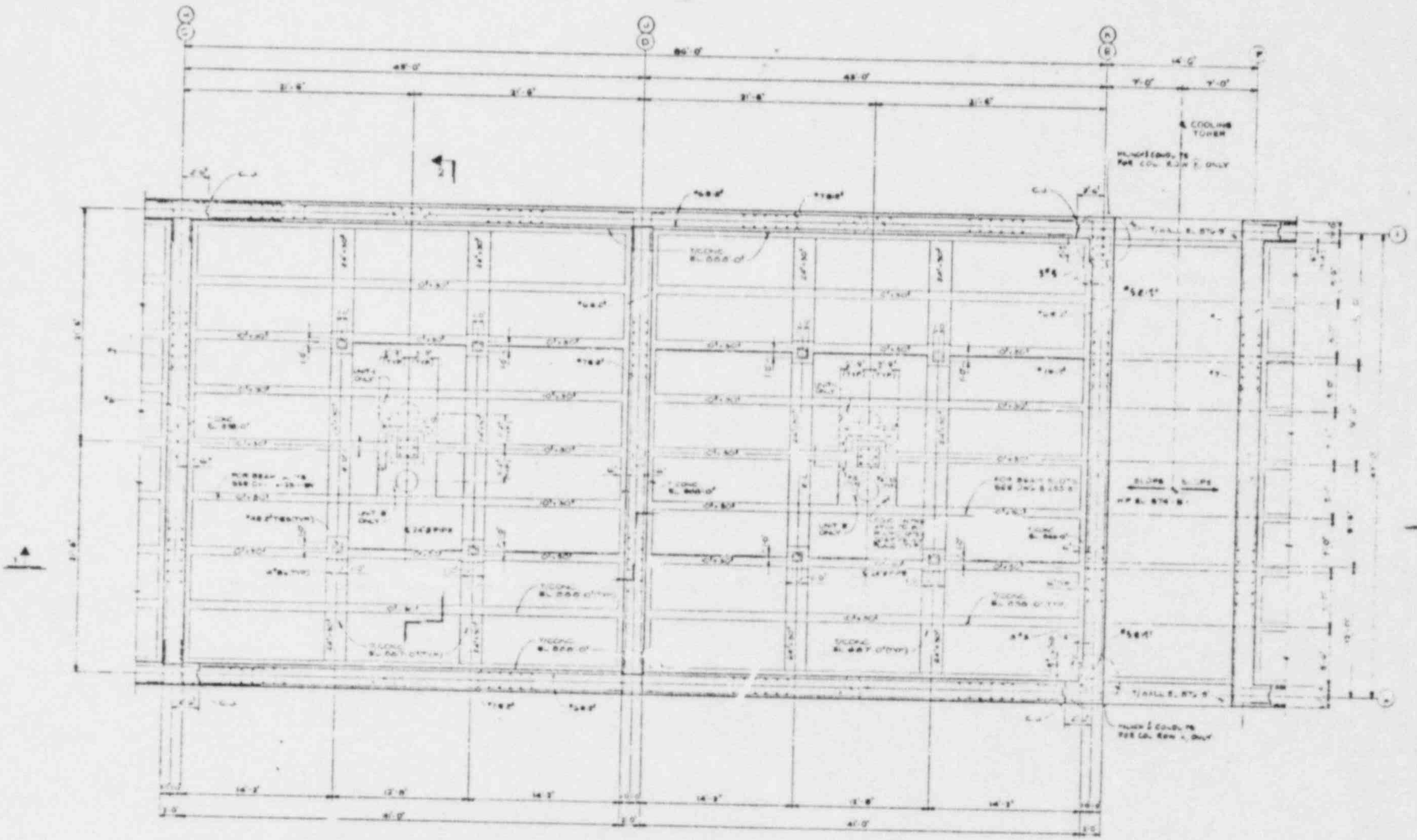
FIGURE 3.8-22



ESSENTIAL SERVICE COOLING TOWER

AIR INLET PLAN - EL 875.6

FIGURE 3.8-57

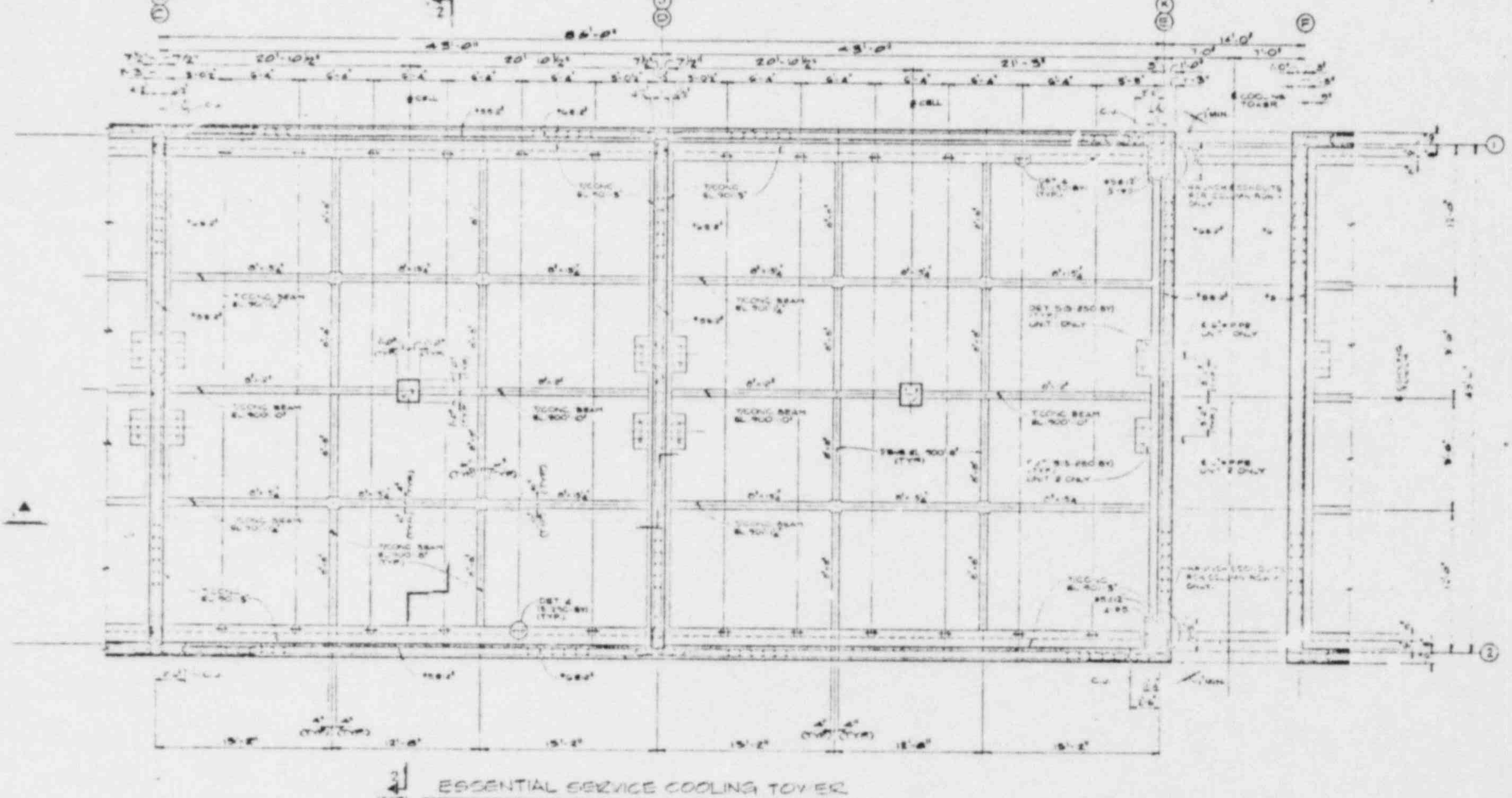


ESSENTIAL SERVICE COOLING TOWER

FILL SUPPORT - BEAM PLAN

ELEVATION 888'-0"(UN)

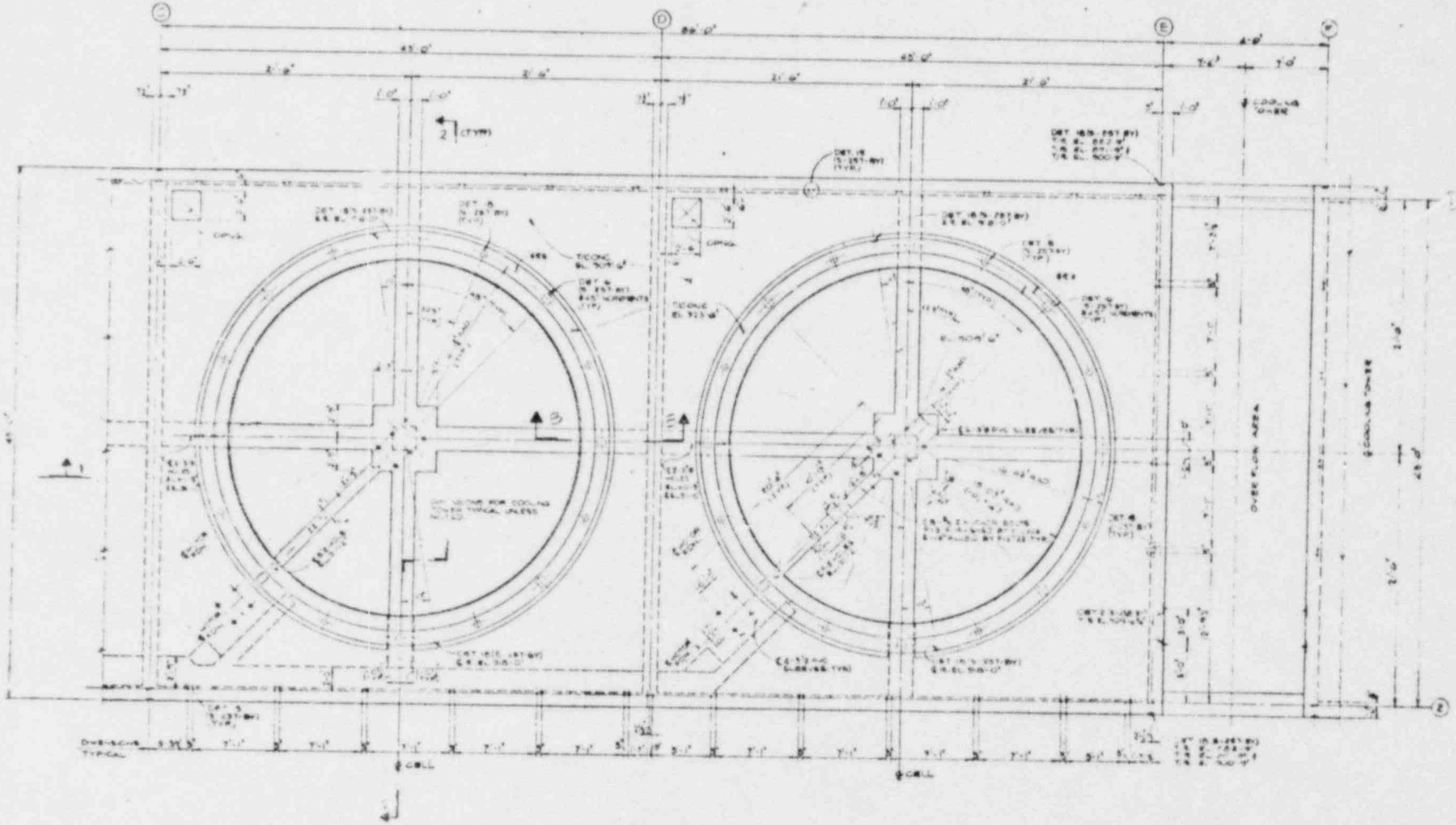
FIGURE 3.8-63



ESSENTIAL SERVICE COOLING TOWER

DISTRIBUTION SUPPORT BEAM PLAN

FIGURE 3.8-69



ESSENTIAL SERVICE COOLING TOWER ROOF FRAMING PLAN

FIGURE 2.5-70

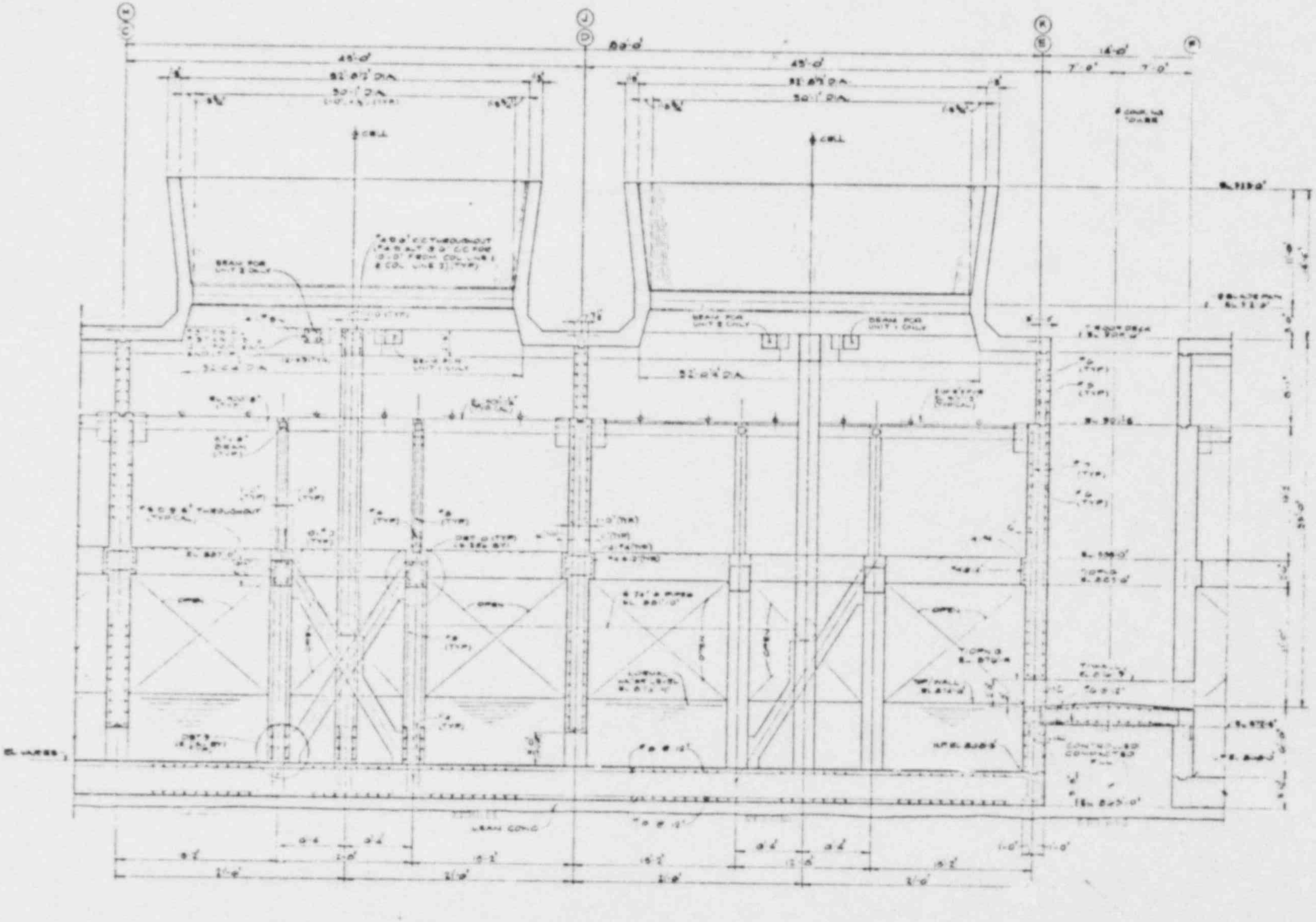
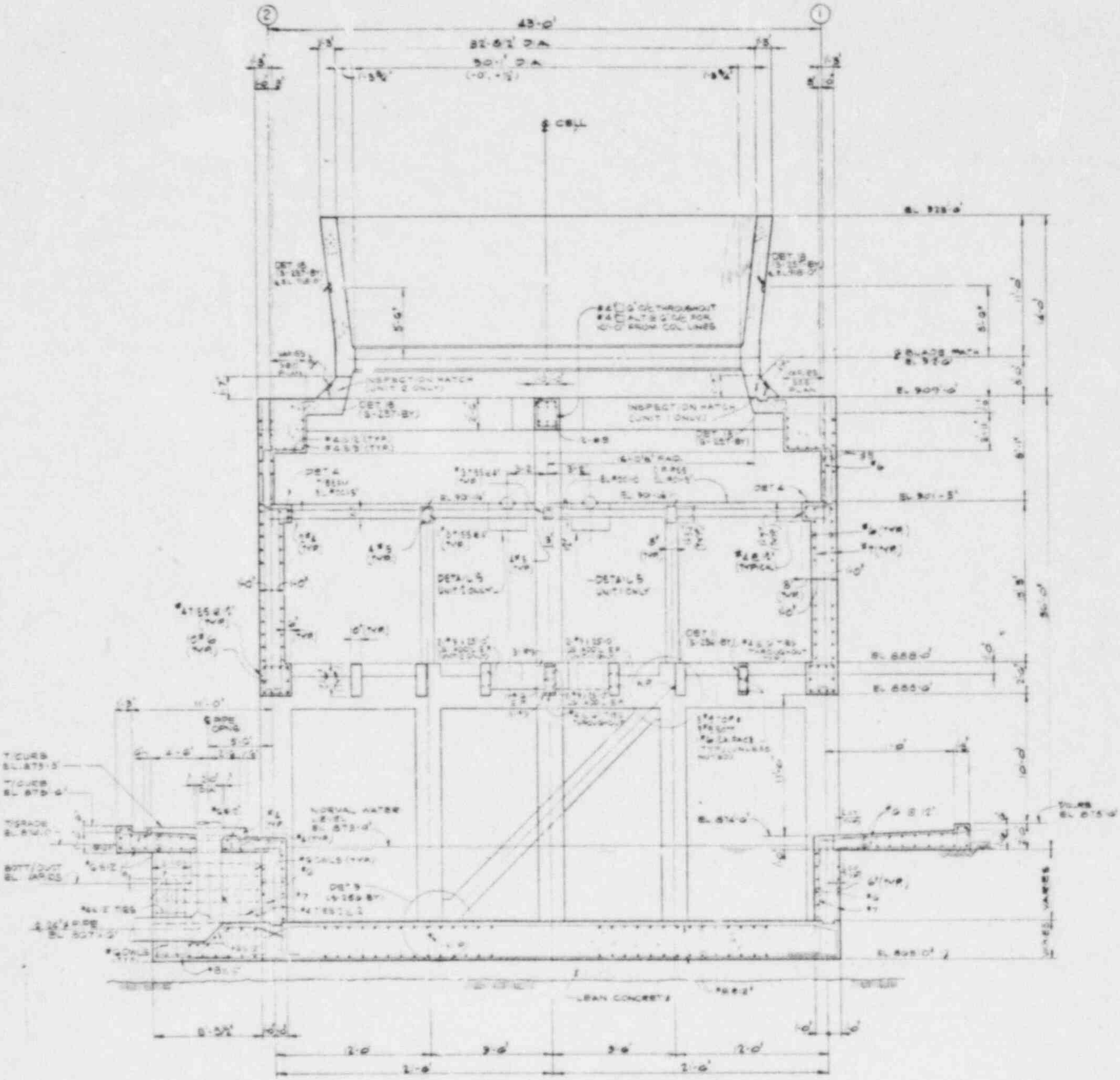
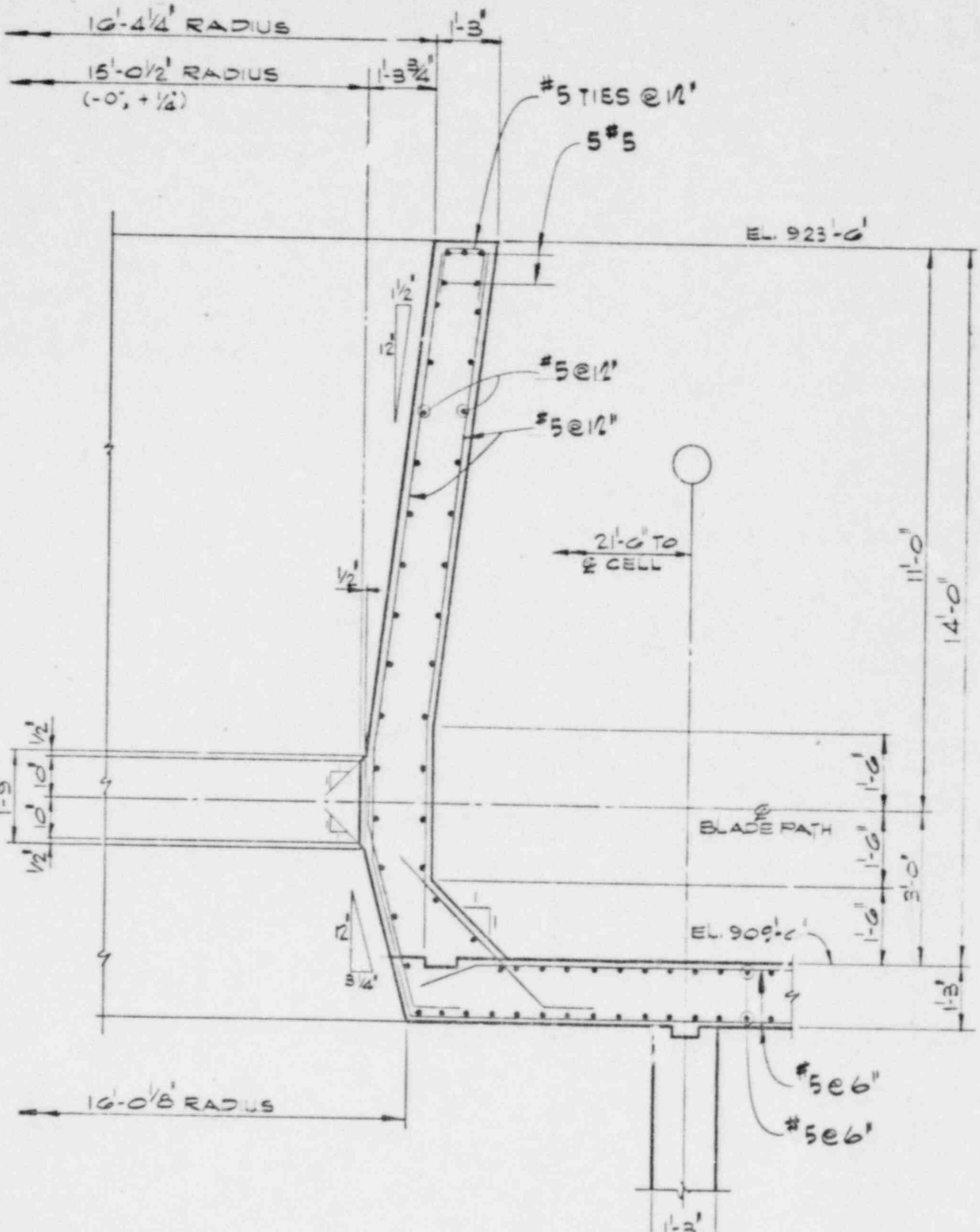


FIGURE 3.8-71



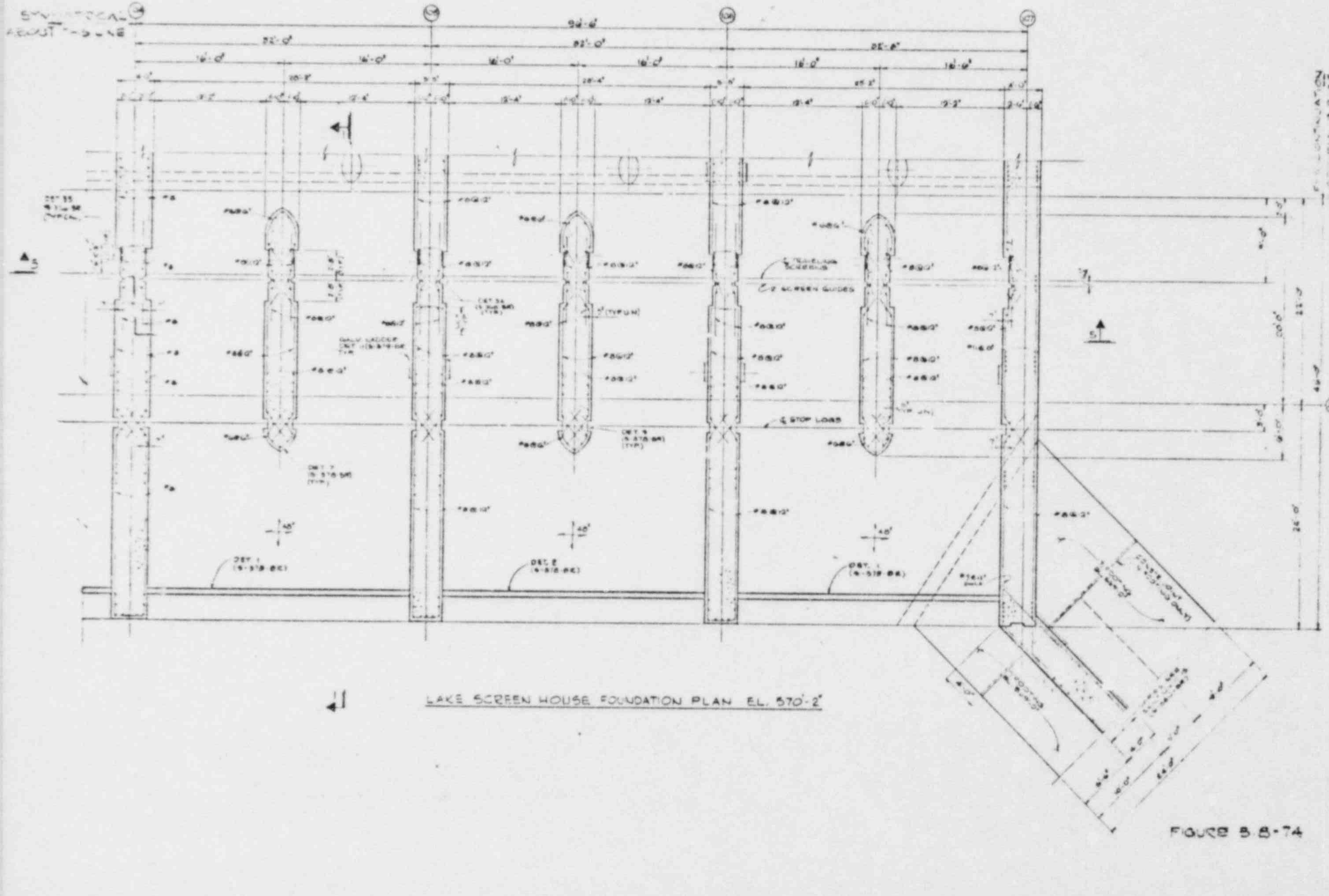
SECTION 2-2

FIGURE 3.8-72



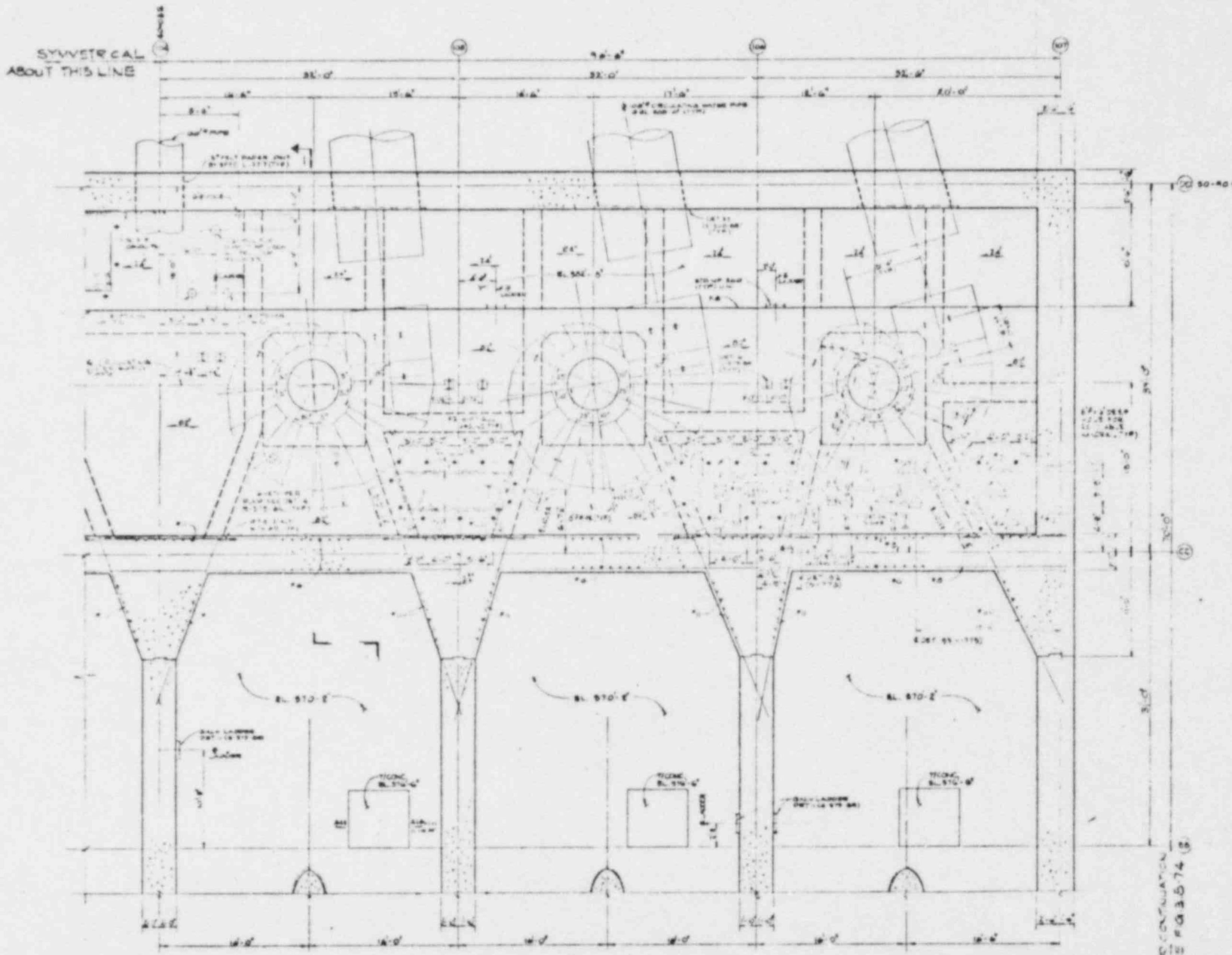
SECTION 3-3

FIGURE 3.8-73



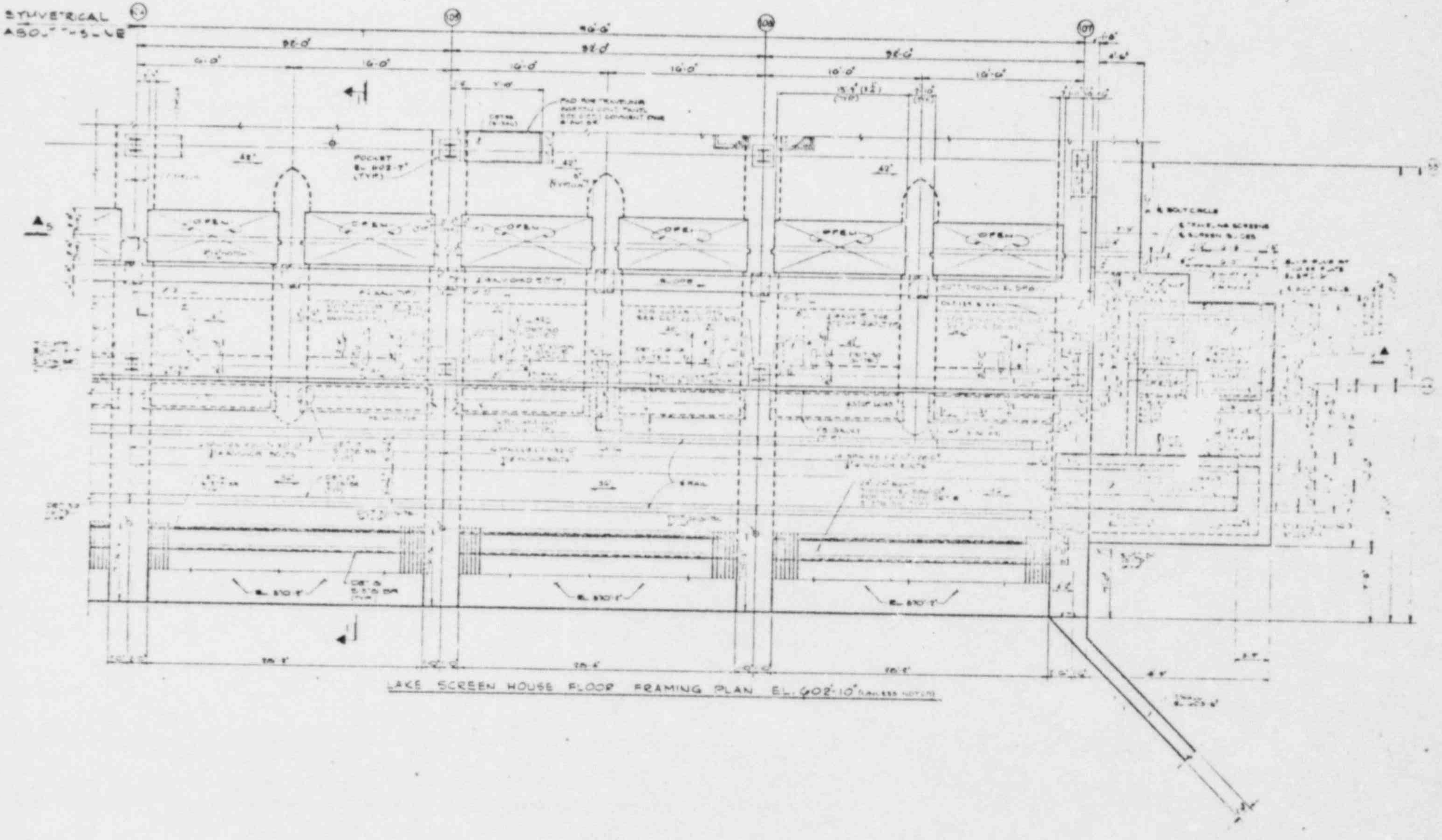
LAKE SCREEN HOUSE FOUNDATION PLAN EL. 570'-2"

FIGURE 3.8-74



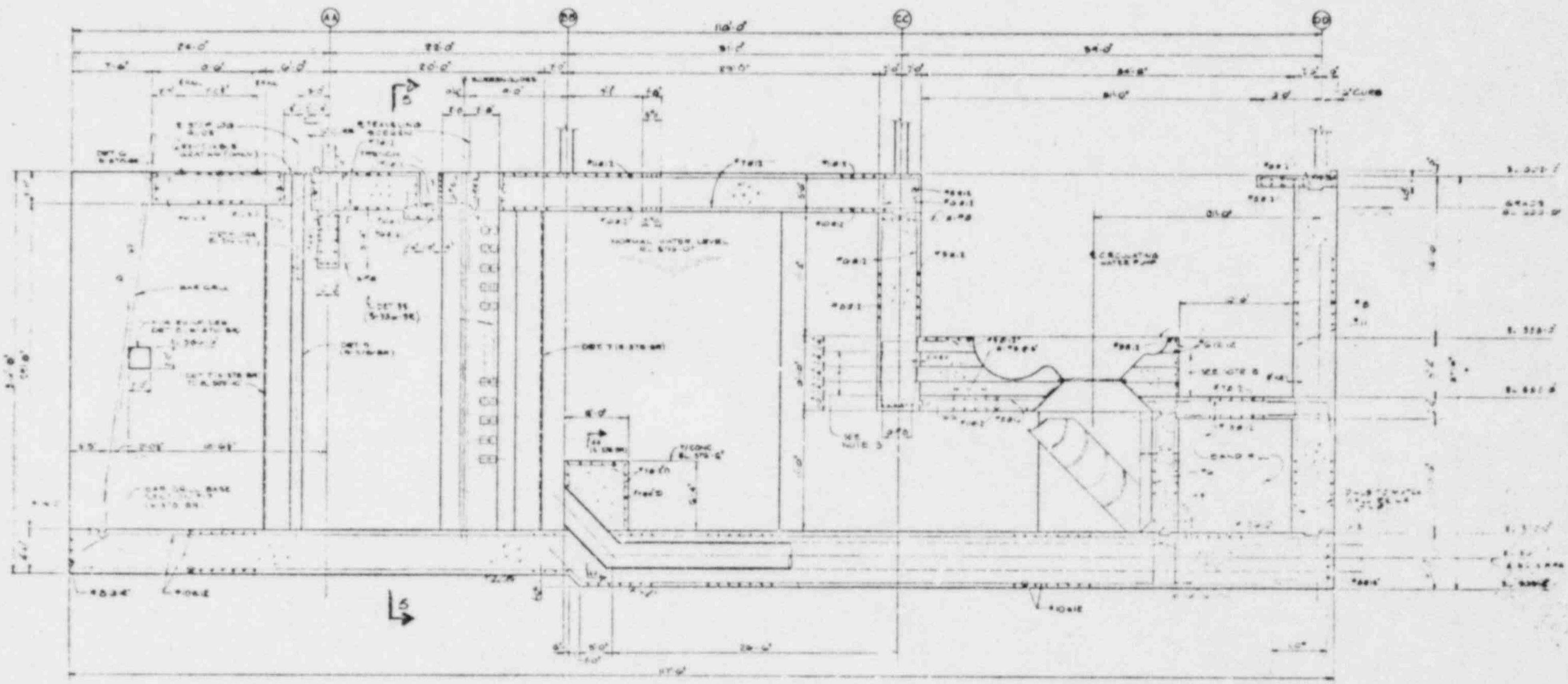
LAKE SCREEN HOUSE FLOOR FRAMING PLAN EL 598'-0" (UNLESS NOTED)

FIGURE 3.8-75



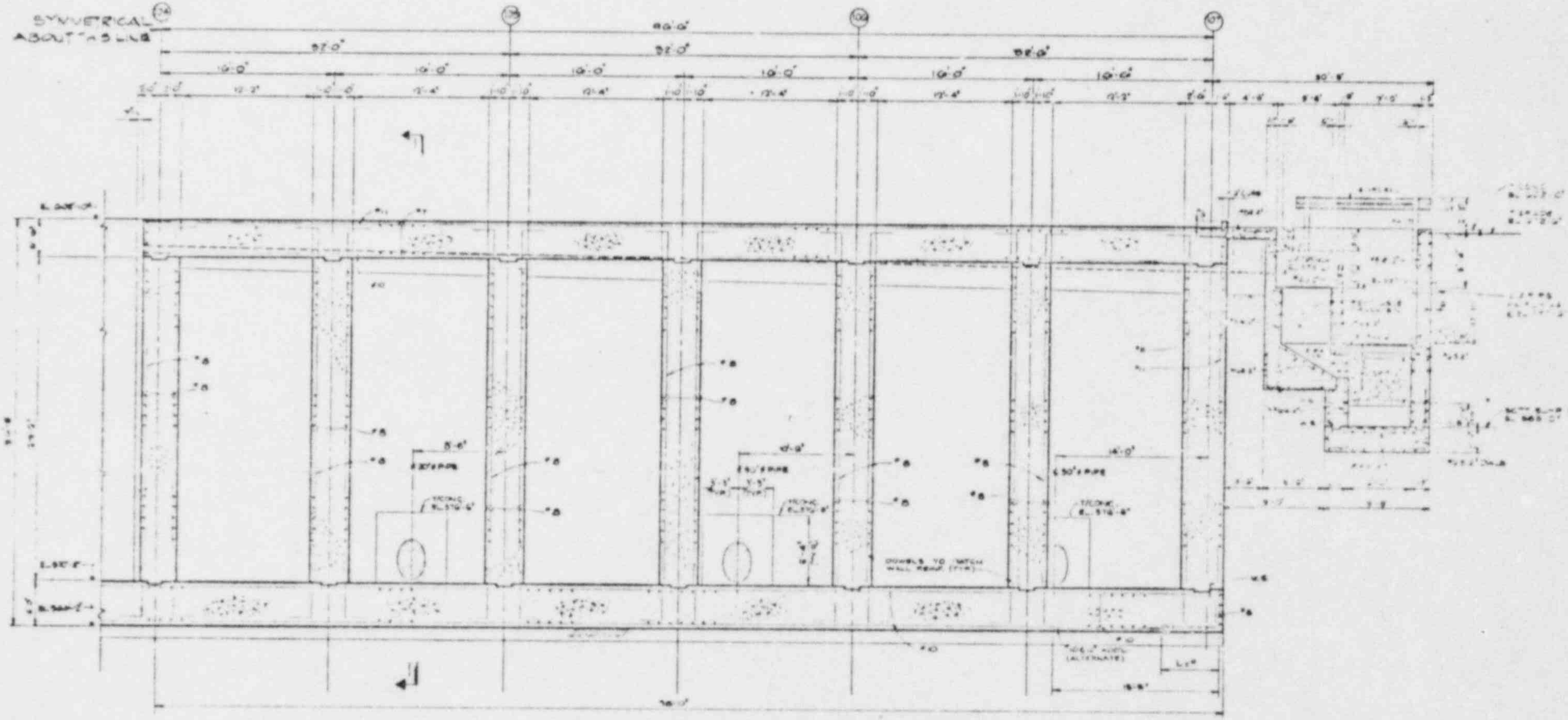
LAKE SCREEN HOUSE FLOOR FRAMING PLAN EL. 602'-10" (UNLESS NOTED)

FIGURE 3.5-73



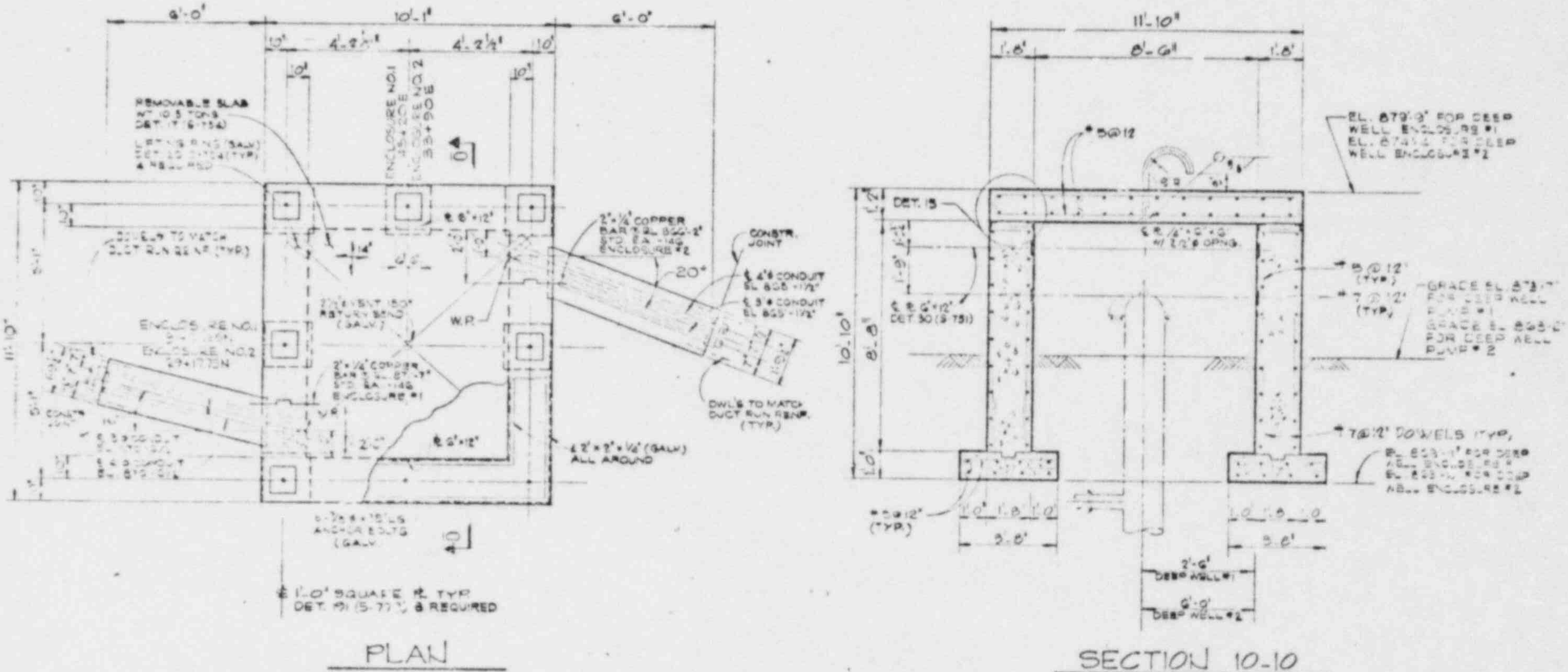
SECTION 1-1

FIGURE 3.8-77



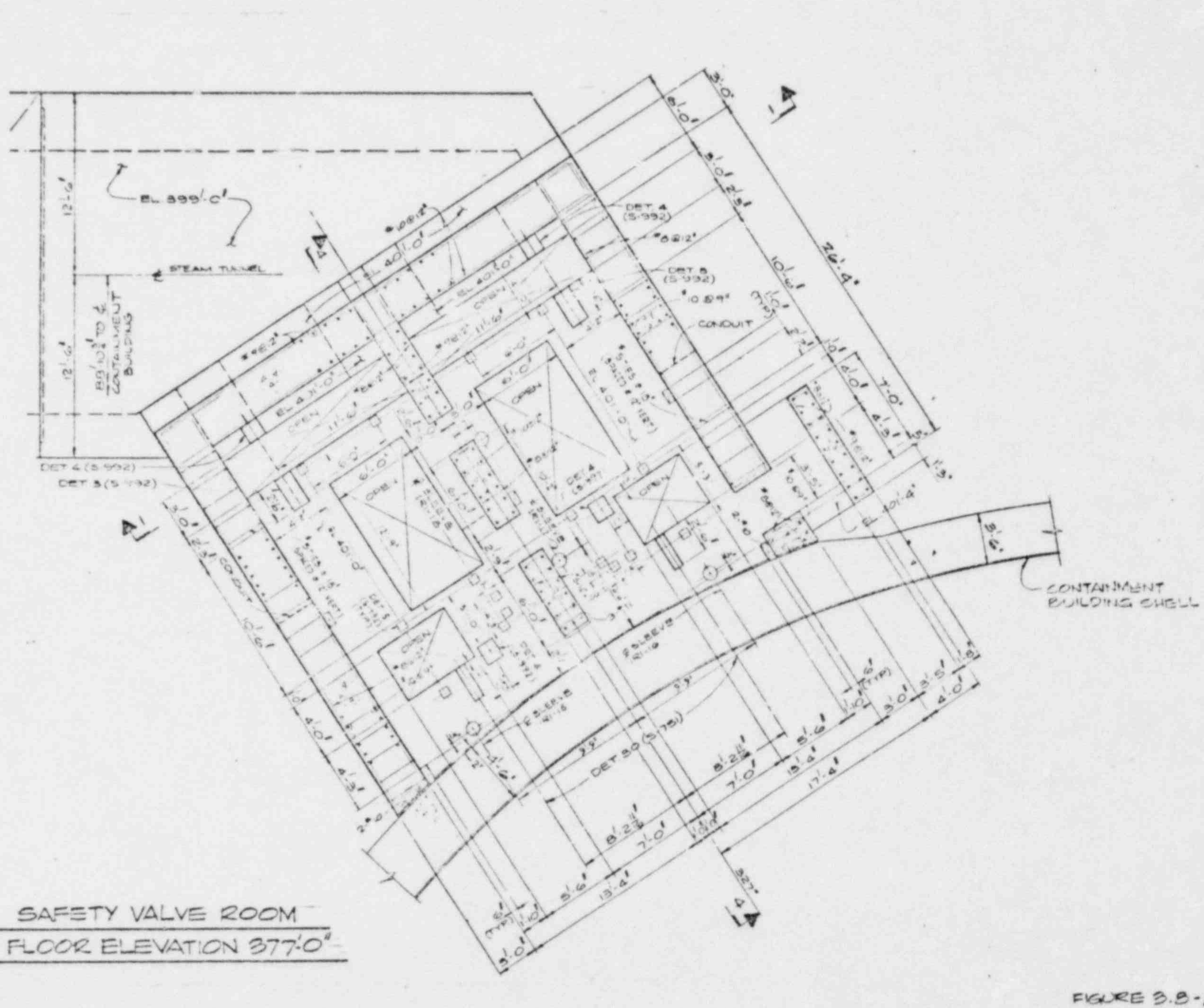
SECTION 5-5

FIGURE 3.8-78



DEEP WELL ENCLOSURES

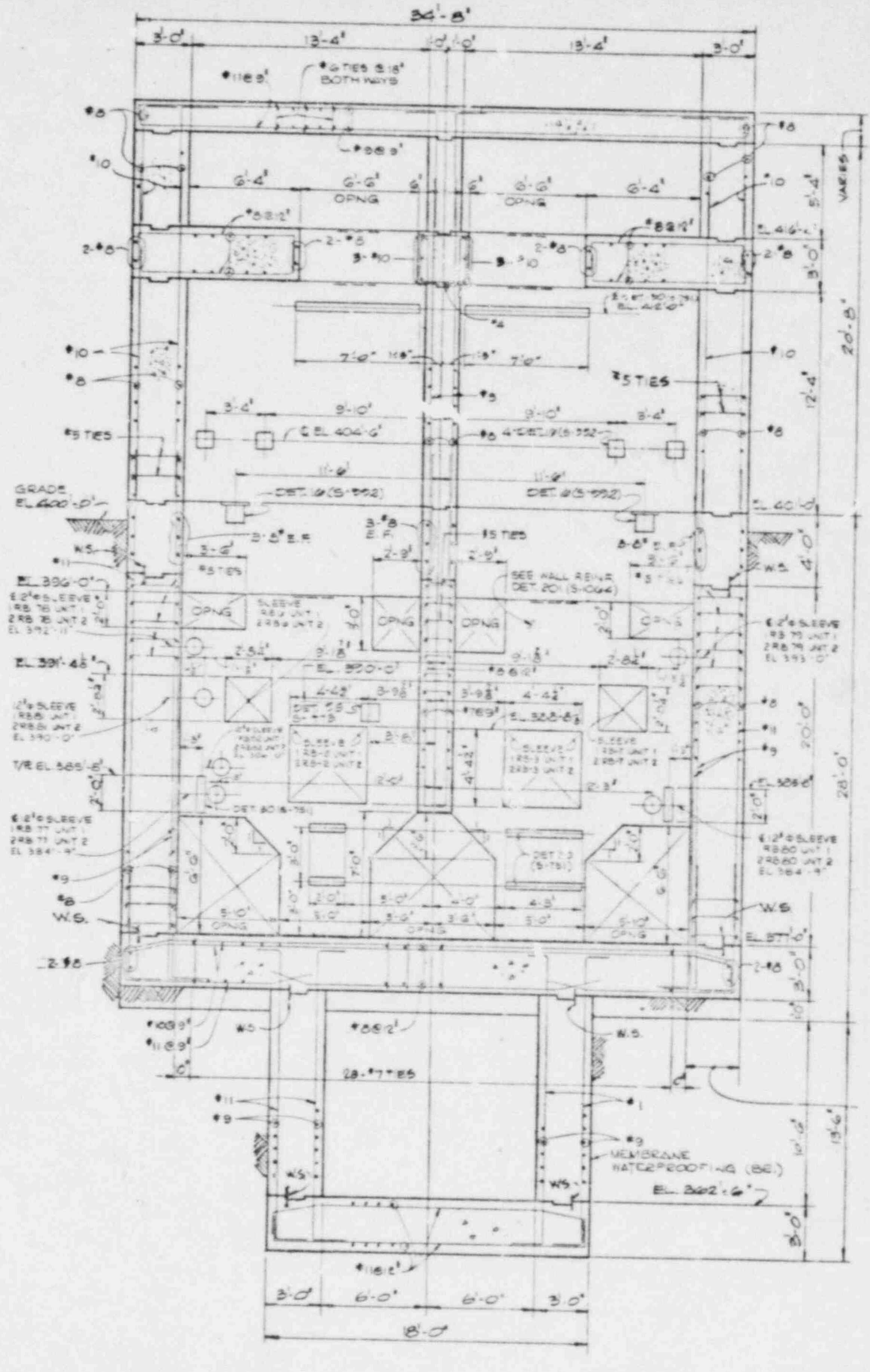
FIGURE 3.8-79



SAFETY VALVE ROOM

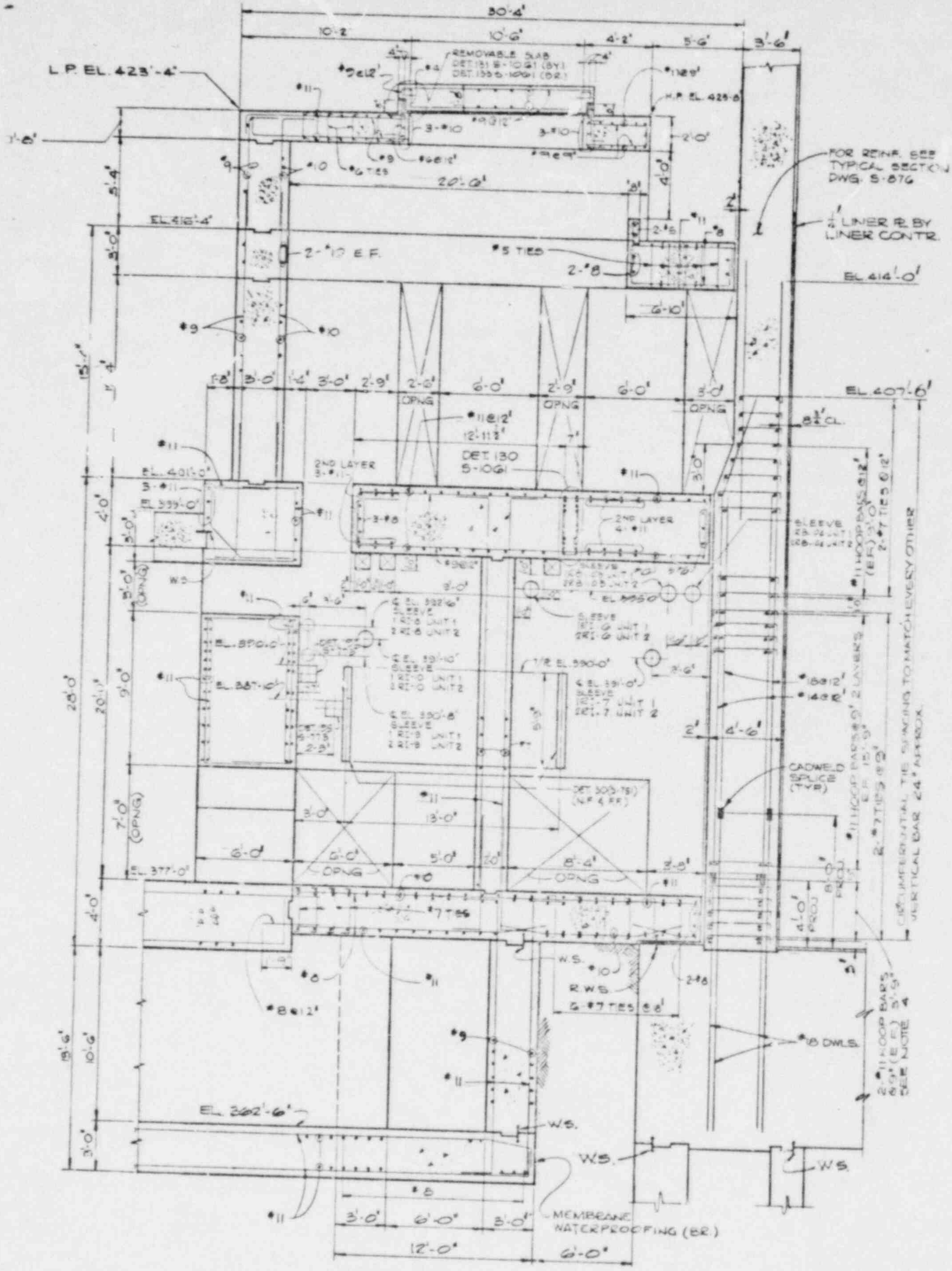
FLOOR ELEVATION 377'-0"

FIGURE 3.8-80



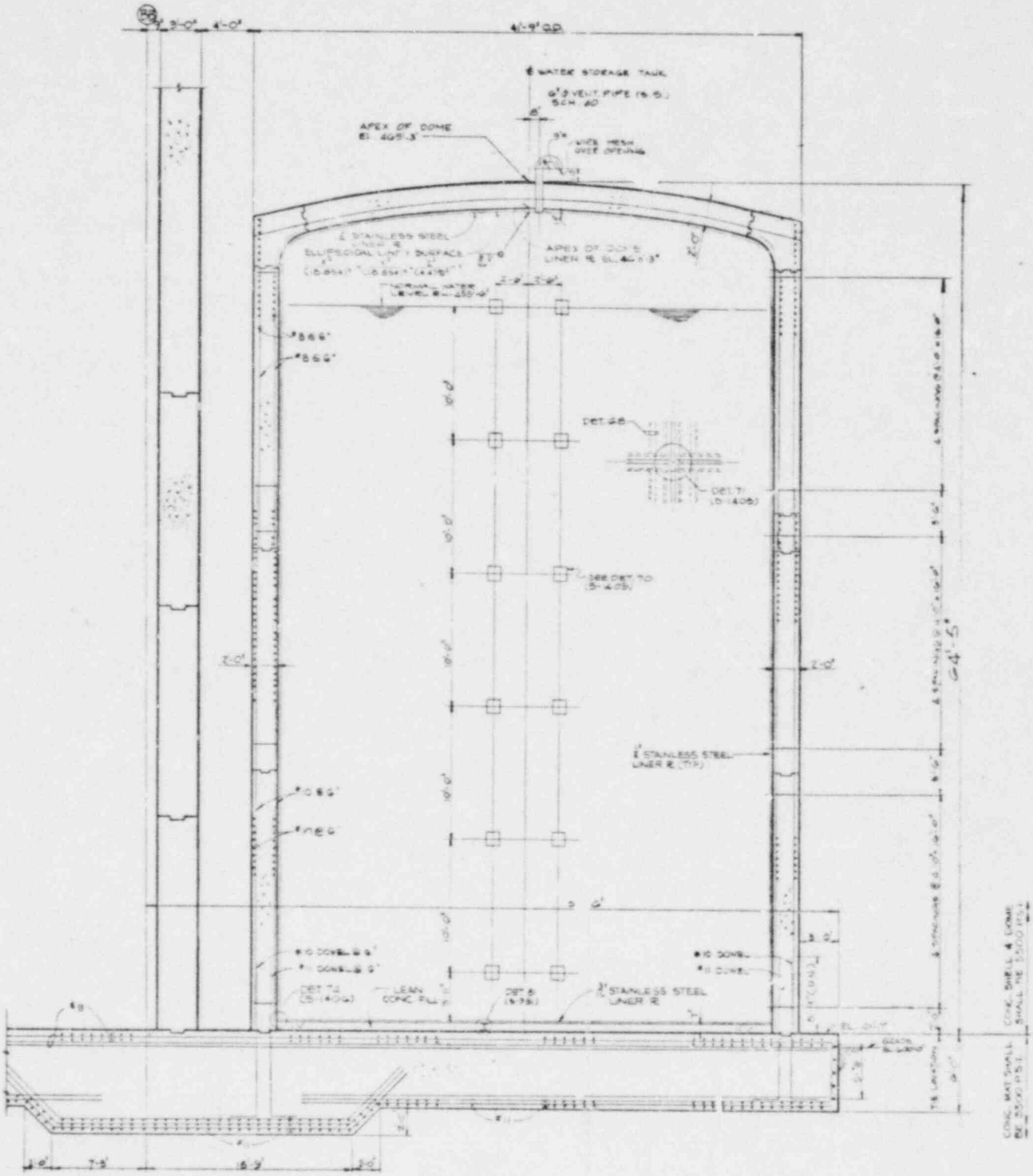
SECTION 1-1

FIGURE 3.8-81



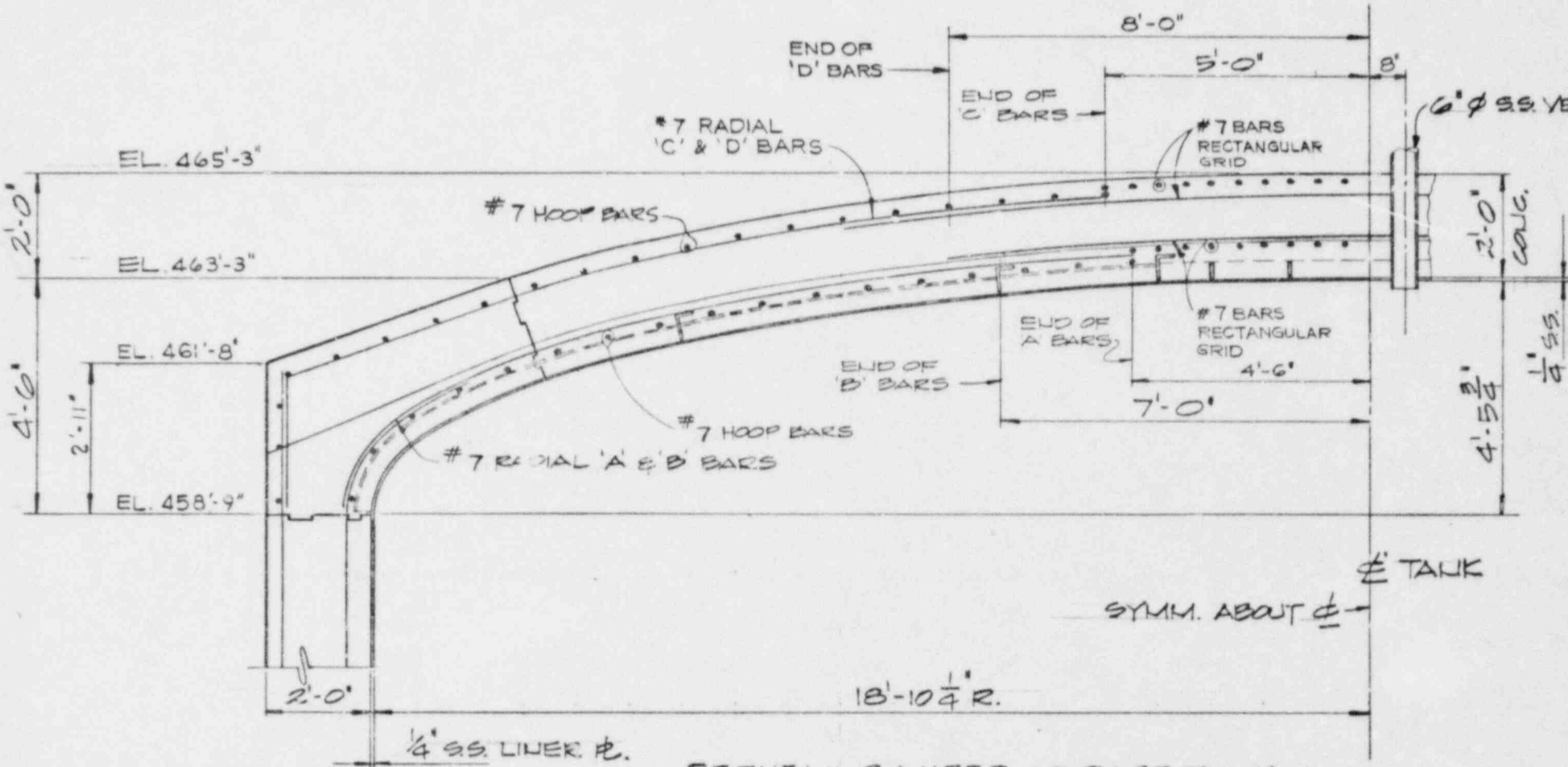
SECTION 4-4

FIGURE 3.8-82



REFUELING WATER STORAGE TANK

FIGURE 3.8-83



REFUELING WATER STORAGE TANK

TYPICAL DOME SECTION

FIGURE 3.8-84

ACTION ITEM 27: Response to Question 130.53

QUESTION 130.53

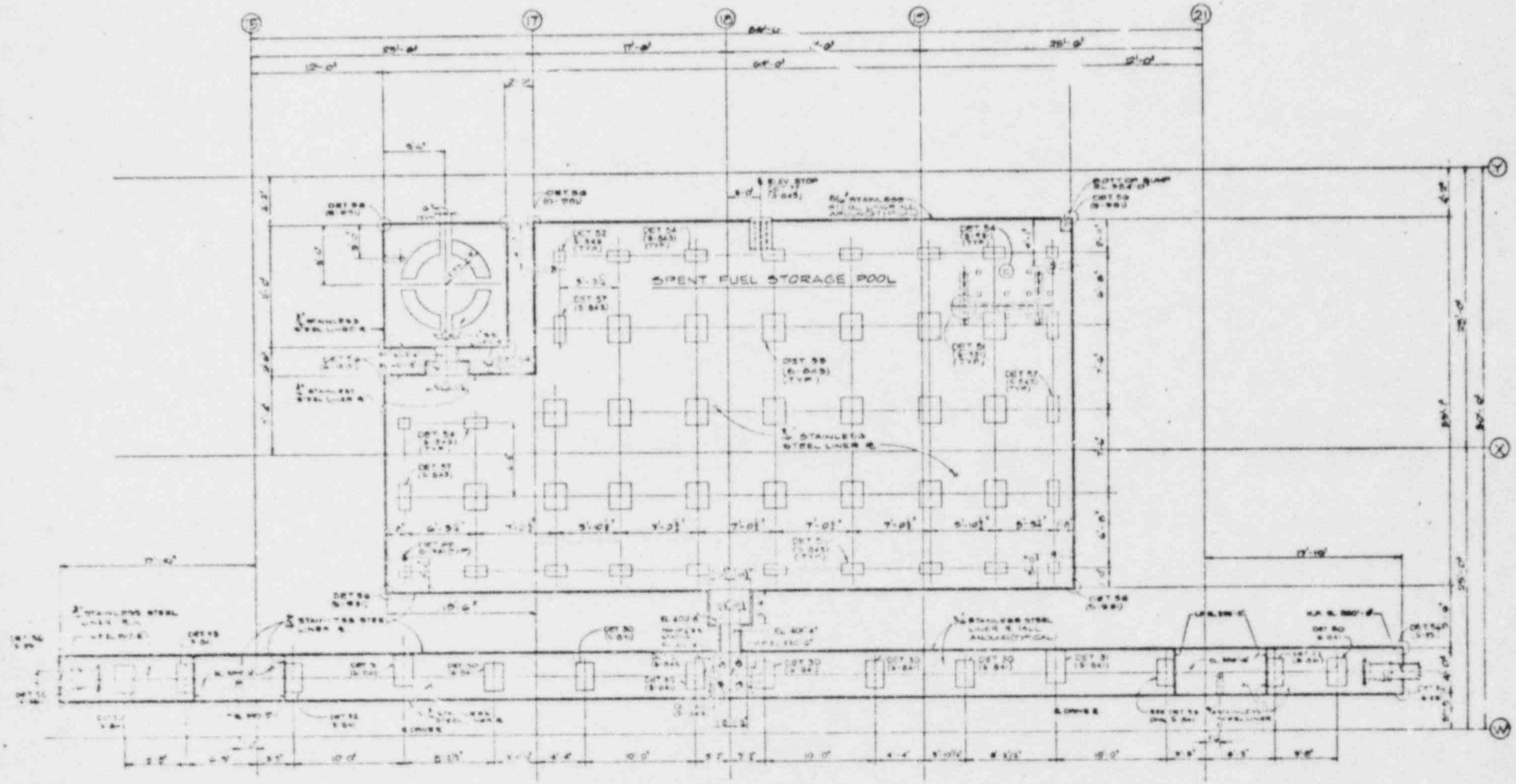
> "Because of the unique nature of their function the spent fuel pool racks require special design features. For this reason the Regulatory staff developed the technical position describing the requirements for their design (Attachment 7). State your conformance with this position or identify and justify any deviations therefrom."

RESPONSE

Appendix D of SRP 3.8.4 (Attachment to Q130.53) has been complied to with the following exceptions:

1. The cask drop has not been considered in the design of fuel pool because the rails of the fuel handling building crane do not permit the hook of the crane to travel over the spent fuel storage rack area. As stated in Subsection 9.1.2.2, the cask will not fall outside the cask storage area. Figure Q130.53-1 shows the spent fuel storage pool liner plan and Figure Q130.53-2 shows liner details.

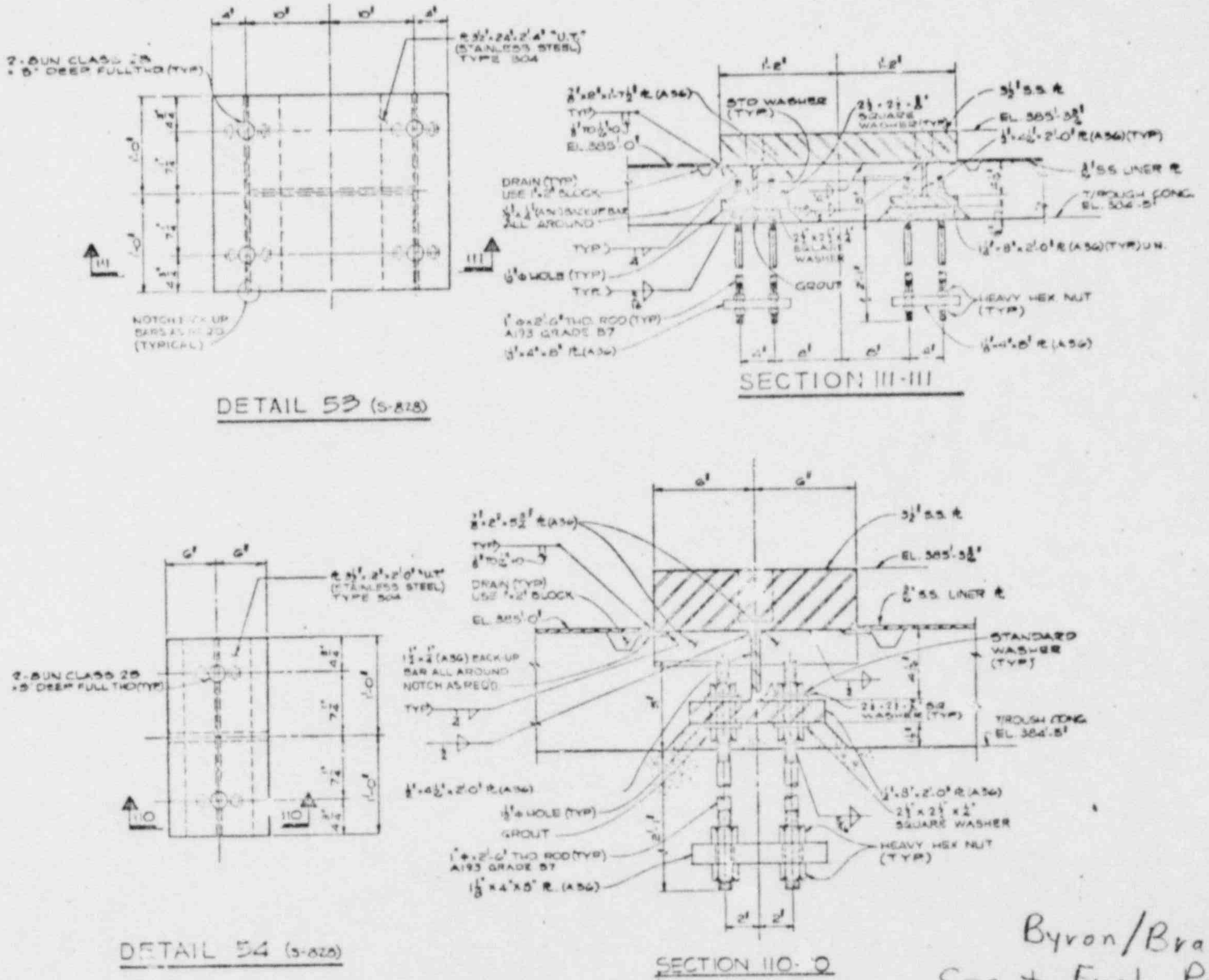
2. The maximum velocity of the fuel assembly for use in the impact analysis of the assembly with the guide tube has not been calculated from spectral velocity which is associated with frequency of the submerged fuel assembly. Instead, the maximum values of the velocity of the floor of the pool and the relative velocity of the rack with respect to the floor, have been combined on a SRSS basis to obtain the maximum value or velocity of the fuel assembly. This method of combination is reasonable because frequencies of vibration of the building and submerged rack are well separated, and since by this approach the multi-degree-of-freedom nonlinear response of the rack is considered in our analysis thorough a time history study.



Byron/Braidwood

SPENT FUEL STORAGE POOL LINER PLAN
ELEVATION 385'-0"

Figure Q130.53-1



Byron/Braidwood
Spent Fuel Pool Liner
Details
Figure Q130.53-2

BYRON/BRAIDWOOD

STRUCTURAL DESIGN AUDIT

OCTOBER 1981

ACTION ITEM 30:

Missile protection for manhole covers.

RESPONSE

Category I electrical manhole covers are being designed to provide protection from the tornado missiles required by SRP Section 3.5.1.4.