Duquesne Light

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May 3, 1982

Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Attn: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing
Washington, DC 20555

Reference: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
IE Bulletin 80-11

Gentlemen:

This letter forwards the additional information for IE Bulletin 80-11, "Masonry Wall Design" as requested by your letter dated March 23, 1982.

If you have any questions, please contact my office.

Very truly yours,

J. J. Carey/RFB

J. J. Carey
Vice President, Nuclear

Attachment

cc: Mr. W. M. Troskoski, Resident Inspector
U. S. Nuclear Regulatory Commission
Beaver Valley Power Station
Shippingport, PA 15077

U. S. Nuclear Regulatory Commission
c/o Document Management Branch
Washington, DC 20555

Mr. Ronald C. Haynes, Regional Administrator
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement, Region 1
631 Park Avenue
King of Prussia, Pennsylvania 19406

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Beaver Valley Power Station - Unit 1

April 30, 1982

The following is provided as the response to the NRC request for additional information dated March 23, 1982. This report provides a reprint of each of the seven (7) staff questions with the applicable response following the question.

1. Attachment D of Reference 4 gives the values for allowable bending stresses (66.7, 53.2, 22.8) and shear stresses (72.2, 57.3, 40.9). These values deviate from the respective allowables calculated using Table 10.1 of ACI 531-79 [10] using the m_0 and f_m' values specified by the Licensee in Table 3.1 of Reference 7. Provide proper justification for these deviations. Also, explain why different allowable stresses are used in Attachment D [4] for the cable vault for the same type of masonry (m_0 = 2500 psi, f_m' = 1500 psi).

1. The values for allowable bending stresses and shear stresses given in Attachment D of Reference 4 are based upon Table 10.1 of ACI 531-79. The allowables calculated in accordance with Table 10.1 of ACI 531-79 using the values for m_o and f'm specified in Table 3.1 of Reference 7 are increased by factors of 1.33 and 1.67 to obtain the allowables for the OBE and DBE cases respectively.

The values shown in Attachment D of Reference 4 reflect the worst case difference between actual and allowable stresses for the given loading conditions. Loading due to OBE conditions was found to govern for walls 4 through 7 of the Cable Vault Building. Thus the allowable stresses shown for these walls are allowables for OBE loading conditions while other allowable stresses shown in Attachment D(4) are allowables for DBE conditions.

2. With reference to Section 5.1 of Attachment 3, Reference 7, provide justification for an increase factor of 1.67 for extreme environmental loads to obtain the allowable stresses. The SEB criteria [8] allow an increase factor of 1.3 for tension normal to the bed joint and masonry sheaf and 1.5 for tension parallel to the bed joint and reinforcement shear for the case of extreme environmental loads.

2. Section 5.1 of Attachment H Reference 7 states that allowable stresses for reevaluation analysis of masonry walls shall be those given in Table 10.1 of the ACI 531-79 with a 1/3 increase for severe environmental loads and a 1.67 increase for extreme environmental loads.

The 1/3 increase in allowable stress for severe environmental loads is in keeping with ACI 531-79 and the Beaver Valley Power Station Unit No. 1 Final Safety Analysis Report (FSAR).

The increase factor of 1.67 for extreme environmental loads (DBE conditions) was arrived at after an investigation of the basis for the allowables given in Table 10.1 of ACI 531-79. A review of NCMA test results used to determine code allowables indicated that large factors of safety were used in determining allowable stresses from ultimate values.

For tension normal to the bed joint the NCMA Specifications give a summary of static monotonic tests performed to determine code allowables. Twenty-seven tests were performed on uniformly loaded single-wythe hollow block walls. Based upon ultimate stresses obtained in these tests and corresponding allowable stresses from Table 10 1 of ACI 531-7 the average safety factor obtained was 4.0.

The minimum factors of safety based upon these same tests were still found to be relatively high. Tests performed on composite walls, which

were greater than 75% solid material, indicated comparable factors of safety for allowable-tensile stresses for solid masonry walls.

Overall the allowable stresses from Table 10.1 of ACI 531.79 have a factor of safety of 2.8 with respect to the lower bound of static tests for unfactored loads. Therefore an increase of 1.67 for factored loads during extreme environmental conditions is considered reasonable. Allowable stresses obtained using this increase factor are still adequately far from the ultimate stress.

For tension parallel to the bed joints the results of NCMA tests on 43 walls containing no joint reinforcement indicated an average factor of safety of 5.3. On the basis of this safety factor the allowable stresses for this case could have been increased by a factor greater than 1.67. However, the 1.67 factor was kept for the purpose of uniformity.

The following table represents our minimum Factor of Safety (F.S.) based on the above NCMA test results for tension perpendicular (I) and parallel (II) to the bed joints.

	Mortar Type	Block Type	Avg. F.S.	Min. F.S.	Avg. F.S. W/1.67 incr.	Min. F.S. W/1.67 incr.
Tension I Bed Joint	M	Hollow	4.0	3.87	2.40	2.32
	S	Hollow	4.0	2.60	2.40	1.56
	N	Hollow	4.0	2.81	2.40	1.68
	S	Solid	4.0	2.33	2.32	1.40
Tension II Bed Joint	M,N,O	Hollow	5.3		3.17	
	M,N,O	Hollow (Load Applied at Center)	6.08	3.59	3.64	2.15

$$F.S. = \frac{\text{Ultimate Stress}}{\text{Allowable Stress}}$$

The 1.67 increase factor is felt to be particularly reasonable in light of other conservatisms taken in the analyses. These include loading application of peak response as uniform rather than sinusoidal, the use of equipment amplified response spectra (ARS) consistent with damping values for piping and equipment rather than high damping specified by Regulatory Guide 1.61 for reinforced concrete, and the use of peak response upon reaching the cut-off frequency for a given wall. Upon

reviewing these conservative measures as well as the high safety factors built into Table 10.1 of ACI 531.79, the increase factors outlined in the SEB would seem to be too highly conservative.

3. With reference to Attachment D of Reference 4 and Section 2.0 of attachment E, Reference 7, provide sample calculations to indicate the following:

   a. how collar joint stresses were determined

   b. how the effect of higher modes were considered

   c. how the temperature and pressure differential loads were calculated

   d. how the boundary conditions were represented

   e. how the effects of wall openings were considered.

3a. How collar joint stresses were determined.

For walls with multiple wythes, the bending of the wall creates shear stress in bending in between the wythes; that is, at the collar joint. This shear stress was calculated by using the following equation:

$$\tau = \frac{VQ}{Ib}$$

where

V = shear force applied at section

Q = statical moment of a wythe about the neutral axis of the wall

I = moment of inertia of the section under consideration

b = width of the section of the wall being analyzed.

(attached is a copy of collar joint stress calculations - Attachment 3-A-1)

A5010.61	S.O./W.O./CALCULATION NO. 1232732-5(8) - AB-2-5	REVISION 0	PAGE 94
PREPARER/DATE FIGH ANTONELLI 12/12/80	REVIEWER/CHECKER/DATE C.E. SHAH 12-12-80	INDEPENDENT REVIEWER/DATE C.E. SHAH 12-12-80	
SUBJECT/TITLE MASONRY WALL ANALYSIS IE 80-11 HUA BLDG. AB 2-5		QA CATEGORY/CODE CLASS I / NSR	

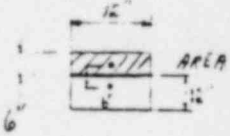
ATTACHMENT 3-A-1

CALCULATE SHEAR STRESSES (IN BED JOINTS (f_v) & COLLAR JOINTS (f_y))

DBE CASE

WALL INERTIA $f_v = \dfrac{V_{max}}{c \cdot \tau}$ $b = 12"$ $\tau = 12$ — ATTACH. AB 2-5C

$V_{max} = 636.76^{\#}$ FROM ANSYS RUN = AGE:IE3



$f_v = \dfrac{636.76}{12 \times 12} = 2.95$ psi

$f_y = \dfrac{Q V_{max}}{Ib}$ $Q = (12" \cdot 6") \times 6 = 432$ in^3 (AREA)

$I = 5832$ in^3 $b = 12"$

$\dfrac{Q}{Ib} = \dfrac{432}{5832 \cdot 12} = 0.006172$ $\frac{1}{in^2}$

$f_y = 0.006172 (636.76) = 3.93$ psi

EQUIPMENT INERTIA

$V_{MAX} = 503.37^{\#}$ FROM ANSYS RUN = AGE:IE3
ATTACH AB 2-5C

$f_v = \dfrac{503.37}{12 \times 18} = 2.33$ psi

$f_y = \dfrac{Q}{Ib}$ 503.37 = 3.11 psi

INTERSTORY DISPL. $V_{max} = 8.47^{\#}$

$f_v = \dfrac{8.47}{12 \times 18} = 0.04$ psi

$f_y = \dfrac{Q}{Ib}$ 8.47 = 0.05 psi

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13247.32-S(2)-AB-2-5	0	95

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
Rich Antonelli 12/11/80	C.K. SHAH 12-12-80	C.K. SHAH 12-12-80

SUBJECT/TITLE: Masonry Wall Analysis IE 80-11 Aux. Bldg. AB2-5

QA CATEGORY/CODE CLASS: I/NSR

OBE CASE

WALL INERTIA

$V_{max} = 269.4$ " FROM ANSYS RUN # AQE06CB @ NODE 63

ATTACH AB 2-5D

$f_z = \frac{269.4}{12 \times 18} = 1.25$ g's

$f_y = \frac{Q}{Ib} \cdot 269.4 = 1.66$ g's

EQUIPMENT INERTIA

$V_{max} = \frac{0.1736}{0.2}(503.37) = 436.93$ "

FROM ANSYS RUN # AQE20I3

$f_z = \frac{436.93}{12 \times 18} = 2.02$ g's

ATTACH. AB 2-5C

$f_y = \frac{Q}{Ib} \times 436.93 = 2.7$ g's

INTERSTORY DISPL.

$V_{max} = 4.56$ "

$f_z = \frac{4.56}{12 \times 18} = 0.02$ g's

$f_y = \frac{2}{Ib} \times 4.56 = 0.03$ g's

PREPARER / DATE	REVIEWER / CHECKER / DATE	INDEPENDENT REVIEWER / DATE
PIER ANTONELLI 12/11/80	C. K. SHAH 12-12-80	C. K. SHAH 12-12-80

SUBJECT / TITLE: "G" SCANRY WALL ANALYSIS TE 80-11 AUX BLDG. AB 2-5

QA CATEGORY / CODE CLASS: I/N-R

ALLOWABLE STRESSES

BENDING STRESSES ⊥ TO BED JOINTS

$$F_t = 1.0\sqrt{m_0} = 1.0\sqrt{2500} = 50 > 40 \text{ psi} \quad \therefore \text{USE } 40 \text{ psi}$$

PER ACI 531-79 TABLE 10.1

$$F_{t_{OBE}} = \frac{4}{3}(40) = 53.33 \text{ psi} \quad \text{(REF: DESIGN CRITERIA)}$$

$$F_{t_{DBE}} = \frac{5}{3}(40) = 66.67 \text{ psi}$$

SHEAR STRESSES IN BED JOINTS

$$v_m = 1.1\sqrt{f'_m} \quad \text{PER ACI 531-79 TABLE 10.1}$$

$$v_m = 1.1\sqrt{1550} = 43.3 < 50 \quad \therefore \text{USE } 43.3 \text{ psi}$$

$$v_{m_{OBE}} = \frac{4}{3}(43.3) = 57.73 \text{ psi} \quad \text{(REF: DESIGN CRITERIA)}$$

$$v_{m_{DBE}} = \frac{5}{3}(43.3) = 72.17 \text{ psi}$$

SHEAR STRESS IN WYTHES

$$v_{OBE} = 8 \text{ psi} \quad \text{(REF: DESIGN CRITERIA)}$$

$$v_{DBE} = 12 \text{ psi}$$

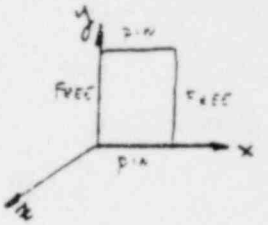
PREPARER / DATE	REVIEWER / CHECKER / DATE	INDEPENDENT REVIEWER / DATE
RICH ANTONELLI 12/11/80	C. K. SHAH 12-12-80	C. K. SHAH 12-12-80

SUBJECT / TITLE: MASONRY WALL ANALYSIS IE 80-11 AUX BLDG. AB2-5

QA CATEGORY / CODE CLASS: I/NSR

SUMMARY OF STRESSES

$t = 18"$



OBE CASE

ITEM		DUE TO WALL INERTIA PSI	DUE TO EQUIP INERTIA PSI	DUE TO INTERSTORY DISPLACEMENT PSI	SESS PSI	ALLOWABLE P.S.I	REMARKS
BENDING STRESSES	⊥ TO BED JT @ MID-HEIGHT	16.17	22.0	0.63	27.55	53.33	O.K
	⊥ TO BED JT @ THE BASE			2(0.63) = 1.26	1.26	53.33	O.K
SHEAR STRESSES	Z DIRECTION	1.25	2.02	0.02	2.38	57.73	O.K
	y DIRECTION	1.66	2.7	0.03	3.17	8	O.K

NOTE: f_s (CAUSED BY STATIC LOADING) IS ASSUMED TO BE NEGLIGIBLE (BEING SMALL AND A COMPRESSIVE STRESSES)

DBE CASE

ITEM		DUE TO WALL INERTIA P.S.I	DUE TO EQUIP INERTIA PSI	DUE TO INTERSTORY DISPLACEMENT PSI	STRESS PSI	ALLOWABLE P.S.I	REMARKS
BENDING STRESSES	⊥ TO BED JT @ MID-HEIGHT	32.06	25.34	1.17	40.38	66.67	O.K.
	⊥ TO BED JT @ THE BASE			2(1.17) = 2.34	2.34	66.67	O.K
SHEAR STRESSES	Z DIRECTION	2.95	2.33	0.04	3.76	72.17	O.K
	y DIRECTION	3.93	3.11	0.05	5.01	12	O.K

3b. How the effect of higher modes was considered.

For stress calculations due to equipment loads; the effect of the higher modes was considered by increasing by a factor of 1.5 the peak resonant acceleration for the floor at which the wall existed.

For wall inertia, participation of higher modes has been found to have a very minor effect on typical masonry panels. For typical masonry panels hand calculations were performed and the participation of higher modes was not included in the analysis.

In general, expansion and combination of the first 10 modes were used in calculations where computer models were used, in lieu of more detailed consideration.

3c. How the temperature and pressure differential loads were calculated.

There are no temperature and pressure differential loads on the masonry walls to be included in the calculations. According to the loads specified in the Beaver Valley Power Station Unit No. 1 FSAR (Final Safety Analysis Report), the masonry walls are not subject to loads from wind, tornado, missile, pipe whip or jet impingement (Refer to Attachment H to Ref. 7, J. J. Carey, letter to B. H. Grier, NRC. Subject: Beaver Valley Power Station Unit No. 1 - IE Bulletin 80-11; revisions to Attachment E & H to report dated November 4, 1980. Duquesne Light, 10-Jul-81).

3d. How the boundary conditions were represented.

The boundary conditions were represented as shown in Attachment C of Reference 3 (C.N.Dunn, Letter to B. H. Grier, NRC. Subject: Beaver Valley Power Station, Unit No. 1 - IE Bulletin 80-11; 180-Day Response, Duquesne Light Company, 31-Oct-80).

3e. How the effects of wall openings were considered.

Relatively small openings due to conduits and pipes passing through the wall were neglected and their effect on wall frequency and wall behavior was determined to be negligible.

Walls with large openings for windows, doors, ventilation ducts, and cable trays were treated as special cases and analyzed by finite element methods. Thirteen block walls fit into this category out of 108 walls analyzed. The procedure used to analyze these walls was the same used to analyze walls without openings except that the wall frequency, wall inertia stress, and equipment inertia stress were determined by computer analysis.

Walls with Openings:

AB-2-5

AB-2-6

AB-4-7 AB-4-14 AB-4-15

FB-1-1

SB-2-1 SB-3-1 SB-3-3 SB-3-5 SB-3-7 SB-3-8 SB-3-10

A calculation for a wall with an opening is attached (attachment 3-E-1)

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
10337.SC-SB)-SB-2-1	0	116

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
[illegible] 2-7-21	J. DiGregorio 2-7-21	J. DiGregorio 2-7-21

SUBJECT/TITLE: MASONRY WALL ANALYSIS IE 80-11
SERVICE BUILDING WALL # SB-2-1 REVISED

QA CATEGORY/CODE CLASS: TIPS

Summary of Analysis: ATTACHMENT 3-E-1

1. Using very conservative boundary conditions the wall was analyzed first as a cantilever and the frequency was found to be in the resonant range.

2. Because of the openings in the wall it was treated as a special case and reanalyzed using finite element (ANSYS).

   The boundary conditions were improved to include a pinned support at the top of the wall due to bond and friction at the top joint between the wall and the reinforced concrete slab.

   Results of the ANSYS run show the frequency to be in the rigid range. (ANSYS run # SGE2KSE) ∴ wall inertia stress was determined from a static analysis (ANSYS run # SGEUDM3)

   Equipment loads were in-put as a uniformly distributed load and the stress was determined from a static analysis (ANSYS run # SGEUDM3)

   Final results show the wall overstressed due to major equipment loads.

3. Because of the relatively higher stiffness of the reinforced concrete wall at the south end of SB-2-1 the boundary conditions were further improved to include a pinned support at that side.

   The frequency for the revised boundary conditions (ANSYS run # SGE UNDR) was in the rigid range

   A static analysis was run to determine the wall inertia stress (ANSYS run # SGEVKY2)

   To remove the conservatism introduced by in-putting the equipment loads as a uniformly distributed load the actual loads were in-put as nodal forces. (ANSYS run # SGE2DFJ)

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13337.32-SCE-59-C-1	0	117

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
2-7-81	S. DiGregorio 2-7-81	S. DiGregorio 2-7-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS - 33-2
SERVICE BUILDING WALL 33-2/ REVIEW

QA CATEGORY/CODE CLASS: I / NCE

INTERSTORY DISPLACEMENT STRESS WAS CALCULATED BY HAND AND ALL THREE STRESSES. WALL INERTA, EQUIDMENT, AND INTERSTORY DISPLACEMENT WERE COMBINED USING SRSS

FINAL RESULTS SHOW THE WALL OVERSTRESSED DUE TO MAJOR EQUIPMENT LOADS.

ATTACHMENT 3-E-1

PROPERTIES OF WALL

	H	THK	LG
SB-2-1 SIZE	7'-11½"	x 1'-0"	x 13'-5"

1. * LIGHT WT. HOLLOW CONCRETE BLOCK WALL $w = 105$ #/CU.FT

   COMPRESSIVE TEST STRENGTH = 600 PSI

2. MORTAR, TYPE N $m_o = 750$ PSI $f_m' = 500$ PSI

3. BLOCK SIZE 12" x 16" x 8"

4. MASONRY WALL THICKNESS 12"

5. NON-LOAD BEARING WALL

6. WYTHES 1

7. WALLS ARE RUNNING BOND

8. WALLS ARE NOT SHEAR WALLS.

9. OPNG IN WALL

10. $E_m = 1000 f_m' = 500,000$ PSI REF: TABLE 10.1 ACI 531-79

    MODULUS OF RIGIDITY $G = 400 f_m' = 200,000$ PSI

* ACCORDING TO THE CRITERIA FOR REEVALUATION OF CONCRETE MASONRY WALLS FOR IE BULLETIN 80-11 J.O. NO. 13387.32 BV-1-8011-01 WALL SB-2-1 IS NORMAL WEIGHT HOLLOW BLOCK $w = 135$ lb/ft³.

FOR THE EFFECTS OF THIS WEIGHT ON THE STRESSES SEE CALC. 13387.76-S(S)-SS-2-1 P. 10 IN THE MODIFICATION SECTION OF THIS JOB BOOK.

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32 - S(B) - SB-2-1	0	119

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 10-15-80	PAUL McINNES 10-15-80	PAUL McINNES 10-15-80

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E. BULLETIN 80-11 SERVICE BLDG. 2ND LEVEL EL. 725'-6"

QA CATEGORY/CODE CLASS: I/NSR

DETERMINE FREQUENCIES

CANTILEVER 12" THK HOLLOW BLOCK WALL $I_x = 1090$ in⁴/ft

$K_{LM} = 0.64$

$$K = \frac{8EI}{12h^3} = \frac{8(500{,}000)(1090)}{12(95.5)^3} = 417.15 \text{ #/IN PER ONE INCH WIDTH}$$

MASS OF SYSTEM $M_t = \frac{1}{12} \cdot 1' \times \frac{7.958 \times 105}{386} \times \frac{64}{192} (1.1)$ (64 = NET AREA, 192 = GROSS AREA)

$= 0.06614$ #/in/sec²

$$f_N = \frac{1}{2\pi}\sqrt{\frac{K}{K_{LM} M_t}} = \frac{1}{2\pi}\sqrt{\frac{417.15}{0.64(0.06614)}} = 15.8 \text{ CPS}$$

MAX. CUT-OFF FREQUENCY: N-S & E-W

	N-S	E-W	
OBE:	15.4	20.0	CPS
DBE:	16.7	20.0	CPS

$f_N = 15.8$ CPS < 20.0 CPS IN E-W DIRECTION (O.B.E.) RESONANT RANGE

$f_N = 15.8$ CPS > 15.4 CPS IN N-S DIRECTION (OBE) RIGID RANGE

$f_N = 15.8$ CPS < 16.7 CPS OR 20 CPS ∴ RESONANT RANGE

NOTE - WALL IS WITH OPENING AND CONSIDERED AS A SPECIAL CASE. ANALYSIS IS DONE USING FINITE ELEMENT (ANSYS) METHOD.

SEE PG. 120 FOR ANSYS RESULT

CALCULATION SHEET

	C/W O./CALCULATION NO. 13387.32-S(B)-SB-2-1	REVISION 0	PAGE 120
PREPARER/DATE C. K. SHAH 2/6/	REVIEWER/DATE S. DiGREGORIO 2-6-91	INDEPENDENT REVIEWER/DATE S. DiGREGORIO 2-6-91	
SUBJECT/TITLE LIST OF WALLS WITH [illegible]		QA CATEGORY/CODE CLASS I/NSR	

*

WALL	FACE	ELEV.	$f_{roughness}$	[illegible]
AA 2-7	N-S	735'-6"	14.3	25.4
AA 4-7	N-S	768'-7"	22.0	[illegible]
AA 4-14	E-W	768'-7"	22.0	27.5
FB 1-1	N-S	[illegible]	14.3	21.9
SB 2-1	[illegible]	[illegible]	20.0	36.35 — RIGID RANGE
SB 3-1	N-S	[illegible]	25.0	[illegible]
SB 3-5	E-W	[illegible]	20.0	[illegible]
SB 3-8	N-S	[illegible]	25.0	[illegible]

* RESULTS FROM ANSYS RUN DONE BY R. ANTONELLI
(SEE PGS 121 - 129)

CALCULATION SHEET

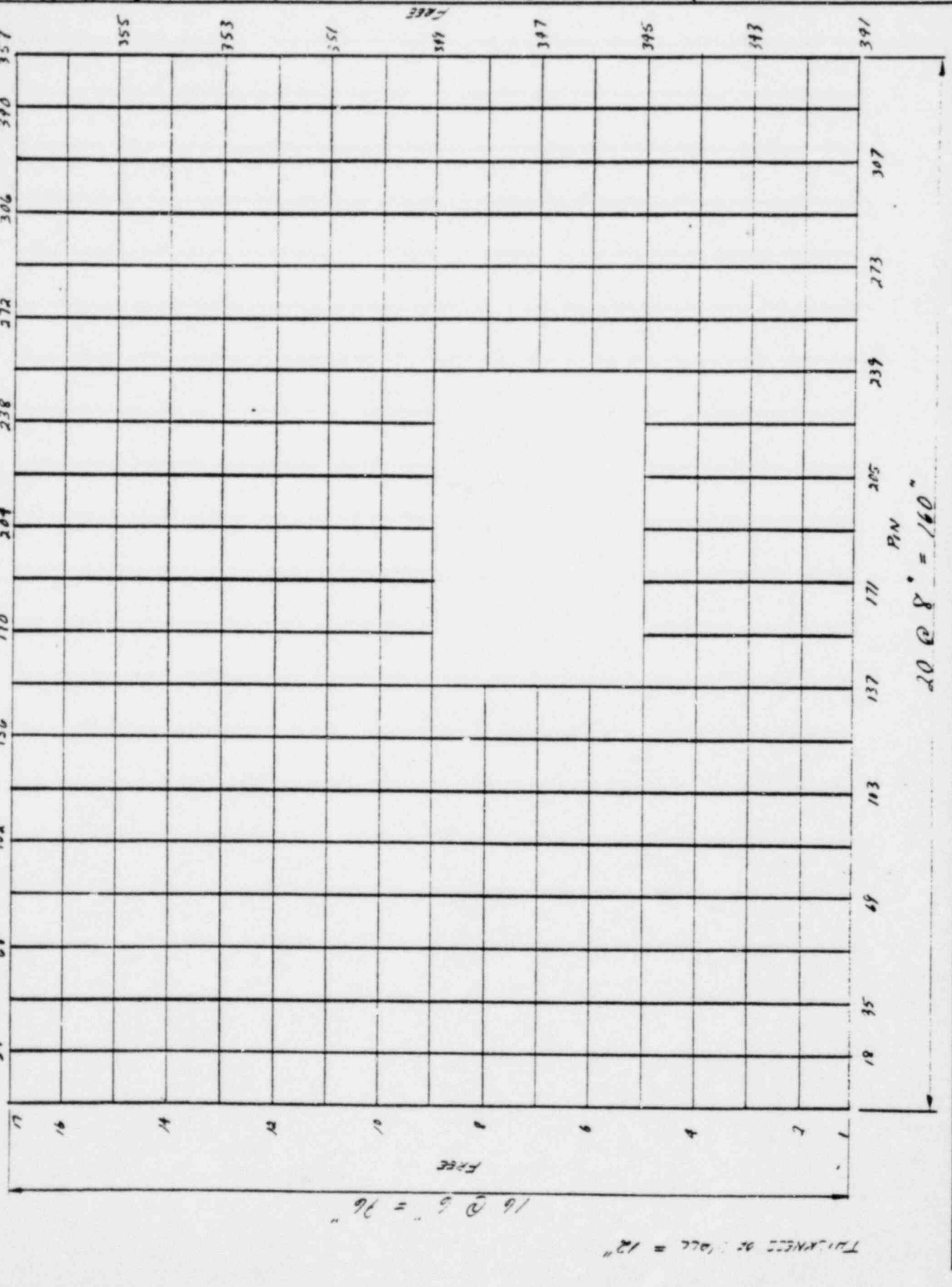
STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-S(B)-SB-2-1	0	121

A5010.61

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
RICH ANTONELLI 10/27/80	L. Miller 11/2/80	L. Miller 11/8/80

SUBJECT/TITLE	QA CATEGORY/CODE CLASS
MASONRY WALL ANALYSIS - E 22-11 SERVICE BLDG SB 2-1	INNER



CALC # 13387.32-SC(B)-38-2-1
PG. # 122

•••••••••• ANSYS INPUT DATA LISTING (TAPE18) ••••••••

```
                    6    12    18    24    30    36    42    48    54    60
                    V     V     V     V     V     V     V     V     V     V
    1   BLOCK WALL  SB 2-1  30 DOF
    2   RICH ANTONELLI
    3   /TAB,7,11,27,29,33,78
    4   -1,2,1,99,1,1
    5   /TAB,37,76
    6   0,-0.05,1
    7   /TAB,5,18
    8   1,46
    9   -1
   10   10.2134
   11   -1
   12   /TAB,7,13,19,55,61,64,73,75
   13   -2,,,,,,20,17,16
   14   1,18,19,2,1,1,16,1,1
   15   -1
   16   /TAB,7,9,11,13,25
   17   17,-2,17,21,8.0
   18   1
   19   17,,1,,,46.0
   20   -1
   21   /TAB,13,19,25,31,37,43,49,55,61,67
   22   ELDE,133,-136,149,-152,165,-168,181,-184,197,-200
   23   ELDE,213,-216
   24   END
   25   /TAB,13
   26   EX,5.E5
   27   NUXY,0.15
   28   DENS,8.556E-5
   29   ALPX
   30   END
   31   /TAB,8
   32   30,TOTAL
   33   -1
   34   /TAB,7,10
   35   1,1,1
   36   1
   37   /TAB,8,37,43,51,57
   38   1,112,341,17
   39   17,02,357,17
   40   -1
   41   -1
   42   -1
   43   END
   44   FINISH
```

DATA CHECK
PIN @ T & B
CHECKED BY A. Miller
11/8/80

RUN # SGE 2KR7 (ATCH # B)

REVISED D.O.F. "100" FOR THE ANALYSIS OF WALL PINNED @ THREE SIDES

C.R. SHAH
2/7/81

CALC# 13387.32-5(B)-58-2-1
PG.# 123

000000000 ANSYS INPUT DATA LISTING (TAPE10) 000000

```
     1    BLOCK *ALL  SS 2-1  30 DOF
     2    GIOVANTONELLI
     3    /TAB,7,11,27,24,33,74
     4    0,2,1,99,1,1
     5    /TAB,37,76
     6    0,-0.05,1                                   FREQUENCY CHECK
     7    /TAB,5,14
     8    1,46                                        PIN @ T & B
     9    -1
    10    10.2134                          CHECKED BY: L. Nicolle 11/8/80
    11    -1
    12    /TAB,7,13,19,55,61,67,73,79      RUN # SGE 2K SF (CATCH" C)
    13    -2,,,,,,20,17,16
    14    1,18,19,2,1,1,16,1,1
    15    -1
    16    /TAB,7,9,11,13,25
    17    17,-2,17,21,8,0
    18    1
    19    17,,1,,,90,0
    20    -1
    21    /TAB,13,19,25,31,37,43,49,55,61,67
    22    ELDE,133,-138,149,-152,165,-168,181,-184,197,-200
    23    ELDE,213,-216
    24    END
    25    /TAB,13
    26    EX,5,E5
    27    NUXY,0.15
    28    DENS,8.550E-5
    29    ALPX
    30    END
    31    /TAB,8
    32    30,TOTAL
    33    -1
    34    /TAB,7,10
    35    1,1,1
    36    0
    37    /TAB,8,37,43,51,57
    38    1,UZ,341,11
    39    17,UZ,357,17          — 1, UZ — 17,)
    40    -1
    41    -1
    42    -1
    43    END
    44    FINISH
```

CALC # 13387.32- SCB)- SB-2-1

PG # 124

ANSYS INPUT DATA LISTING (TAPE15)

CHECKED BY [illegible] 2-9-

SEE ATCH # D
STATIC RUN
SGOUDM3

PIN @ T & B

```
1   BLOCK *ALL  SH 2-1  30 DOF
2   C.K.SHAH                    ( R.ANTONELLI )
3   /TAH,11,15,27,77
4   0,1,1,66,1
5   /TAB,76
6   ,1
7   /TAH,5,14
8   1,46
9   -1
10  10,2134
11  -1
12  /TAB,7,13,19,55,61,69,73,76
13  -2,,,,,,20,17,15
14  1,14,19,2,1,1,15,1,1
15  -1
16  /TAB,7,9,11,13,25
17  17,-2,17,21,8,0
18  I
19  17,,1,,,96,0
20  -1
21  /TAH,13,19,25,31,37,43,49,55,61,67
22  ELDE,133,-136,147,-152,165,-168,181,-184,197,-200
23  ELDE,213,-216
24  END
25  /TAB,13
26  EX,5,E5
27  NUXY,0,15
28  DENS,8,556E-5
29  ALPX
30  END
31  /COM LOAD CASE 1  *ALL INERTIA LOADS  (ONE CASE)
32  /COM L CARD
33  /TAB,7,10
34  1,1,1
35  /COM A CARD
36  0
37  /COM N CARD BOUNDARY CONDITIONS
38  /TAB,8,37,43,51,57
39  1,12,341,17
40  17,02,357,17
41  -1
42  /COM O CARD
43  -1
44  /COM P CARD PRESSURE DEFINITIONS
45  /TAH,13,37,43
46  1,0,.033B,296,1
47  -1
48  /COM LOAD CASE 2  EQUIPMENT LOADS  (ONE CASE)
49  /COM L CARD
50  /TAB,7,10
```

CALC# 13387.32-SC(B)-SB-2-1
PG # 125

0000000000 ANSYS INPUT DATA LISTING (TAPE15) 0000000000

```
      1    2    3    4    5    6    7    8    9   10
      V    V    V    V    V    V    V    V    V    V
   51 -1.1.1
   52 /COM,M CARD
   53 0
   54 /COM,N CARD
   55 -1
   56 /COM,O CARD
   57 -1
   58 /COM,P CARD
   59 /TAB,13,37,43
   60 1.0.73A.296.1
   61 -1
   62 END
   63 FINISH
```

0,622

STATIC RUN
56ELDM3
PIN @ T & B

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-S(Q)-SB 2-1	0	126

A5010 81

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
RICH ANTONELLI 10/27/80	D. Hughes 12-12-80	D. Hughes 12-12-80

SUBJECT/TITLE	QA CATEGORY/CODE CLASS
MASONRY WALL ANALYSIS IE 80-11 SERVICE BLDG SB 2-1	I/NSR

BLOCK WALL SB 2-1 30 00F

10,2137

-2,,,,,,, 20, 17, 16

1, 18, 19, 2, 1, 1, 16, 1, 1

-1

17, -2, 17, 21, 8.0

1

17,,1,,, 96.0

-1

ELDE, 133, -136, 149, -152, 165, -168, 181, -184, 197, -200

ELDE, 213, -216

EX, 5.E5

DENS, 8.556E-5

B.C.

1, UZ, 341, 17

17, UZ, 357, 17

Parkway Concrete Company

CALC # 1338Z.32-SCBI-SB-2-1
PG # 127

7"x8"x16" 2 CELL, [illegible] BLOCK

Physical Dimensions and Data

	Block "A"	Block "B"	Block "C"	Average
Length (in.)	15-5/8	15-[illegible]	[illegible]-7/16	
Width (in.)	11-5/8	11-[illegible]	11-[illegible]/8	
Height (in.)	7-5/8	7-9/16	7-[illegible]/16	
Shell (in.)	1¼	1½	1½	
Web (in.)	1-5/16	1-3/8	1-[illegible]/8	
Weight as Received (lbs.)	52.0	51.9	[illegible]	52.0

Compressive Strength Results

	Block "A"	Block "B"	Block "C"	Average
Load Applied (kips)	166.0	153.0	152.5	
Compressive Strength Gross Area (psi)	1692	1572	1567	1610
Compressive Strength Net Area (psi)	3529	3286	3276	3364
Absorption, % of Dry Weight	9.12%	8.66%	8.[illegible]%	8.86%

NOTE: Minimum compressive strength, on Gross Area, as per ASTM C-90 specification shall be 1000 psi.

CALCULATION SHEET

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-5(B)-SB-2-1	0	129

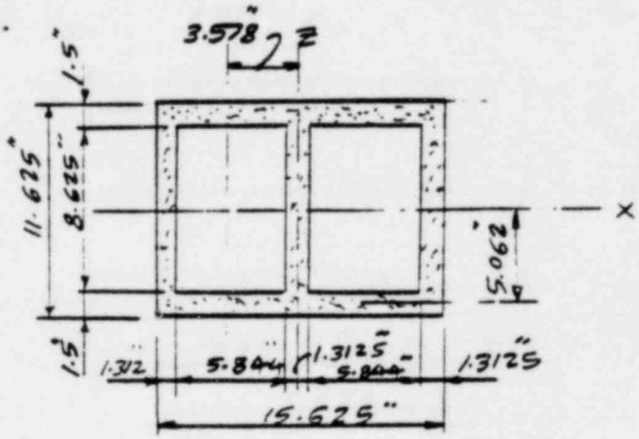
PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 12-3-80	CC TORLEY 12.3.80	CC TORLEY 12.3.80

SUBJECT/TITLE: IE 80-11 MASONRY WALL REVIEW WALL # SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

PARKWAY CONC. COMPANY BLOCK-"A" 12"x8"x16"

2 CELL HOLLOW CONC. BLOCK.



PROPERTIES:

1) LENGTH = $15\frac{5}{8}$"

WIDTH = $11\frac{5}{8}$"

HEIGHT = $7\frac{5}{8}$"

SHELL = $1\frac{1}{2}$"

WEB = $1\frac{5}{16}$"

2) NET AREA, A_N

$A_N = 15.625 \times 11.625 - 2(8.625 \times 5.844) = 80.83$ SQ IN.

3) MOMENT OF INERTIA, I_{XX}

$$I_{XX} = \frac{15.625(11.625)^3}{12} - \frac{2(5.844)(8.625)^3}{12} = 1420.65 \text{ IN}^4 \text{ / BLOCK LENGTH}$$

MOMENT OF INERTIA, I_{ZZ}

$$I_{ZZ} = \frac{11.625(15.625)^3}{12} - 2\left[\frac{8.625(5.844)^3}{12} + (8.625 \times 5.844)(3.578)^2\right]$$

$= 2118 \text{ IN}^4$

4) WALL INERTIA LOAD, Q

UNIT WT OF BLOCK, $w = 105$ PCF

$$\therefore Q = w(A_N) = \frac{105(80.83)}{144} = 58.94 \text{ \#/FT / BLOCK LENGTH}$$

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

A5010.61

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-SCB-SSR-1	3	129

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 12-11-80	[illegible] 12-17-80	[illegible]

SUBJECT/TITLE: MASONARY WALL ANALYSIS IE 20-11 SEISMIC B.O.S. E-1

QA CATEGORY/CODE CLASS: I / NSR

I_x FOR UNIT WIDTH = $\frac{1420.65}{16}$ = 88.79 IN^4

$I_{xx} = \frac{1}{12}(1)(t)^3 = 88.79$ $\quad \therefore t_{EFFECTIVE} = 10.2137$ IN.

SURFACE AREA OF WALL = $(96 \times 160) - (24 \times 48) = 14208$ IN^2

WT. = $\frac{58.94(14208)}{12 \times 16} = 4361.56$ #

$M_t = \frac{WT}{g} = \frac{4361.56}{32.2 \times 12} = 11.288$ $lb\text{-}sec^2/IN.$

10 % INCREASE $M_t = 11.288(1.1) = 12.416$

DENSITY = $m/V = \frac{12.416}{14208(10.2137)} = 8.556 \times 10^{-5}$

(WALL PINNED TOP & BOTTOM)

BY COMPUTOR RUN # SGE2KR2 DATED 12-8-80

TOTAL MASS = 12.416 $\approx$ 12.416 CALCULATED BY HAND O.K.

FREQUENCY PER RUN # SGE2KSF DATED 12-11-80

= 36.35 CYCLES/SEC. (MODE 1) > 20 CYCLES/SEC. ∴ RIGID RANGE

SEE FOLLOWING PGS FOR REVISED BOUNDARY CONDITIONS

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

A5010.61

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-5(B)-SB-2-1	0	130

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
D. HUGHES 2-6-81	C. K. SHAH 2-6-81	S. DIGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS IE 80-11

QA CATEGORY/CODE CLASS: 1/NIR

CALCULATE EQUIPMENT LOADS

TOTAL EQUIPMENT LOADS = ΣDL EAST FACE + Σ DL WEST FACE + Σ DL NORTH FACE (↑ CONSERVATIVE)

= 1951.27 + 2408.22 + 56.64

= 4416.13 lb.

AREA = 14208. in²

$W_{EQUIP} = \frac{4416.13 \text{ lb}}{14208.1 \text{ in}^2} = 0.3108 \text{ psi} = 44.76 \text{ psf} > 10 \text{ PSF}$

$\ell_{EQUIP} = (a)(1.5)(2)\, W_{EQUIP.}$ g = .667 E-W LBS

= (0.667)(1.5)(2)(44.76) SEE p. 7 ATTACHMENT A

= 89.56 PSF

= 0.622 psi

NOTE: WALL HAS BEEN RE-ANALYSED FOR ACTUAL EQUIP. LOADS.

CALCULATE INERTIA LOADS (DBE)

$\ell = \frac{gW}{A}$

W = 4361.5#

$\ell_i = \frac{(0.11)(4361.5)}{14208.} = 0.0338 \text{ psi}$

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

A5010 81

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-S(3)-SB-2-1	0	131

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C.A. Hawk 2/7/81	S. DiGREGORIO 2-7-81	S. DiGREGORIO 2-7-81

SUBJECT/TITLE MASONRY WALL ANALYSIS IE 80-11
SERVICE BUILDING WALL # SB-2-1 REVIEW

QA CATEGORY/CODE CLASS I/NSR

FOR BOUNDARY CONDITIONS PINNED @ TOP AND BOTTOM THE MAX. EQUIPMENT STRESS DUE TO UNIFORMLY DISTRIBUTED LOAD IS 82.92 PSI (ANSYS RUN # SGEUDM3 ATCH # D)

82.92 PSI > 22.82 PSI ALLOW. STRESS FOR TENSION ⊥ BED JOINT.

∴ BY INSPECTION WALL IS OVERSTRESSED AND A FURTHER DETAILED ANALYSIS IS REQUIRED.

CALCULATION SHEET

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32-S(B)-53-2-1	0	132

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 12-17-80	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E BULLETIN 80-11 SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

REVISED BOUNDARY CONDITIONS:

$E_{\text{CONC. BLOCK WALL}} = 500{,}000$ PSI

$I_{\text{CONC BLOCK WALL}} = 1420.65$ IN^4 12"X8"X16" HOLLOW BLOCK WALL

$E_{\text{CONC. WALL}} = 57000\sqrt{f_c'} = 57000\sqrt{3000} = 3122018$ PSI

$I_{\text{CONC. WALL}} = \frac{1}{12}(16)(12)^3 = 2304$ IN^4

$$\frac{EI_{\text{CONC. WALL}}}{EI_{\text{BLOCK WALL}}} = \frac{(3122018)(2304)}{(500{,}000)(1420.65)} = 10.12$$

NOTE: LENGTH OF BOTH WALLS ARE SAME. STIFFNESS RATIO BET^N CONC WALL & BLOCK WALL IS 10.12 MEANS CONC WALL IS STIFF. ALSO PER S & W STD PA-7A 3, MASONRY BLOCK WALL HAS BEEN TIED WITH CONC. WALL THIS MEANS WE CAN CONSIDER ADD'L PIN SUPPORT. THEREFORE ANALYSE THIS WALL FOR THREE SIDES PIN SUPPORTS.

FREQUENCY FOR REVISED BOUNDARY CONDITIONS:

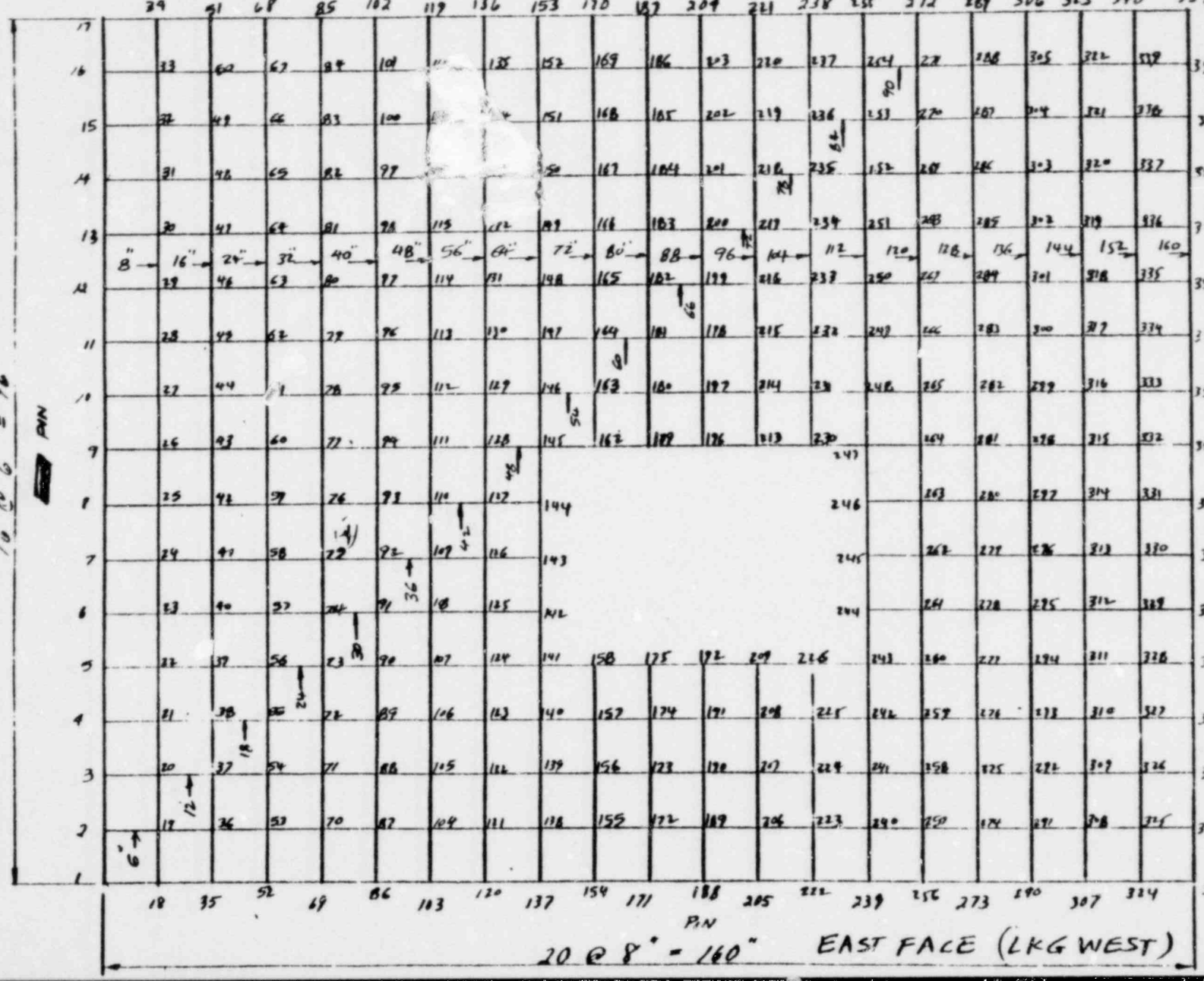
ANSYS RUN SGE2HDR DATED 2-5-81 (ATCH F)

$f_n = 39.71$ CYCLES/SEC > 20 CYCLES/SEC OBE & DBE

EAST ELEV. LKG WEST.

FREQUENCY = 36.35 CPS (30 DOF)
39.71 CPS (100 DOF)

ANSYS RUN # SGE2KSF (PINNED T & B)
ANSYS RUN # SGE2HDR (3 SIDES PINNED)



CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

PREPARED / DATE: R.GH ANTONELLI 11/2/80	J.O. / W.O. / CALCULATION NO.: 13207.37-S(B)-SB-2-1	REVISION: 0	PAGE: 133
REVIEWER / CHECKER / DATE: L. Miller 11/2/80	INDEPENDENT REVIEWER / DATE: L. Miller 11/8/80		
SUBJECT / TITLE: MASONRY WALL ANALYSIS - EL 23'-11" SERVICE BLDG SEC 2-1	QA CATEGORY / CODE CLASS: I / NSR		

CALC # 13387.32-S(B)-SB-2-1
PG # 134

DATA CHECK
RUN # SGE2KLF (ATCH. E

********** ANSYS INPUT DATA LISTING (TAPE18) ********

```
                6    12    18    24    30    36    42    48    54    60
                V     V     V     V     V     V     V     V     V     V
   1  BLOCK WALL  SB 2-1  30 DOF          CHECKED BY S. DEGREGORIO  2-6-81
   2  RICH ANTONELLI
   3  /TAB,7,11,27,29,33,78
   4  -1,2,1,99,1,1
   5  /TAB,37,76
   6  0,-0.05,1
   7  /TAB,5,18
   8  1,46
   9  -1
  10  10.2134
  11  -1
  12  /TAB,7,13,19,55,61,69,73,76
  13  -2,,,,,,20,17,16
  14  1,18,19,2,1,1,16,1,1
  15  -1
  16  /TAB,7,9,11,13,25
  17  17,-2,17,21,8.0
  18  1
  19  17,,1,,,96.0
  20  -1
  21  /TAB,13,19,25,31,37,43,49,55,61,67
  22  ELDE,133,-136,149,-152,165,-168,181,-184,197,-200
  23  ELDE,213,-216
  24  END
  25  /TAB,13
  26  EX,5.E5
  27  NUXY,0.15
  28  DENS,8.556E-5
  29  ALPX
  30  END
  31  /TAB,8          100, TOTAL  FOR DATA CHECK 30 D.O.F. WILL NO
  32  -30,TOTAL
  33  -1
  34  /TAB,7,10
  35  1,1,1
  36  /COM N CARD
  37  0
  38  /COM N CARD BOUNDARY CONDITIONS
  39  /TAB,8,37,43,51,57
  40  1,UZ,341,17
  41  1,UZ,17,1
  42  17,UZ,357,17
  43  -1
  44  /COM O CARD
  45  -1
  46  -1
  47  END
  48  FINISH
```

CALC# 13387.32-S(B)-SB-2-1 RUN# SGEZHOR
PG# 135 ********** ANSYS INPUT DATA LISTING (TAPE18) ********
FREQUENCY CHECK

```
                0    12    18    24    30    36    42    48    54    60
                V     V     V     V     V     V     V     V     V     V
1   BLOCK WALL SB-2-1 BEAM ELEM 100 DOF                    CHECKED BY S DiGRE
2   C.R.SHAH                                ( R.ANTONELLI )
3   /TAB,7,11,27,29,33,78 ✓                    (SEE ATCH. F)
4   0,2,1,99,1,1
5   /TAB,37,76
6   0,-0.05,1
7   /TAB,5,18
8   1,46
9   -1
10  10.2134
11  -1
12  /TAB,7,13,19,55,61,69,73,75 ✓
13  -2,,,,,,20,17,16 ✓
14  1,18,19,2,1,1,16,1,1
15  -1
16  /TAB,7,9,11,13,25
17  17,-2,17,21,8.0 ✓
18  1
19  17,,1,,,96.0,
20  -1
21  /TAB,13,19,25,31,37,43,49,55,61,67
22  ELDE,133,-136,149,-152,165,-168,181,-184,197,-200
23  ELDE,213,-216
24  END
25  /TAB,13
26  EX,3.E7
27  NUXY,0.15
28  DENS,8.556E-5
29  ALPX
30  END
31  /TAB,8
32  100,TOTAL
33  -1
34  /TAB,7,10
35  1,1,1
36  /COM M CARD
37  0
38  /COM F CARD, BOUNDARY CONDITIONS
39  /TAB,8,37,43,51,57
40  1,UZ,341,17
41  1,UZ,17,1
42  17,UZ,357,17
43  -1
44  /COM D CARD
45  -1
46  -1
47  END
48  FINISH
```

********** ANSYS INPUT DATA LISTING (TAPE18) **********

```
                5       12      18      24      30      36      42      48      54      60
                V       V       V       V       V       V       V       V       V       V
  1  BLOCK WALL  SB 2-1  30 DOF
  2  C.K.SHAH                        ( R.ANTONELLI )
  3  /TAB,11,16,27,77
  4  0,1,1,99,1
  5  /TAB,76
  6  ,1
  7  /TAB,5,18
  8  1,46
  9  -1
 10  10.2134
 11  -1
 12  /TAB,7,13,19,55,61,69,73,76
 13  -2,,,,,,,20,17,16
 14  1,18,19,2,1,1,16,1,1
 15  -1
 16  /TAB,7,9,11,13,25
 17  17,-2,17,21,8.0
 18  1
 19  17,,1,,,96.0
 20  -1
 21  /TAB,13,19,25,31,37,43,49,55,61,67
 22  ELDE,133,-136,149,-152,165,-168,181,-184,197,-200
 23  ELDE,213,-216
 24  END
 25  /TAB,13
 26  EX,5.E5
 27  NUXY,0.15
 28  DENS,8.556E-5
 29  ALPX
 30  END
 31  /COM LOAD CASE 1  WALL INERTIA LOADS  (DBE CASE)
 32  /COM L CARD
 33  /TAB,7,10
 34  1,1,1
 35  /COM M CARD
 36  0
 37  /COM N CARD BOUNDARY CONDITIONS
 38  /TAB,8,37,43,51,57
 39  1,UZ,341,17
 40  1,UZ,17,1
 41  17,UZ,357,17
 42  -1
 43  /COM O CARD
 44  -1
 45  /COM P CARD PRESSURE DEFINITIONS
 46  /TAB,13,37,43
 47  1,0.0338,320,1
 48  -1
 49  /COM LOAD CASE 2  EQUIPMENT LOADS  (DBE CASE)
 50  /COM L CARD
                A       A       A       A       A       A       A       A       A       A
```

WALL INERTIA

RUN* SGEYKXZ

PINNED @ THREE SIDES

(SEE ATCH. G)

********** ANSYS INPUT DATA LISTING (TAPE18) **********

```
                    6     12     18     24     30     36     42     48     54     60
                    V      V      V      V      V      V      V      V      V      V
   51   /TAB,7,10
   52   -1,1,1
   53   /COM M CARD
   54   0
   55   /COM N CARD
   56   -1
   57   /COM O CARD
   58   -1
   59   /COM P CARD
   60   /TAB,13,37,43
   61   1,0.736,320,1
   62   -1
   63   END
   64   FINISH
```

UNIFORM PRESSURE DIDNOT USE IN FINAL CALCS

0.622, WALL HAS BEEN RE-ANALYSED FOR ACTUAL EQUIP LOADS.

CALCULATION SHEET

PREPARER/DATE: W. GOUWS 1/27/88 | J.O./W.O./CALCULATION NO.: 13387.32-S(B)-SB-2-1 | REVISION: 0 | PAGE: 138

SUBJECT/TITLE: MASONRY WALL ANALYSIS TE 80-11 WALL SB-2-1 | REVIEWER/CHECKER/DATE: S. DIGREGORIO 1/28/88 | INDEPENDENT REVIEWER/DATE: | UA REQUIRMENT CODE CLASS: I/NSR

LOAD SUMMARY SHEET FOR WALL SB-2-1

EAST ELEVATION

DESCRIPT.	LOCATION 37"	FACE	DL (lb.)	SE-W (lb) F_E	SN-S (lb.)	SHORT (lb)	SHORT DL (lb)	M_E (in-lb)	M_N (in-lb)	M_D (in-lb)	REMARKS NODE NOS.
DET. 2	(3.0833', 36 3.0', 0.0')	E	106.5	106.5	121.4	89.4	195.9	655.3	662.0	1630.2	92
DET. 2	111 (10.0833', 36 3.0', 0.0')	E	141.1	141.4	160.8	118.5	259.6	876.1	691.6	1827.2	262
DET. 3	37 (3.0833', 29 2.4167', 0.0')	E	57.8	57.8	65.8	48.4	106.2	796.9	353.2	258.4	91
DET. 3	121 (10.0833', 29 2.4167', 0.0')	E	48.4	48.4	55.2	40.6	89.0	663.9	679.1	922.2	261
DET. 4	129 (10.75', 23 1.9167', 0.0')	E	2.45	2.45	2.8	2.06	4.51	6.5	10.3	20.0	277
DET. 4	157 (13.083', 23 1.9167', 0.0')	E	2.28	2.28 ✓	2.6	1.92	4.2	6.0	11.1	21.75	345
DET. 5 (TT.1)	37 (3.0833', 6 0.5', 0.0')	E (ALL DET. SON JOB 1794)	241.0	303.0 ✓	541.1 ✓		241.0	0	0	3659.3	87
"	37 (3.0833',			607.7	388.9			0		3890.1	89
TT. 5	16 1.3333' 0.0')		533.2				533.2		0		
"	37 (3.0833',			210.1	187.6			0		4675.1	92
TT. 9	33 2.75', 0.0')		171.2				171.2		0		
"	37 (3.0833',			404.9	322.8			0		5362.2	93
TT. 13	43.5 3.625' 0.0')		354.9				354.9		0		
"	37 (3.0833',			115.3	135.7			0		6675.2	96
TT. 17	59.5 4.9583' 0.0')		84.5				84.5		0		
"	37 (3.0833',			222.2	625.7			0		7500.6	114
TT. 21	67.5 5.625', 0.0')		171.4				171.4		0		
DET. 8	66 (5.417', 20 1.67', 0.0')	E	18.27	18.27	20.83	15.36	33.63	343.5	285.1	132.7	140
DET. 8	77 (6.417', 20 1.67', 0.0")	E	18.27	18.27	20.83	15.36	33.63	343.5	285.1	132.7	174
TOTALS			1951.27	2258.57	2652.06		1282.87	3691.7	2977.5	36707.65	

LOAD SUMMARY SHEET FOR WALL SB-2-1

CALCULATION SHEET

DIVISION

PREPARER / DATE: W. GOUWS 1/27/81

REVIEWER / CHECKER / DATE: [illegible] 1-28-81

J.O. NO. / CALCULATION NO.: 13387.32-SB-SB-2-1

REVISION: 0

PAGE: 139

SUBJECT / TITLE: MASONRY WALL ANALYSIS IE 80/11 WALL SB-2-1

INDEPENDENT REVIEWER / DATE: S. DiGREGORIO 2-7-81

SEISMIC CATEGORY / CODE CLASS: I/NSC

DESCRIPT.	LOCATION	FACE	DL (lb.)	SE-W (lb.)	SN-S (lb.)	SVERT (lb.)	SISRTDL (lb.)	ML (in-lb)	MY (in-lb)	MZ (in-lb)	REMARKS NODE NO.
DET. 2	(3.33', 2.0', 0.0') 40 24	W	78.315	78.32	89.2	65.8	144.1	851.0	385.2	916.5	260
DET. 2	(10.33', 2.0', 0.0') 124 24	W	95.1	95.1	108.3	79.9	175.0	553.6	366.3	1007.0	90
DET. 5 (JT. 1)	(3.33', .33', 0.0') 40 4	W	216.0	254.8	323.0		216.0	0	0	1788.4	STRUDL 257 JOB 1363
" JT. 5	(3.33', 1.16', 0.0') 40 14	W	176.7	229.1	151.9		176.7	0	0	1886.7	" 258
" JT. 9	(3.33', 3.96', 0.0') 40 45	W	214.7	285.5	176.1		214.7	0	0	2499.9	" 264
" JT. 13	(3.33', 4.625', 0.0') 40 55.5	W	80.9	180.0	95.9		80.9	0	0	2699.3	" 263
" JT. 17	(3.33', 6.625', 0.0') 40 77.5	W	228.3	287.7	161.5		228.3	0	0	3263.4	" 269
" JT. 21	(3.33', 7.33', 0.0') 40 88	W	55.5	136.1	310.4		55.5	0	0	3434.0	" 271
DET. 5 (JT. 1)	(10.33', 4.33', 0.0') 124	W	281.4	329.0	391.1		281.4	0	0	2067.1	STRUDL 87 JOB 1001
" JT. 5	(10.33', 1.16', 0.0') 124 18	W	224.4	265.5	162.6		224.4	0	0	2176.1	88
" JT 9	(10.33', 2.167', 0.0') 124 26	W	52.1	90.5	63.4		52.1	0	0	2399.4	90
" JT. 13	(10.33', 3.083', 0.0') 124 37	W	62.4	114.5	74.9		62.4	0	0	2717.7	92
" JT. 17	(10.33', 3.96', 0.0') 124 475	W	218.9	261.6	170.0		218.9	0	0	3057.9	94
" JT. 21	(10.33', 4.625', 0.0') 124 55.5	W	82.0	181.0	113.3		82.0	0	0	3362.0	95

(CONT'D ON NEXT PAGE)

LOAD SUMMARY SHEET FOR WALL SB-2-1

DESCRIPT	LOCATION	FACE	D.L (lb.)	SE-W (lb)	SN-S (lb.)	SVERT (lb)	SVERT+DL (lb)	ML (in-lb)	MY (in-lb)	MZ (in-lb)	REMARKS NODE NOS.
"	(10.33', 124	W	232.4				232.4	0	0	4108.6	STRUDL 99
JT. 25	77.56.625', 0.0')			292.0	169.4						JOB 1001
"	77.124/10.33',	W	56.3				56.3	0	0	4306.4	101
JT. 29	88 7.33', 0.0')			136.2	399.0						
DET. 6	(3.33', 40	W	26.1	26.1	29.8	22.0	48.1	227.7	226.3	378.0	267
	68 5.66', 0.0')										
DET. 6	(10.33', 124	W	26.7	26.7	30.4	22.4	49.1	232.6	212.5	352.2	97
	68 5.66', 0.0')										
DET 7		N	NEGLECTED FOR ANALYSIS SAY O.K.								
TOTALS			2408.22	3269.72	2871.3		2598.3	1464.9	1190.3	42420.6	

PROJECT 13387.32-S(B)-SB-2-1

PREPARER/DATE W. GUNN'S 1/28/01

REVIEWER/CHECKER/DATE 1-28-01

INDEPENDENT REVIEWER/DATE S. DiGREGORIO 2-7-01

SUBJECT/TITLE MASONRY WALL ANALYSIS IE SOIL WALL SB-2-1

QA CATEGORY/CODE CLASS 1/NUSR

REVISION 0

PAGE 140

CALCULATION SHEET

J.O. / W.O. / CALCULATION NO	REVISION	PAGE
13387.32-S(3)-SB-2-1	0	141

PREPARER / DATE	REVIEWER / CHECKER / DATE	INDEPENDENT REVIEWER / DATE
C.K. SHAH 1-31-81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT / TITLE: MASONRY WALL ANALYSIS I.E BULLETIN 80-11 SB-2-1 (EAST ELEV)

QA CATEGORY / CODE CLASS: I/NSR

NODE NO'S	MOMENTS @ FACE OF WALL "#" M_x	MOMENTS @ FACE OF WALL "#" M_y	ECCENTRICITIES @ FACE OF WALL e_z	ECCENTRICITIES @ ℄ OF WALL e_z	MOMENTS @ ℄ OF WALL $M_x = M_x + F_y(6")$ IN LBS	MOMENTS @ ℄ OF WALL $M_y = M_y + F_x(6)$ IN FT	F_z N-S LBS
* 92	655.3	662.0	0.75	6.75	1830.7	1390.4	106.5
262	876.1	691.6	0.75	6.75	2433.7	1656.4	141.4
91	796.9	353.2	5.5 AVG	11.5	1431.1	748.0	57.8
261	663.9	679.1	5.5	11.5	1197.9	1010.3	48.4
277	6.5	10.3	.625	6.625	33.6	27.1	2.45
345	6.0	11.1	0.625	6.625	31.2	26.7	2.28
** 87	-	-	-	-	-	-	303.0
** 89			-	-	-	-	607.7
* 92			-	-	-	-	210.1
93			-	-	-	-	404.9
96			-	-	-	-	115.3

CALCULATION SHEET

A.O. / W.O. / CALCULATION NO	REVISION	PAGE
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PREPARER / DATE	REVIEWER / CHECKER / DATE	INDEPENDENT REVIEWER / DATE
C.K. SHAH 1-31-81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT / TITLE: MASONRY WALL ANALYSIS I.E. BULLETIN 80-11 SB-2-1 (EAST ELEV.)

QA CATEGORY / CODE CLASS: I/NSR

NODE NO'S	MOMENTS @ FACE OF WALL "b" M_x	MOMENTS @ FACE OF WALL "b" M_y	ECCENTRICITIES @ FACE OF WALL	ECCENTRICITIES @ ℄ OF WALL	MOMENTS @ ℄ OF WALL $M_x = M_x + F_y(e)$ M_x IN. LBS	MOMENTS @ ℄ OF WALL $M_y = M_y + F_x(e)$ M_y IN. LBS	F_z N-S	F_z LBS
114	-	-	-	-	-	-	222.2	
140	343.5	285.1	11.25	17.25	5453	410.1	18.27	
174	343.5	285.1	11.25	17.25	545.3	410.1	18.27	

CALCULATION SHEET

J.O./W.O./CALCULATION NO	REVISION	PAGE
13387.32-SC(B)-58-2-1	0	143

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C.K. SHAH 1-31-81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E. 80-11
WEST FACE SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

NODE NO'S	MOMENTS @ FACE OF WALL # M_x	MOMENTS @ FACE OF WALL # M_y	ECCENTRICITIES FACE OF WALL	ECCENTRICITIES ℄ OF WALL	MOMENTS @ ℄ OF WALL M_x IN LBS	MOMENTS @ ℄ OF WALL M_y IN LBS	F_z N-S LBS
260	451	385.2	0.75	6.75	1315.6	887.2	78.32
**** 90	553.6	366.3	0.75	6.75	1603.6	1016.1	95.1
257	-	-	-	-	-	-	254.8
258	-	-	-	-	-	-	229.1
264	-	-	-	-	-	-	285.1
265	-	-	-	-	-	-	180.0
269	-	-	-	-	-	-	287.7
271	-	-	-	-	-	-	136.1
*** 87	-	-	-	-	-	-	329.0
** 88	-	-	-	-	-	-	265.5
*** 90	-	-	-	-	-	-	90.5

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORP.

J.O. / W.O. / CALCULATION NO	REVISION	PAGE
13387.32-S(B)-SB-2-1	0	144

PREPARER / DATE	REVIEWER / CHECKER / DATE	INDEPENDENT REVIEWER / DATE
C.K. SHAH 1-31-80	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT / TITLE: MASONRY WALL ANALYSIS I.E. BULLETIN 80-11
WEST FACE SB-2-1

QA CATEGORY / CODE CLASS: I/NSR

NODE NO'S	MOMENTS @ FACE OF WALL "#" M_x	MOMENTS @ FACE OF WALL "#" M_y	ECCENTRICITIES @ FACE OF WALL	ECCENTRICITIES @ ℄ OF WALL	MOMENT @ ℄ OF WALL $M_x = M_x + F_y(6)$ IN LBS M_x	MOMENT @ ℄ OF WALL $M_y = M_y + F_y(6)$ IN LBS M_y	F_z N-S LBS
92	-	-	-	-	-	-	114.5
94	-	-	-	-	-	-	261.6
95	-	-	-	-	-	-	181.0
99	-	-	-	-	-	-	292.0
101	-	-	-	-	-	-	136.2
267	227.7	226.3	2.875	8.875	516.3	405.1	26.1
97	232.6	212.5	2.875	8.875	527.2	394.9	26.7

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
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PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 2-3-81	S. DiGREGORIO 2-6-91	S. DiGREGORIO 2-6-91

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E 80-11
WALL # SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

/ TAB, 8, 13
92, FZ, 431.1
92, MX, 1830.7
92, MY, 1390.4
262, FZ, 141.1
262, MX, 2433.7
262, MY, 1656.4
91, FZ, 57.8
91, MX, 1434.1
91, MY, 748
261, FZ, 48.4
261, MX, 1197.9
261, MY, 1010.3
277, FZ, 2.45
277, MX, 33.6
277, MY, 27.1
345, FZ, 2.28
345, MX, 31.2
345, MY, 26.7
87, FZ, 632.0
89, FZ, 607.7
93, FZ, 404.9
96, FZ, 115.3
114, FZ, 222.2
140, FZ, 18.27
140, MX, 545.3
140, MY, 410.1
174, FZ, 18.27
174, MX, 545.3
174, MY, 410.1
260, FZ, 78.32
260, MX, 1315.6
260, MY, 887.2
90, FZ, 185.6
90, MX, 1603.6
90, MY, 1016.1
257, FZ, 254.8
258, FZ, 229.1
264, FZ, 285.1
265, FZ, 180.0
269, FZ, 287.7
271, FZ, 136.1
94, FZ, 261.6
99, FZ, 292.0
101, FZ, 136.2
267, FZ, 26.1
267, MX, 516.3
267, MY, 405.1
97, FZ, 26.7
97, MX, 527.2
97, MY, 374.9
95, FZ, 181.0
88, FZ, 265.5

********** ANSYS INPUT DATA LISTING (TAPE18) **********

```
                5       12      18      24      30      36      42      48      54      60
                V       V       V       V       V       V       V       V       V       V
     1  BLOCK WALL SB-2-1 BEAM ELEM 100 DOF
     2  C.K.SHAH                              ( R.ANTONELLI )        (SEE ATCH. "H")
     3  /TAB,11,16,27,77
     4  0,1,1,99,1
     5  /TAB,76
     6  ,1
     7  /TAB,5,18
     8  1,46
     9  -1
    10  10,2134
    11  -1
    12  /TAB,7,13,19,55,61,69,73,76
    13  -2,,,,,,20,17,16
    14  1,18,19,2,1,1,16,1,1
    15  -1
    16  /TAB,7,9,11,13,25
    17  17,-2,17,21,8.0
    18  1
    19  17,,1,,,96.0
    20  -1
    21  /TAB,13,19,25,31,37,43,49,55,61,67
    22  ELDE,133,-136,149,-152,165,-168,181,-184,147,-200
    23  ELDE,213,-216
    24  END
    25  /TAB,13
    26  EX,5.E5
    27  NUXY,0.15
    28  DENS,8.556E-5
    29  ALPX
    30  END
    31  /COM LOAD CASE 2  EQUIPMENT LOADS  (ONE CASE)
    32  /COM L CARD
    33  /TAB,7,10
    34  1,1,1
    35  /COM M CARD
    36  0
    37  /COM N CARD BOUNDARY CONDITIONS
    38  /TAB,8,37,43,51,57
    39  1,UZ,341,17
    40  1,UZ,17,1
    41  17,UZ,357,17
    42  -1
    43  /COM O CARD
    44  /TAB,8,13
    45  92,FZ,431.1
    46  92,MX,1830.7
    47  92,MY,1390.4
    48  262,FZ,141.1
    49  262,MX,2433.7
    50  262,MY,1656.4
                A       A       A       A       A       A       A       A       A       A
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                    6    12    18    24    30    36    42    48    54    60
                    V     V     V     V     V     V     V     V     V     V
  51  91,FZ,57.8
  52  91,MX,1434.1
  53  91,MY,746.0
  54  261,FZ,48.4
  55  261,MX,1197.9
  56  261,MY,1010.3
  57  277,FZ,2.45
  58  277,MX,33.6
  59  277,MY,27.1
  60  345,FZ,2.24
  61  345,MX,31.2
  62  345,MY,26.7
  63  87,FZ,632.0
  64  88,FZ,265.5
  65  89,FZ,607.7
  66  93,FZ,404.9
  67  96,FZ,115.3
  68  114,FZ,222.2
  69  140,FZ,18.27
  70  140,MX,545.3
  71  140,MY,410.1
  72  174,FZ,18.27
  73  174,MX,545.3
  74  174,MY,410.1
  75  260,FZ,78.32
  76  260,MX,1315.6
  77  260,MY,867.2
  78  90,FZ,185.6
  79  90,MX,1603.6
  80  90,MY,1016.1
  81  257,FZ,254.8
  82  258,FZ,229.1
  83  264,FZ,285.1
  84  265,FZ,180.0
  85  269,FZ,267.7
  86  271,FZ,136.1
  87  94,FZ,261.6
  88  95,FZ,181.0
  89  99,FZ,292.0
  90  101,FZ,136.2
  91  267,FZ,26.1
  92  267,MX,516.3
  93  267,MY,405.1
  94  97,FZ,26.7
  95  97,MX,527.2
  96  97,MY,349.4
  97  -1
  98  /COM P CARD
  99  -1
 100  END
 101  FINISH A    A    A    A    A    A    A    A    A    A
```

CALCULATION SHEET — STONE & WEBSTER ENGINEERING CORPORATION

J.O./W.O./CALCULATION NO.	REVISION	PAGE
13387.32 - S(B) - SB-2-1	0	148

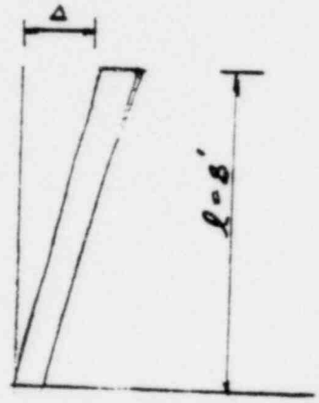
PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K SHAH 2-2-80	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL REVIEW I.E 80-11 SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

OUT OF PLANE INTERSTORY DISPLACEMENTS:

RELATIVE BUILDING FLOOR MOVEMENT AS A RESULT OF SEISMIC EXCITATION.



$$\Delta = \frac{Pl^3}{3EI} + \frac{1.2Pl}{GA}$$

$$\therefore P = \frac{\Delta_R}{\left(\frac{l^3}{3EI} + \frac{1.2l}{GA}\right)}$$

OBE:

$\Delta_{@\ EL\ 725.50} = 0.000858$ E-W

$\Delta_{@\ EL\ 735.50} = 0.001403$

$\Delta_{@\ EL\ 733.50} = (0.001403 - 0.000858)\frac{8}{10} + 0.000858 = 0.001294$

$\Delta_{REL.} = 0.001294 - 0.000858 = 0.000436$

DBE

$\Delta_{@\ EL\ 725.50} = 0.001671$ E-W

$\Delta_{@\ EL\ 735.50} = 0.002739$

$\Delta_{REL.} = (0.002739 - 0.001671)\frac{8}{10} = 0.0008544$

$l = 96"$

$E = 500\,000$ PSI $(1000\ f_m')$

$G = 200\,000$ PSI $(400\ f_m')$

$S = \frac{1091.06}{11.625/2} = 187.71\ IN^3/FT$

$I = 1420.66\ IN^4 \left(\frac{12}{15.625}\right) = 1091\ IN^4/FT$

$A_{NET} = 80.83\ IN^2/BLOCK$

$= 80.83\left(\frac{12}{15.625}\right)$

$= 62.08\ IN^2/FT$ WIDTH STRIP

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

A5010 61

J.O./W.O./CALCULATION NO.	REVISION	PAGE
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PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 2-2-80	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE MASONRY WALL REVIEW I.E. 80-11 SB-2-1

QA CATEGORY/CODE CLASS I/NSR

$$P_{OBE} = \left[\frac{0.000436}{\frac{(96)^3}{3(500000 \times 1091.06)} + \frac{1.2(96)}{(200,000)(62.08)}}\right] = 0.793 \text{ \#/FT WIDTH}$$

$$P_{DBE} = \left[\frac{0.000B544}{\frac{(96)^3}{3(500000 \times 1091.06)} + \frac{1.2(96)}{(200,000)(62.08)}}\right] = 1.554 \text{ \#/FT WIDTH}$$

$V_{b\ OBE}$ (MAX SHEAR OCCURS @ SUPPORT) = 0.793 #/FT WIDTH

$V_{b\ DBE}$ " " = 1.554 #/FT WIDTH.

DISTANCE FROM TOP OF WALL-INCHES	MOMENTS (IN-LBS) OBE 0.793(ℓ)	MOMENTS (IN-LBS) DBE 1.554(ℓ)	STRESSES (PSI) $f = M/S$ WHERE $S = 187.71$ IN.^{3} OBE	STRESSES (PSI) DBE
6	4.76	9.32	0.025	0.05
12	9.52	18.65	0.051	0.1
18	14.28	27.97	0.076	0.149
24	19.03	37.30	0.101	0.199
30	23.79	46.62	0.127	0.248
36	28.55	55.94	0.152	0.298
42	33.31	65.27	0.177	0.348
48	38.06	74.59	0.203	0.397
54	42.82	83.92	0.228	0.447
60	47.58	93.24	0.253	0.497
66	52.34	102.56	0.279	0.546
72	57.10	111.9	0.304	0.596
78	61.8	121.21	0.329	0.646
84	66.61	130.54	0.355	0.695
90	71.37	139.9	0.38	0.745
96	76.13	149.2	0.406	0.795

IN-PLANE INTERSTORY DISPLACEMENTS (E-W DIRECTION)

MAX ALLOWABLE STRAIN = 0.0001 IN/IN FOR OBE & DBE

USING THE SAME DISPLACEMENTS AS FOR OUT OF PLANE : E-W

OBE : $\gamma = \frac{\Delta}{H} = \frac{0.000436}{96} = 0.00000045$ IN/IN.

DBE : $\gamma = \frac{\Delta}{H} = \frac{0.0008544}{96} = 0.00000089$ IN/IN.

BOTH OBE & DBE STRAINS ARE LESS THAN 0.0001 IN/IN ALLOW.

∴ THE WALL IS ACCEPTABLE FOR THE IN-PLANE CASE.

IN-PLANE (N-S)

OBE Δ @ EL 725-50 = 0.001276

Δ @ EL 735-50 = 0.003105

Δ @ EL 733.50 = 0.002859

Δ_R = 0.002859 - 0.001876 = 0.0009832

$\gamma = \frac{\Delta}{H} = \frac{0.0009832}{96} = 0.00001024$ IN/IN < 0.0001 O.K

DBE: N-S

Δ @ EL 725-5 = 0.003533

Δ @ EL 735-5 = 0.005858

Δ @ EL 733-5 = 0.005393

Δ_R = 0.005393 - 0.003533 = 0.00186

$\gamma = \frac{\Delta}{H} = \frac{0.00186}{96} = 0.00001938$ IN/IN $<$ O.K 0.0001

CALCULATION SHEET

STONE & WEBSTER ENGINEERING CORPORATION

A5010.61

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PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 2-4-81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E. BULLETIN 80-11
SUMMARY OF STRESSES WALL # SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

ELEMENT NOS.	NODE NOS.	BENDING STRESSES-DBE* WALL* INERTIA	EQUIP.**	INTERSTORY DISPL."	SRSS▲ PSI	ALLOW. BENDING STRESSES PSI	REMARKS
53	56,73,74,57	1.509	30.53	0.596	30.57	22.82	N.G
54	57,74,75,58	1.439	30.09	0.546	30.12	22.82	N.G
69	73,90,91,74	1.688	33.93	0.596	33.97	22.82	N.G
70	74,91,92,75	1.680	37.18	0.546	37.22	22.82	MAX N.G
		0.315	21.96	0.546	21.97	45.65	MIN O.K
71	75,92,93,76	1.642	38.11	0.497	38.14	22.82	MAX N.G
		0.464	28.04	0.497	28.05	45.65	MIN. O.K
72	76,93,94,77	1.603	32.77	0.447	32.81	22.82	N.G
76	80,97,98,81	1.531	25.72	0.248	25.76	45.65	MAX O.K
		0.146	7.6	0.248	7.61	22.82	MIN. O.K
86	91,108,109,92	1.959	35.17	0.546	35.22	22.82	N.G
87	92,109,110,93	1.968	41.08	0.497	41.12	22.82	N.G.
88	93,110,111,94	1.938	37.05	0.447	37.09	22.82	MAX N.G
		0.479	24.0	0.447	24.01	45.65	MIN. O.K
102	108,125,126,109	2.277	37.97	0.546	38.03	22.82	N.G
103	109,126,127,110	2.353	40.39	0.497	40.45	22.82	N.G
104	110,127,128,111	2.332	39.11	0.447	39.17	22.82	N.G
116	123,140,141,124	2.144	28.94	0.646	29.05	22.82	N.G
117	124,141,142,125	2.75	41.12	0.596	41.2	22.82	N.G
118	125,142,143,126	2.599	41.6	0.546	41.67	22.82	N.G.
119	126,143,144,127	2.747	44.0	0.497	44.09	22.82	N.G
120	127,144,145,128	3.284	48.72	0.447	48.81	22.82	N.G
121	128,145,146,129	2.488	34.50	0.397	34.58	22.82	N.G.
144	157,174,175,158	0.941	6.77	0.646	6.87	45.65	O.K
193	230,247,248,231	2.333	27.45	0.397	27.53	22.82	N.G.
205	243,260,261,244	2.937	35.26	0.596	35.37	22.82	N.G.

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G. K. SHAH 2-4 81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E BULLETIN 80-11
SUMMARY OF STRESSES WALL # SB-2-1

QA CATEGORY/CODE CLASS: I/NSR

ELEMENT NOS.	NODE NOS	BENDING STRESSES-DBE WALL # INERTIA	EQUIP ##	INTERSTORY DISPL.	SRSS PSI	ALLOW. BENDING STRESSES PSI	REMARKS
206	244, 261, 262, 245	3.113	37.49	0.546	37.62	22.82	N.G
207	245, 262, 263, 246	3.447	46.44	0.497	46.54	"	N.G
208	246, 263, 264, 247	4.088	49.48	0.447	50.15	"	MAX. N.G
209	247, 264, 265, 248	2.991	36.47	0.397	36.59	"	N.G
211	249, 266, 267, 250	1.978	19.79	0.298	19.87	"	O.K
212	250, 267, 268, 251	1.737	18.02	0.248	18.11	"	O.K
223	262, 279, 280, 263	3.186	38.98	0.497	39.11	"	N.G
224	263, 280, 281, 264	3.208	37.79	0.447	37.93	"	N.G
225	264, 281, 282, 265	3.005	35.30	0.397	35.43	22.82	N.G.

TABULATED VALUES HAVE BEEN ADJUSTED FOR ACTUAL THICKNESS OF WALL

INPUT VALUE FOR THICKNESS OF WALL = 10.2134"

EX. ELEM.# 53 $1.2843 \times \frac{12}{10.2134} = 1.508$ PSI

COMPUTER RUN # SGEVKX2 DATED 1-9-81

TABULATED VALUES HAVE BEEN ADJUSTED FOR ACTUAL THICKNESS OF WALL. (12/10.2134 = 1.1749) COMPUTER RUN # SGE2PPJ

▲ STRESS $SRSS = \sqrt{(\text{WALL INERTIA})^2 + (\text{EQUIP. STRESS})^2 + (\text{INTERSTORY DISPL. STRESS})^2}$

ALLOWABLE BENDING STRESS: HOLLOW BLOCK

BLDG CODE ACI 531-79 - TABLE 10.1

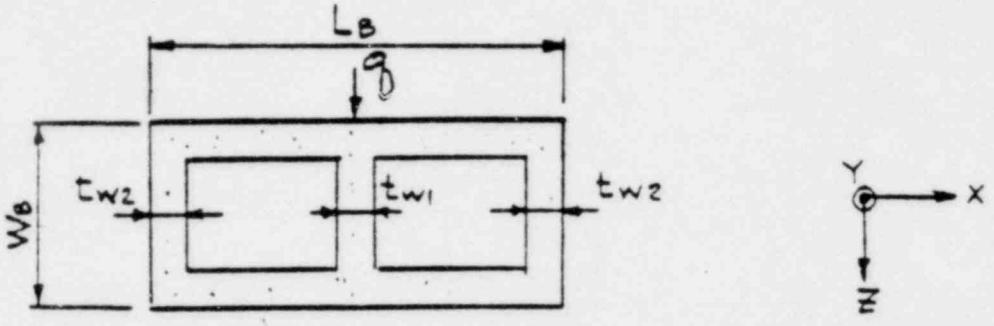
		PSI	OBE	DBE (PSI)
TENSION NORMAL TO BED JTS "y" DIRECTION	$0.57\sqrt{m_0} = 0.57\sqrt{750} =$	13.693	18.25	22.82
TENSION PARALL ⊥ TO BED JTS- "x"	$1.0\sqrt{m_0} = 1.0\sqrt{750} =$	27.386	36.51	45.65

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
CCTORRES/10.23.80	M. PARSIMIAN/10.24.80	M. PARSIMIAN/OCT. 25.

SUBJECT/TITLE / MASONRY/ WALL ANALYSIS IE 80-11 WALL # SB-2-1

QA CATEGORY/CODE CLASS I/NSR

SUBJECT - SHEAR ANALYSIS PROCEDURE FOR HOLLOW BLOCK WALLS



LET: L_B = LENGTH OF BLOCK (IN)

W_B = WIDTH OF BLOCK (IN)

t_{w_1}, t_{w_2} = WEB THICKNESS (IN)

q = UNIFORM DISTRIBUTED LD IN Z-DIRECTION

= LBS/FT/FT WIDTH OF WALL

L = CLEAR HT OF WALL (FT)

R = MAX REACTION @ SUPPORT IN Z-DIRECTION

$= \frac{q(L)}{2}$ FOR SIMPLE SUPPORT (LBS/FT WIDTH)

$= qL$ FOR CANTILEVER (LBS/FT WIDTH)

SHEAR STRESS || TO BED JTS IN Z-DIRECTION

SHEAR AREA, A_w = [TOTAL WEBS AREA] $\left[\frac{12''}{L_B}\right]$

$= \left[W_B(t_{w_1} + 2t_{w_2})\right]\left[\frac{12}{L_B}\right]$ = IN^2/FT WIDTH

SHEAR STRESS, $v = \frac{R}{A_w}$ = PSI

FROM ACI 531-79 TABLE 10.1 FOR FLEXURAL MEMBERS

ALLOW $v_m = 1.1\sqrt{f'_m} \geq v$

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PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 2-4-81	S. DiGREGORIO 2-6-81	S. DiGREGORIO 2-6-81

SUBJECT/TITLE	QA CATEGORY/CODE CLASS
MASONRY WALL ANALYSIS I.E BULLETIN 80-11 WALL # SB-2-1	I/NSR

SHEAR STRESS: SHEAR AREA, $A_w = \frac{(\text{TOTAL WEB AREA})}{L_B}$

$= \frac{3(1.312)(11.625)}{15.625}$

$= 2.928384$ IN²/INCH WIDTH.

∴ SHEAR AREA FOR 6" WIDTH = 6(2.928384) = 17.57 IN²

SHEAR AREA FOR 8" WIDTH = 8(2.928) = 23.427 IN²

SHEAR STRESS $v = \frac{R}{A_w}$ PSI

PER ACI 531-79 TABLE 10.1 ALLOWABLE SHEAR STRESS FOR FLEXURAL MEMBERS $v_m = 1.1\sqrt{f_m'}$ OR MAX 50 PSI WHICHEVER LESS

$= 1.1\sqrt{500} = 24.5967$ PSI

∴ $v_{m\ OBE} = 1.333(24.5967)$

$= 32.78$ PSI

$v_{m\ DBE} = 1.667(24.5967) = 40.99$ PSI

SHEAR STRESS IN VERTICAL MORTAR JOINTS *OBE = 4.38

*DBE = 6.57

$\sqrt{\frac{750}{2500}} = 0.5477$

*OBE ALLOW. = 8(0.5477) = 4.38

*DBE ALLOW. = 12(0.5477) = 6.57

NOTE: CORNER NODES AVE. WIDTH = 8/2 + 6/2 = 7"

∴ SHEAR AREA = 7(2.9283) = 20.5 IN²

PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
C. K. SHAH 2-5-81	S. DiGREGORIO 2-7-81	S. DiGREGORIO 2-7-81

SUBJECT/TITLE: MASONRY WALL ANALYSIS I.E BULLETIN 80-11
WALL # SB-2-1 DBE

QA CATEGORY/CODE CLASS: I/NSR

NODE NOS.	FORCE Fz (LBS) WALL INERTIA RUN # SGEVKXZ	FORCE Fz (LBS) EQUIP RUN # SGE2PFJ	INTER-STORY DISPL.	SHEAR STRESSES (PSI) WALL INERTIA	SHEAR STRESSES (PSI) EQUIP.	SHEAR STRESSES (PSI) INTER STORY DISPL	SRSS PSI	ALLOW. SHEAR STRESS	REMARKS
1	38.65	707.33	1.554	1.885	34.50	0.08	34.55	6.57	N.G MAX
69	10.92	371.79	"	0.466	15.87	0.07	15.88	40.99	O.K
86	11.94	626.92	"	0.510	26.76	0.07	26.76	40.99	O.K
103	12.84	382.79	"	0.548	16.34	0.07	16.35	40.99	O.K
341	11.42	66.18	"	0.557	3.23	0.08	3.28	6.82	O.K
17	37.13	579.17	"	1.81	28.25	0.08	28.3	6.82	N.G
85	10.86	188.39	"	0.464	8.04	0.07	8.05	40.99	O.K
102	11.57	258.01	"	0.494	11.01	0.07	11.02	40.99	O.K
272	12.10	191.25	"	0.516	8.16	0.07	8.17	40.99	O.K
357	12.70	45.69	"	0.62	2.29	0.08	2.37	6.57	O.K
7	10.41	164.91	"	0.592	9.39	0.09	9.41	"	N.G
8	10.71	165.49	"	0.61	9.42	0.09	9.44	"	N.G
9	10.74	158.88	"	0.611	9.04	0.09	9.06	"	N.G
10	10.55	146.56	1.554	0.60	8.34	0.09	8.36	6.57	N.G

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STONE & WEBSTER ENGINEERING CORPORATION

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PREPARER/DATE	REVIEWER/CHECKER/DATE	INDEPENDENT REVIEWER/DATE
2-13-81	S.DiGREGORIO 3-11-81	S.DiGREGORIO 3-11-81

SUBJECT/TITLE: BV-#1 MASONRY WALL ANALYSIS I.E. BULLETIN 80-11

QA CATEGORY/CODE CLASS: #1/NSL

RESULTS SUMMARY:

SEE PG. NO. 151 & 152 FOR SUMMARY OF BENDING STRESSES. & SEE PG. NO. 155 FOR SUMMARY OF SHEAR STRESSES. BY COMPARISON IT CAN BE CONCLUDED THAT BENDING & SHEAR STRESSES ARE MORE THAN ALLOWABLE STRESSES. THEREFORE WALL IS OVERSTRESSED.

THE MAJOR CONTRIBUTION OF OVERSTRESS IN THE ACTUAL STRESSES ARE DUE TO EQUIPMENT STRESSES THEREFORE MODIFICATION IS REQUIRED TO RELEASE EQUIPMENT STRESSES.

4. With reference to the collar joint strength in tension and the shear assumed in Attachment D of Reference 4, provide justification and test data (if available) on the allowable tensile and shear stresses in collar joints applicable for the type of masonry walls at Beaver Valley Power Station Unit 1.

4. The allowable tension and shear stresses in collar joints applicable for the type of masonry walls at Beaver Valley Power Station Unit No. 1 are taken to be 8 psi and 12 psi for severe environmental loads (OBE) and extreme environmental loads (DBE) respectively. These allowable stresses are outlined in the "Criteria for Reevaluation of Concrete Masonry Walls for IE Bulletin 80-11" Beaver Valley Power Station Unit No. 1. Attachment D of Reference 4 shows the allowable collar joint stresses in relation to actual collar joint stresses for the walls in the various buildings at Beaver Valley Power Station Unit No. 1.

Bechtel has published test data pertaining to the Trojan Nuclear Power Plant that is applicable to collar joint stress. The tests conducted at the Trojan Plant indicated an average tensile bond strength of 194 psi. This result was consistant with predicted values based on block compressive strength. The recommended allowable for the Trojan Plant was 20 percent of the ultimate (194) = 39 psi. The extreme environmental conditions allowable stress of 12 psi is only 6 percent of the ultimate test value for tensile bond strength. Shear bond and tensile bond strengths are taken to be the same. The previously accepted NRC allowable for shear bond strength is 12 psi.

The Uniform Building Code (UBC) 1979 allows a maximum value of 12 psi for shear or tension in flexure and a minimum value of 6 psi for shear and tension in flexure. Therefore, the allowables of 12 psi (DBE) and 8 psi (OBE) do not exceed maximum UBC allowables even without the permitted increase factor of 1.33 for seismic loads.

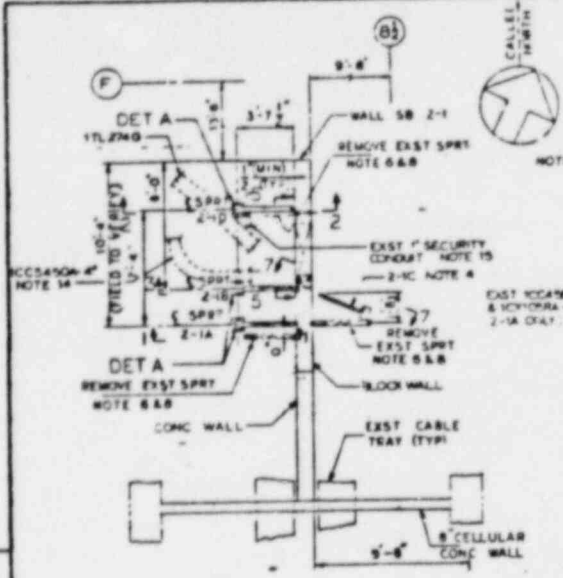
The workmanship and quality control procedures at Beaver Valley Power Station Unit No. 1 have been shown to be of such quality that the intent of the design and drawings is very closely adherred to. Based on these conditions of workmanship, the available test data and the relationship of the collar joint allowable stresses to allowable values given in the UBC 1979 the values of 12 psi and 8 psi for extreme environmental (DBE) and severe environmental (OBE) conditons respectively appear reasonable.

5. With reference to the proposed modification for the walls indicated in the attachment to Reference 6, provide sketches and confirmatory analysis to indicate the adequacy of these modifications.

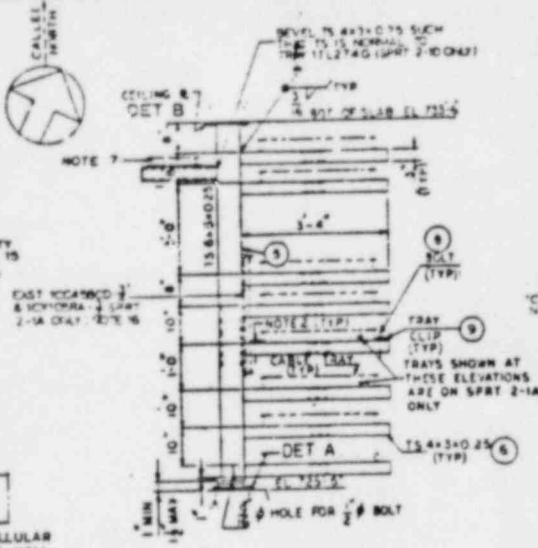
The proposed modifications for the walls were developed in accordance with the Beaver Valley Power Station Unit No. 1 "Criteria for Re-evaluation of Concrete Masonry Walls for I & E Bulletin 80-11." The confirmatory analysis for the modifications is too voluminous to be included in this submittal, however, information is on file with the Duquesne Light Company Structural Engineering Department for review if needed.

The boundry conditions were modified as shown on the attached drawings (Attachment 5-A).

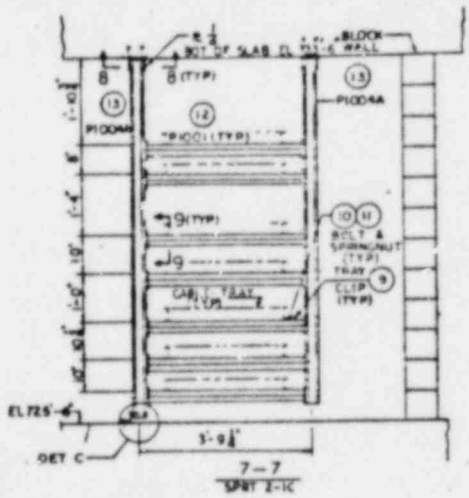
No. 8700-PS-5U



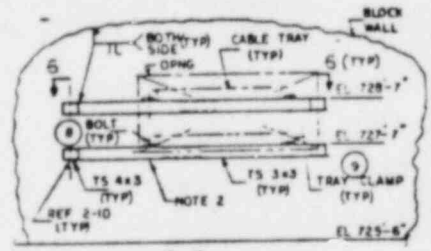
PART PLAN EL 725'-6"



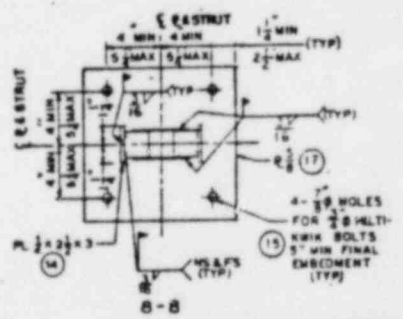
1-1 SPRT 2-1A
2-2 SPRT 2-1D



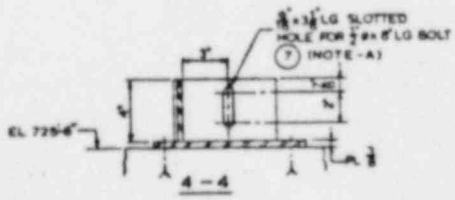
7-7
SPRT 2-1C



5-5

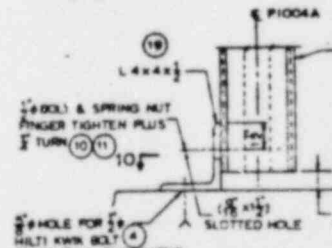


8-8



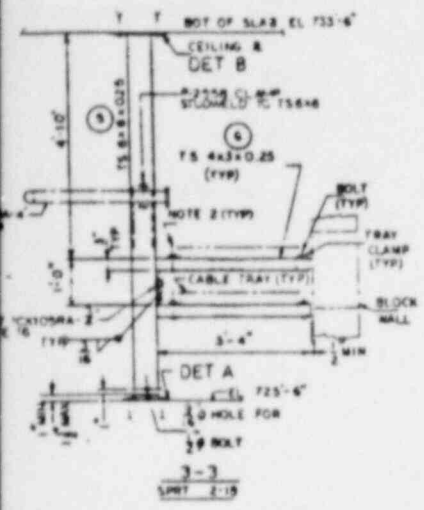
4-4

NOTE-A:
FINGER TIGHTEN ⅝ϕ BOLT PLUS ½ TURN, THEN LOCK 2ND NUT IN PLACE

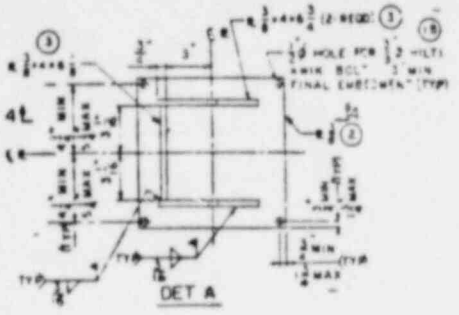


DET-C

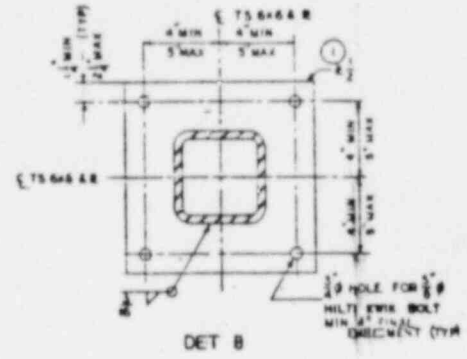
ATTACHMENT 5-A

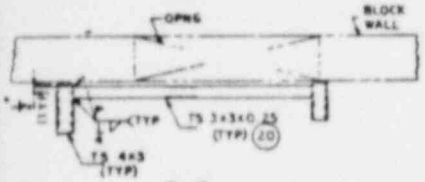


3-3



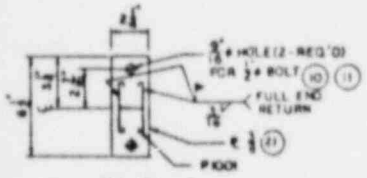
BILL OF MATERIAL			
ITEM	QTY	DESCRIPTION	MAT. SPEC
1	3	PL (SIZE BY FIELD)	ASTM A36
2	3	PL (SIZE BY FIELD)	DO
3	5	PL (SIZE BY FIELD)	DO
4	2	HILTI KWIK BOLT 5" LG	
5	7	6x6x0.25x LENGTH BY FIELD	ASTM A500 GR B
6	11	TS 4x3x0.25x LENGTH BY FIELD	DO
7	3	⅝ø x 0'-8" LG BOLTS W/ 2 NUTS	ASTM A-325
8	38	⅝ø x 0'-5" LG BOLTS NUTS & LOCK WASHERS	DO
9	50	CABLE TRAY HOLD CLIPS (CPE CAT NO 6C17)	
10	43	⅜ø SPRING NUTS (UNISTRUT NO P1010)	
11	43	⅜ø x 2" LG BOLTS & LOCK WASHERS	ASTM A-307
12	7	UNISTRUT P1001 LENGTH BY FIELD	
13	3	UNISTRUT P1004A LENGTH BY FIELD	
14	4	PL ½ x 2½ x 3	ASTM A36
15	8	⅝ø HILTI KWIK BOLT 7" LG	
16	12	⅝ø HILTI KWIK BOLT 6" LG	
17	2	PL ⅜ (SIZE BY FIELD)	ASTM A36
18	12	⅝ø HILTI KWIK BOLT 5" LG	
19	1	L 4x4x½ x 0'-8" MAX	ASTM A36
20	2	TS 3x3x0.25 LENGTH BY FIELD	ASTM A500 GR B
21	14	PL ⅜ x 2½ x 6½	ASTM A36



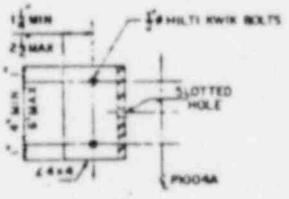


6-6

NOTES
1. ALL SUPPORTS TO BE INSTALLED PER THE APPROPRIATE SECTIONS FROM "NF PLANT CONSTRUCTION MANUAL"
2. FOR SUPPORTS 2-1A 2-1B & 2-1C THE FIELD IS TO LOCATE AND DRILL ⅝ø BOLT HOLES THROUGH TS 4x3 OR TS 3x3 TO ACCOMMODATE ⅝ø A-325 LG BOLTS FOR THE CABLE TRAY HOLD DOWN CLIPS
3. FIELD TO RELOCATE CONDUIT AND LIGHT FIXTURES TO FACILITATE SUPPORT INSTALLATIONS
4. FIELD TO VERIFY ORIENTATION OF SUPPORT NO 2-1C (SUPPORT TO BE AS CLOSE TO NORMAL WITH CABLE TRAY AS POSSIBLE)
5. FIELD TO EXTEND TRAY NO ITC415P ONTO SPRT NO 2-1C
6. FIELD TO PROVIDE TEMPORARY TRAY SUPPORT PRIOR TO REMOVAL OF EXISTING SUPPORT FIELD TO INSTALL NEW SUPPORT 2-1A AT SAME LOCATION AS EXISTING SUPPORT
7. TRAY TC 2AG MAY BE TEMPORARILY REMOVED TO FACILITATE INSTALLATION OF SUPPORT 2-1C FIELD TO SUPPORT TRAY TC3740 FROM NEW SUPPORT 2-1B WITH TS 4x3x0.25 AFTER TRAY IS REINSTALLED
8. AFTER ALL NEW CABLE TRAY SUPPORTS HAVE BEEN INSTALLED FIELD TO REMOVE ALL EXISTING CABLE TRAY SUPPORTS FROM BLK WALL
9. DISCONNECT ALL VERTICAL TRAY SUPPORTS ON EACH FACE OF THE BLOCK WALL NEAR OPENING IN BLOCK WALL
10. FIELD TO VERIFY BY AS-BUILT THAT TRAY RISER IS ANCHORED TO EL 725'-6"
11. FIELD TO VERIFY ALL TRAY SUPPORT LOCATIONS
12. WELDS SHALL BE INSTALLED IN ACCORDANCE WITH APPROVED WELD PROCEDURES
13. THIS DWG SUPERSEDES THE FOLLOWING SKETCHES: 133878-S-494 THRU 503
14. ATTACH EXIST CONDUIT 1CC5453A-4" TO NEW SUPPORT 2-1B
15. EXIST 1" SECURITY CONDUIT IN AREA OF BASE PLATE FOR SUPPORT 2-1D MAY BE TEMPORARILY RELOCATED TO FACILITATE BASE PLATE INSTALLATION CONDUIT TO BE REINSTALLED AND A CLEARANCE OF 2" TO BE MAINTAINED FROM NEW BASE PLATE TO EXIST 1" CONDUIT
16. ATTACH EXIST CONDUITS 1CX1058A 2" AND 1CC4580D 3" TO NEW SUPPORTS 2-1B & 2-1A WITH P-2558 CLAMPS STUD WELDED TO TUBE STEEL



9-9



10-10

REFERENCES
1. ARCH DWG 11700-RA-1G
2. CONC DWG 11700-RC-7G

INTERIM ISSUE
MAN 12/19/78 PAR
RESPONSIBLE ENGINEER

MODIFICATIONS REQUIRED FOR THE FOLLOWING BLOCK WALLS ARE SHOWN ON THIS DRAWING 58-2-1

APPROVED
REGISTERED PROFESSIONAL ENGINEER NO.
DEPARTMENT OR COMMONWEALTH

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

BLOCK WALL MODIFICATION
SERVICE BLDG SHEET 1

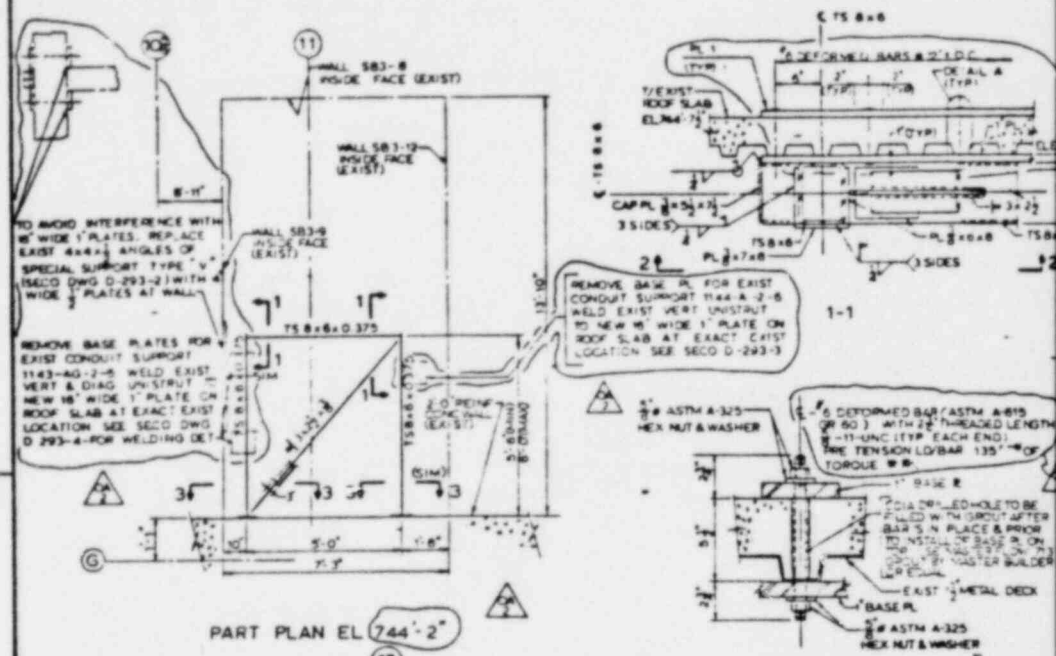
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

SCALE NTS

BEAVER VALLEY POWER STATION UNIT NO 1

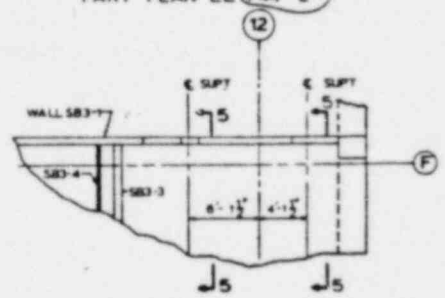
AA No. 8700-RS-5U

S&W DWG. NO. 11700-RS-5U

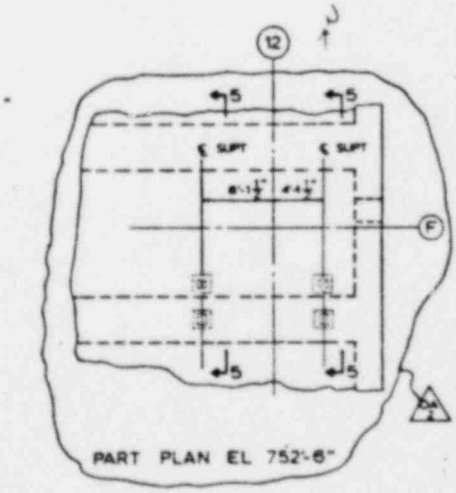

WALL SB3-8 INSIDE FACE (EXIST)
WALL SB3-12 INSIDE FACE (EXIST)
WALL SB3-9 INSIDE FACE (EXIST)
TO AVOID INTERFERENCE WITH 16" WIDE 1" PLATES, REPLACE EXIST 4x4x½ ANGLES OF SPECIAL SUPPORT TYPE "V" (SECO DWG D-293-2) WITH 4" WIDE ½" PLATES AT WALL
REMOVE BASE PLATES FOR EXIST CONDUIT SUPPORT 1143-AG-2-6 WELD EXIST VERT & DIAG UNISTRUT TO NEW 16" WIDE 1" PLATE ON ROOF SLAB AT EXACT EXIST LOCATION SEE SECO DWG D 293-4 FOR WELDING DET
TS 8x6x0.375
2.0 REINF CONC (EXIST)
PART PLAN EL 744'-2"

TS 8x6
DEFORMED BARS @ 12" O.C.
DET A (TYP)
T/EXIST ROOF SLAB EL 744'-7½"
CAP PL ⅜"x5½"x1½" 3 SIDES
TS 8x6
PL ⅜"x6"x8"
PL ⅜"x7"x8"
3 SIDES
REMOVE BASE PL FOR EXIST CONDUIT SUPPORT 1144-A-2-6 WELD EXIST VERT UNISTRUT TO NEW 16" WIDE 1" PLATE ON ROOF SLAB AT EXACT EXIST LOCATION SEE SECO D-293-3
1-1

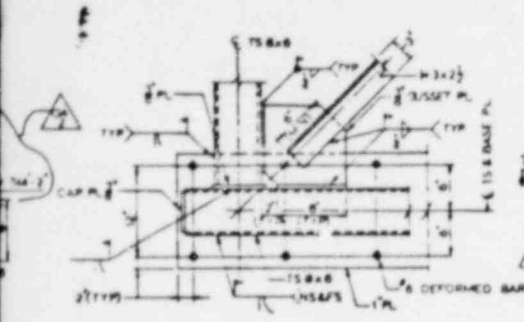
¾" ASTM A-325 HEX NUT & WASHER
6 DEFORMED BAR (ASTM A-615 GR 60) WITH 2½" THREADED LENGTH 1"-11-UNC (TYP EACH END) PRE TENSION LOADED TO 135" KIPS OF TORQUE
1" BASE PL
DIA DRILLED HOLE TO BE FILLED WITH GROUT AFTER BAR IS IN PLACE & PRIOR TO INSTALL OF BASE PL ON TOP OF WATER BUILDER
EXIST 1½" METAL DECK
BASE PL
1" ASTM A-325 HEX NUT & WASHER


WALL SB3-7
SB3-4
SB3-3
℄ SUPT
PART PLAN EL 735'-6"

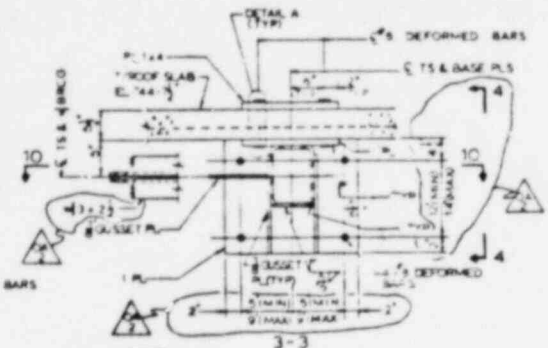
DETAIL A
NOTE: TORQUE IS TO BE APPLIED IMMEDIATELY AFTER GROUT IS PLACED
TS 8x8x.500
DET C
TS 8x8x.500
DET D
5 - 5


℄ SUPT
PART PLAN EL 752'-6"

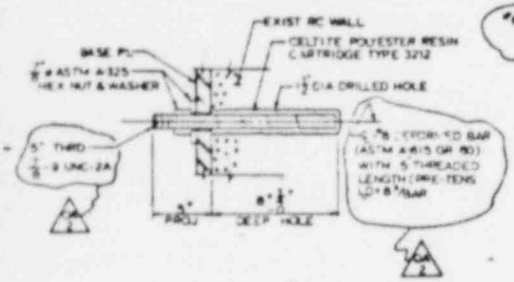
⅜" GUSSET PL
L3x2½
TS 8x6
3 SIDES
10 - 10



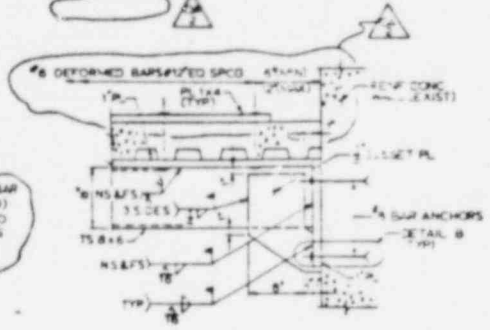
2-2



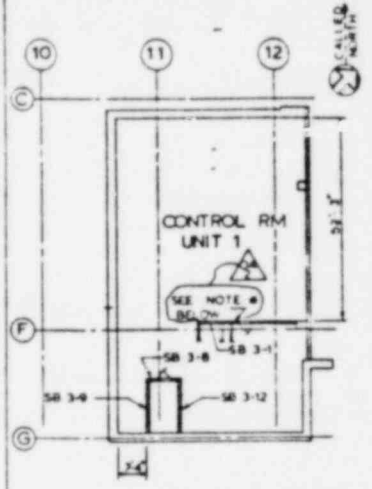
3-3



DETAIL B

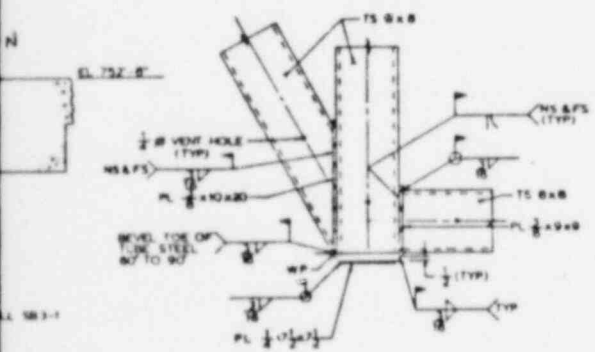


4-4

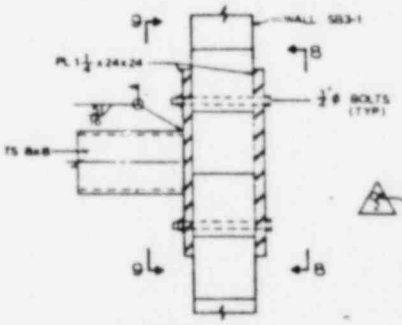


KEY PLAN EL 735'-6"
SERVICE BLDG

#FIELD NOTE
THE MAX SPAN BETWEEN SUPPORTS FOR EXIST CONDUITS ON WALL SB-3-1 TO BE 4'-9". IF NEW SUPPORTS ARE REQ'D, SUPPORTS SHALL BE THE SAME AS THE EXIST SUPPORTS



DETAIL C

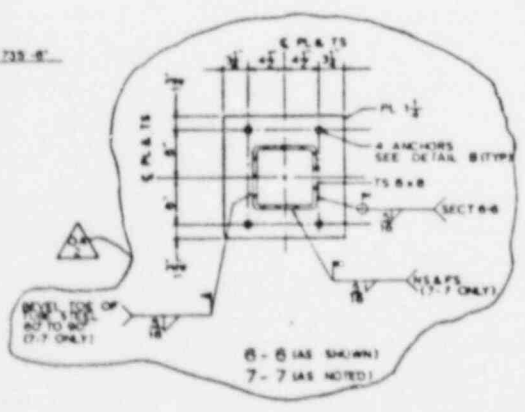


DETAIL D

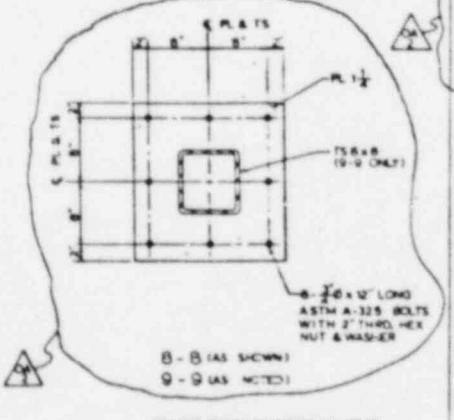
NOTES:
1. ALL STEEL SHALL BE ASTM A-36 EXCEPT TUBING WHICH SHALL BE ASTM A-500, GR B.
2. FABRICATION OF STEEL SHALL BE IN ACCORDANCE WITH PMM 5-8 SEE AWS D1.1 REV 1-76 FOR STRUCTURAL TUBING
3. ALL WELDS SHALL BE INSTALLED IN ACCORDANCE WITH PMM 5-8
4. CELTITE ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH BVPP NO 229
5. GROUT SHALL BE IN ACCORDANCE PMM 5-2
6. EXISTING CONCRETE FOR DRILLING OF HOLES SHALL NOT BE DAMAGED WHILE DRILLING HOLES FOR BASE PL WELDED WIRE REINFORCING IN SLAB ON DECKING MAY BE CUT AS REQ'D
7. THIS DWG SUPERSEDES THE FOLLOWING SKETCHES 13387.76-S434 THRU-S438

MODIFICATIONS REQUIRED FOR THE FOLLOWING BLOCK WALLS ARE SHOWN ON THIS DRAWING
SB-3-1, SB-3-8, SB-3-9 & SB-3-12

REF DWGS
1. SECU-C-293-1 REF 1
2. SECO-D-293-2
3. SECO-D-293-3
4. SECO-D-293-4
5. ARCH DWG 8700-RA-1A & BA
6. CONC DWG 8700-RC-8C & 8E



6 - 6 (AS SHOWN)
7 - 7 (AS NOTED)



8 - 8 (AS SHOWN)
9 - 9 (AS NOTED)

INTERIM ISSUE

THE INFORMATION ON THIS DRAWING MAY NOT BE USED OR LOANED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF THE PLANT FACILITY DESCRIBED IN THE TITLE BLOCK.

APPROVED _____

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

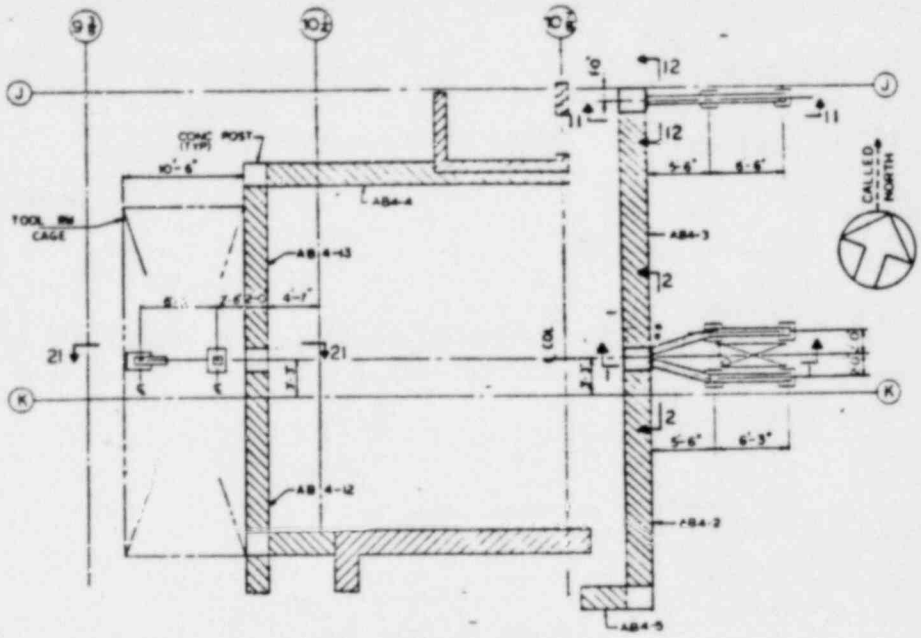
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

BLOCK WALL MODIFICATION
SERVICE BLDG SHEET 2

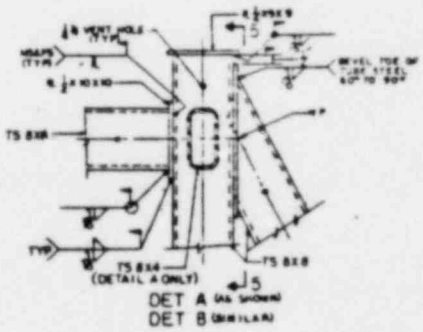
BEAVER VALLEY POWER STATION UNIT NO. 1

AA No. 8700-RS-5V

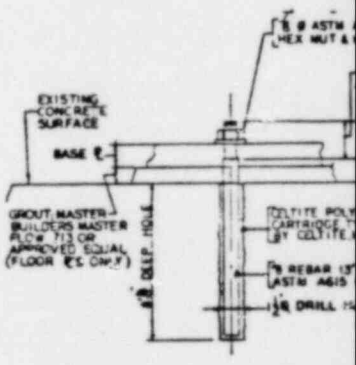
S&W DWG. NO. 11700-RS-5V-0A2



PART PLAN EL 768'-7"

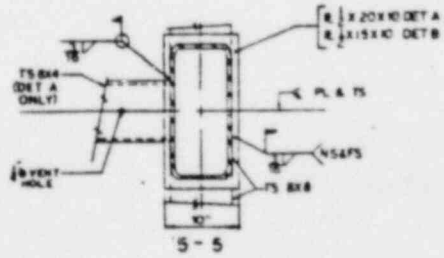


DET A (AS SHOWN)
DET B (SIMILAR)

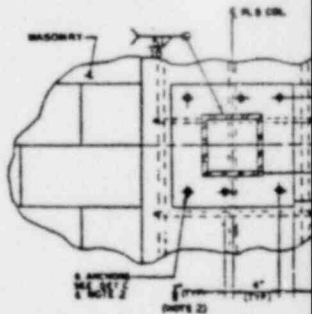


DET C

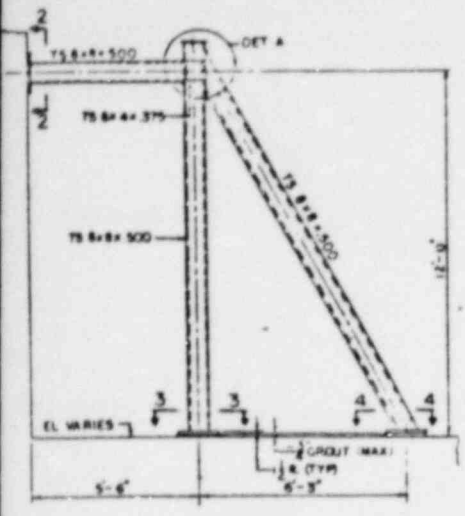
NOTES
REF INSTALLATION PROCEDURE 8VPP-229
PRELOAD ANCHOR TO 8,000 LB



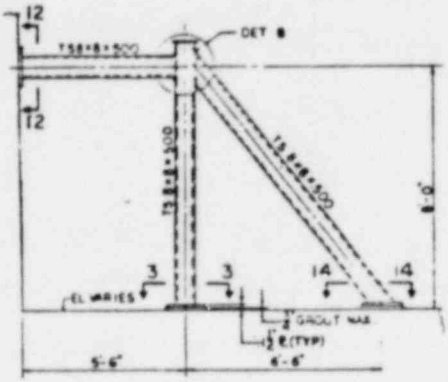
5 - 5



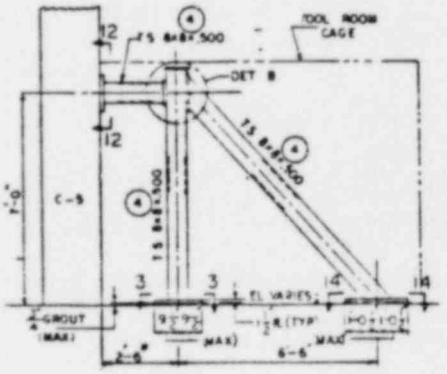
12 - 12



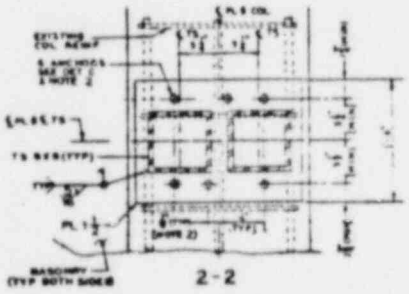
I – I (TYPICAL)



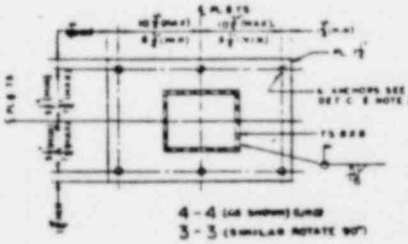
II – II



21-21



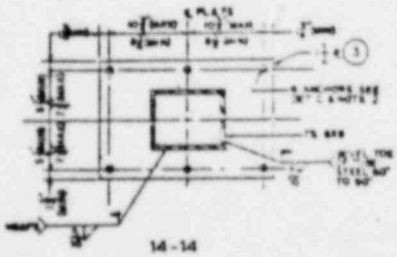
2 - 2



4 - 4 (AS SHOWN) &
3 - 3 (SIMILAR ROTATE 90°)

NOTES

1. GENERAL NOTES RS - 3A
2. EXISTING REINFORCEMENT SHALL NOT BE DAMAGED WHILE DRILLING HOLES WHEN WALLS ARE ENCOUNTERED HOLES SHALL BE PLACED TO PROVIDE A CONCENTRIC PATTERN WITH RESPECT TO ½ OF TUBE STEEL AS SHOWN IN SECTS 2-2 & 12-12 TYPICAL ALL PLATES
3. ALL STRUCTURAL STEEL SHALL BE ASTM A-36 EXCEPT STRUCTURAL TUBING WHICH SHALL BE ASTM A-500 GRADE B
4. FABRICATION OF STEEL SHALL BE IN ACCORDANCE WITH PNPM S-8 SEE ANSI D1.1 PCV 1.1.76 FOR STRUCTURAL TUBING
5. ALL WELDS SHALL BE INSTALLED IN ACCORDANCE W/PNPM S-8
6. GROUT SHALL BE IN ACCORDANCE W/PNPM S-2
7. THIS DWG SUPERSEDES THE FOLLOWING SKETCHES 13382.76-S-371 THRU S-377 & 13382.76-S-411 THRU S-418



14 - 14

REFERENCE DWGS

1. 11700-RC-24M
2. 11700-RA-10A

MODIFICATIONS REQUIRED FOR THE FOLLOWING BLOCK WALLS ARE SHOWN ON THIS DRAWING
AB4-2 AB4-3 AB4-5 AB4-12 & AB4-13

INTERIM ISSUE

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

BLOCK WALL MODIFICATION
AUXILIARY BLDG

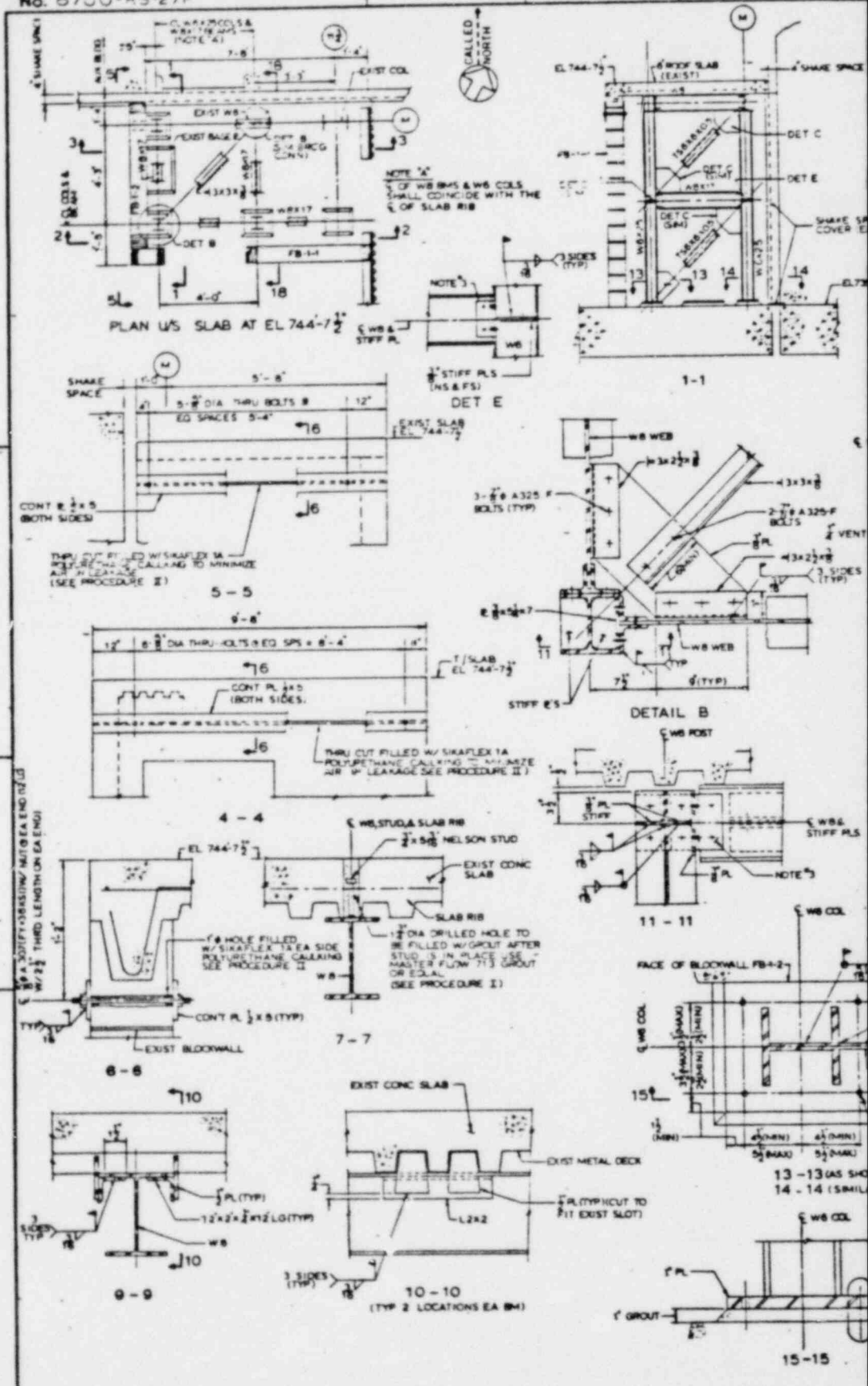
BEAVER VALLEY POWER STATION UNIT NO. 1

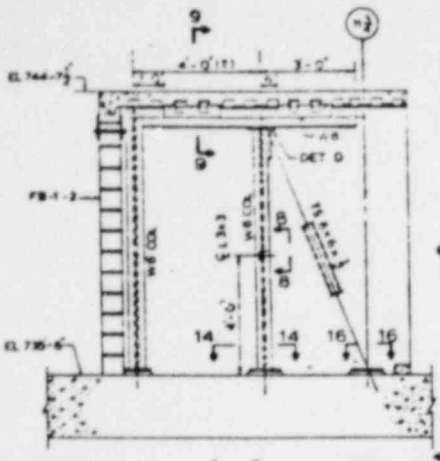
AA No. 8700-RS-24H

STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

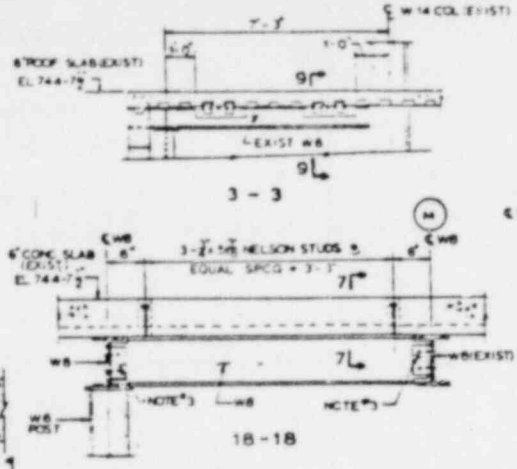
S&W DWG. NO. 11700-RS-24H

No. B700-RS-27F



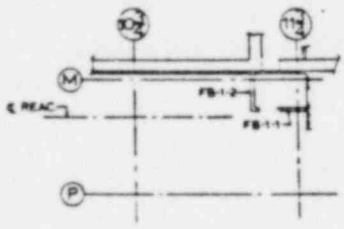


2 - 2

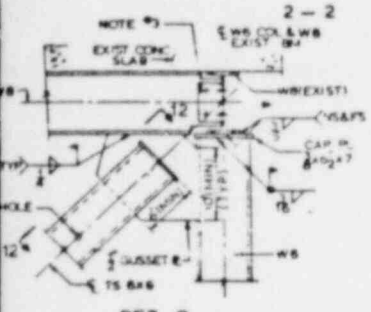


3 - 3

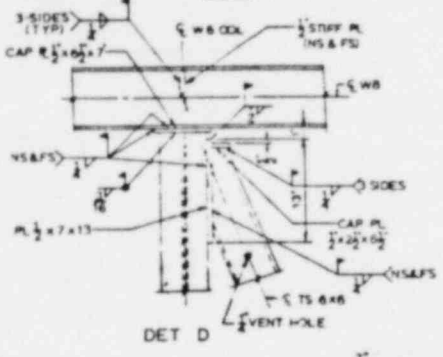
18 - 18



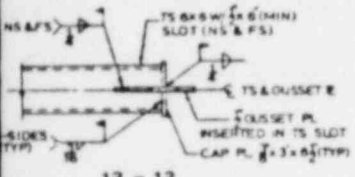
KEY PLAN EL 735'-6"
FUEL BUILDING



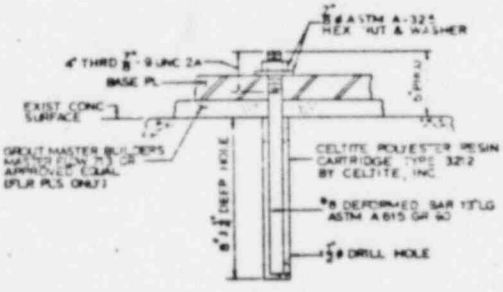
DET C



DET D



12 - 12



DET - A

INSTALLATION PROCEDURE

I 1. CORE DRILL THRU 6" EXIST CONC SLAB & METAL DECK AT ℄ OF SLAB RIB
2. TAKE FIELD MEASUREMENT OF CORED LOCATIONS
3. LOCATE & WELD STUDS ON BEAMS TO THESE DIMENSIONS
4. ERECT BEAMS
FILL CORES WITH GROUT - USE MASTER FLOW 713 GROUT OR EQUAL

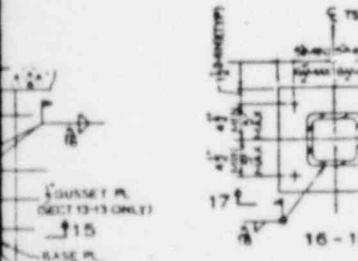
II 1. SAW CUT INSIDE PART OF BLOCKWALL
2. ERECT STEEL FRAMINGS
3. SAW CUT REMAINING OUTSIDE PART OF BLOCKWALL
4. FILL THRU CUT WITH CAULKING MATERIAL ON EACH SIDE FOR MIN DEPTH OF ¼"
5. INSTALL ⅝ø THRU BOLTS & ½" CONT PLS

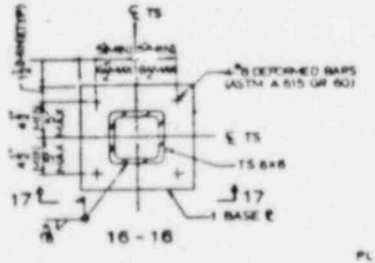
NOTES

1. ALL STEEL SHALL BE ASTM A-36 EXCEPT TUBING WHICH SHALL BE ASTM A-500 GR B
2. FABRICATION OF STEEL SHALL BE IN ACCORDANCE WITH PNM S-8 SEE AWS D1.1 REV 1976 FOR STRUCTURAL TUBING
3. ALL NEW BEAMS SHALL HAVE BOLTED CONNECTIONS USING ⅞ø A 325F BOLTS AND 2"W 3x3x¼ U.G.S.
4. ALL WELDS SHALL BE INSTALLED IN ACCORDANCE WITH PNM S-8
5. CELTITE ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH BVPP NO 299
6. GROUT SHALL BE IN ACCORDANCE WITH PNM S-2
7. EXIST CONC SLAB REINFORCEMENT SHALL NOT BE DAMAGED WHILE DRILLING HOLES

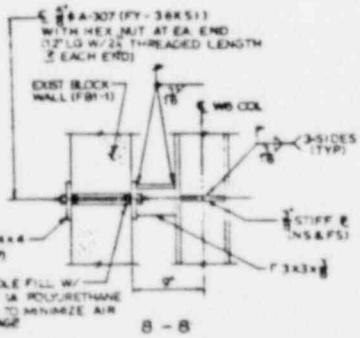
REFERENCES

1. ARCH DWG 8700 RA-11A,B&C
2. CONC DWG 8700 RC-27E
3. STEEL DWG 8700 RS 27B&C

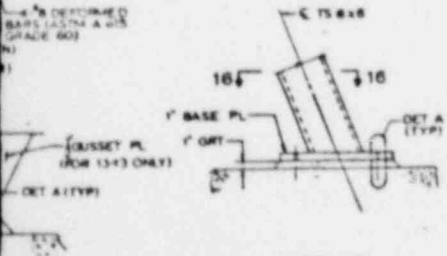




16 - 16



8 - 8



17 - 17

MODIFICATIONS REQUIRED FOR THE FOLLOWING BLOCK WALLS ARE SHOWN ON THIS DRAWING:
FB-1-1 & FB-1-2

INTERIM ISSUE

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

BLOCKWALL MODIFICATION
FUEL BLDG SHEET NO 1

STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

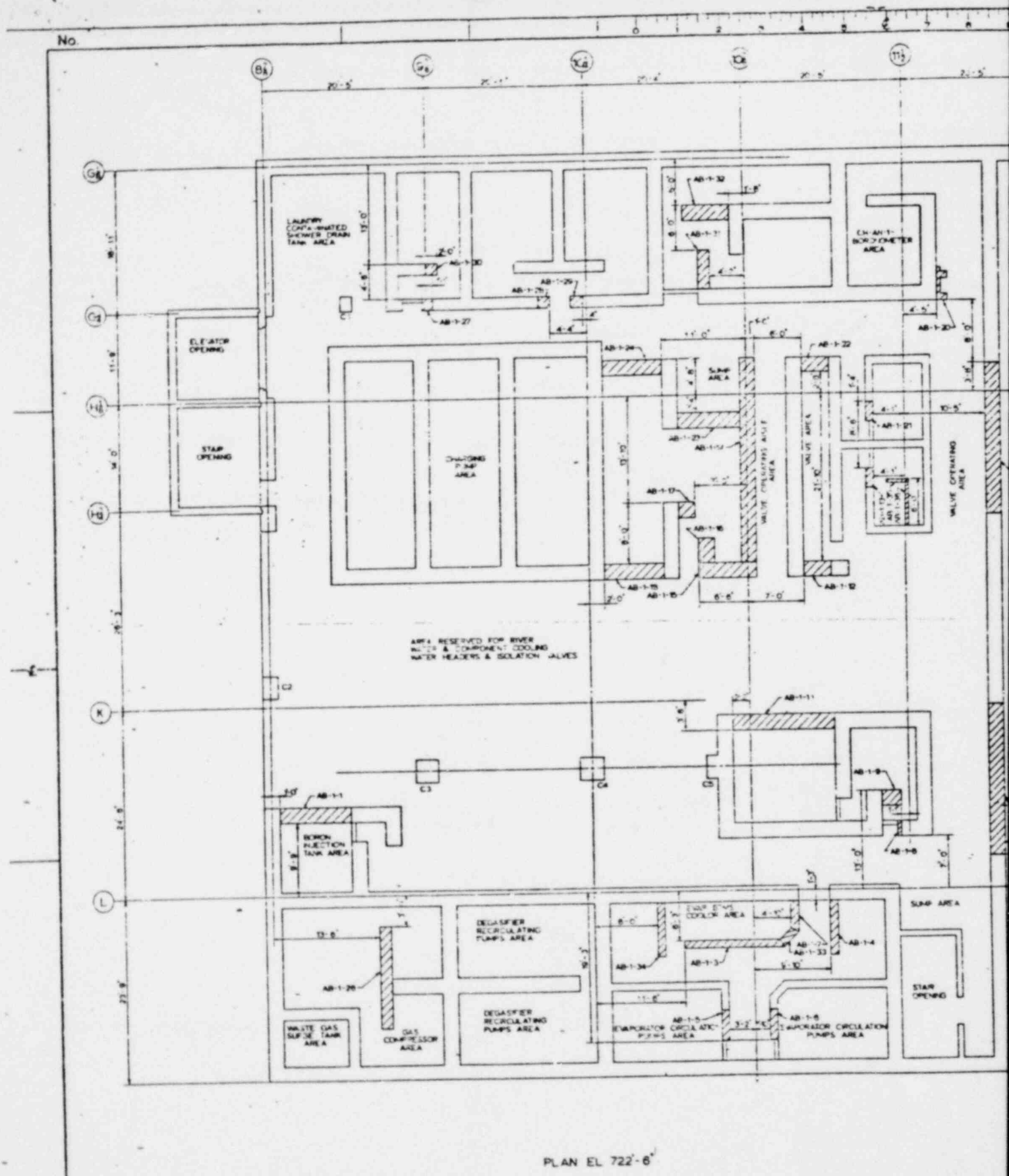
BEAVER VALLEY POWER STATION UNIT #1

AA No. 8700-RS-27F

S&W DWG. NO. 11700-RS 27F

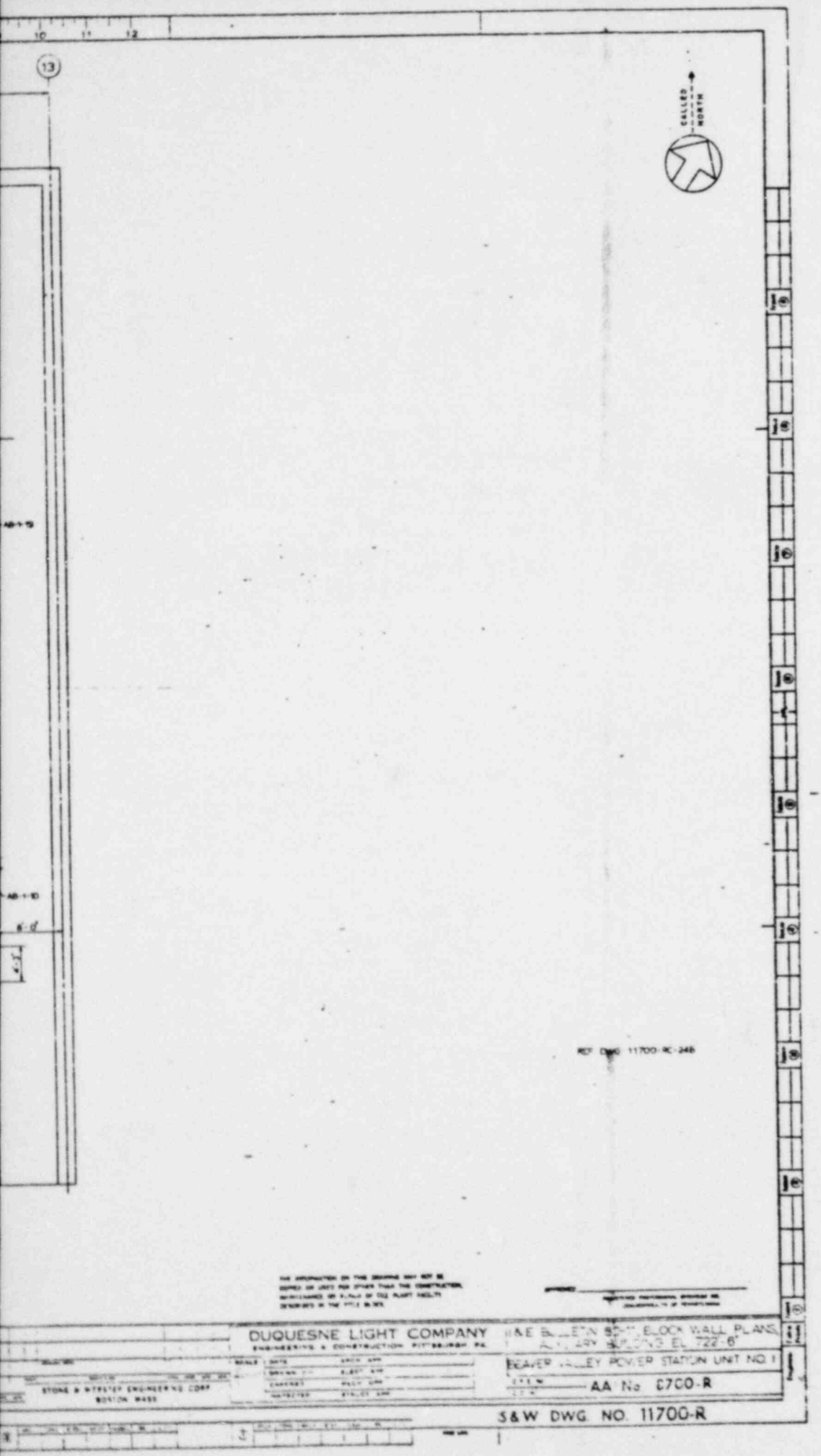
6. Provide legible copies of drawings indicating the locations of safety-related masonry walls in the auxiliary building, cable vault, fuel and decontamination building, and service building of Beaver Valley Power Station Unit 1. Location plans for auxiliary building masonry walls included ir Attachment A of Reference 3 are not legible.

6. Attached are sketches indicating the locations of safety related masonry walls in the auxiliary building, cable vault, fuel and discontamination building, and service building of Beaver Valley Power Station Unit 1 (Attachment 6-A).


LAUNDRY CONT'A INATED SHOWER DRAIN TANK AREA
ELEVATOR OPENING
STAIR OPENING
CHARGING P.W. AREA
SUMP AREA
VALVE OPERATING AREA
CHANNEL-BORIZOMETER AREA
AREA RESERVED FOR RIVER WATER & COMPONENT COOLING WATER HEADERS & ISOLATION VALVES
BORON INJECTION TANK AREA
DEGASIFIER RECIRCULATING PUMPS AREA
WASTE GAS SURGE TANK AREA
GAS COMPRESSOR AREA
EVAPORATOR CONDENSATE PUMPS AREA
EVAPORATOR CIRCULATION PUMPS AREA
STAIR OPENING

PLAN EL 722'-6"

ATTACHMENT 6 of 7



THE INFORMATION ON THIS DRAWING MAY NOT BE COPIED OR USED FOR OTHER THAN THE CONSTRUCTION, MAINTENANCE OR REPAIR OF DLC PLANT FACILITY DESIGNATED IN THE TITLE BLOCK.

APPROVED _____

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH PA.

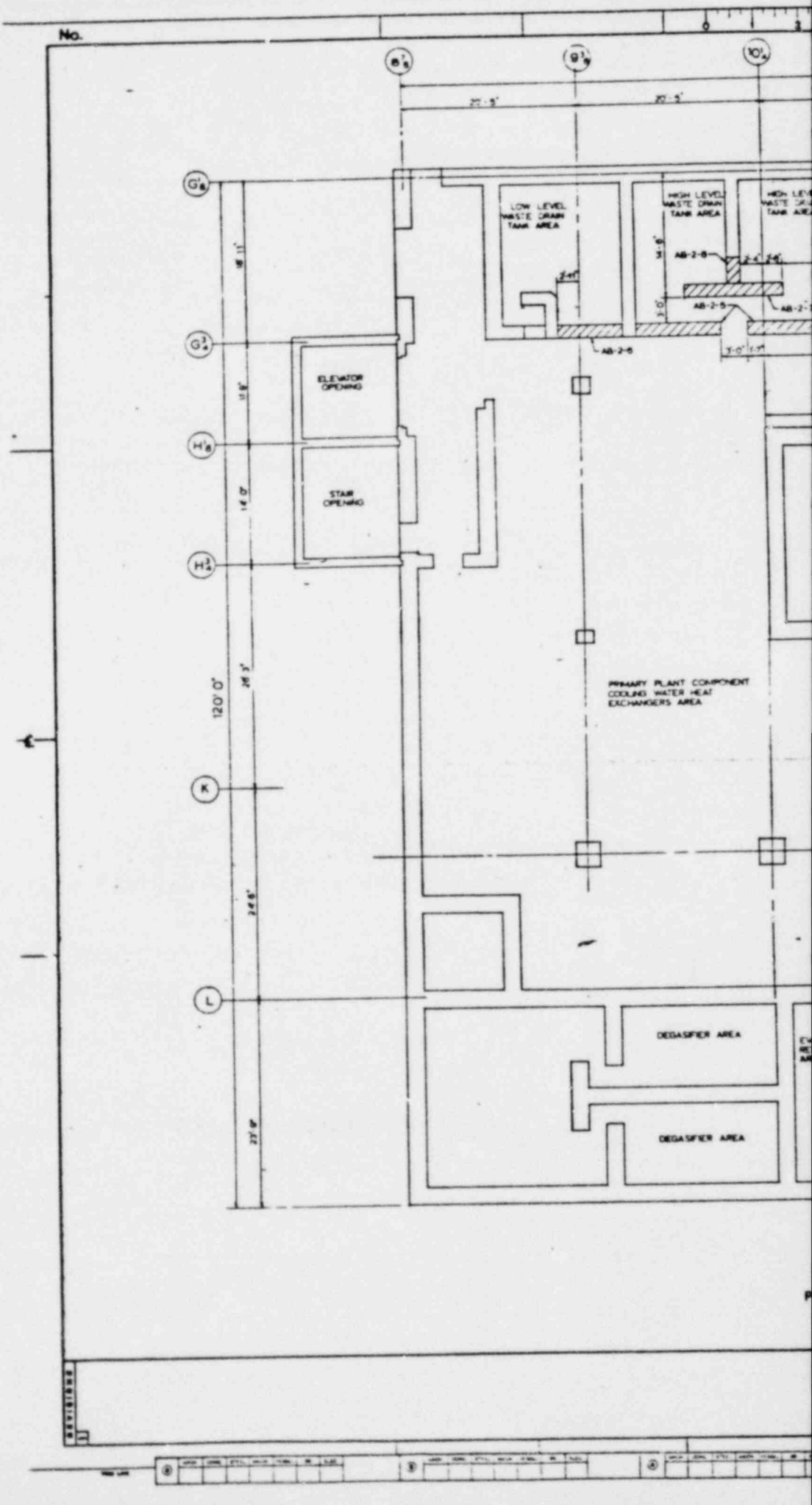
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

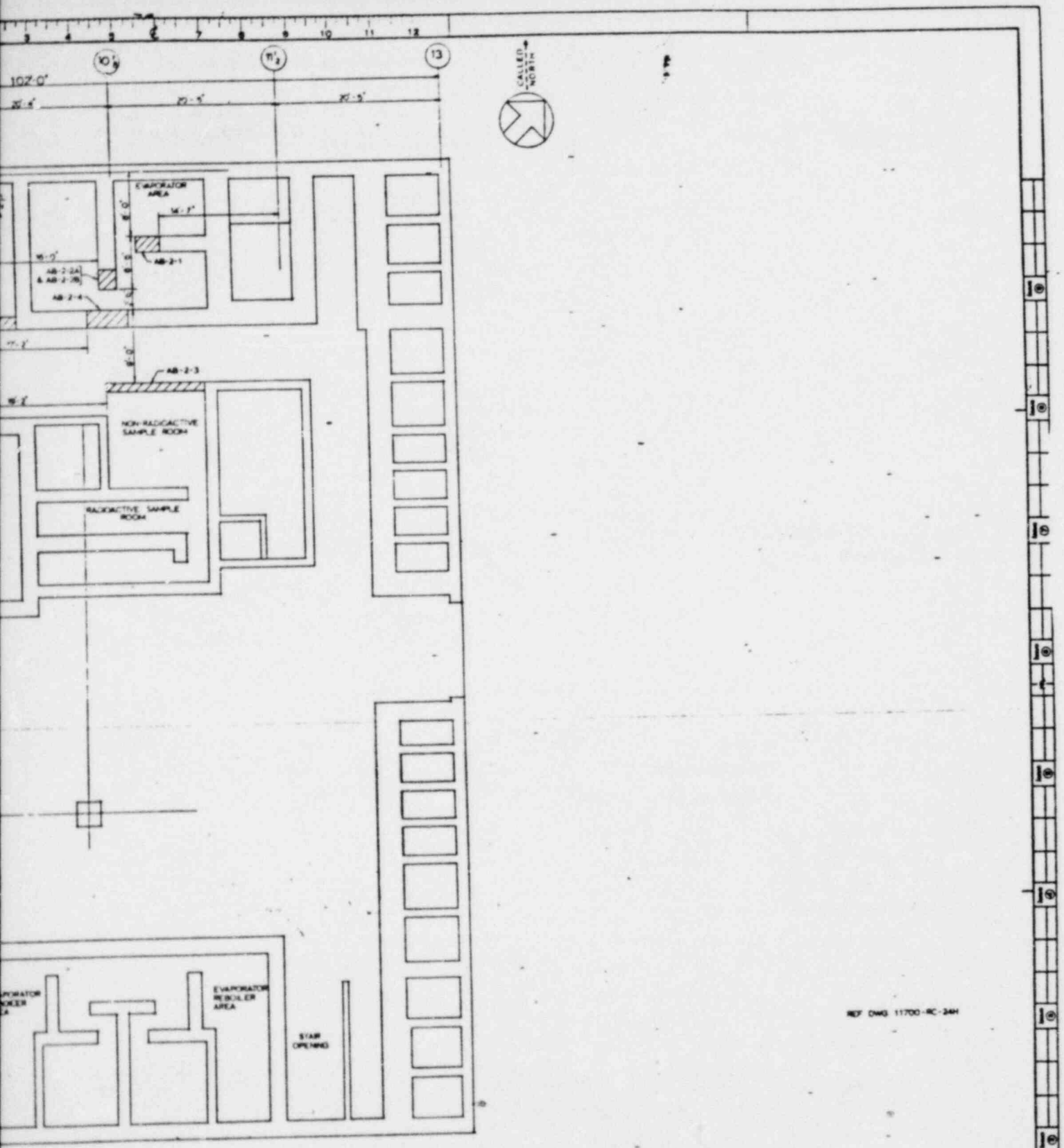
I&E BULLETIN 80-11 BLOCK WALL PLANS
AUXILIARY BUILDING EL 722'-6"

BEAVER VALLEY POWER STATION UNIT NO. 1

AA No 07CO-R

S&W DWG. NO. 11700-R


LOW LEVEL WASTE DRAIN TANK AREA
HIGH LEVEL WASTE DRAIN TANK AREA
AB-2-8
AB-2-5
AB-2-6
ELEVATOR OPENING
STAIR OPENING
PRIMARY PLANT COMPONENT COOLING WATER HEAT EXCHANGERS AREA
DEGASIFIER AREA
DEGASIFIER AREA
120' 0"



AN EL 735'-6"

DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

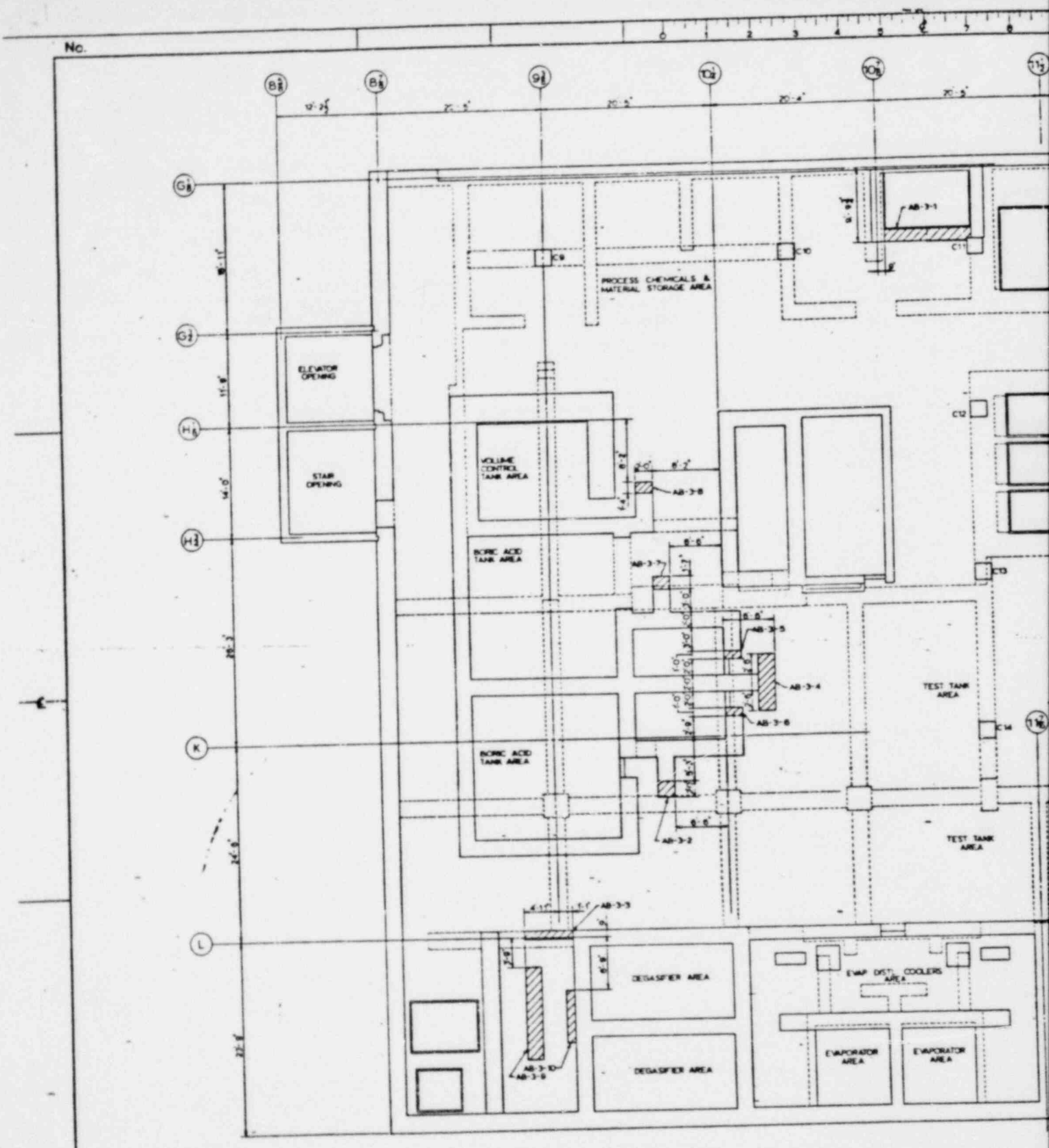
I&E BULLETIN 80-11, BLOCK WALL PLANS
AUXILIARY BUILDING EL 735'-6"

BEAVER VALLEY POWER STATION UNIT NO 1

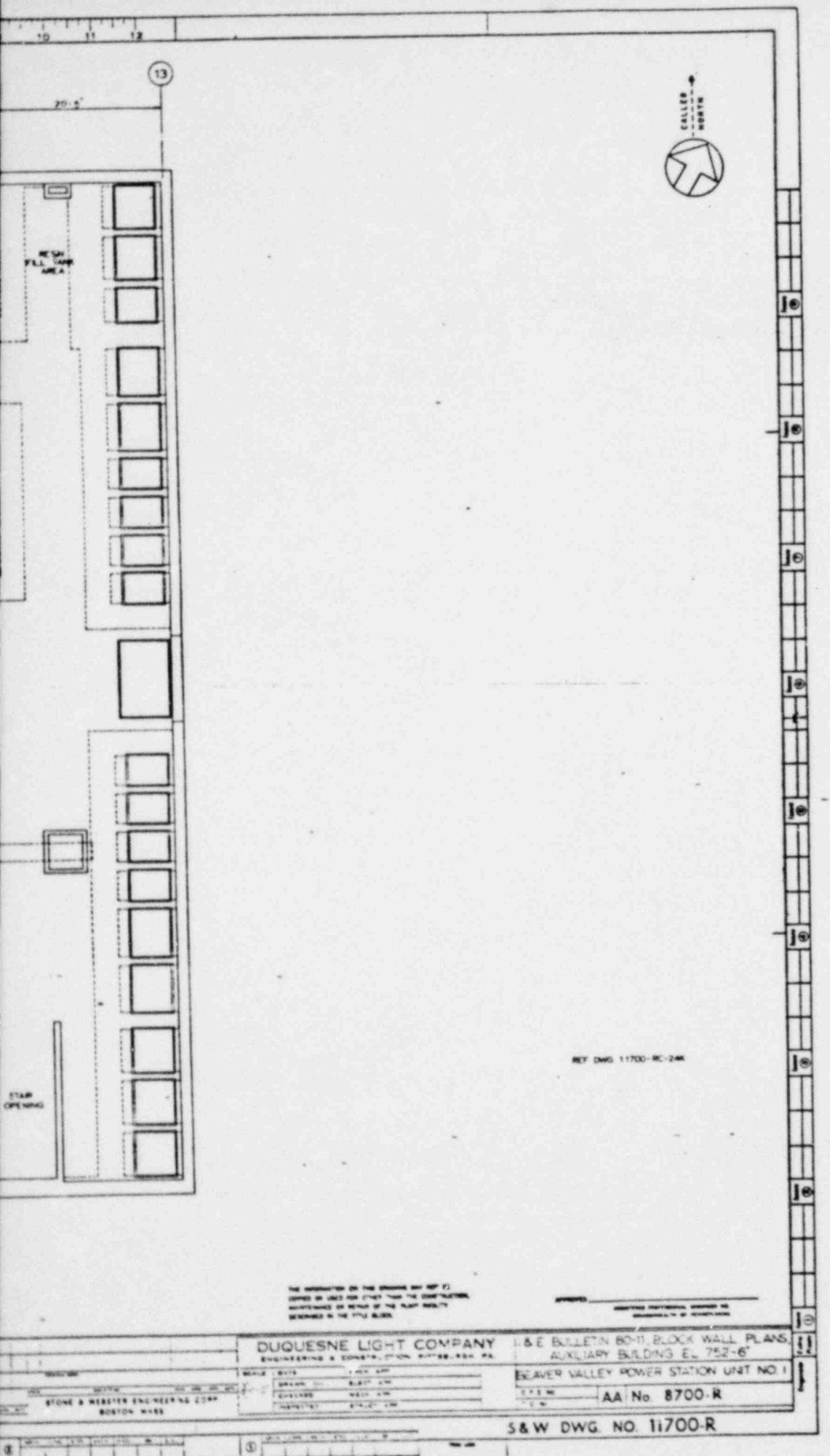
AA No. 8700-R

STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

S&W DWG. NO. 11700-R


PROCESS CHEMICALS & MATERIAL STORAGE AREA
ELEVATOR OPENING
STAIR OPENING
VOLUME CONTROL TANK AREA
BORIC ACID TANK AREA
BORIC ACID TANK AREA
TEST TANK AREA
TEST TANK AREA
DEGASIFIER AREA
DEGASIFIER AREA
EVAP DIST. COOLERS AREA
EVAPORATOR AREA
EVAPORATOR AREA
AB-3-1
AB-3-2
AB-3-3
AB-3-4
AB-3-5
AB-3-6
AB-3-7
AB-3-8
AB-3-9
AB-3-10

PLAN EL 752'-6"



DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION DEPARTMENT, PA.

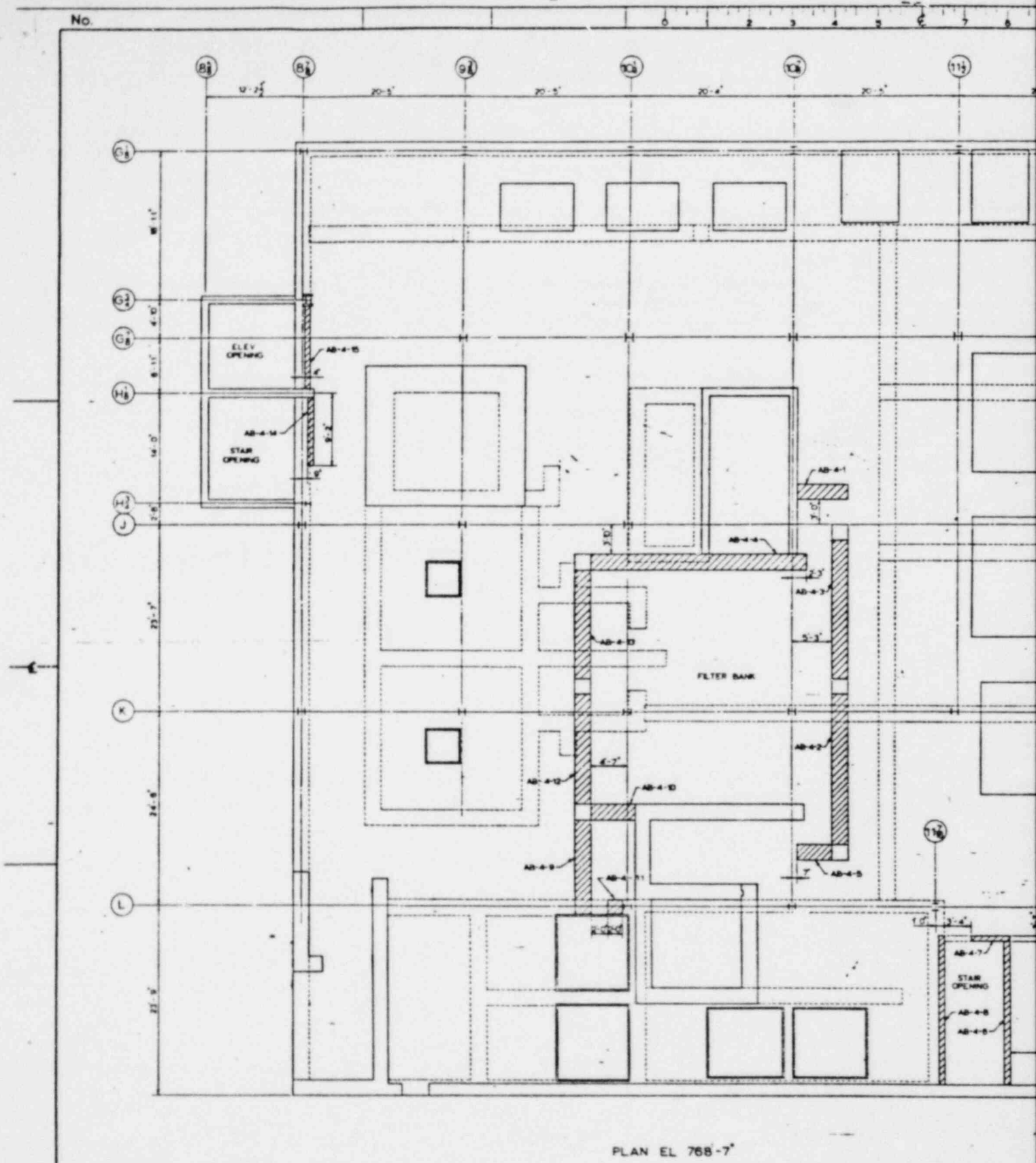
I & E BULLETIN 80-11, BLOCK WALL PLANS, AUXILIARY BUILDING EL. 752'-6"

BEAVER VALLEY POWER STATION UNIT NO. 1

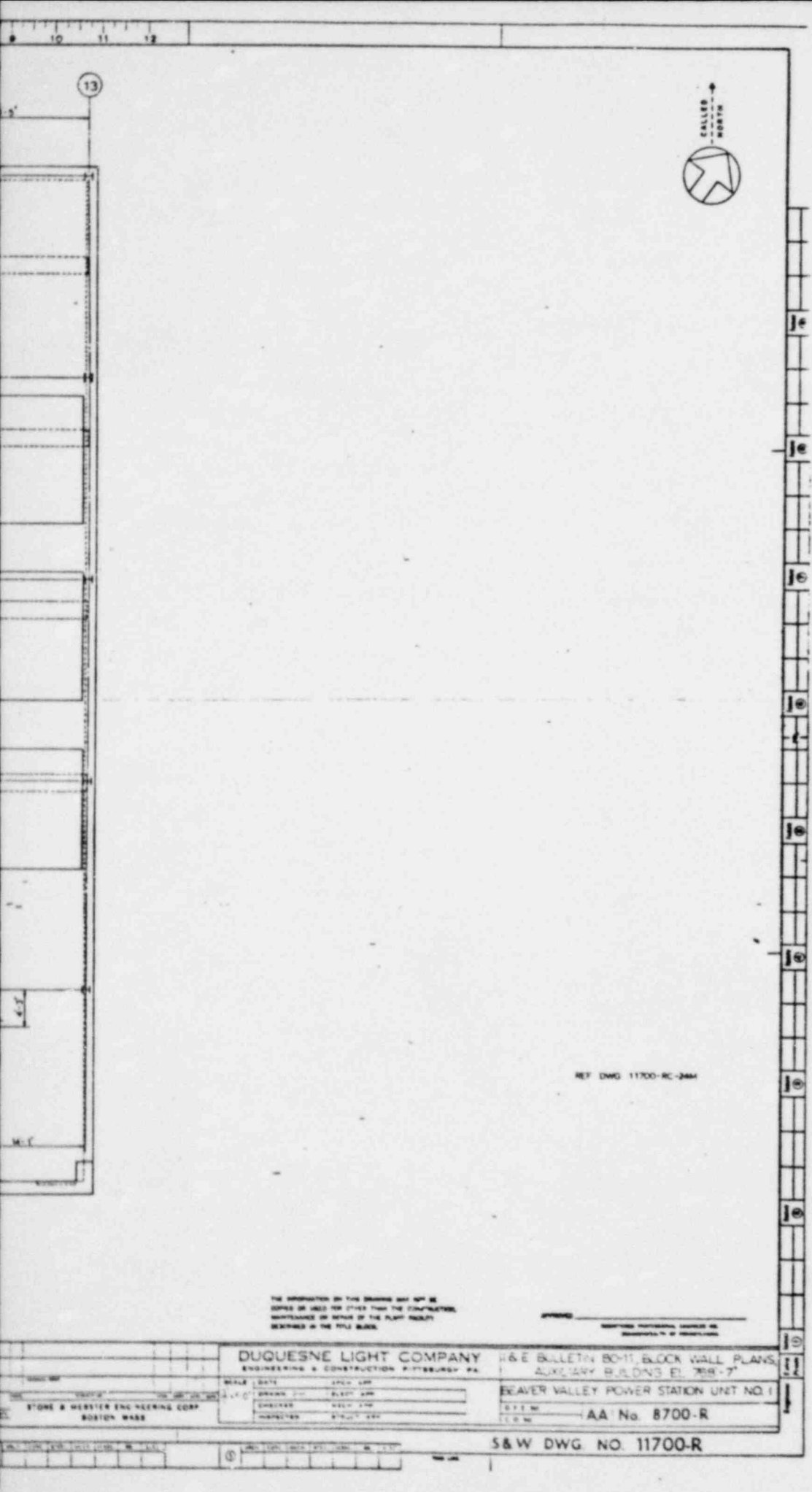
AA No. 8700-R

STONE & WEBSTER ENGINEERING CORP.
BOSTON, MASS.

S&W DWG. NO. 1i700-R



PLAN EL 768'-7"


9
10
11
12
13
CALLED NORTH
REF DWG 11700-RC-24M
THE INFORMATION ON THIS DRAWING MAY NOT BE
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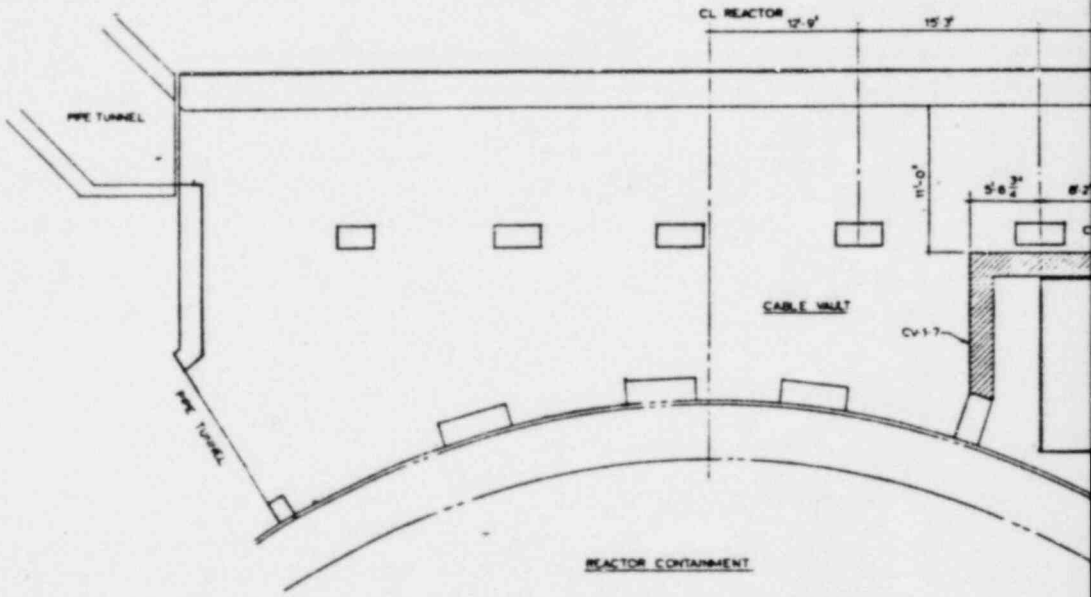
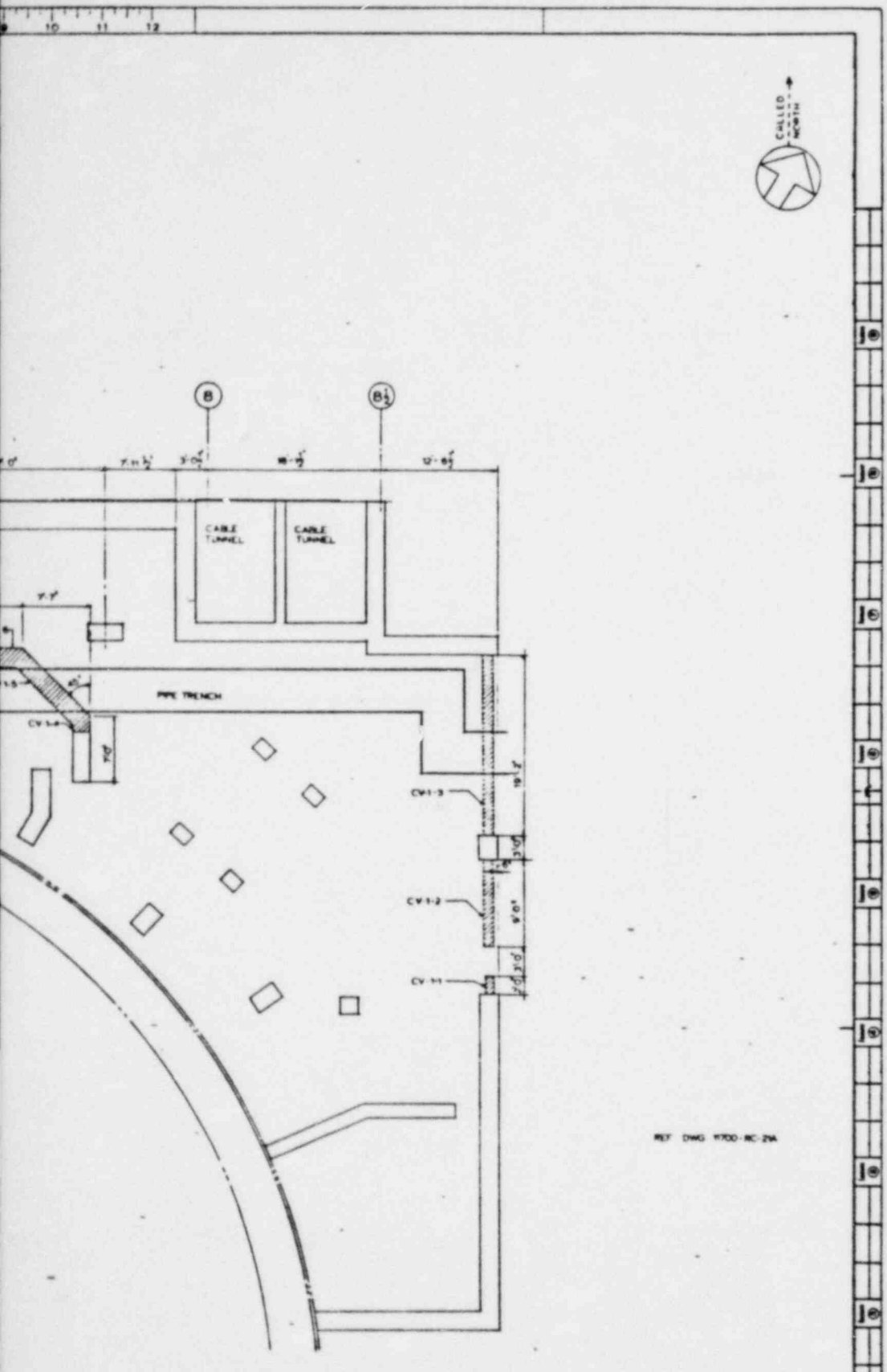
MAINTENANCE OR REPAIR OF THE PLANT FACILITY
DESCRIBED IN THE TITLE BLOCK.
APPROVED
DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH PA.
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS
B & E BULLETIN 80-11, BLOCK WALL PLANS
AUXILIARY BUILDING EL. 738'-7"
BEAVER VALLEY POWER STATION UNIT NO. 1
AA No. 8700-R
S&W DWG. NO. 11700-R


CL REACTOR
12'-8"
15'-3"
PIPE TUNNEL
11'-0"
CABLE VAULT
CV-1-7
PIPE TUNNEL
REACTOR CONTAINMENT

PLAN EL 722'-6"



DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH PA

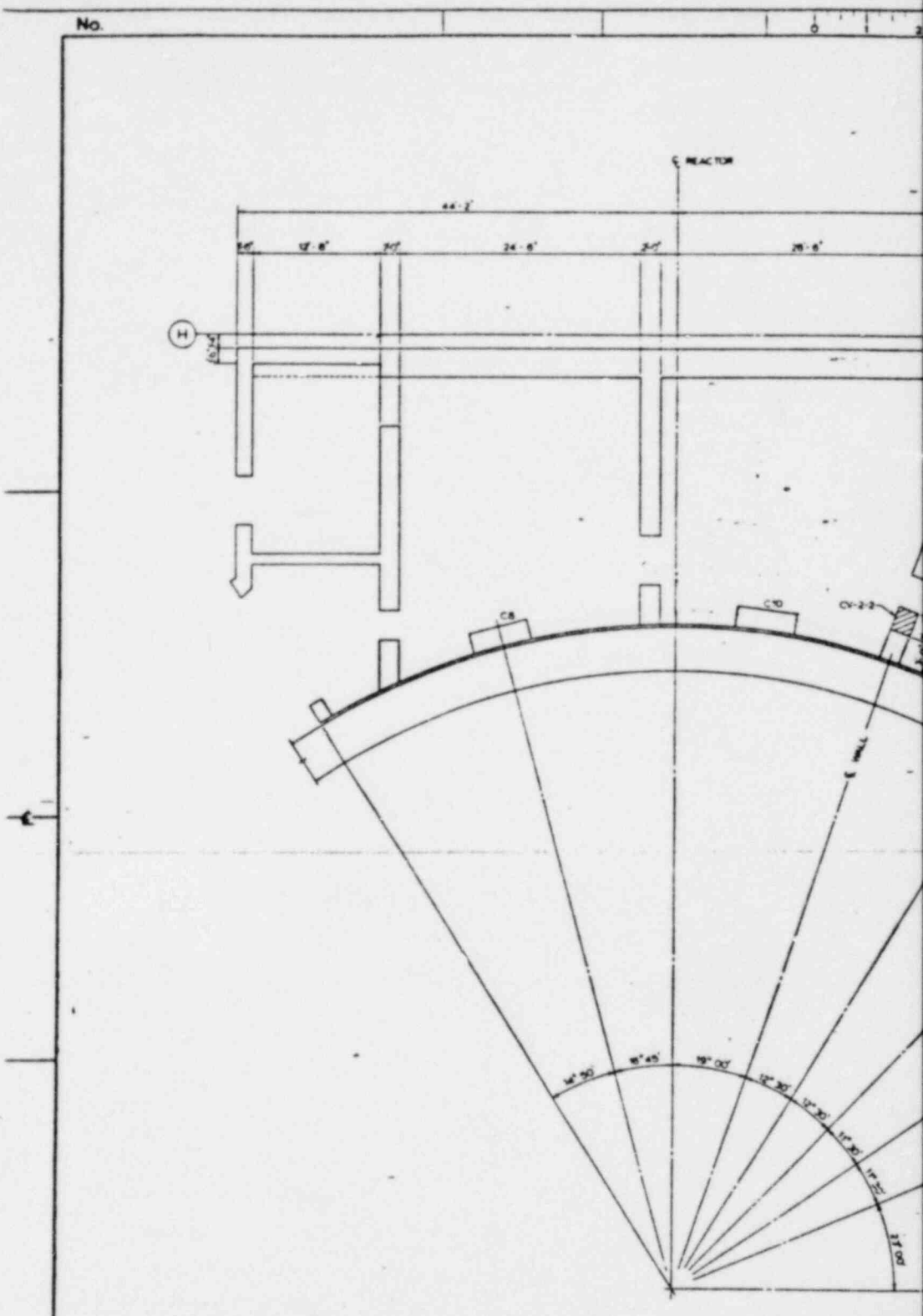
I & E BULLETIN 80R BLOCK WALLS PLAN
CABLE VAULT EL 722'-6"

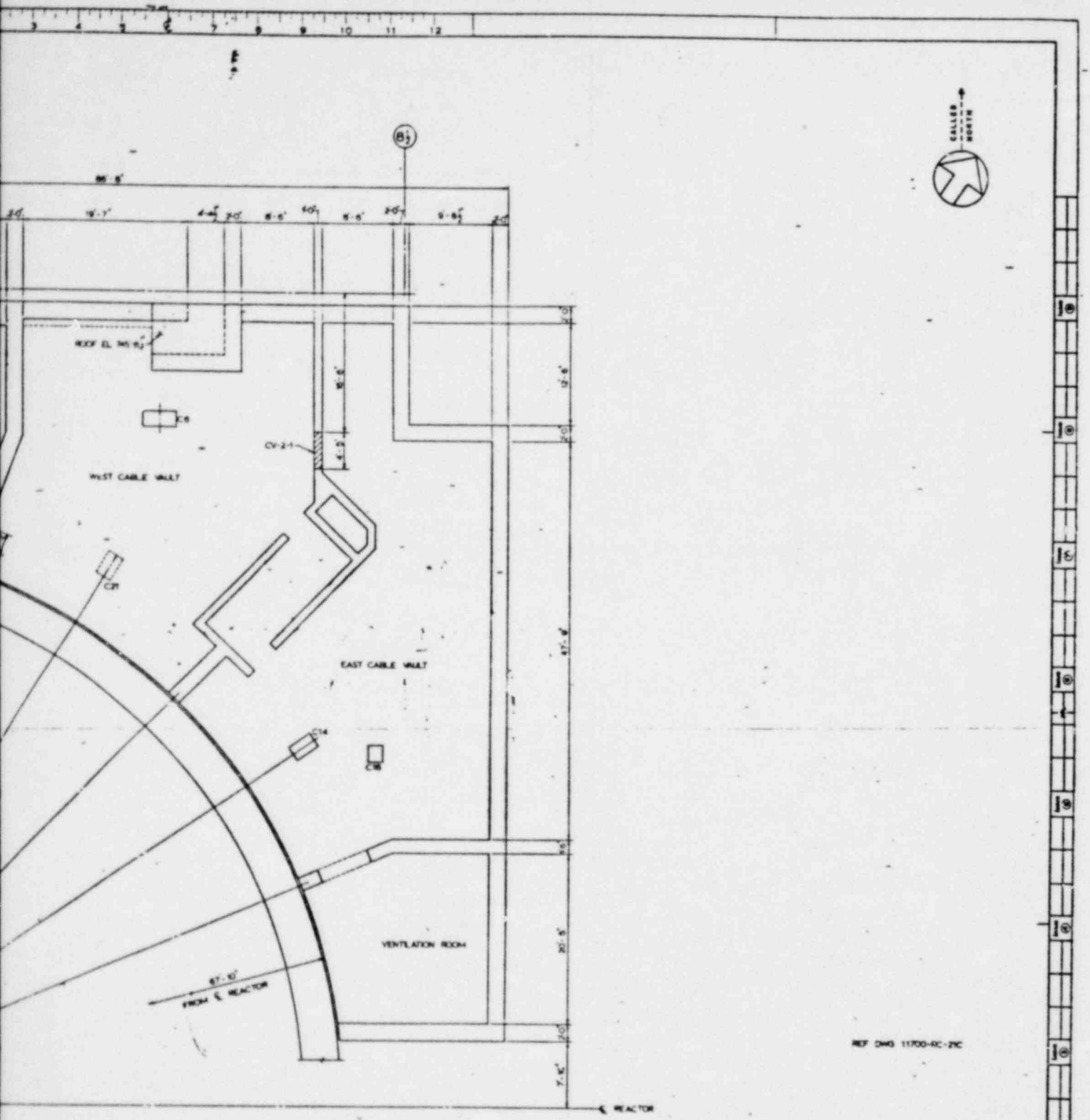
BEAVER VALLEY POWER STATION UNIT NO. 1

AA No. 8700-R

STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

S&W DWG. NO. 11700-R


No.
℄ REACTOR
44'-2"
H
C8
C10
CY-2-2
PLAN AT EL 735'-6"



REF DWG 11700-RC-21C

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DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH PA.

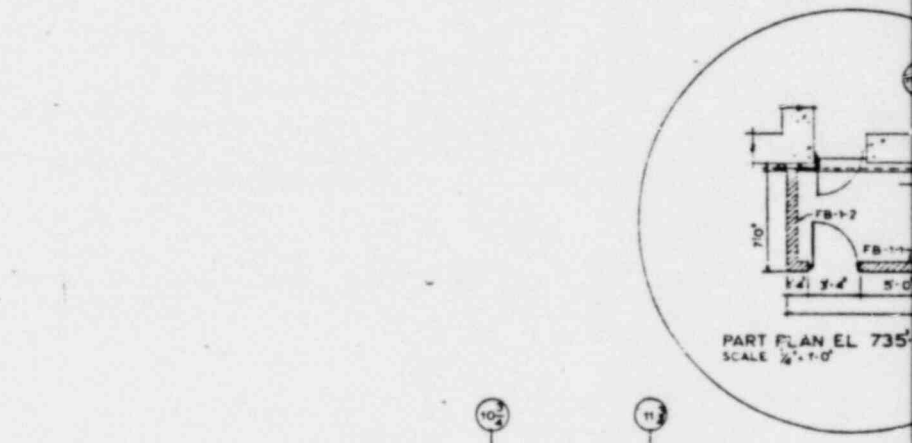
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

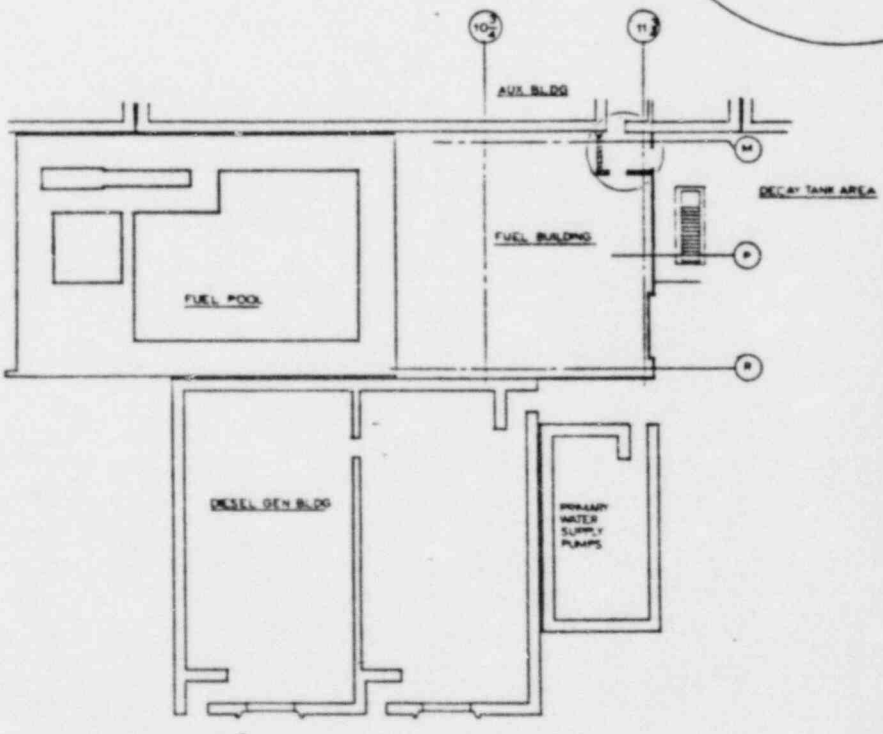
I&E BULLETIN 80-11 BLOCK WALL PLANS
CABLE VAULT AREA EL 735'-6"

BEAVER VALLEY POWER STATION UNIT NO. 1

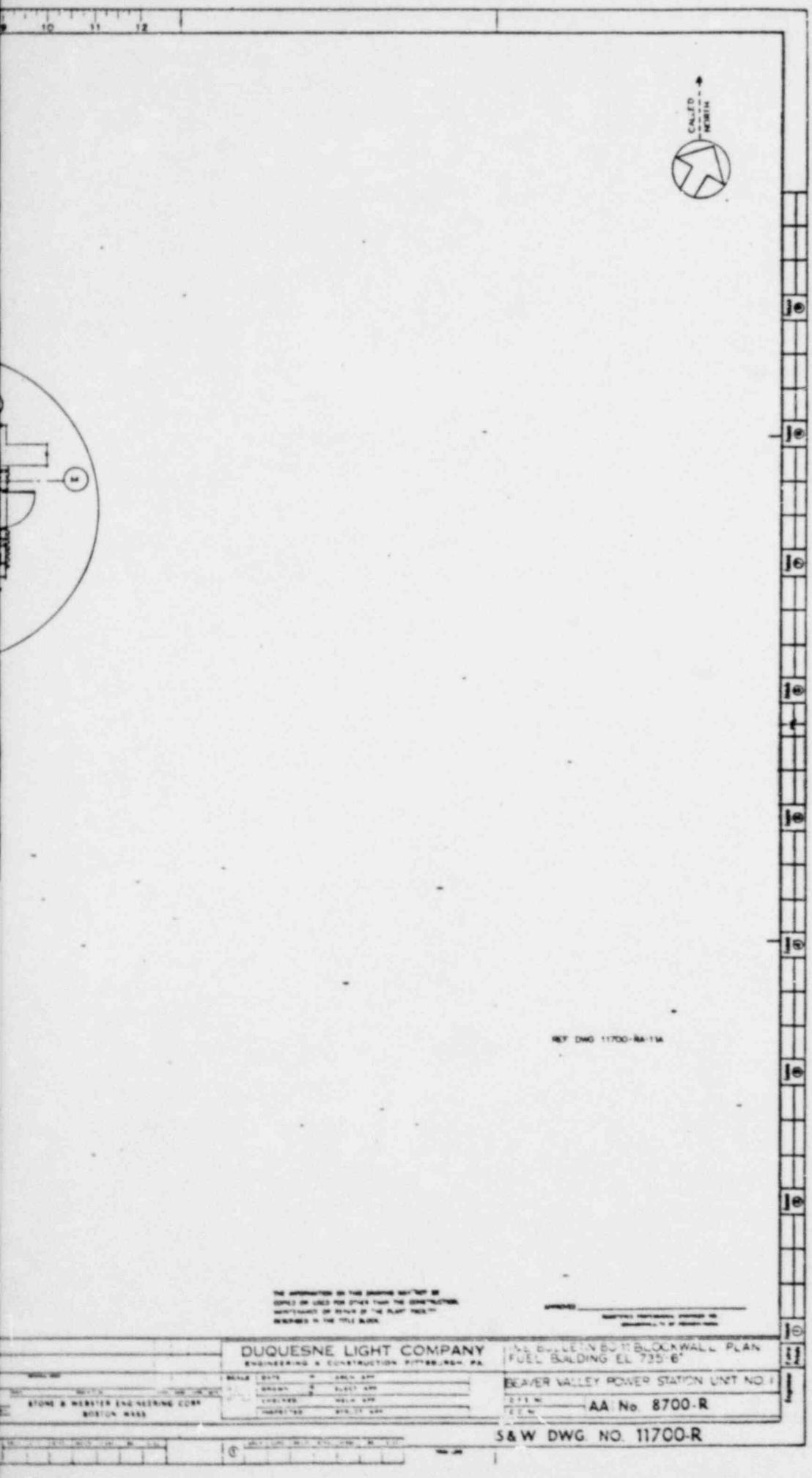
AA No. 8700-R

S&W DWG. NO. 11700-R


FB-1-2
7'0"
PART PLAN EL 735'
SCALE 1/4"=1'-0"


AUX. BLDG.
FUEL BUILDING
DECAY TANK AREA
FUEL POOL
DIESEL GEN. BLDG.
PRIMARY WATER SUPPLY PUMPS

PLAN EL 735'-6"



DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

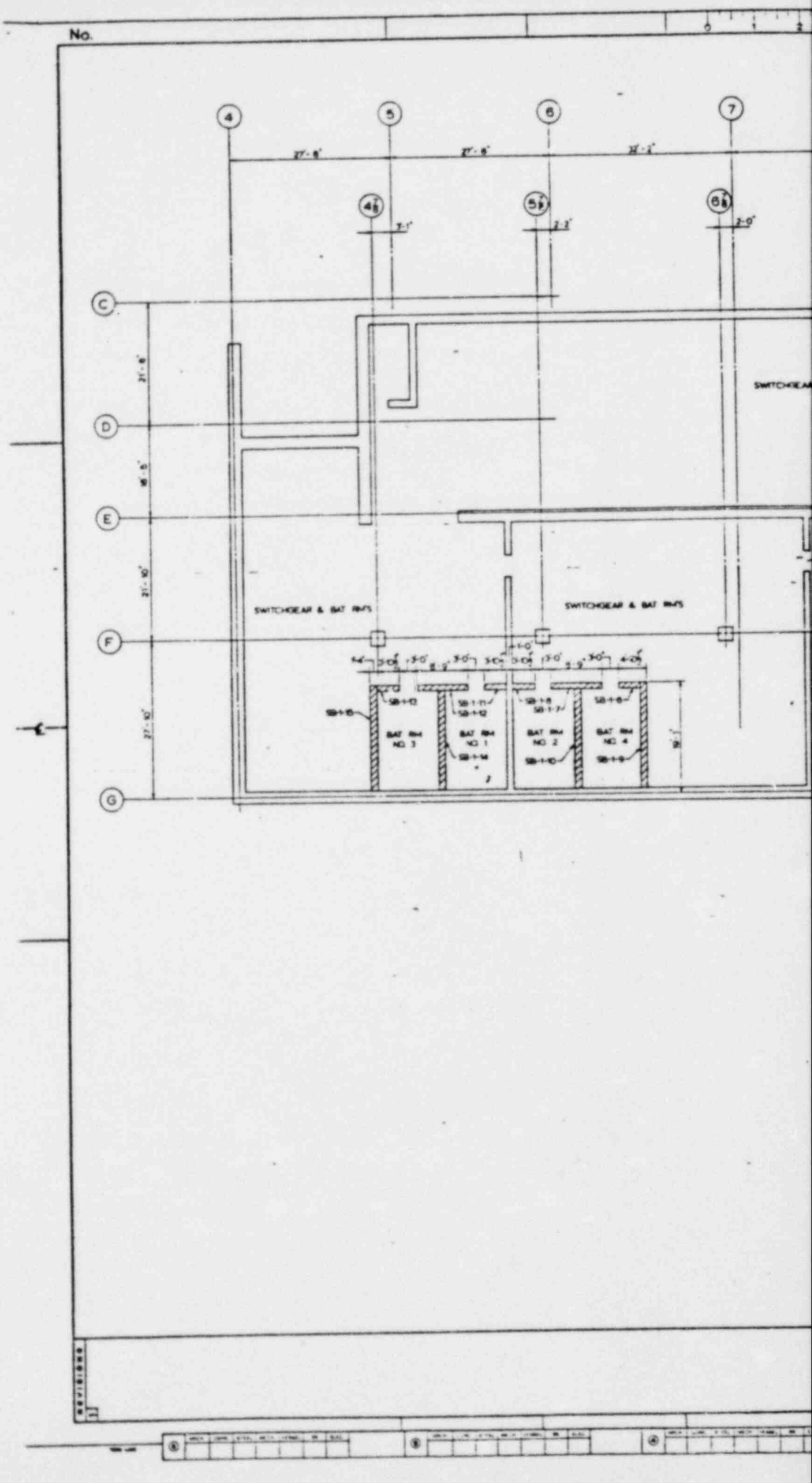
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

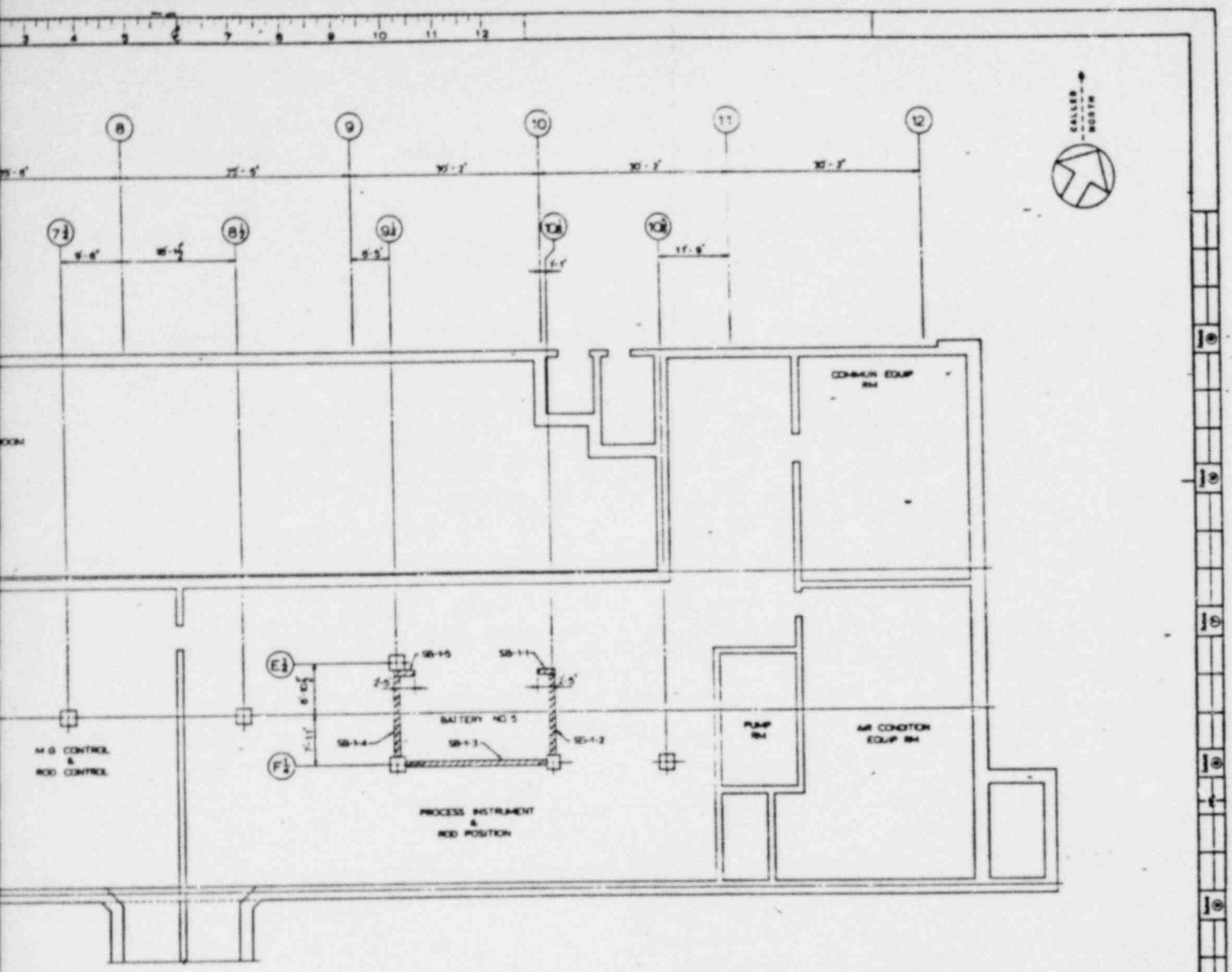
ALL BULLETIN 80 TYP BLOCKWALL PLAN
FUEL BUILDING EL 735'-6"

BEAVER VALLEY POWER STATION UNIT NO. 1

AA No 8700-R

S&W DWG. NO. 11700-R


No.
4
5
6
7
4A
5A
6A
C
D
E
F
G
SWITCHGEAR & BAT RMS
SWITCHGEAR & BAT RMS
BAT RM NO. 3
BAT RM NO. 1
BAT RM NO. 2
BAT RM NO. 4



PLAN EL 713'-6"

REF DWG 11700-RC-6A

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DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

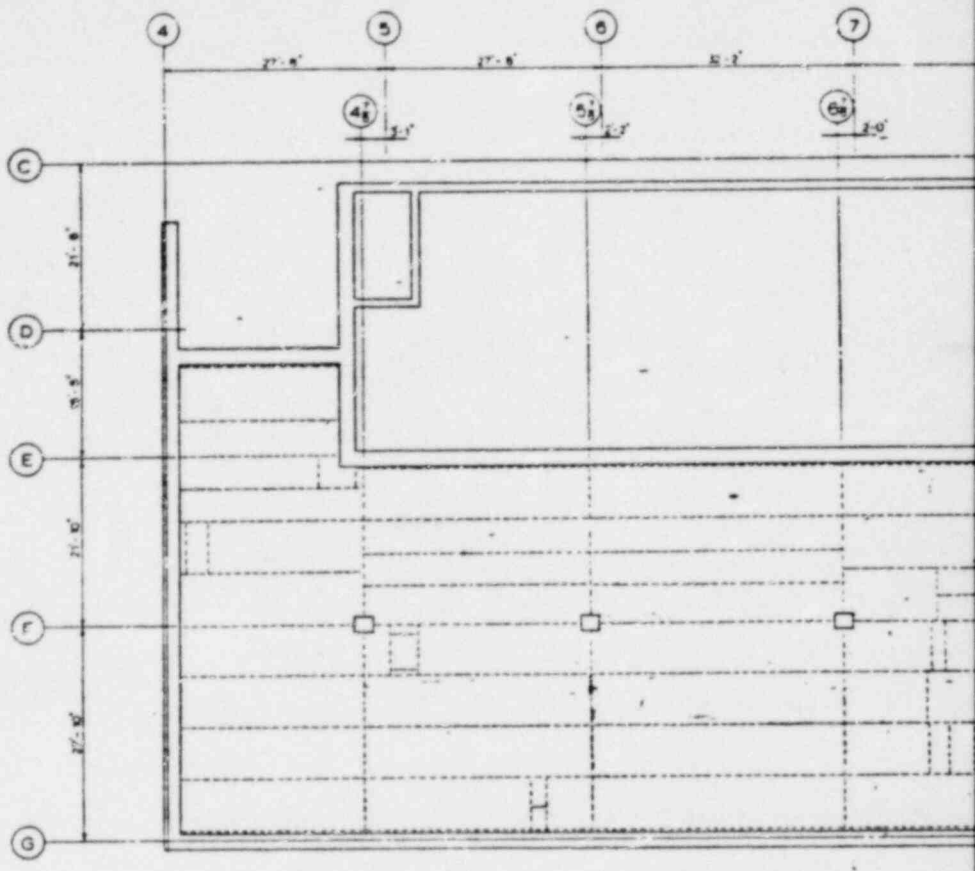
STONE & WEBSTER ENGINEERING CORP. BOSTON MASS

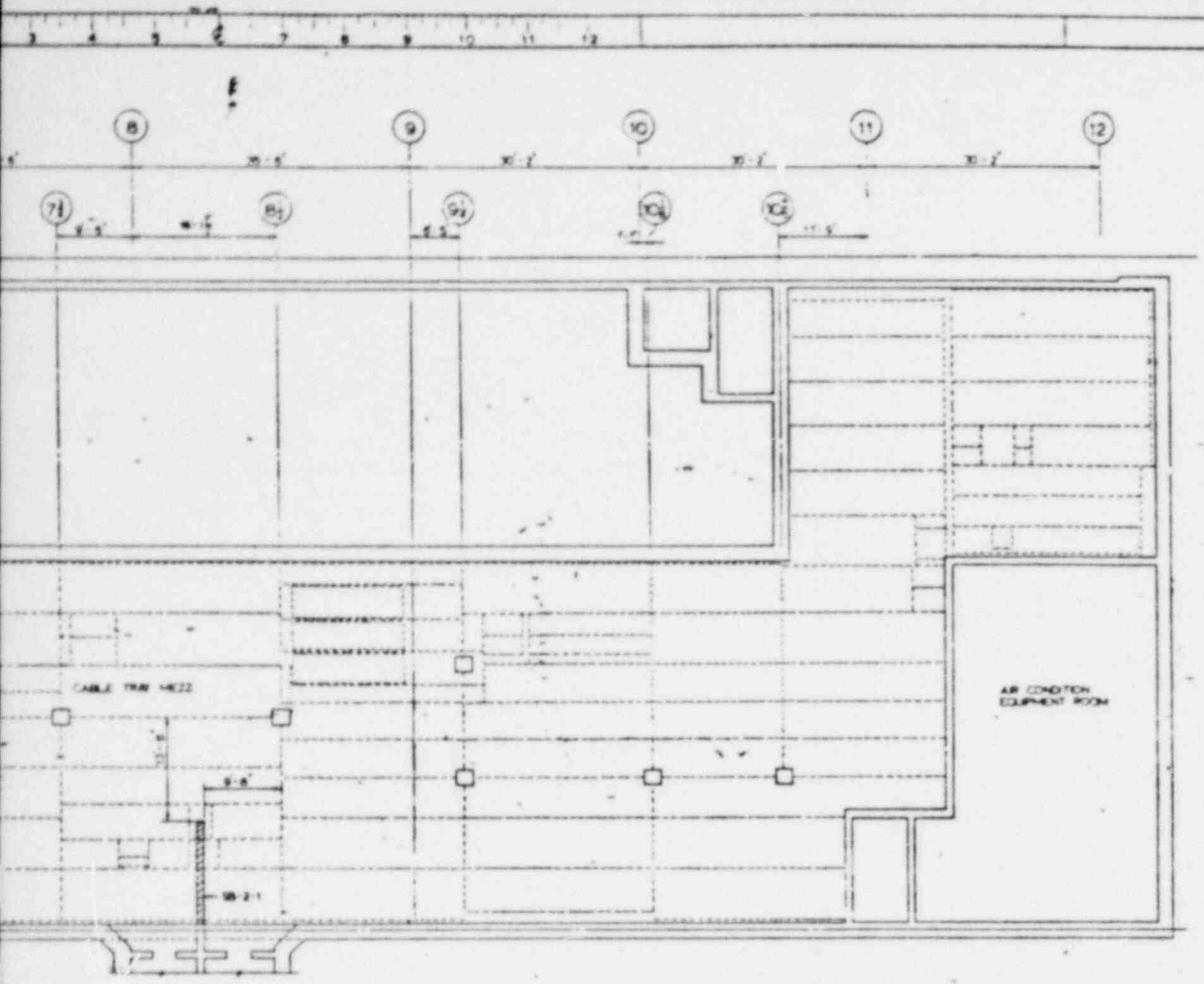
I & E BULLETIN 80-11 BLOCK WALL PLANS SERVICE BUILDING EL 713'-6"

BEAVER VALLEY POWER STATION UNIT NO. 1

AA No. 8700-R

S&W DWG. NO. 11700-R


4
5
6
7
C
D
E
F
G



PLAN EL 725'-6"

REF DWG 11700-RA-10

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DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH, PA.

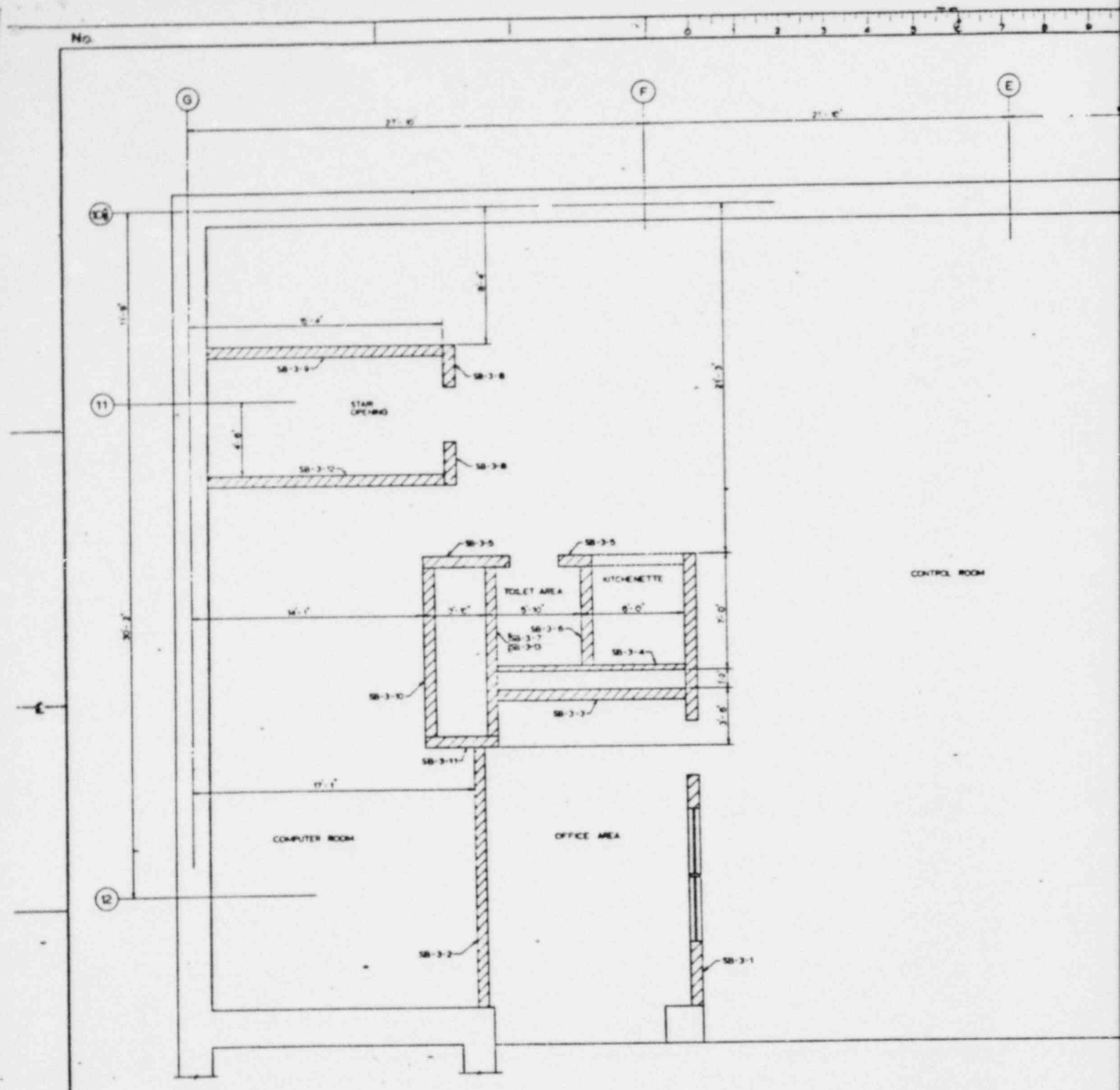
STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

I&E BULLETIN 80-11, BLOCK WALL, PLANS, SERVICE BUILDING EL 725'-6"

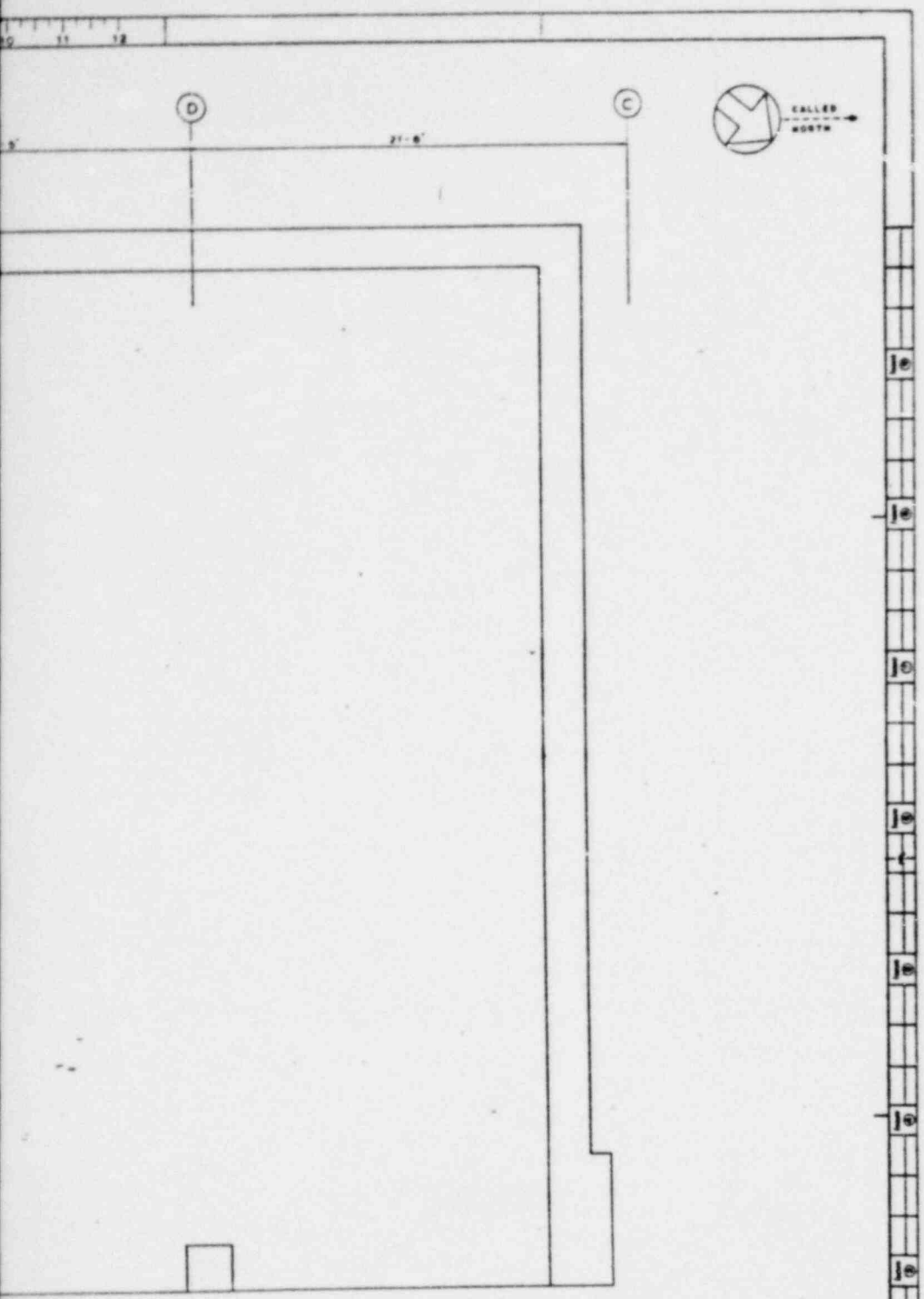
BEAVER VALLEY POWER STATION UNIT NO. 1

AA No. 8700-R

S&W DWG. NO. 11700-R


G
F
E
11
12
STAIR OPENING
SB-3-9
SB-3-8
SB-3-12
SB-3-5
SB-3-5
TOILET AREA
KITCHENETTE
CONTROL ROOM
SB-3-6
SB-3-7
SB-3-10
SB-3-4
SB-3-10
SB-3-3
SB-3-11
COMPUTER ROOM
OFFICE AREA
SB-3-2
SB-3-1

PLAN EL 735'-6"



DUQUESNE LIGHT COMPANY
ENGINEERING & CONSTRUCTION PITTSBURGH PA

I&E BULLETIN 80-11, BLOCK WALL PLANS
SERVICE BUILDING EL 735'-6"

BEAVER VALLEY POWER STATION UNIT NO 1

AA No. 8700-R

S&W DWG. NO. 11700-R

STONE & WEBSTER ENGINEERING CORP
BOSTON MASS

7. Provide a schedule for the proposed wall modifications.

7. All wall modifications are complete at this time. Note that proposed modifications to walls AB 4-4 and AB 4-5 were not needed since the inadequacies of these walls were resolved as a result of modifications performed on walls AB 4-12 and 13 and AB 4-2 and 3, respectively. Also, walls AB 4-14 and AB 4-15, initially identified as being unacceptable in accordance with the established acceptance criteria, have been re-evaluated and it has been determined that a failure of these walls would have no adverse effects on the safe shutdown of the plant. Therefore, no modifications are required for these walls.