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VASSALLO,D.B. Operating Reactors Branch 2

SUBJECT: Forwards response to 820422 request for addl info re util response to IE Bulletin 80-11, "Masonry Wall Design."
SEE REPTS. #

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

June 14, 1982

Director of Nuclear Reactor Regulation
Attention: Mr. Domenic B. Vassallo, Chief
Operating Reactors Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Gentlemen:

Your letter of April 22, 1982 requested information regarding our response to Inspection and Enforcement Bulletin 80-11, "Masonry Wall Design". Additional information as requested in your letter is attached.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

Thomas E. Lempges

Thomas E. Lempges
Vice President - Nuclear Generation

MGM/kmb

A001

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT UNIT 1

Additional Information
Regarding Inspection and Enforcement
Bulletin 80-11

Masonry Walls

1. Question

Provide and justify the boundary conditions and modeling techniques used for the reevaluation of masonry walls at the Nine Mile Point plant and indicate how the potential for block pull-out was considered.

Response

Boundary conditions were established for the masonry walls based on the actual geometries of the walls. The walls were analyzed to verify the transfer of forces and moments consistent with the boundary conditions. Potential for block pull-out was not a problem with the safety-related masonry walls at Nine Mile Point Unit #1. Piping that was attached to the walls was small in diameter and the loads exerted were negligible.

2. Question

Indicate how earthquake forces in three direction and equipment loads were considered in the analysis. Using sample calculations, indicate how the effects of higher modes of vibration are included in the analysis. Provide the damping values used and justify any deviation from the SEB criteria [4].

Response

Wall stresses due to horizontal in-plane and vertical loads were considered to be negligible. The design and analysis of masonry walls was based on the FSAR for Nine Mile Point Unit #1 which uses a 0.11g ground acceleration and an equivalent static analysis utilizing the resulting floor acceleration values. Since an equivalent static approach was used, neither higher modes nor damping values were of concern.

3. Question

Provide a brief description and sample calculations to show the analytical approach used for single wythe and multiple wythe walls.

Response

The masonry walls at Nine Mile Point Unit 1 were re-analyzed using ACI 531-79. Calculations for single and multiple wythe walls are attached.

[illegible]

4. Question

Provide and justify the increase factors used in the criteria for allowable stresses. The SEB criteria [4] allow no increase in the allowable stresses for load combinations including wind or operating basis earthquake (OBE) loads. The allowable working stresses for load conditions which represent abnormal/severe and abnormal/extreme environmental conditions such as a design basis earthquake (DBE) may be multiplied by factors shown in the table in the SEB criteria [4] which are given below:

Type of Stress	Factor
Axial or flexural compression	2.5
Bearing	2.5
Reinforcement stress except shear	2.0 but no to exceed 0.9 fy
Shear reinforcement and/or bolts	1.5
Masonry tension parallel to bed joint	1.5
Shear carried by masonry	1.3
Masonry tension perpendicular to bed joint	
- for reinforced masonry	0
- for unreinforced masonry	1.3

Response

Increase factors were not required in the reanalysis of the safety related walls at Nine Mile Point Unit #1. However, two walls which were installed as a result of fire protection analysis were designed with a 1/3 increase in allowable stress since they were non-safety related. Re-analysis in accordance with the bulletin indicated that increase factors were not necessary.

5. Question

Provide sketches of the proposed wall modifications [3] and indicate, using sample calculations, how these modifications will correct the wall deficiencies. Indicate the out-of-plane drift effects of the bracing added to walls 31, 44, 45, 59 and 66 as stated in Reference 3.

Response

See attached calculations and sketches. Out-of-plane drift effects will not cause overstress due to the limiting nature of the support deflection.

6. <u>Question</u>

Provide the status of the proposed wall modifications.

<u>Response</u>

All proposed wall modifications are complete.

7. <u>Question</u>

Provide the results of the analysis of all masonry walls in terms of actual stresses versus allowable stresses.

<u>Response</u>

See attached calculations for typical stresses (actual vs. allowable).

[illegible]

INSPECTION AND ENFORCEMENT

BULLETIN 80-11

CALCULATIONS ON SINGLE

AND MULTIPLE WYTHE WALLS

113-2 N D-600

SHEET NO. 1 OF 4

SUBJECT: Nine Mile Point Unit 1 8010070088

DATE 9/18/80

NRC. I.E. Bulletin 80-11

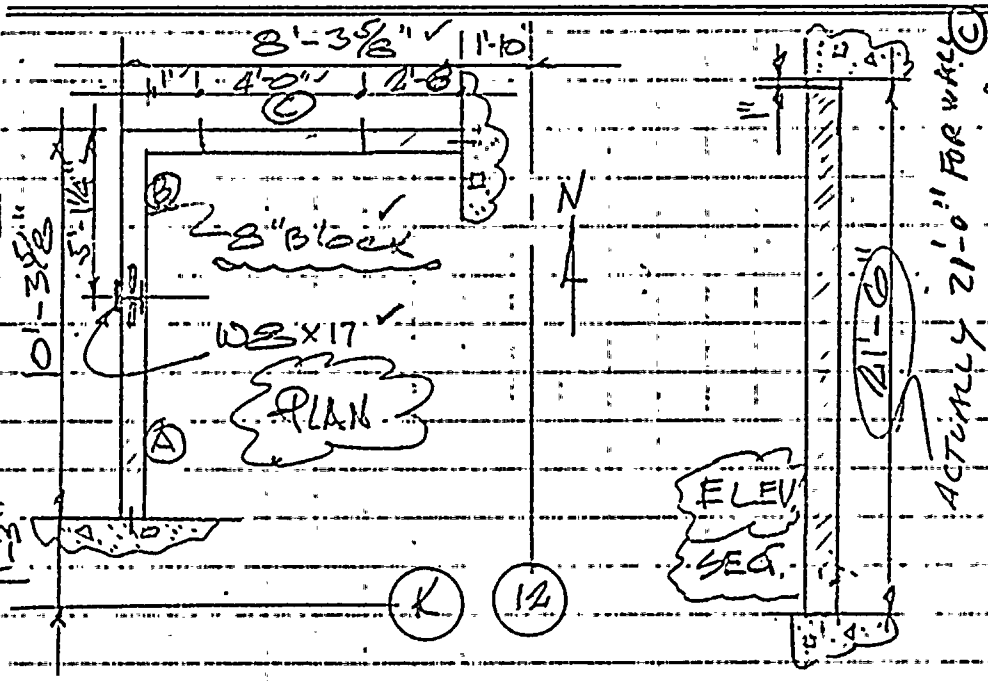
INDEX OR FILE NO. 3-N21-S6

Masonry Walls 317.20-2033-18-0000

PREPARED BY Leeimanis

Wall #1 (Elev. 237'-0" to 261'-0")

CHECKED BY JPS - 10/2/80



Ref. Dwgs.

- C-18764-C (S10)
- C-18765-C (S10)
- C-18879-C (S10)
- B-18791-C (S7)
- C-18801-C (S6)
- C-15150-C (S6)
- C-15143-C (S6)
- C-15164-C (S6)

adjusts with numbered it needed

Horiz. Reinf. Extra Heavy Dur-o-wal every other course.

Check the W8x17 - span 21'-6" $S = 14.1 \text{ in}^3$

conservative 17.8

Load (horiz.) from 8" wall → Occ. (FSAR) x wt. = 0.227x55 = 12.5 PSF

Force on W8x17 = (10.30/2) 0.0125 = 0.064 K/LF beam

$M = 0.064 \times 21.5^2/8 = 3.70$ K'

$f_{s_{bm}} = 3.70 \times 12/14.1 = 3.17$ ksi < 22.0 ok!

Part (A)

$M_{A_{Horiz.}} = 0.0125 \times 5.20^2/8 = 0.042$ K'

As(provided) = 0.051/2 = 0.025 □"

$f_s = \dfrac{12{,}000 \times 0.042}{0.875 \times 6.625 \times 0.025} = 3{,}478$ psi < 30,000 ok.

Note:
1. Bond stress negligible
2. Block stress negligible

Shear at support 12.5x(5.20/2)/12/2.5 (contact thickness) = 1.1 psi < 29 ok!

113-2 N 8-600

SHEET NO. 2 OF 4

SUBJECT NINE MILE POINT UNIT #1 7 0 0 8 DATE 9/18/80

NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-56

Masonry Walls 317.20-2033-18-0000 PREPARED BY Heimanis

Wall #1 (ELEV 237'-0 to 261'-0") CHECKED BY JPS - 10/2/80

Wall part (A) cont.

Anchors at conc. wall.

2 - 1/4"φ anch. & rod every 2nd course (@ 16" o.c.)

Allowable shear = 1,363 (book val.) / 5 (F.S.F.) = 272#/anch.

346# ALLOWABLE FOR 1/4"φ THREADED ROD

Load on anch = 12.5 × (5.2/2) × 1.33 = 43#/anch. ok!

Wall part (B)

same as (A) - more conservative.

Wall part (C)

Upper part - span - 7'-8"

M = 0.0125 × 7.67²/8 = 0.092 k

f_s = 12,000 × 0.092 / (0.875 × 6.625 × 0.025) = 7,618 psi < 30,000 ok.

(Es/Ec) np = (29/1.1) × 0.025 / (12 × 6.625) = .013

Masonry Manual III-70

f_c = 0.092 × 12,000 × 14.15 / (12 × 6.625²) = 29 psi < 231 OK!

check anch. load.

Load = 12.5 × (7.67/2) × 1.33 = 64#/anch < 272#/anch. see part (A) above

Shear in block

12.5 × (7.67/2) / 12 / 2.5 = 2 psi < 29 ok

Bond stress on Dur-o-wal

u = V / (Σo j d) = 12.5 × (7.67/2) × 1.33 / (0.875 × 6.625 × 0.59) = 19 psi < allow. (160) ok!

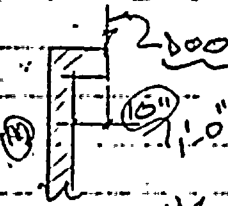
113-2 II 8-600

SUBJECT Nine Mile Point Unit #1	SHEET NO. 3 OF 4
NRC. I.E. Bulletin 80-11	DATE 09/18/80
Masonry Walls 317.20-2033-18-0000	INDEX OR FILE NO. 3-N2.1-56
Wall #1 : (ELEV. 237-0 to 261-0")	PREPARED BY Heimann
	CHECKED BY JPS - 10/2/80

0 4 0 0 7 0 0 0 9

Lower part (C) (west end)

Cantilever from wall (B) (very cons. can span vert. since upper part can be used as load on lower)



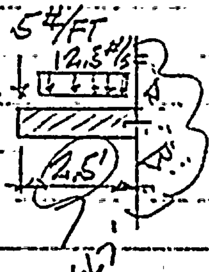
Door load - 2' x .227 x 10#/ft = 4.5#/LF. vert. (use 5#) cons.

$M = 0.0125 \times (10/12) \times 0.42 + 1.0 \times 0.005 = 0.009^{k}$ — 0.01125^{k}

$f_s = \dfrac{12,000 \times 0.009}{0.875 \times 6.625 \times 0.025} = 775$ psi (932 psi) < 30,000 ok

Shear and bond negligible

Lower part (C) (east end)



CANTILEVER

$M = 2.5 \times 0.005 + 0.0125 \times 2.5^2/2 = 0.052^{k}$ (2.667) (0.058^{k})

Dur-o-wal stress less than upper part - ok

$f_s = 4785$ psi ≤ 30,000 psi (allowable)

Check anch. pullout and shear combined

1/4"φ anch's. @ 16" o.c.

Pullout = 0.052 x 1,000 x (12/3.81) x 1.33 = 217.8 #/anch.
Shear = 0.005 + 0.0125 x 2.5 = 0.036 K - 36 #/anch.

(217.8/2,912) x 5 + (36/1,363) x 5 = 0.51 < 1.0 ok!

Block shear and dur-o-wall bond negligible,

Can also be taken by vert. span - see next sh.

SUBJECT NINE MILE POINT UNIT #1 DATE 9/18/80
NRC, IE, BULLETIN 80-11 INDEX OR FILE NO. 3-N21-56
Masonry Walls 317.20-2033-18-0000 PREPARED BY [illegible]
Wall #1 (El. 237'-0") CHECKED BY JPS-10/2/80

$M = [(12.5 \times 2.5) + 5] \times 7.17^2 / 12 / 1000 = 0.155$ k/2.5' wide strip.

$f_c = .155 \times 12 \times 1000 / 80 \times 2.5 = 9.32$ psi $< .5 \times \sqrt{700} = 13.2$ OK!

SHEET NO. ___ OF ___

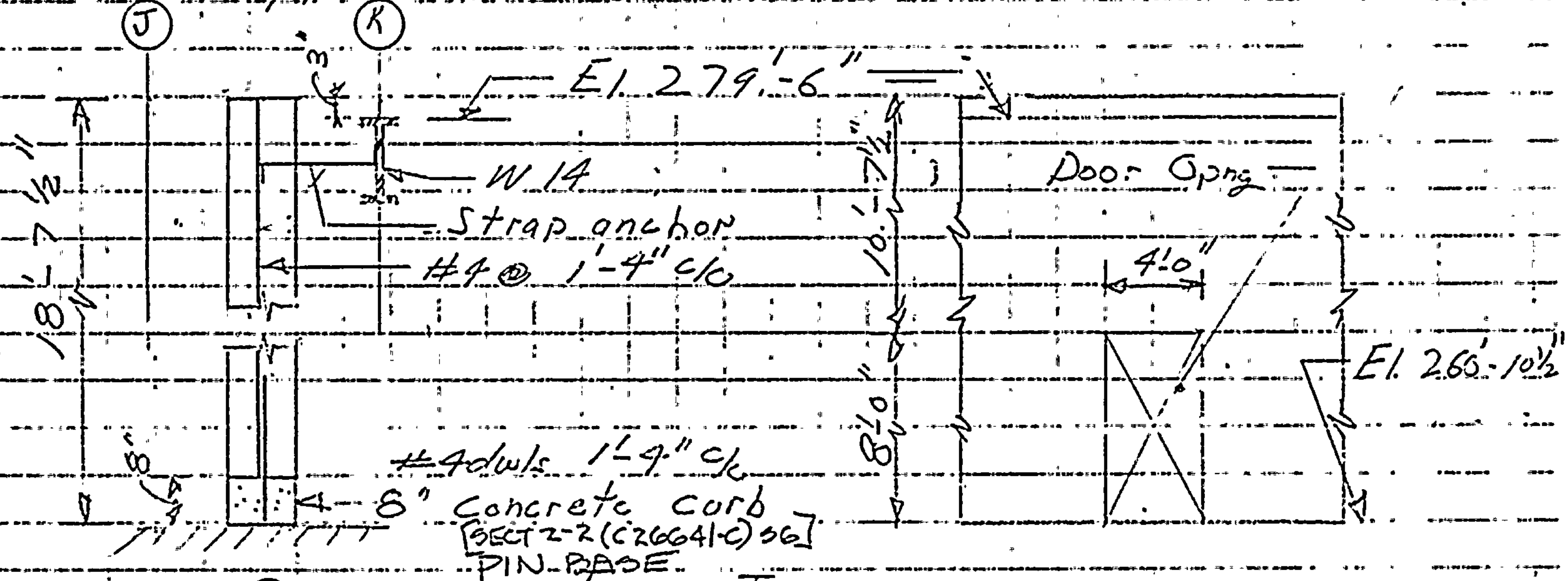
SUBJECT: NINE MILE PO... 15 — DATE: 9/30/80

N.R.C. I.E. BULLETIN 80-11 — INDEX OR FILE NO. 3-N21-56

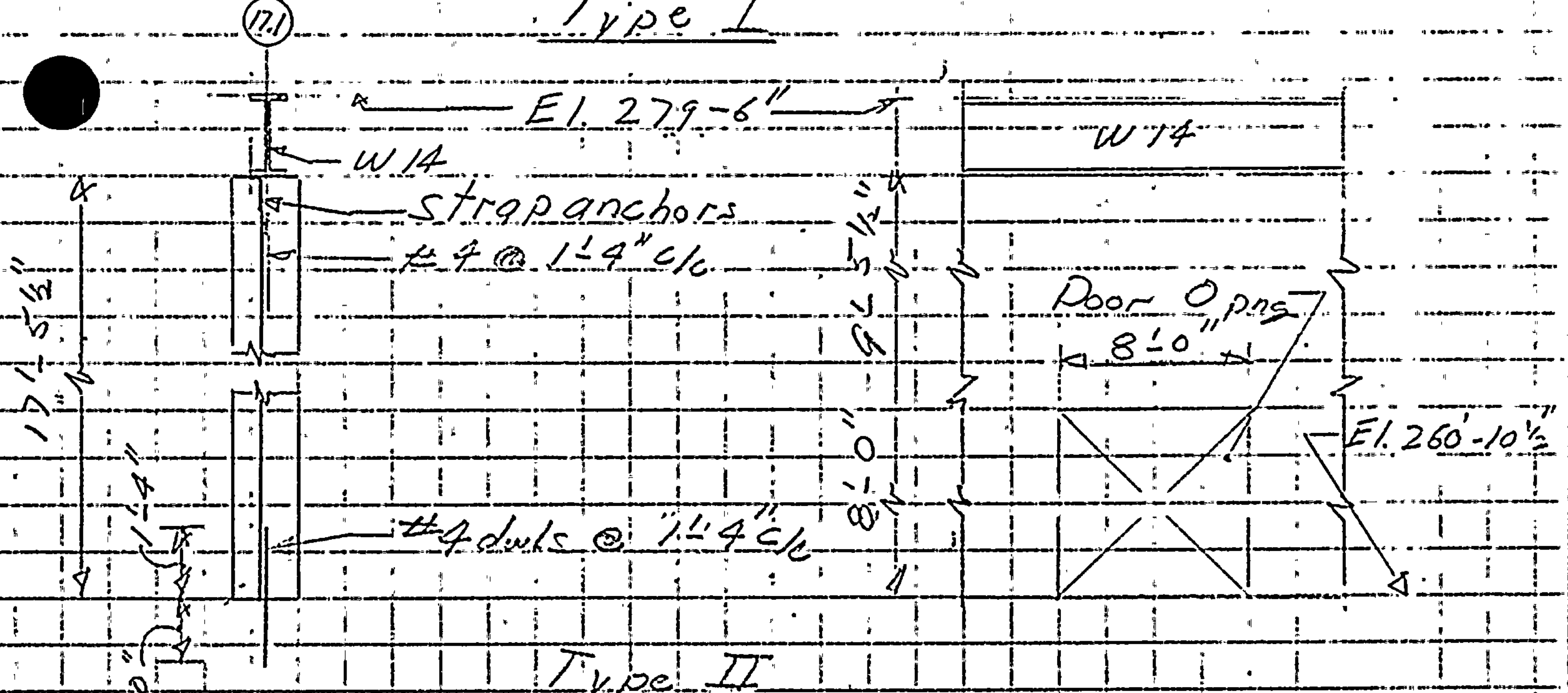
MASONRY WALL DESIGN - Wall #31 — PREPARED BY: MJ CULLY

21720-2033-18-0000 — CHECKED BY: R.P. AUPPERLE 11/4/80

Two types of 11 5/8" hollow block wall.



Type I



Type II

Type I 11 5/8" hollow block wall will assume to act as cantilever due to buckling of strap anchor.
See page 16 for anchor strap calculations ✓

$$F_I = (0.14)(80\,\#/ft^2) = 11.2\,\#/ft^2$$

SUBJECT NINE MILE [illegible] 16 DATE 9/30/80

N.R.C. I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N21-56

MASONRY WALL DESIGN - WALL #31 PREPARED BY M J CULLY

317.20 - 2033 - 18 - 0000 CHECKED BY R.P. AUPPERLE 11/4/80

12" H.C. CM. WALL

$$V_{MAX} = wL = (11.2^{\#}/ft^2)(18.625 ft) = 208.6^{\#}/ft$$

$$M_{MAX} = \frac{wL^2}{2} = \frac{(11.2^{\#}/ft^2)(18.625 ft)^2}{2} = 1942.6 \frac{ft\text{-}\#}{ft}$$

$$M_{MAX} = \left(1942.6 \frac{ft\text{-}\#}{ft}\right)\left(12 \, in/ft\right) = 23,311 \frac{in\text{-}\#}{ft}$$

Check Steel Stress

$$f_s = \frac{M}{A_s \, j \, d} = \frac{23,311 \frac{in\text{-}\#}{ft}}{\left(.15 \frac{in^2}{ft}\right)(.901)(5.81 in)}$$

$$f_s = \frac{23,311 \frac{in\text{-}\#}{ft}}{.786 \, in^3/ft} = 29,687 \, Psi$$ CANTILEVER WALL

29,687 Psi > 20,000 Psi N.G. 40 Grade Steel

Must use pin connection at top. Strap anchors must be stiffned up to take compression load. Use simple beam moment (See pg 16).

$$F_I = (accel)(W_{gt})$$

$$F_I = (0.18)(80^{\#}/ft^2) = 14.4^{\#}/ft^2$$

$$V_{MAX} = \frac{wL}{2} = \frac{(14.4^{\#}/ft^2)(18.625 ft)}{2} = 134^{\#}/ft$$

$$M_{MAX} = \frac{wL^2}{8} = \frac{(14.4^{\#}/ft^2)(18.625 ft)^2}{8} = 624.4 \frac{ft\text{-}\#}{ft}$$

SEE SHT 18

$$M_{MAX} = 624.4 \frac{ft\text{-}\#}{ft} \, (12 \, in/ft) = 7,492.8 \frac{ft\text{-}\#}{ft}$$ (corrected: 1,961 ft-#/ft)

SUBJECT NINE MILE POINT UNIT 2 DATE 9/30/80
NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-NZ1-56
MASONRY WALL DESIGN-WALL #31 PREPARED BY MJ CULLY
12170 - 2033 - 18 - 0000 CHECKED BY R.P. AUDRAS 11/4/80

Check Steel Stress

SEE SHT. 18

$$f_s = \frac{M}{A_s j d} = \frac{\overset{1961}{\cancel{7493}}\ \frac{in\text{-}\#}{ft}}{(.15\frac{in^2}{ft})(.901)(5.81in^2)}$$

$$f_s = \frac{7493\ \frac{in\text{-}\#}{ft}}{.786\ in^2/ft} = 9543\ Ksi$$

$$f_s = \overset{2497}{\cancel{9543}}\ Ksi < 20{,}000\ Ksi \quad O.K.$$ ✓ 40 Grade Steel

Check Concrete Compression

$$F_m = 0.33\ f'_m = 0.33\ (700\ Psi) \doteq 231\ Psi$$

$$F_a = 0.25\ f'_m = 0.25\ (700\ Psi) = 175\ Psi$$ (ACI 531-79 10.1)

Flexure $$f_m = \frac{M}{\frac{bd^2 Kj}{2}} = \frac{\overset{1961}{\cancel{7493}}\ \frac{in\text{-}\#}{ft}}{54.01\frac{in^3}{ft}} = 138.7\ Psi$$

$$f_a = \frac{\frac{(18.625ft)(80\#/ft)}{2}}{30in^2} = \frac{745\#}{30in^2} = 24.8\ Psi$$

$$\frac{f_a}{F_a} + \frac{f_m}{F_m} \le 1$$ (ACI 531-79 11.1.1)

$$\frac{24.8}{175} + \frac{138.7}{231} = .14 + .60 = .74 < 1.0 \quad O.K.$$ ✓ CONSERVATIVE

Check Shear Stress

$$V_{max} = 134\ \#/ft$$

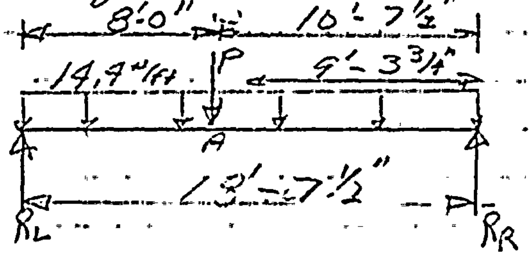
$$v_{act} = \frac{V_{max}}{b\ t_{eff}} = \frac{134\ \#/ft}{(12in)(2.5in)} = 4.5\ Psi$$ ✓

$V_{all} = 1.1\sqrt{f'_m} = 1.1\sqrt{700} = 29.1\,Psi$

(ACI 531-79 10.1)

$V_{all} = 29.1\,Psi > 4.5\,Psi$ ∴ O.K.

Check Door Opng.

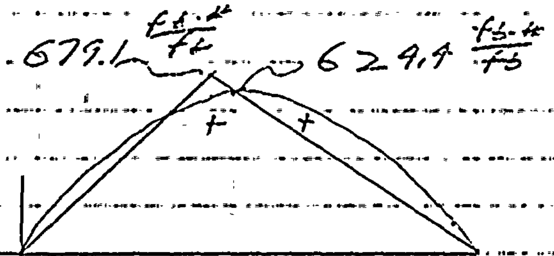


$P = \left(\frac{10.625\,ft}{2}\right)(2.0\,ft)(14.4\,\#/ft) = (10.625\,ft^2)(14.4\,\#/ft)$

$P = 148.8\,\#/ft$ loading from Lintel

$M_A = \left(\frac{10.625'}{18.625'}\right)(148.8\,\#/ft)(8.0\,ft) = 84.9\,\#/ft\,(8.0\,ft)$

$M_A = 679.1\,\frac{ft\text{-}\#}{ft}$



Moment Diagram

$M_{max} = \frac{9.3125\,ft\,(679.1\,\frac{ft\text{-}\#}{ft})}{10.625\,ft} + 624.9\,\frac{ft\text{-}\#}{ft}$

$M_{max} = 595.2 + 624.9 = 1219.6\,\frac{ft\text{-}\#}{ft}$

$V_{max} = 84.9\,\#/ft + 134.9\,\#/ft = 219.8\,\#/ft$

SUBJECT NINE MILE POINT UNIT 1/0 DATE 9/30/80
N.R.C. I.E. BULLETIN 80-11 INDEX OR FILE NO. 7-N2.1-56
MASONRY WALL DESIGN-WALL #31 PREPARED BY MJ C...
317.20 - 2033 - 18 - 0000 CHECKED BY R.P. AUPPERLE 11/4/80

Check Steel Stress

$$f_s = \frac{M}{A_s j d}$$

$A_s = .20\,in^2/ft$ Extra bar placed in coarse adjacent to door jam

Determine j from Flexure Coefficients Table

$$\rho = \frac{A_s}{bd} = \frac{.20\,in^2}{(12\,in)(5.81\,in)} = \frac{.20\,in^2}{69.72\,in^2} = .00287$$

$$n\rho = (41.4)(.00287) = .119$$

$$K = .3832 \quad j = .8723$$

$$\therefore f_s = \frac{1219.6\,\frac{ft\text{-}\#}{ft} \times 12\,in/ft}{(.20\,\frac{in^2}{ft})(.8723)(5.81\,in)} = \frac{14635.2\,\frac{in\text{-}\#}{ft}}{1.014\,\frac{in^3}{ft}}$$

$f_s = 14,438$ Psi $<$ 20,000 Psi O.K.
40 Grade Steel

Check Concrete Compression

$$F_m = 0.33\,f'_m = 0.33\,(700\,Psi) = 231\,Psi$$
$$F_a = 0.25\,f'_m = 0.25\,(700\,Psi) = 175\,Psi$$

(ACI 531-79 10.1)

Flexure $$f_m = \frac{M}{\frac{bd^2 K j}{2}} = \frac{14635.\,\frac{in\text{-}\#}{ft}}{\frac{(12\,in)(5.81\,in)^2}{2}(.3832)(.8723)}$$

$$f_m = \frac{14,635\,\frac{in\text{-}\#}{ft}}{202.5\,in^3\,(.334)} = 216.2\,Psi$$

8409070020

SUBJECT NINE MILE POINT UNIT #1
N.R.C. I.E. BULLETIN 80-11
MASONRY WALL DESIGN - WALL #31
317.20 - 2033 - 18 - 0000

DATE 9/30/80
INDEX OR FILE NO. 3-N2.1-56
PREPARED BY M J SCULLY
CHECKED BY R.P. AUPPERLE 11/4/80

$f_a = 19.4$ Psi   Previous Calc's

$\frac{f_a}{F_a} + \frac{f_m}{F_m} \leq 1$ ACI 531-79 - 11.1.1

$\frac{19.4}{175} + \frac{216}{231} = .11 + .94 = 1.05 > 1.0$ N.G.

5% OVERSTRESS

This is not much of a problem because point load from lintel will be spread over a larger area than 1ft because of extra Dur O Wall place over doorway

Check Shear Stress

$V_{max} = 219.8$ #/ft

$V_{act} = \frac{V_{MAX}}{b\, t_{eff}} = \frac{219.8\text{ \#/ft}}{(12\text{ in})(2.5\text{ in})} = 7.3$ Psi

$V_{all} = 1.1\sqrt{f'_m} = 1.1\sqrt{700} = 29.1$ Psi
(ACI 531-79 10.1)

$\therefore V_{all} = 29.1$ Psi > 7.3 Psi O.K.

Type II 11 5/8 in Hollow Block Wall will be assumed to be pin at top and bottom. Only problem that exists is at 8ft x 8ft door opng. Check south side of door opng, north side Column H 17.1 braces wall.

$F_I = (\text{accel})(\text{Wgt})$

$F_I = (0.18)(80\text{ \#/ft}) = 14.4\text{ \#/ft}^2$

SHEET NO. 14 OF 20

SUBJECT NINE MILE POINT UNIT #1 [illegible]

[illegible] BULLETIN 80-11 [illegible]

[illegible] WALL [illegible] - WALL #2

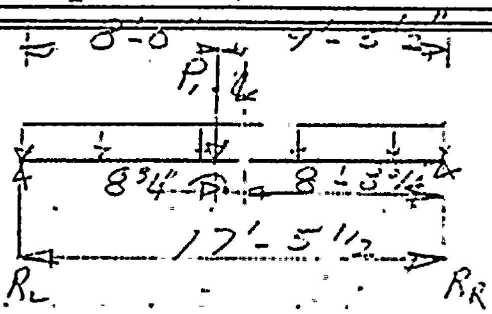
[illegible] -17 [illegible] -2032 -13-0010 [illegible]

DATE [illegible]

INDEX OR FILE NO. 3-N21-56

PREPARED BY [illegible]

CHECKED BY R.P. [illegible]



$$P = \frac{(17.46ft - 8.0ft)}{2}(4.0ft)(14.4\ \#/ft) = (18.92ft)(14.4\ \#/ft)$$

$P = 272.5\ \#/ft$ — Spread over 2 ft piece of wall due to [illegible] being [illegible] O.

$$P_1 = \frac{272.5\ \#/ft}{2\ ft} = 136\ \#/ft$$

$$V_{MAX} = \frac{P}{2} + \frac{wL}{2} = \frac{136\ \#/ft}{2} + \frac{(\ldots)(17.46ft)}{2}$$

$$V_{MAX} = 68\ \#/ft + 125.7\ \#/ft = 193.7\ \#/ft$$

$$M_{MAX} = \frac{8.73'}{9.46'}(R_L)(8.0') + \frac{wL^2}{8} = (.92)(73.7\#)(8.0') + [illegible]$$

$$M_{MAX} = 542.2\ \frac{ft\text{-}\#}{ft} + 548.7\ \frac{ft\text{-}\#}{ft} = 1090.9\ \frac{ft\text{-}\#}{ft}$$

$$M_{MAX} = (1090.9\ \frac{ft\text{-}\#}{ft})(12\ in/ft) = 13{,}091\ \frac{in\text{-}\#}{ft}$$

Check Steel Stress

$$f_s = \frac{M}{A_s j d}$$

$$f_s = \frac{13{,}091\ \frac{in\text{-}\#}{ft}}{(.20\ \frac{in^2}{ft})(.901)(5.81\ in)} = \frac{13{,}091\ \frac{in\text{-}\#}{ft}}{1.05\ \frac{in^3}{ft}}$$

SUBJECT NINE MILE POINT UNIT 1 — DATE 9/30/80
NRC I.E. BULLETIN # 80-11 — INDEX OR FILE NO. 3-N2.1.5.6
MASONRY WALL DESIGN - WALL #21 — PREPARED BY MJC
21-23-2022-18-0000 — CHECKED BY RP

$f_s = 12,504\ Psi < 20,000\ Psi$ O.K.

Check Concrete Compression

$F_m = 0.33\ f'_m = 0.33\ (700\ Psi) = 231\ Psi$
$F_a = 0.25\ f'_m = 0.25\ (700\ Psi) = 175\ Psi$

(ACI 531-79 10.1)

Flexure $f_m = \frac{M}{\frac{bd^2}{6}} = \frac{M}{S} = \frac{13,091\ ^{in\text{-}\#}/_{ft}}{\frac{(12\ in)(\ldots)}{2}}$

S from previous calc

$f_m = \frac{13,091\ \frac{in\text{-}\#}{ft}}{67.6\ \frac{in^3}{ft}} = 193.5\ Psi$

Bearing $f_a = \frac{\left(\frac{17.45\ ft}{2}\right)(80\ \#/ft^2)}{30\ in^2} = 23.3\ Psi$

$\frac{f_a}{F_a} + \frac{f_m}{F_m} \leq 1.0$ (ACI 531-79 11.1.1)

$\frac{23.3}{175.0} + \frac{193.5}{231} = .13 + .84 = .97 < 1.0$ O.K.

Check Base Shear

$V_{max} = 193.7\ \#/ft$

$v_{act} = \frac{V_{max}}{b\ t_{eff}} = \frac{193.7\ \#/ft}{(12\ in)(2.5\ in)} = 6.5\ Psi$

SUBJECT: NINE MILE POINT - UNIT 1
DATE: 9/30/80
N.R.C. I.E. BULLETIN #80-11
INDEX OR FILE NO. [illegible]
MASONRY WALL DESIGN - WALL 31
PREPARED BY M J C[illegible]
317.[illegible] - 2032 - [illegible]
CHECKED BY [illegible]

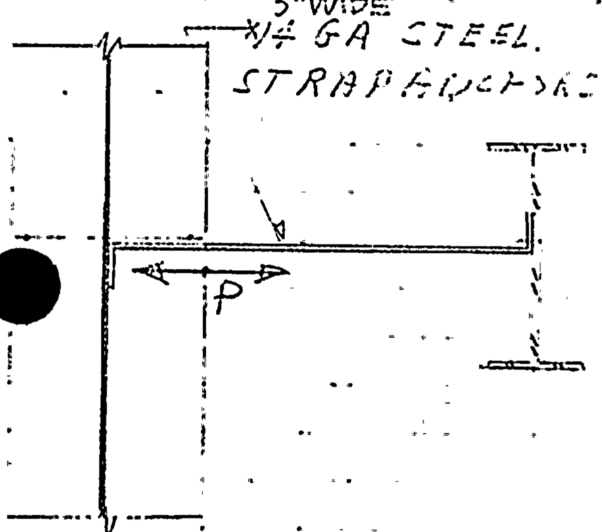
$V_{m} = 1.1\sqrt{f_m} = 1.1\sqrt{700} = 29.1 \text{ psi}$

$V_{a} = 29.1$ Psi $>$ 6.5 Psi O.K

Check Anchor Stress for [illegible] compression load

$11\frac{5}{8}$" ⊥ 1'-8" (K)

NOTE: (K) LINE WF BEAM SIZE SUFFICIENT TO SUPPORT MASONRY WALL.



$P = (134\#/ft)(2.67 ft) = 358\#$

$t = .0747 in$ 14 GA.
$w = 3 in$

$I = \frac{bh^3}{12} = \frac{wt^3}{12}$

$I_o = \frac{(3 in)(.0747)^3}{12} = .0001042 in^4$

Use E_2 [illegible] from Popov book

$P_{cr} = 2.05\frac{\pi^2 EI}{L^2} = 2.05\pi^2 \frac{(29{,}000{,}000 \text{ psi})(.0001042 in^4)}{(20 in)^2}$

$P_{cr} = 153\# < 358\#$ N.G.

∴ FAILURE

This assumes fix connection, [illegible] one [illegible] pin [illegible]. Anchor strap will buckle. Use a stiffer member

Summary

FAILURE OCCURS
$11\frac{5}{8}$" Hollow block wall between column lines J & K require a Fix at top ✓

0 4 0 0 7 0 0 2 4

SUBJECT NINE MILE POINT UNIT #1 — SHEET NO. 17 OF ___

N.R.C. I.E. BULLETIN 80-11 — DATE 10/27/80

MASONRY WALL DESIGN - WALL #31 — INDEX OR FILE NO. 3-N2.1-56

31720 - 2033 - 18-0000 — PREPARED BY M J CULLY

CHECKED BY RP. AUPPERLE 11/18

Recheck Type I 11 5/8" Hollow Block WALL — H.C. WALL MORE CRITICAL THAN 12" (100%) SHIELD WALL

It has been determined that the existing block is lightweight block. Recheck wall with lower applied

$$F_t = (accel)(Wgt.)$$

accel = 14% gravity ✓

Area of grouted cell = 104.50 in²/ft − 68.59 in²/ft = 35.91 in²/ft

≐ 4 @ 16 in

$$A = \left(35.91\ \frac{in^2}{ft}\right)\left(\frac{ft^2}{144\ in^2}\right) = .249\ ft^2/ft$$

Weight of grouted cell = (.249 ft²/ft)(144 #/ft³) = 35.9 #/ft

Weight of ungrouted haydite block = (105 #/ft³)(.4625) ← % Solids confirm

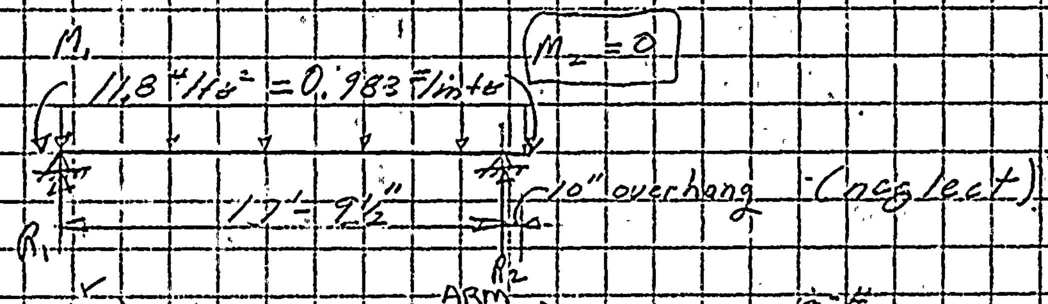
= 48.6 #/ft²

Weight of grouted haydite block = 35.9 #/ft² + 48.6 #/ft²

Wgt. = 84.5 #/ft²

$$F_t = (0.14)(84.5\ \#/ft^2) = 11.8\ \#/ft^2$$ ✓

Check as simple beam w/ Moment applied @ end due to weight of wall



$$M_1 = (84.5\ \#/ft^2)(18.625\ ft)(5.81\ in) = 9143\ \frac{in\text{-}\#}{ft}$$ (ARM)

$$l = 213.5\ in$$

0400020025

SUBJECT NINE MILE POINT UNIT 1 — DATE 10/27/80
N.R.C. IE BULLETIN 80-11 — INDEX OR FILE NO. 3-N2.1-56
MASONRY WALL DESIGN - WALL #31 — PREPARED BY M J CULLY
31720 - 2033 - 18 - 0000 — CHECKED BY R.P. AUPPERLE 11/4/80

Use AISC Beam diagrams and formulas #22

$$R_1 = \frac{wl}{2} + \frac{M_1 - M_2}{l} = \frac{(.983 \text{ \#/in})(213.5 \text{ in})}{2} + \frac{9143 \text{ in-\#/ft}}{213.5 \text{ in}}$$

$$R_1 = 104.9 \text{ \#/ft} + 42.8 \text{ \#/ft} = 147.7 \text{ \#/ft}$$

overhang

$$R_2 = 104.9 \text{ \#/ft} - 42.8 \text{ \#/ft} + (10 \text{ in})(.983 \text{ \#/in ft})$$

$$R_2 = 104.9 \text{ \#/ft} - 42.8 \text{ \#/ft} + 9.8 \text{ \#/ft} = 114.7 \text{ \#/ft} - 42.8 \text{ \#/ft}$$

$$R_2 = 71.9 \text{ \#/ft}$$

$$M_3 = \frac{wl^2}{8} - \frac{M_1 + M_2}{2} + \frac{(M_1 - M_2)^2}{2wl^2}$$

{REF: 1970 AISC Pg 2-209}

$$M_3 = \frac{(.983 \text{ \#/in})(213.5 \text{ in})^2}{8} - \frac{9143 \text{ in-\#}}{2} + \frac{(9143 \text{ in-\#})^2}{2(.983 \text{ in})(213.5 \text{ in})^2}$$

UNIFORM SEISMIC

$$M_3 = 5600 \text{ in-\#/ft} - 4571.5 \text{ in-\#/ft} + 932.8 \text{ in-\#/ft}$$

$$M_3 = 1961.3 \text{ in-\#/ft} \checkmark$$

Determine load on anchor strap @ top of wall

SPACING, R2

$$P_{act} = (2.67 \text{ ft})(71.9 \text{ \#/ft}) = 192 \text{ \#} \checkmark$$

$$P_{all} = 153 \text{ \#} < 192 \text{ \#} \quad N.G. \quad \underline{25\%} \text{ over stress}$$

(Pg. 16)

Anchor Straps will have to be stiffened. The wall is adequate in flexure from previous calc's (pages 8 - 13).

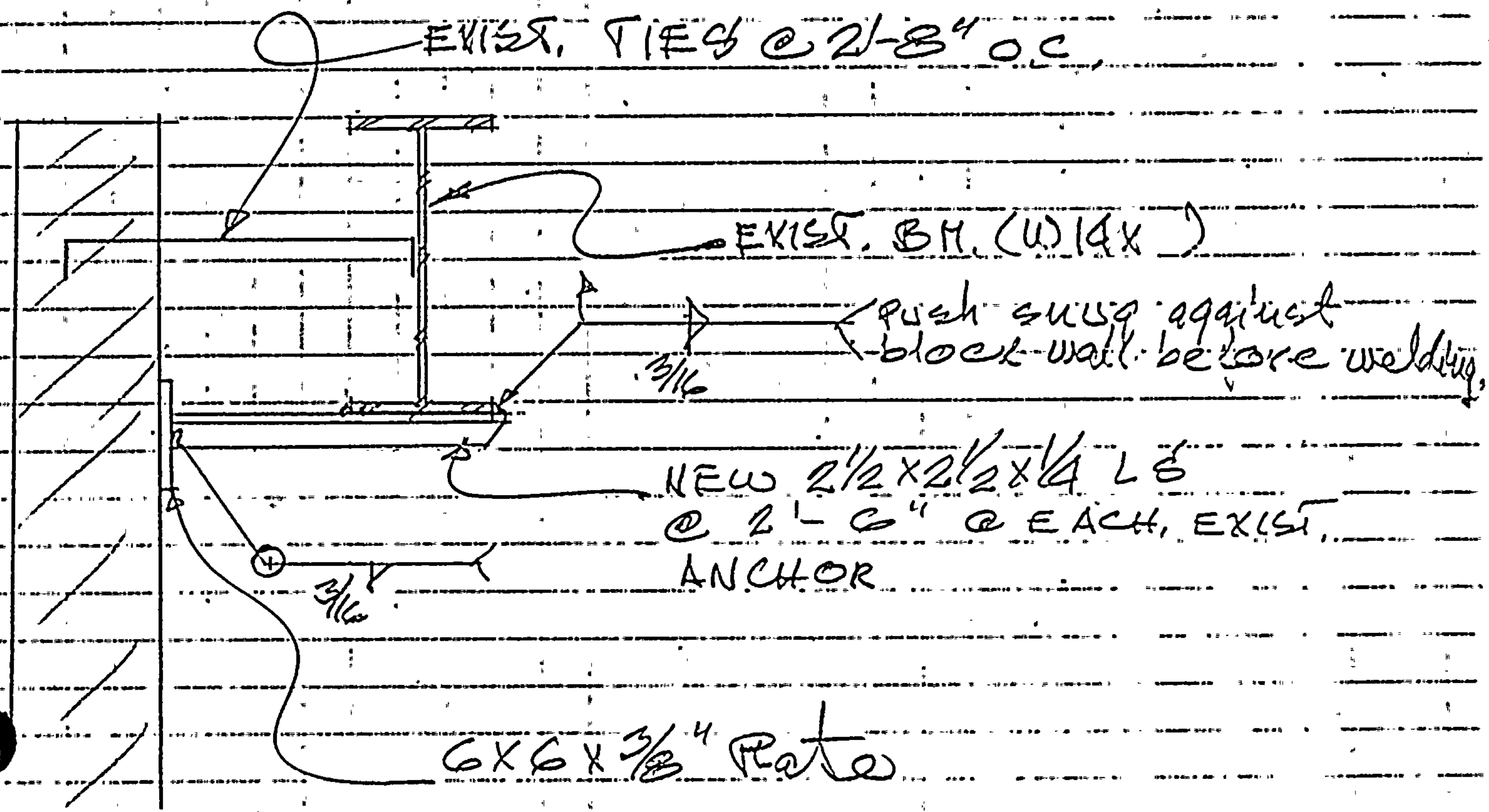
SHEET NO. ____ OF ____

SUBJECT NINE MILE POINT UNIT #1 — DATE 11/13/80

Masonry Wall Bulletin #80-11 — INDEX OR FILE NO. ____

Wall # 31 FIX — PREPARED BY JL

CHECKED BY R.P. AUPPERLE 11/24/80



Force per anchor less than 200 #
(see orig. calc's.)

$200 / (2 \times 2\frac{1}{2} \times \frac{3}{16} \times .707) = 302$ psi negligible
(weld)

EXIST. anch. OK! in tension.
(see orig. calcs.)

SUBJECT NINE MILE POINT UNIT #P 0 7 0 3 DATE 3/22/80
NRC IE BULLETIN 80-11
MASONRY WALL DESIGN - WALL #38
317.20-2033-18-0000

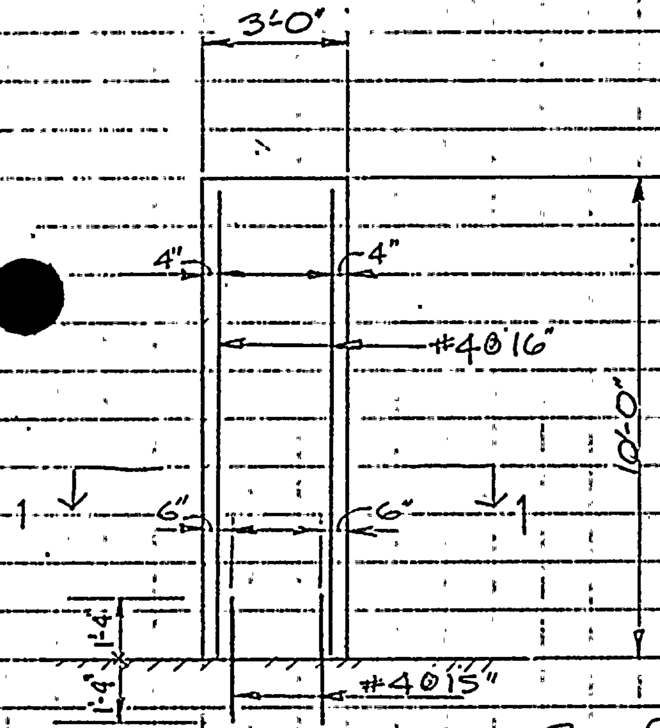
INDEX OR FILE NO. 3-N2.1-86
PREPARED BY R.E. RICE
CHECKED BY E. TAYLOR, JR. 10/9/80

MASONRY WALL ANALYSIS

WALL # 38 ✓ — C-18795-C (5-6) ✓ ; C-19247-C (5-6) ✓

EL. 261'-0" TURBINE BLDG. ✓

WALL LGT = 9'-4" (Scaled from Drawing) ✓
WALL HGT = 10'-0" (Drawing) - 19247-C Sec. 1 & 2 ✓
WALL THK = 3'-0" (100% Solid)



Reinforcing Size, Spacing & Location from C-19247-C Plan, Sec 1 & 2

Boundry Conditions
- ✓ Top - FREE
- ✓ Bottom - Fixed
- ✓ North End - Unknown
- ✓ South End - Free

SHEET NO. ____ OF ____

SUBJECT NINE MILE POINT UNIT #1 0400703 DATE 9/22/80
NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-56
MASONRY WALL DESIGN - WALL #38 PREPARED BY R.E. RICE
317.20-2033-18-0000 CHECKED BY E. TAYLOR, JR. 10/9/80

Check development length in concrete (l_{dc})

$l_d = 0.04\,A_b f_y/\sqrt{f'_c}$ but $\geq 0.0004\, d_b f_y \geq 12\text{in}$ (ACI 318-77 12.2.2)
(" " " 12.2.5)

A_b = Area bar $f'_c = 3500\ \#/\text{in.}^2$

$l_d = (0.04)(.20)(40{,}000)/\sqrt{3500} = 5.41\text{ in.}$

but

$\geq (0.0004)(.5)(40{,}000) = 8\text{ in.} \geq 12\text{ in.}$

$l_d = 12\text{ in.} < 1'\text{-}4''$ OK

Check developement length in masonry (l_{dm})

$l_{dm} = 0.0015\, d_b f_s \geq 12\text{ in.}$ (ACI 531R-79 8.9.3)

$l_{dm} = 0.0015(.5)(20{,}000) = 15\text{ in.}$

$l_{dm} = 15\text{ in.} = 1'\text{-}3'' < 1'\text{-}4''$ O.K.

Check lap length on dowels

$l = 0.002\, d_b F_s$ (ACI 531R-79 8.7.2.1)

$= 0.002(.5)(20{,}000)$

$= 20\text{ in.} > 1'\text{-}4$ $\therefore$ factor allowable F_s by $(16/20)$ if compatible

Check compatibility of wall and dowel spacing

Allowable Transverse Spacing = (1/5)(Required Lap) (ACI 531-79 8.7.2.3)

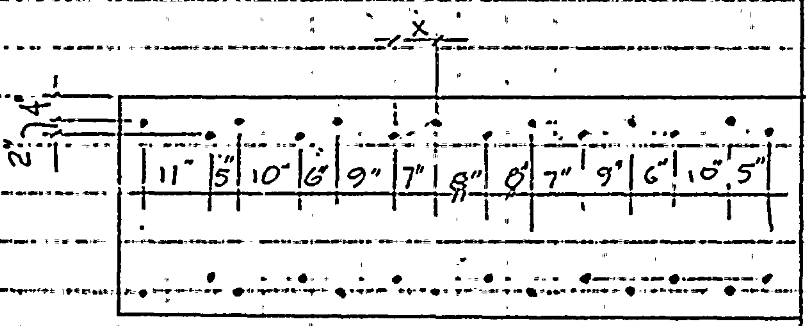
$= (1/5)(20) = 4\text{ in.}$

SUBJECT NINE MILE POINT UNIT #1 0 4 0 0 7 0 3 DATE 9/22/80

NRC IE BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-86

MASONRY WALL DESIGN - WALL #38 PREPARED BY R. E RICE

317.20-2033.18-0000 CHECKED BY E. TAYLOR JR. 10/9/80



SECTION 1-1

Find Max. All. "x"

$4 = \sqrt{2^2 + x^2}$

$x = 3.46"$

at worst possible spacing.

Min. x = 4" ≥ 3.46 N.G.

Therefore assume bars are not lapped and f_s is a function of development length.

F_p = accel. (wt.) accel = .14g (FSAR)

$W_p = 100\% \,(150\ \mathrm{lb/ft^3})(3\ \mathrm{ft.}) = 450\ \mathrm{lb/ft^2}$

$\therefore F_p = .14(450) = 63\#/ft/ft.$

∴ Span Vertically as cantilever from floor –

✓ $V_{MAX} = wL = (63)(10) = 630\ \#/ft.$

✓ $M_{MAX} = \frac{wL^2}{2} = \frac{(63)(10)^2}{2} = 3150$ ft.#/ft. 3150 ft-# × 12in/ft = 37,800 in-#/ft.

Find Max Mall based on #4 dwls @ 15

A_s = #4 @ 15 = .16 in²/ft. ✓ Analyze 1 FT. WIDTH.

$\rho = \frac{A_s}{bd}$ b = 12 in. d = 36 - 6 = 30

0 4 0 0 7 0 3

SUBJECT NINE MILE POINT UNIT #1 DATE 9/22/80
NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-56
MASONRY WALL DESIGN WALL # 38 PREPARED BY R.E. Rice
817.20-2033-18:0000 CHECKED BY E. TAYLOR, JR 10/9/80

$\rho = \frac{.16}{(12)(30)} = 4.44\times10^{-4}$

$n = E_s/E_m = 29\times10^6 / 7\times10^5 = 41.4$

$n\rho = .018$ ∴ From Masonry Design Manual - Table of Flex. Coefficients

$k = .1726$ $j = .9424$ $2/kj = 12.30$ $kj/2 = .0813$

$M_{sd} = A_s f_s jd$ $f_s = 20\times10^3$ psi ∴ G40. bars

$= (.16)(20\times10^3)(.9424)(30) = 90,500$ in-#

$M_{md} = 1/2 f_m bd^2 kj$ $f_m = .33 f'_m = .33(700 \text{ lb/in}^2) = 231 \text{ lb/in}^2$

$= (231)(12)(30)^2(.0813) = 202,800$ in-# (→ 202,827 in-#) $\gg$ 37,800 in-# OK

∴ M_{sd} controls and varies linerly from M_{sd} at base to 0 at ht. 2d See graph on Sht-5

Find Max Mall based on #4 @ 16 (Wall Steel)

$A_s = \#4 @ 16 = .15 \text{ in}^2/\text{ft}$ Analyze 1 Ft width

$\rho = \frac{A_s}{bd} = \frac{.15}{(12)(32)} = 3.91\times10^{-4}$ $d = 36-4 = 32$

$\rho n = .016$ $n = 41.4$ ∴ As above

$K = .1636$ $j = .9455$ $2/kj = 12.93$ $kj/2 = .0773$

SHEET NO. 5 OF 6

SUBJECT NINE MILE POINT UNIT #1 0 4 0 0 7 0 3 DATE 7/22/80

NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-86

MASONRY WALL DESIGN WALL #38 PREPARED BY R.E. Rice

317.20-2033-18.0000 CHECKED BY E.TAYLOR, JR. 10/9/82

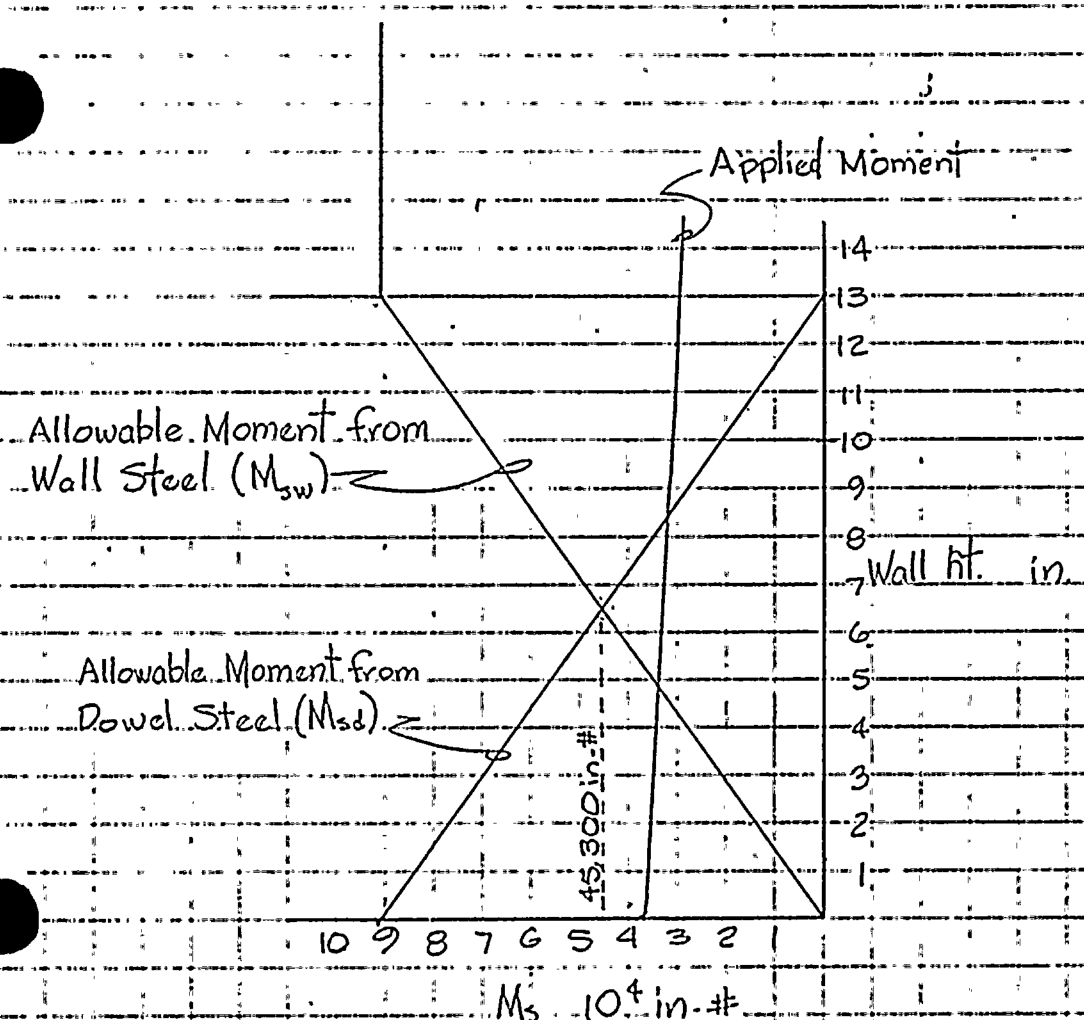
$M_{sw} = A_s f_s jd$

$= (.15)(20{,}000)(.9455)(32) = 90{,}800$ in-# (⇒ 90,765 in-#)

$M_{mw} = f_m bd^2 (kj/2)$

$= (231)(12)(32)^2(.0773) = 219{,}400$ in-# (⇒ 219,418 in-#) $\gg 37{,}800$ in-# OK

∴ M_{sw} controls and varies linearly from 0 at base to M_{sw} at Ht. 2d
See graph on Sht. 5



SUBJECT NINE MILE POINT UNIT #1 0400703 DATE 1 8/23/80
NRC I.E. BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-56
MASONRY WALL DESIGN WALL #38 PREPARED BY R.E. Rice
317.20-2033-18-0000 CHECKED BY E. TAYLOR JR. 10/9/80

FROM GRAPH ON SHEET 5 IT MAY BE SEEN THAT THE MIN. ALLOWABLE MOMENT = 45,300 in-# > 37,800 in-# OK (Note: Conservative because $M_{all} = (M_{sw} + M_{sd})$)

BASE SHEAR

$V_B = 630^{\#}$

ASSUME 50% CONTACT

$A_B = 3\,FT. \times 1\,FT. \times 50\% = 216\,in^2$

$v = V_B / A_B = 630^{\#} / 216\,in^2 = 2.92^{\#}/in^2$

$v_{all} = 1.1\sqrt{f'_m} = 1.1\sqrt{700} = 29.1^{\#}/in^2 > 2.92^{\#}/in^2$

Wall requires no fix.

SUBJECT: NINE MILE POINT UNIT #1
NRC I.E. BULLETIN 80-11
MASONRY WALL DESIGN
317.20-2033-18-0000

SHEET NO. 1 OF 4
DATE 11-4-80
INDEX OR FILE NO. 3-N2.1-50
PREPARED BY R.E. Rice
CHECKED BY PBGEORGE 11/7/80

Find When Collar Jt. Shear Stress would control over Flexure Stress:

Collar Jt. Shear Stress $= v = \frac{VQ}{It}$ psi ✓

Flexure Stress $= \frac{M}{S}$ psi ✓

Take a beam "b" wide × d" deep with a density γ #/in³ and span L"

and apply a seismic force equal to $(\%g/100)(\gamma)(d)(b)$ #/in.

For Collar Jt. Shear Stress (pinned-pinned end conditions - VERT. SPAN).

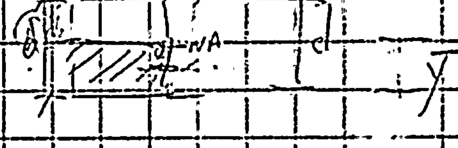
$v = \frac{VQ}{It}$ psi

$V = Shear_{max} = \overbrace{(\%g/100)(\gamma)(d)(b)(L)/2}^{\frac{wl}{2}}$ #

$Q = A\bar{y}$ = static moment of the area, beyond which the shear stress is being considered, about the neutral axis.

$v = Max @ N.A. \longrightarrow \bar{y} = d/4$

$A = db/2$



$Q = bd^2/8$ in³

I = Moment of Inertia $= \frac{bd^3}{12}$ in⁴

t = thickness of section = b in.

$\therefore v = \frac{((\%g/100)\gamma d b L/2)(bd^2/8)}{\frac{bd^3}{12} b} = \frac{12\%g\gamma b^2 d^3 L}{1600\, b^2 d^3} = .0075\,\%g\gamma L$ #/in²

From ACI 531-79 Table 10.1 $v_{all} = 1.1\sqrt{f'_m}$ for $f'_m = 700$

$v_{all} = 29.10$ psi

PROJECT NINE MILE POINT UNIT #1
NRC I.E. Bulletin 80-11
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DATE 11-4-80
INDEX OR FILE NO. 3-N21-50
PREPARED BY R. E. Rice
CHECKED BY PB GEORGE 11/7/80

∴ at limit

$v_{all} = v$

$29.10\ \#/in^2 = .0075\ \%g\gamma L\ \#/in^2$

$3880\ \#/in^2 = \%g\gamma L\ \#/in^2 \rightarrow L_{all} = \frac{3880}{\%g\gamma}\ in.$ ✓

For Flexural Stress

$f_b = M/S$ psi

$M = \text{Moment} = (\%g/100)(\gamma)(b)(d)(L)^2/8$ in-#

$S = \frac{bd^2}{6}\ in^3$

$f_b = \frac{(\%g/100)(\gamma bdL^2/8)}{\frac{bd^2}{6}} = \frac{6\%g\gamma bdL^2}{800\ bd^2} = .0075\ \%g\gamma L^2/d\ \#/in^2$ ok

From ACI 531-79 Table 10.1 $f_{ball} = F_t = 1.0\sqrt{m_o}$ for m_o = ~~750~~ psi (100% SOLID) USE 700 psi

$F_t = 27.39$ psi $F_t = 26.5$

∴ at limit

$F_t = f_b$

$27.39 = .0075\%g\gamma L^2/d\ \#/in^2$
$26.5 =$

JECT NINE MILE POINT UNIT #1
NRC I.E. BULLETIN 80-11
Masonry Wall Design
317.20.2033-18-0090

DATE 11-4-80
INDEX OR FILE NO. 3-NZ.1-50
PREPARED BY R. E. Rice
CHECKED BY SEE NOTES [signature] 11/7/80

$$3652 = \%g\gamma L^2/d \text{ psi}$$

$$\sqrt{\frac{3652\,d}{\%g\gamma}} = L_{all} \text{ in.} \qquad L_{ALL} = \sqrt{\frac{3533\,d}{\%g\,\gamma}}$$

if we make a ratio such that

$$\alpha = \frac{L_{all} \text{ shear stress in}}{L_{all} \text{ flexural stress in}}$$ WHERE L = HEIGHT OF WALL

$\alpha > 1$ flexure controls

$\alpha < 1$ = shear stress controls

$\alpha = 1$ - shear stress = flexural stress

$$1 = \alpha = \frac{\dfrac{3880}{\%g\gamma} \text{ in}}{\sqrt{\dfrac{3652d}{\%g\gamma}} \text{ in}}$$ (3652 altered to 3533)

$$\sqrt{\frac{3652d}{\%g\gamma}} \text{ in} = \frac{3880}{\%g\gamma} \text{ in}$$

$$\sqrt{3652d}\ \%g\gamma = 3880\sqrt{\%g\gamma}$$ SEE NEXT PAGE

$$\sqrt{\%g\gamma} = \frac{64.21}{\sqrt{d}}$$

$$\%g\gamma = \frac{4123}{d} \text{ lb/in}^3$$ 9296

SUBJECT: NINE MILE POINT UNIT #1
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MASONRY WALL DESIGN
317.20-2033-18-0000

SHEET NO. 4 OF 4
DATE 11-4-80
INDEX OR FILE NO. 3-N12.1-50
PREPARED BY R. E. Rico
CHECKED BY PBGEORGE 11/7/80

$\%g\,\gamma\,d = 4123\ \#/in^2$

$\%g_{max} = 43 \qquad \gamma = 150\ \#/ft^3 = .0868\ \#/in^3$

$\therefore (43)(.0868)\,d = 4123\ \#/in^2 \qquad d = \frac{4490}{\%g\,\gamma} = \frac{4490}{43(.0868\ \#/in^3)}$

d = ~~1105~~ 1202 in. @ balanced point   d = 1202 IN

if d ≤ ~~1105~~ 1202 IN in. flexure controls ✓

if d > ~~1105~~ 1202 IN in shear stress controls ✓

All wall thicknesses are much less than 1105 in. ∴ flexure controls. ✓

Check with $\%g_{min} = 11 \quad \gamma = .0868\ \#/in^3$ } NOT REQ'D

$(11)(.0868)\,d = 41.23\ \#/in.$

d = 43.18 in @ balanced point.

All wall thicknesses are much less than 43.18 in. ∴ flexure controls

Flexure will control over Collar Jt. Shear Stress for all problems encountered. Similar arguments and results may be had for end conditions other than pinned-pinned (@ α = d = 4566 IN FOR CANTILEVER CONDITION.)

THIS IS ALSO A CONSERVATIVE APPROACH SINCE THE DUROWAL (EITHER EVERY OTHER COURSE, OR EVERY COURSE) CAN BE USED TO KEEP THE WYTHES ACTING COMPOSITELY.

PROJECT NINE MILE POINT UNIT # 1 — DATE 10-14-80

NRC I.E. BULLETIN 80-11 — INDEX OR FILE NO. 3-N21-56

MASONRY WALL DESIGN WALL #3 — PREPARED BY R. E. Rice

317.20-2033-18-0000 — CHECKED BY Heilmann 10/14/80

WALL #3

El. 249'-0" Reator Building — C-15150-C S-6 Plan
12" Solid Block — B-18791-C S-7 Block
Horizontal Span = 8'-0" Hard — C-15161-C S-6 Section
H. Ea End — C-19622-C S-6 Dwls
Vertical Span = 7'-10½" 1" Gap
@ Top, Hard H. w/ #4
x 4'-0" Dwls @ 16 @ Bottom — Wall has steel to match dwls B-18791-C S-7

Assume load from penetration ≤ 50#/ft.

Force

$F_p = wt \times \%g/100$ wt = (100%)(150#/ft)(1ft) + 50#/ft = 200#/ft² (100% Solid; Density; 12" Block; Penetrations)

%g = 17 (FSAR)

$F_p = 200\#/ft^2 \times 17/100 = 34\#/ft^2$

M & V

Cantilever Vertically

$M = \frac{wL^2}{2} = (34)(7'\text{-}10\tfrac{1}{2}")^2/2 = 1054 \text{ ft-\#} = 12,650 \text{ in-\#}$

$V = wL = (34)(7'\text{-}10\tfrac{1}{2}) = 268\#$

Final f_s & f_c

$A_s = .150 in^2/ft$ (#4 @ 16) b = 12 in d = 6 in (Possibly 2 6" Block to make wall thk.)

$p = A_s/bd = (.150)/(12)(6) = 2.08 \times 10^{-3}$ pn = .0862

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SUBJECT NINE MILE POINT UNIT #1
NRC I.E. BULLETIN 80-11
MASONRY WALL DESIGN WALL #3
317.20-2033-18-0000

DATE 10-14-80
INDEX OR FILE NO. 3-N21-86
PREPARED BY R. E. Rico
CHECKED BY [signature] 10/14/80

$k = .3376$ $j = .8875$ $2/kj = 6.68$ (Table of flex. Coef.)

$f_m = \frac{M}{bd^2}(2/kj) = \frac{12650}{(12)(6)^2}(6.68) = 195\text{ psi} < .33f'_m = .33(700) = 231\text{ psi}$

$f_s = \frac{M}{A_s jd} = \frac{12650}{(.15)(.8875)(6)} = 15837\text{ psi} < F_s = 20{,}000\text{ psi}$

Check Lap in Masonry

Lap Length $= 0.002\, d_b F_s$ ACI 531-79 8.7.2.1

$= (0.002)(.5)(20{,}000) = 20\text{ in.}$

$20\text{ in} < 40'' - 20'' = 20''$

Check Embedment in Conc.

$l_d = 0.04\, A_b f_y / \sqrt{f'_c}$
but $\geq .004\, d_b f_y$
and ≥ 12 in

$A_b = .20$ #4 bar
$f_y = 40{,}000$ psi Gr. 40 steel
$f'_c = 3700$ psi
$d_b = .50$ in

$= (0.04)(.20)(40{,}000)/\sqrt{3500} = 5.4\text{ in}$
but $\geq (.0004)(.50)(40{,}000) = 8\text{ in}$

$\therefore l_d = 12\text{ in} < 18\text{ in}$ OK

Shear

$V = \frac{V}{bd} = \frac{268}{(12)(6)} = 3.72\text{ psi}$

$v = 1.1\sqrt{f'_m} = 1.1\sqrt{700} = 29.1\text{ psi} > 3.72\text{ psi}$ OK

NO FIX REQUIRED

SHEET NO. 1 OF 3

SUBJECT: NINE MILE POINT UNIT 2   8 0 1 0 0 7 0 1 4 5   DATE 9/30/80

IE BULLETIN 80-11   INDEX OR FILE NO. 3-N2-M31.1

MASONRY WALLS   PREPARED BY PB GEORGE

WALL #10   CHECKED BY [signature] 10/30/80

TURBINE BLDG. - EL. 250'-0"   C-27069-C (M31.1 SHTS. 1 & 2)

%g = 14% (FSAR) EL. 261'-0"

WALL 'A' HGT = 9'-4½"
THK = 12" CMU

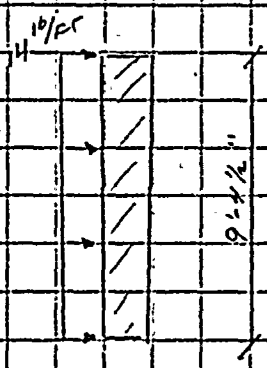
NO VERT. REINF.
DUR-O-WAL EVERY OTHER COURSE

WALL 'B' HGT = 9'-4½"
THK = 8" (FILLED SOLID)

ASTM C-270-73 TYPE S MORTAR m_o = 1800 psi

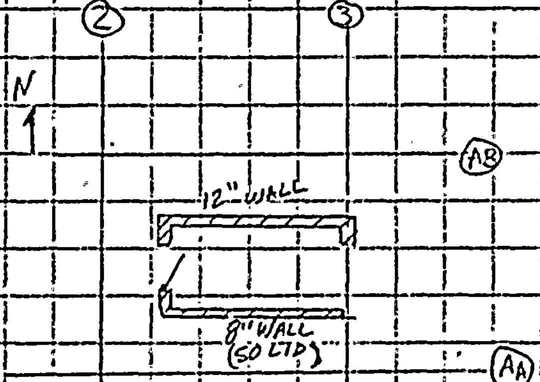
CHECK 8" WALL   ASTM C-90-75 MASONRY UNITS f'_m = 1700 psi

$$F = g \cdot W$$
$$= 0.14\,(150\ \text{lb/ft}^3)\left(\frac{8''}{12''/\text{ft}}\right)$$
$$= 14\ \text{lb/ft/ft}$$



$$V = \frac{wL}{2} = \frac{14\ \text{lb/ft}\,(9.375\ \text{ft})}{2} = 66\ \text{lb}$$

$$M = \frac{wL^2}{8} = \frac{14\ \text{lb/ft}\,(9.375\ \text{ft})^2}{8} = 154\ \text{ft-lb}$$



CHECK TENSION STRESS

$$F_t = f_m - 0.75 f_a$$
$$= \frac{M}{S} - 0.75\,\frac{P}{A}$$

0 4 0 0 7 0 4 6

SUBJECT NINE MILE POINT UNIT
IE BULLETIN 80-11
MASONRY WALLS
WALL # 10

DATE 10/2/80
INDEX OR FILE NO. 3-N2.1-M31.1
PREPARED BY P.B. GEORGE
CHECKED BY [signature] 10/30/80

$$F_t = \frac{154^{FT\text{-}lb}(12^{in}/_{FT})}{116\ IN^3} - 0.75\ \frac{100^{lb}/_{FT} \times 4.7\,FT}{91.5\ IN^2}$$

$\frac{bh^2}{6}$

very cons. may double for solid walls

0.5√m₀ ACI 531-79 TABLE 10.1

$F_t = 12.1\ ^{lb}/_{IN^2} < 21.2\ ^{lb}/_{IN^2}$ OK

CHECK SHEAR

$$v_m = \frac{V}{A} = \frac{66^{\#}}{7\tfrac{5}{8}'' \times 12'' \times 59\%} = 1.44\ ^{lb}/_{IN^2} < 45.4\ ^{lb}/_{IN^2}$$

CONS. OK

$$v_{all} = 1.1\sqrt{f_m'} = 1.1\sqrt{1700\ ^{lb}/_{IN^2}} = 45.4\ ^{lb}/_{IN^2}$$

CHECK 12" WALL

CONSERVATIVE .4625 (115) = 53 #/FT
× .14 = 7.4 #/FT

$F = g\,W$
$= 0.14\,(85\ ^{lb}/_{FT})$
$= 11.9\ ^{lb}/_{FT}$

$$V = \frac{WL}{2} = \frac{11.9\ ^{lb}/_{FT}\,(9.375\,FT)}{2} = 55.8\ ^{\#}$$

$$M = \frac{WL^2}{8} = \frac{11.9\ ^{lb}/_{FT}\,(9.375\,FT)^2}{8} = 130.7\ ^{FT\text{-}\#}$$

113.2 N B-60D

SHEET NO. 3 OF 3

SUBJECT NINE MILE POINT UNIT 0 4 Q 0 7 0 4 7 DATE 10/6/80

IE BULLETIN 80-11 INDEX OR FILE NO. 3-N2.1-M31.1

MASONRY WALLS PREPARED BY PB GEORGE

WALL #10 CHECKED BY [signature] 10/30/80

TENSION

$F_t = f_m - 0.75 f_a$

$= M/S - 0.75\, P/A$

$= \dfrac{130.7^{\text{FT-lb}}\,(12\,\text{IN/FT})}{190\,\text{IN}^3} - 0.75\, \dfrac{85^{\text{lb/FT}}\,(4.7\,\text{FT})}{70\,\text{IN}^2}$

190 IN³ ← NCMA TABLES

$= 8.25\ ^{\text{lb}}/_{\text{IN}^2} - 4.28\ ^{\text{lb}}/_{\text{IN}^2}$

$F_t = 3.97\ ^{\text{lb}}/_{\text{IN}^2} < 21.2\ ^{\text{lb}}/_{\text{IN}^2}$ O.K. → PREVIOUS

→ CONSERVATIVE

[signature] Acceptable

SHEAR

$v_m = \dfrac{V}{A} = \dfrac{55.8^{\#}}{1\tfrac{1}{4}'' \times 2 \times 12''} = 1.86\ ^{\text{lb}}/_{\text{IN}^2} < 45.4\ ^{\text{lb}}/_{\text{IN}^2}$ O.K.

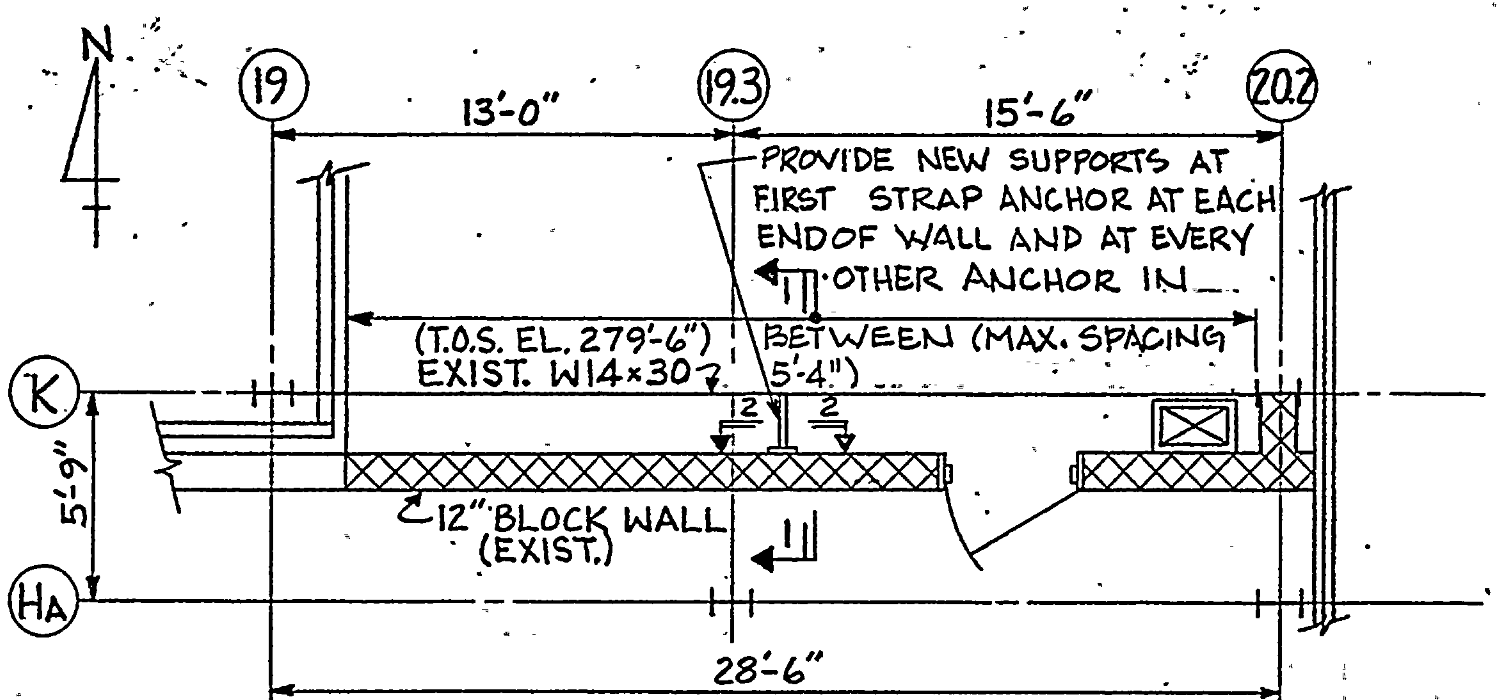
CONSERVATIVE. PREVIOUS

NO FIX REQUIRED

INSPECTION AND ENFORCEMENT

BULLETIN 80-11

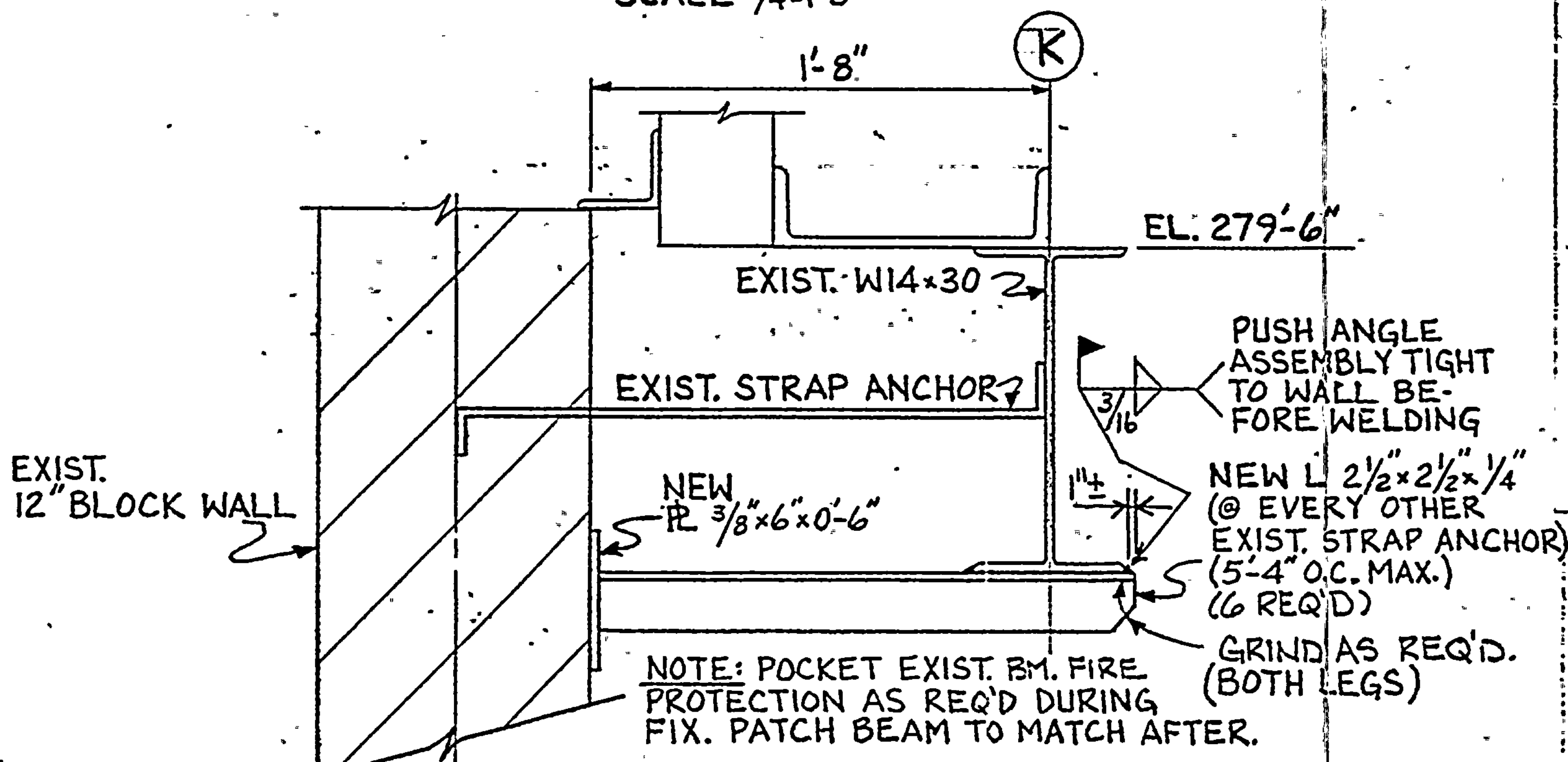
WALL FIXES



PARTIAL PLAN-WALL #31

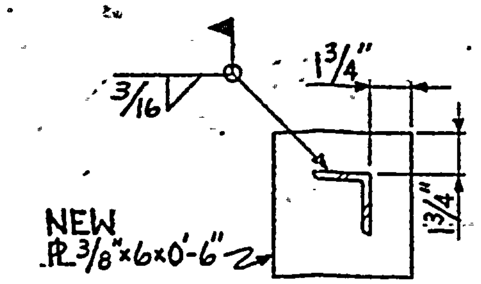
OFF GAS BUILDING-ABOVE FL. EL. 261'-0"

SCALE 3/4"=1'-0"



SECTION 1-1

SCALE 1 1/2"=1'-0"



SECTION 2-2

SCALE 1 1/2"=1'-0"

GENERAL NOTES

ALL MATERIAL AND WORKMANSHIP BOTH SHOP AND FIELD SHALL MEET THE REQUIREMENTS OF THE FOLLOWING (CURRENT) SPECIFICATIONS.

1. Material - Structural steel shapes, plates, etc. shall be ASTM A36 material with actual physical and chemical certifications. (UNLESS OTHERWISE NOTED)
2. Workmanship - A.I.S.C. (Unless otherwise noted).
3. Prior to fabrication, check and verify all existing conditions and dimensions before fabricating and installing steel.
4. Welding - A.W.S. by qualified welders per D1.1.
5. Weld electrodes - E70XX series, unless otherwise noted.
6. Paint - One coat N.M.P. No. 24 Red Lead-Lead Chromate Primer shop coat. After all welding is completed, all surfaces of restraints shall be given one coat of an approved paint to match existing. No shop paint within two inches of any field weld. Prime area after welding.
7. All bolts to be A.S.T.M. A-307 with double nuts.
8. CAUTION should be exercised when cutting or drilling into existing concrete to avoid contact with embedded electrical conduits. Check with appropriate plant personnel before drilling.
9. Use procedure ABKB-1, Rev. 1, dated 5-29-79 for drilling holes in concrete for Kwik-Bolts.
10. Use procedure ABGN-1, Rev. 1, dated 5-23-79 for erecting base plates.

REFERENCE DRAWINGS

PLAN & DETAILS - C-26641-C SH. 1 (S6)

M.O. 317.20-2033-18-0000

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION

SYRACUSE, N.Y.

NINE MILE POINT UNIT NO. 1

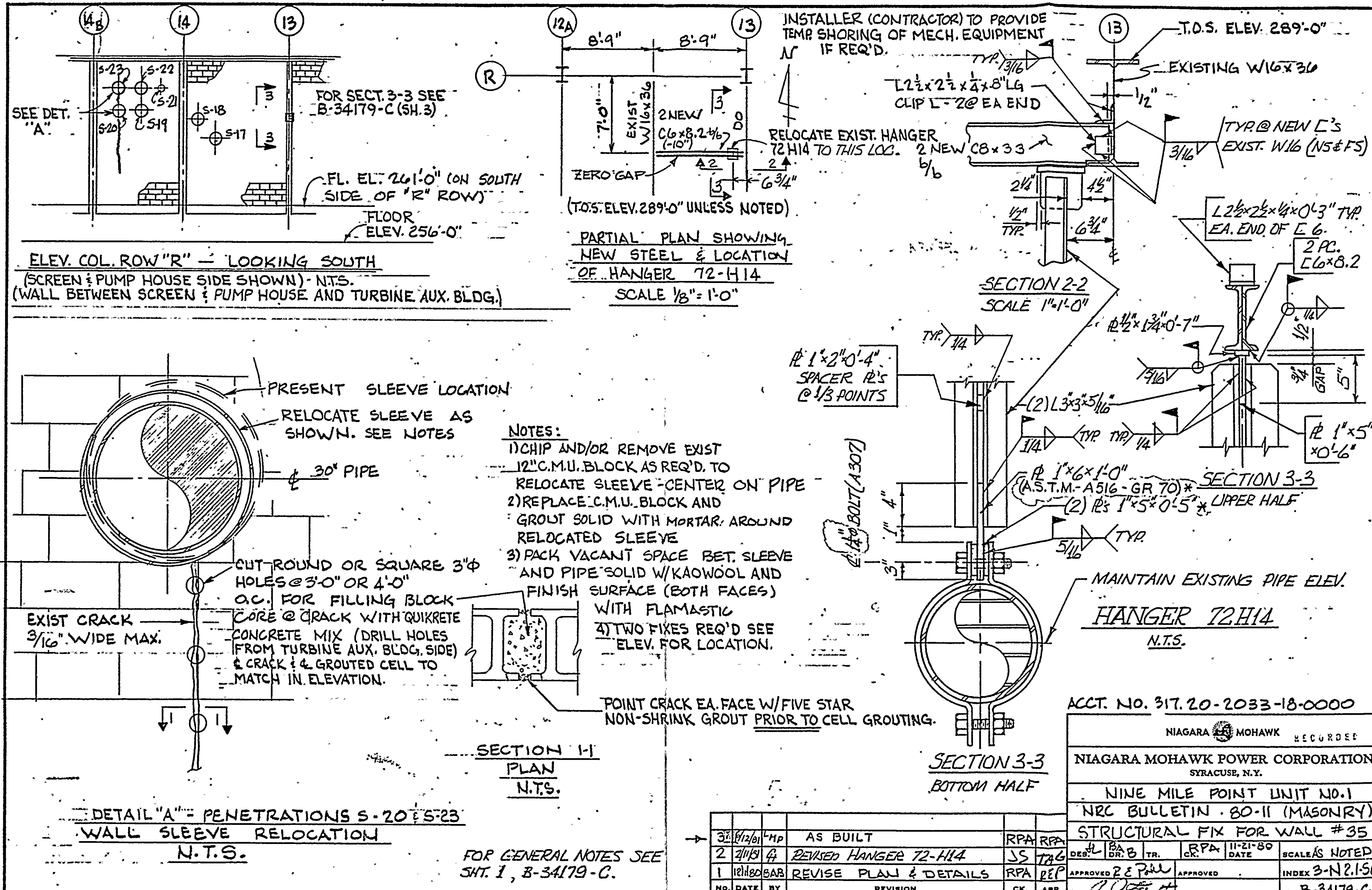
N.R.C. BULLETIN-80-11 (MASONRY)

STRUCTURAL FIX FOR WALL #31

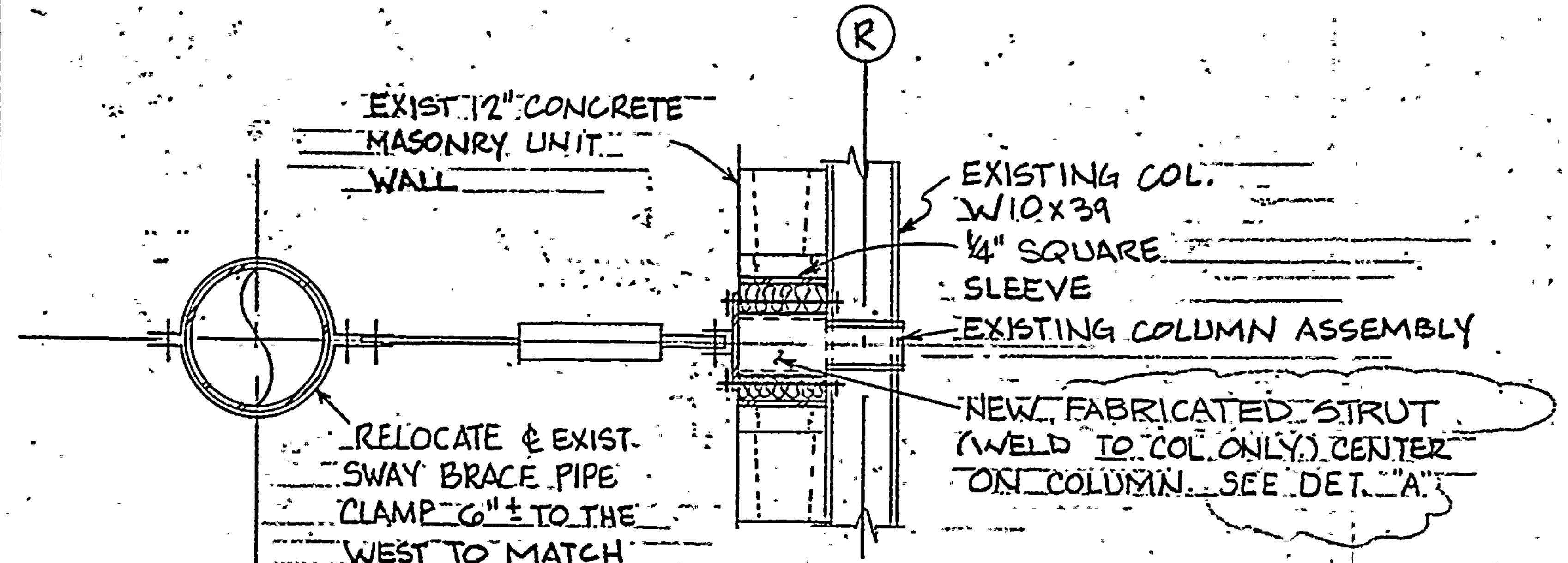
NO.	DATE	BY	REVISION	CK.	APP.
2	7/12/81	MP	AS BUILT	RPA	RPA
1	12/1/80	AB	REVISE PLAN & DETAILS	RPA	ZEP

DES.	DWM DR.	TR.	CK. MS	11/21/80 DATE	SCALE AS NOTED
APPROVED ZEP		APPROVED			INDEX 3-N2.1-S6
APPROVED [signature]		APPROVED			NO. B-34179-C

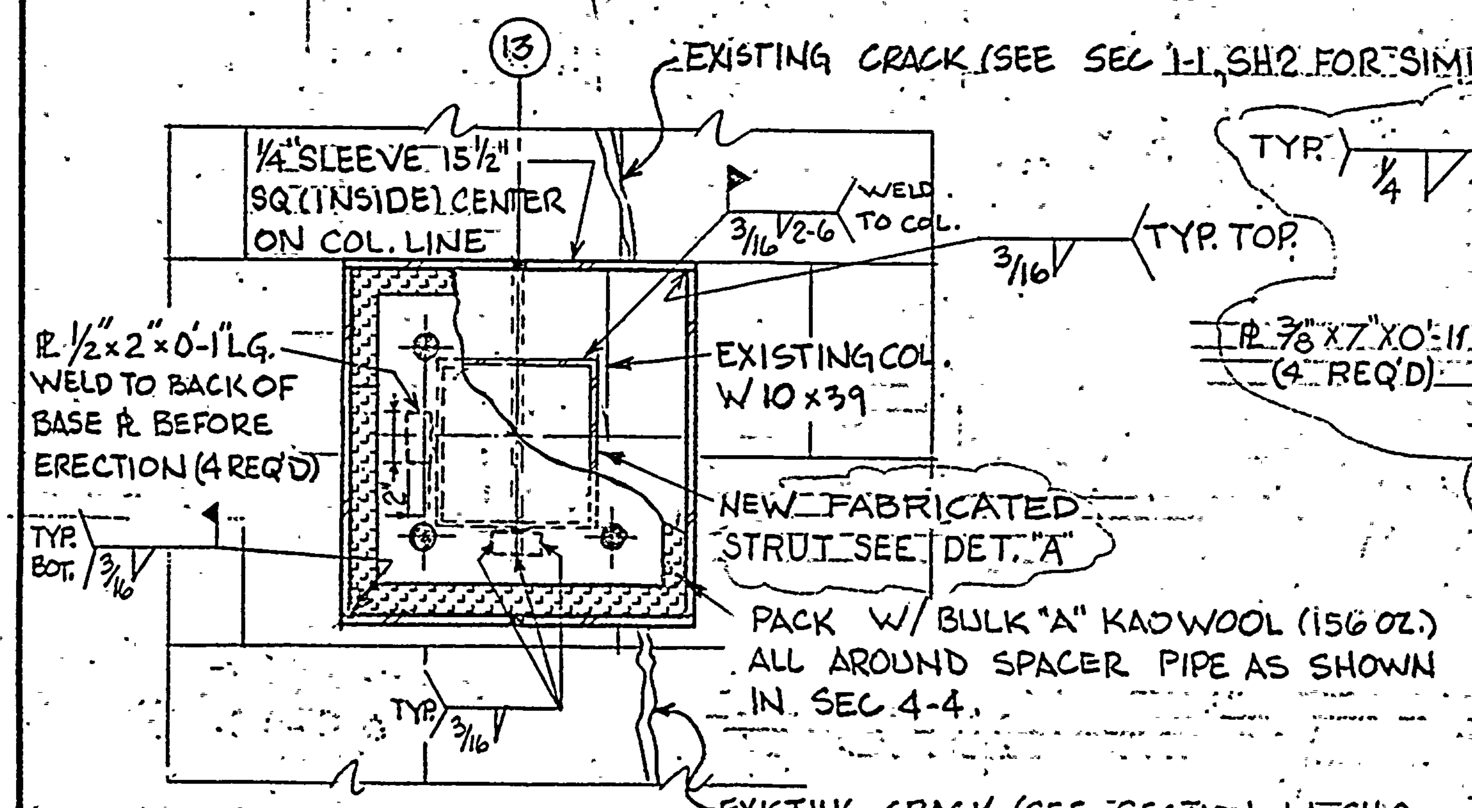
SH. 1



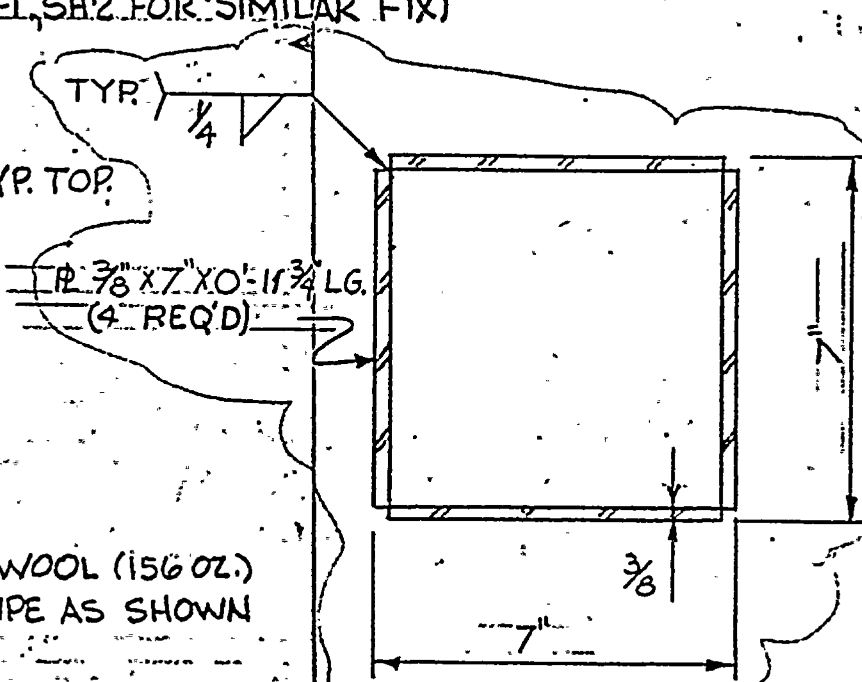
14B
14
13
S-23
S-22
S-21
S-20
S-19
S-18
S-17
SEE DET. "A"
3
FOR SECT. 3-3 SEE B-34179-C (SH.3)
FL. EL. 261'-0" (ON SOUTH SIDE OF "R" ROW)
FLOOR ELEV. 256'-0"
ELEV. COL. ROW "R" — LOOKING SOUTH
(SCREEN & PUMP HOUSE SIDE SHOWN) - N.T.S.
(WALL BETWEEN SCREEN & PUMP HOUSE AND TURBINE AUX. BLDG.)
12A
R
8'-9"
8'-9"
7'-0"
EXIST W16x36
2 NEW C6x8.2 (-10")
ZERO GAP
RELOCATE EXIST. HANGER 72H14 TO THIS LOC.
6 3/4"
(T.O.S. ELEV. 289'-0" UNLESS NOTED)
PARTIAL PLAN SHOWING NEW STEEL & LOCATION OF HANGER 72-H14
SCALE 1/8" = 1'-0"
INSTALLER (CONTRACTOR) TO PROVIDE TEMP. SHORING OF MECH. EQUIPMENT IF REQ'D.
N
TYP. 3/16
L2 1/2 x 2 1/2 x 1/4 x 8" LG CLIP L - 2 @ EA END
T.O.S. ELEV. 289'-0"
EXISTING W16x36
1/2"
TYP. @ NEW C's EXIST. W16 (N5 & F5)
3/16
2 NEW C8x33 b/b
2 1/4"
4 1/2"
1/2" TYP.
6 3/4"
SECTION 2-2
SCALE 1" = 1'-0"
L2 1/2 x 2 1/2 x 1/4 x 0'-3" TYP. EA. END OF C 6.
2 PC. C6x8.2
PL 1/2" x 1 3/4" x 0'-7"
TYP. 1/4
PL 1"x2"x0'-4" SPACER PL's @ 1/3 POINTS
(2) L3x3x5/16"
5/16
3/4" GAP
5"
1/4
TYP. TYP. 1/4
PL 1"x5" x0'-6"
PL 1"x6"x1'-0" (A.S.T.M.-A516-GR 70)*
(2) PL's 1"x5"x0'-5"*
SECTION 3-3 UPPER HALF
5/16 TYP.
1 1/4" ø BOLT (A307)
4"
1"
3"
MAINTAIN EXISTING PIPE ELEV.
HANGER 72H14
N.T.S.
SECTION 3-3
BOTTOM HALF
PRESENT SLEEVE LOCATION
RELOCATE SLEEVE AS SHOWN. SEE NOTES
℄ 30" PIPE
CUT ROUND OR SQUARE 3"ø HOLES @ 3'-0" OR 4'-0" O.C. FOR FILLING BLOCK CORE @ CRACK WITH QUIKRETE CONCRETE MIX (DRILL HOLES FROM TURBINE AUX. BLDG. SIDE) ℄ CRACK & ℄ GROUTED CELL TO MATCH IN ELEVATION.
EXIST CRACK 3/16" WIDE MAX.
1 1
NOTES:
1) CHIP AND/OR REMOVE EXIST 12" C.M.U. BLOCK AS REQ'D. TO RELOCATE SLEEVE - CENTER ON PIPE
2) REPLACE C.M.U. BLOCK AND GROUT SOLID WITH MORTAR AROUND RELOCATED SLEEVE
3) PACK VACANT SPACE BET. SLEEVE AND PIPE SOLID W/ KAOWOOL AND FINISH SURFACE (BOTH FACES) WITH FLAMASTIC
4) TWO FIXES REQ'D SEE ELEV. FOR LOCATION.
POINT CRACK EA. FACE W/ FIVE STAR NON-SHRINK GROUT PRIOR TO CELL GROUTING.
SECTION 1-1
PLAN
N.T.S.
DETAIL "A" - PENETRATIONS S-20 & S-23
WALL SLEEVE RELOCATION
N.T.S.
FOR GENERAL NOTES SEE SHT. 1, B-34179-C.
ACCT. NO. 317.20-2033-18-0000
NIAGARA MOHAWK
RECORDED
NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.
NINE MILE POINT UNIT NO.1
NRC BULLETIN 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #35
3 | 6/12/81 | HP | AS BUILT | RPA | RPA
2 | 2/11/81 | | REVISED HANGER 72-H14 | JS | TAG
1 | 12/11/80 | BAB | REVISE PLAN & DETAILS | RPA | REP
NO. | DATE | BY | REVISION | CK. | APP.
DES. | DR. BAB | TR. | CK. RPA | 11-21-80 DATE
SCALE AS NOTED
APPROVED
INDEX 3-N2.1-S6
NO. B-34179-C
SHEET # 2



SECTION 3-3 (FOR LOCATION SEE B-34179-C SH.2)
LOOKING WEST
SCALE 1/2" = 1'-0"



ENLARGED ELEV. OF BASE ℄
FOR 72-SC-4 LOOKING SOUTH
SCALE 1 1/2" = 1'-0"



DET. A
FABRICATED STRUT
SCALE 3" = 1'-0"

NOTES

1. REMOVE EXISTING BLOCK AS REQUIRED TO INSTALL SLEEVE.
2. WHILE REMOVING BLOCK FOR NEW SQUARE STEEL SLEEVE AS SHOWN ON THIS DRAWING, REMOVE ENOUGH BLOCK (MAXIMUM 1 COURSE ABOVE AND BELOW SLEEVE) TO VERIFY MASONRY ANCHORAGE TO COLUMN (TYPE AND SPACING.)
3. NOTIFY N.M.P.C. CIVIL/STRUCTURAL ENGINEERING DEPARTMENT WHEN BLOCK IS REMOVED FOR ANCHOR INSPECTION. ADDITIONAL FIX MAY BE REQUIRED PER SHEET #6.
4. AFTER SLEEVE IS INSTALLED, REPLACE BLOCK AND GROUT SOLID WITH MORTAR AROUND SLEEVE.
5. REUSE EXISTING SWAY BRACE BASE ASSEMBLY, THRU-BOLTS AND COLUMN ASSEMBLY.

ACCT. NO. 317.20-2033-18-0000

NIAGARA MOHAWK RECORDED

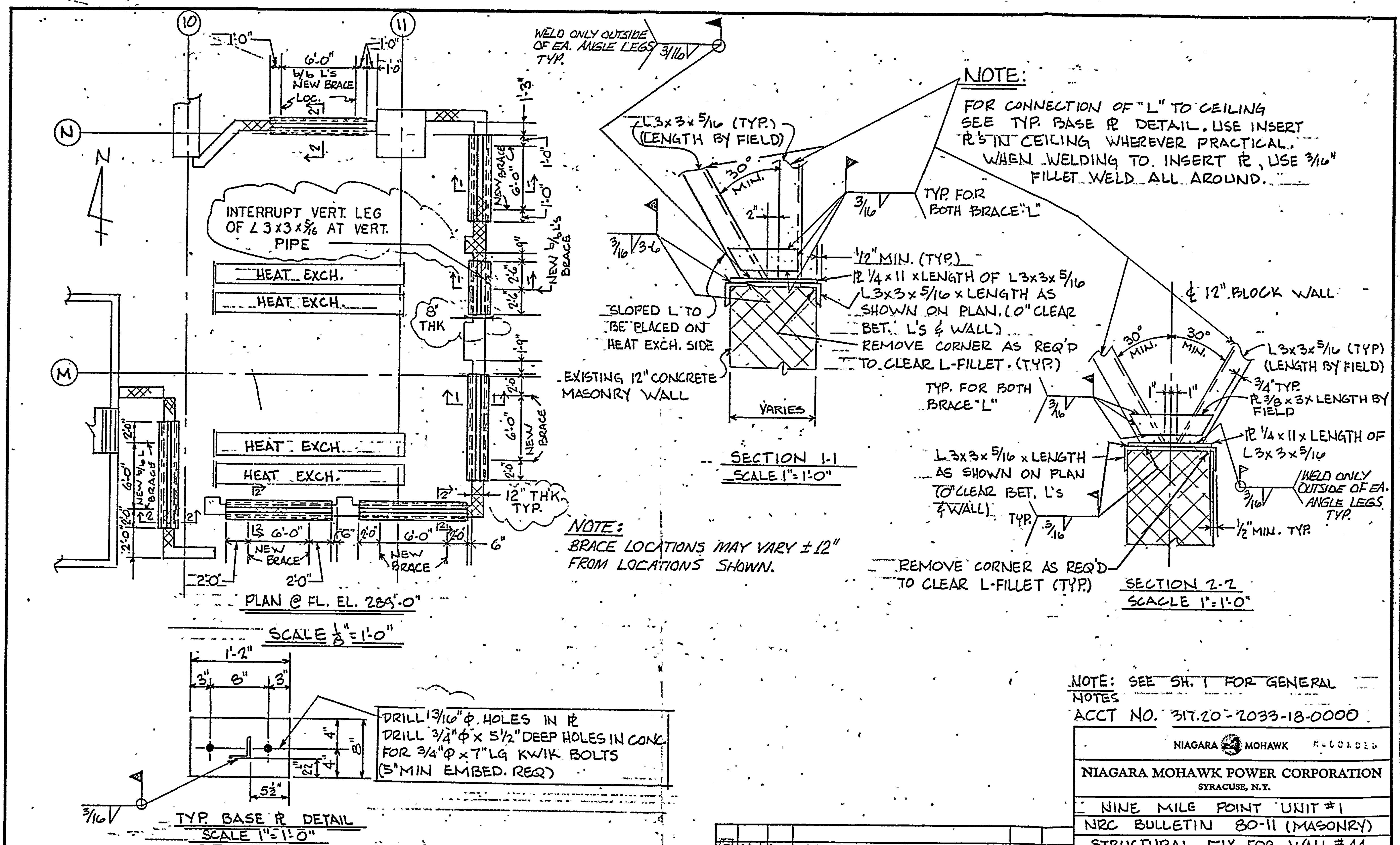
NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

NINE MILE POINT UNIT NO. 1
N.R.C. BULLETIN -80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #35

DES. ZDA | DR. BAB | TR. | CK. MAR | DATE 11-21-80 | SCALE AS NOTED
APPROVED Z E P | APPROVED | INDEX 3-N2.1-56
APPROVED [signature] | APPROVED | NO. B-34179-C

NO.	DATE	BY	REVISION	CK.	APP.
2	2/5/81	LMP	AS BUILT	RPA	RPA
1	12/1/80	FC	REVISE DETAILS	RPA	ZEP

SHEET 3



NOTE: SEE SH. 1 FOR GENERAL NOTES

ACCT NO. 317.20-2033-18-0000

NO.	DATE	BY	REVISION	CK.	APP.
3	6/12/81	LMP	AS BUILT	RPA	RPA
2	2/11/81	GL	ADDED NOTE - REVISED WELD	JL	TAG
1	12/1/80	BAG	REVISE PLANS & DETAILS	RPA	REP

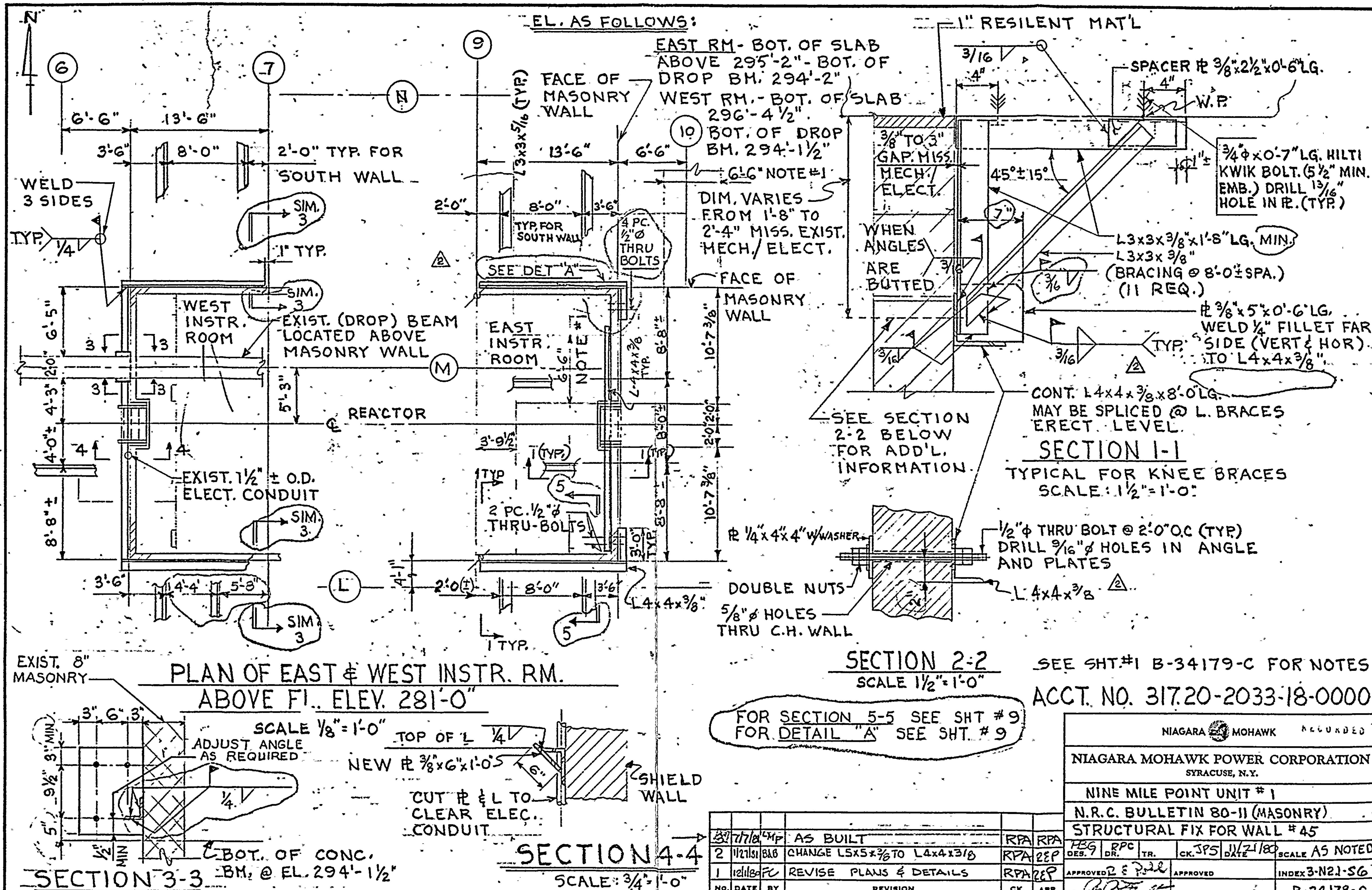
NIAGARA MOHAWK — RECORDED

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

NINE MILE POINT UNIT #1
NRC BULLETIN 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #44

DES. PBG	DR. RAB	TR.	CK. E.J.R.	DATE 11-21-80	SCALE AS NOTED
APPROVED R. E. Pohl			APPROVED		INDEX 3-N2.1-56
APPROVED [signature]			APPROVED		NO. B-34179-C

SHEET #4



SEE SHT. #1 B-34179-C FOR NOTES

ACCT. NO. 31720-2033-18-0000

NO.	DATE	BY	REVISION	CK.	APP.
3	7/7/81	LMP	AS BUILT	RPA	RPA
2	11/27/81	BLG	CHANGE L5x5x3/8 TO L4x4x3/8	RPA	REP
1	12/11/80	FC	REVISE PLANS & DETAILS	RPA	REP

NIAGARA MOHAWK — RECORDED

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

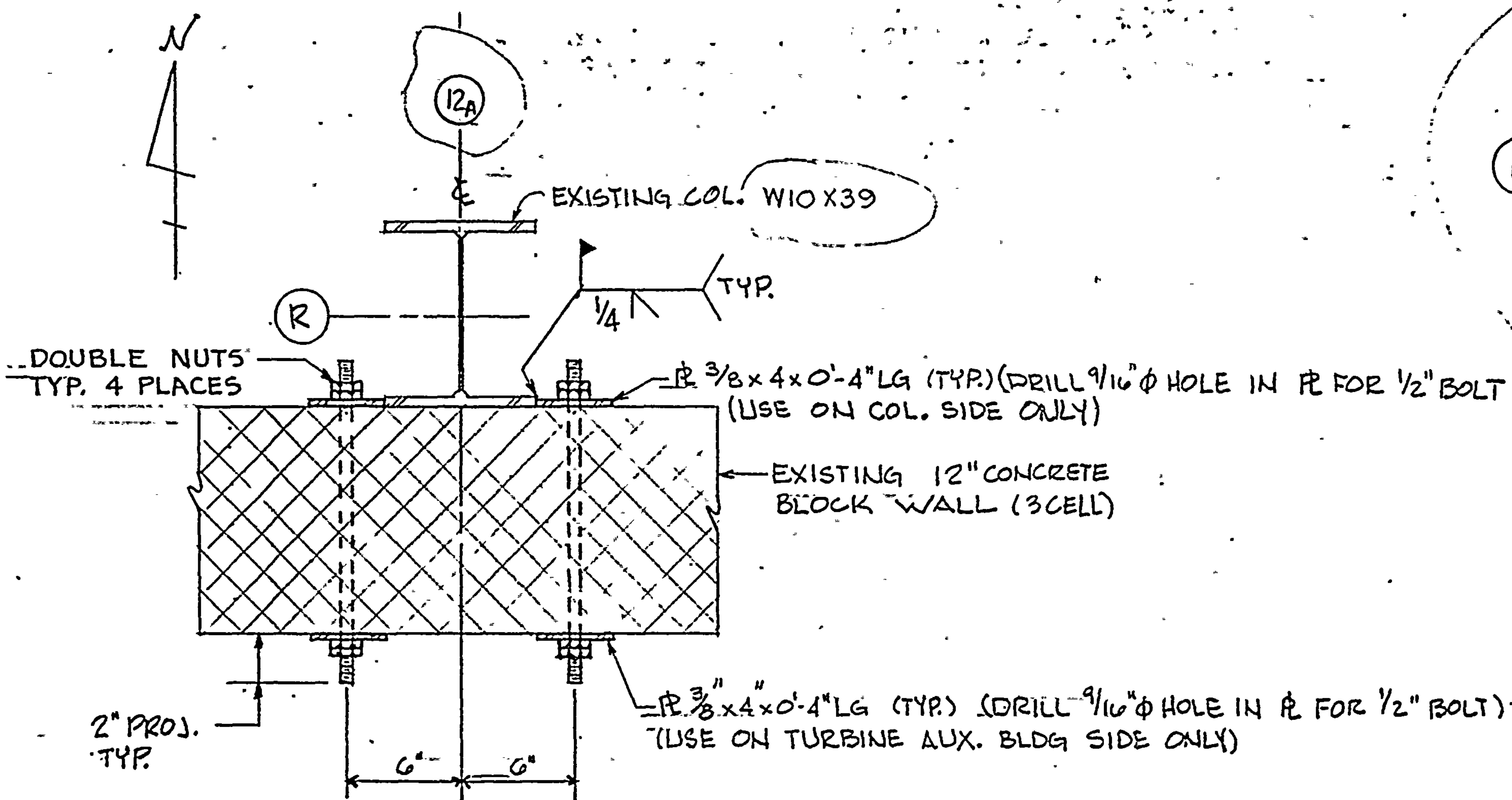
NINE MILE POINT UNIT #1
N.R.C. BULLETIN 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #45

DES. HBG | DR. RPC | TR. | CK. JPS | DATE 11/21/80 | SCALE AS NOTED

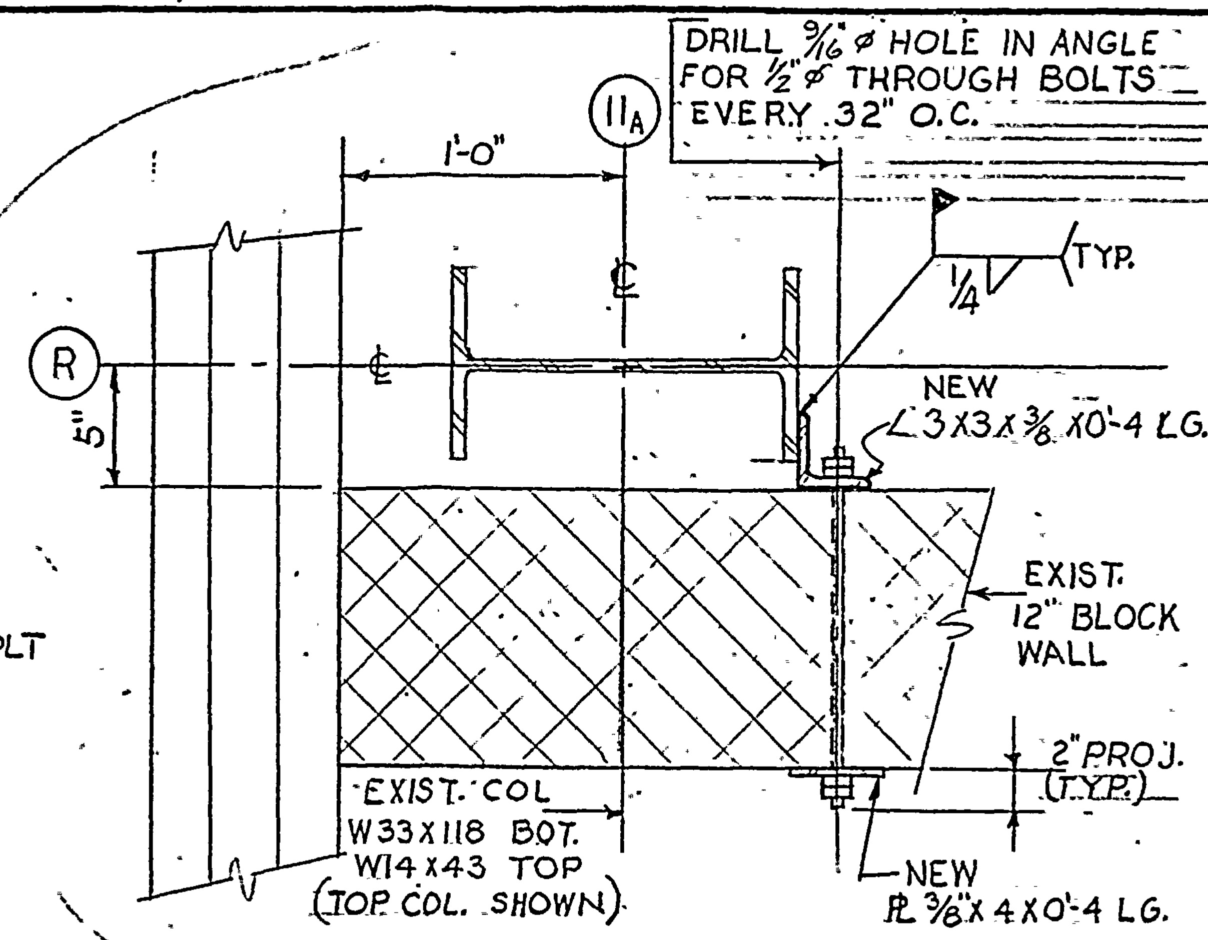
APPROVED | APPROVED | INDEX 3-N21-S6

APPROVED | APPROVED | NO. B-34179-C

SHT 5



TYP. DETAIL
FOR COL @ R-12A
SCALE 1 1/2" = 1'-0



TYP. DETAIL
FOR COL @ R-11A
SCALE 1 1/2" = 1'-0

REFERENCE DWG.
C-15496C-5.2.1 SCREEN & PUMPHOUSE WALL ELEVATIONS, TYP. SECTIONS AND BRACING.

NOTE: FOR GENERAL NOTES SEE SH. 1 B-34179-C

NOTE:
CONTACT NMPC. CIVIL & STRUCTURAL ENGINEERING DEPARTMENT FOR APPROVAL PRIOR TO STARTING WORK SHOWN ON THIS SHEET. SEE ALSO SHT. #3 DWG. NO. B-34179-C

ACCT. NO. 317.20-2033-18-0000

NIAGARA MOHAWK RECORDED

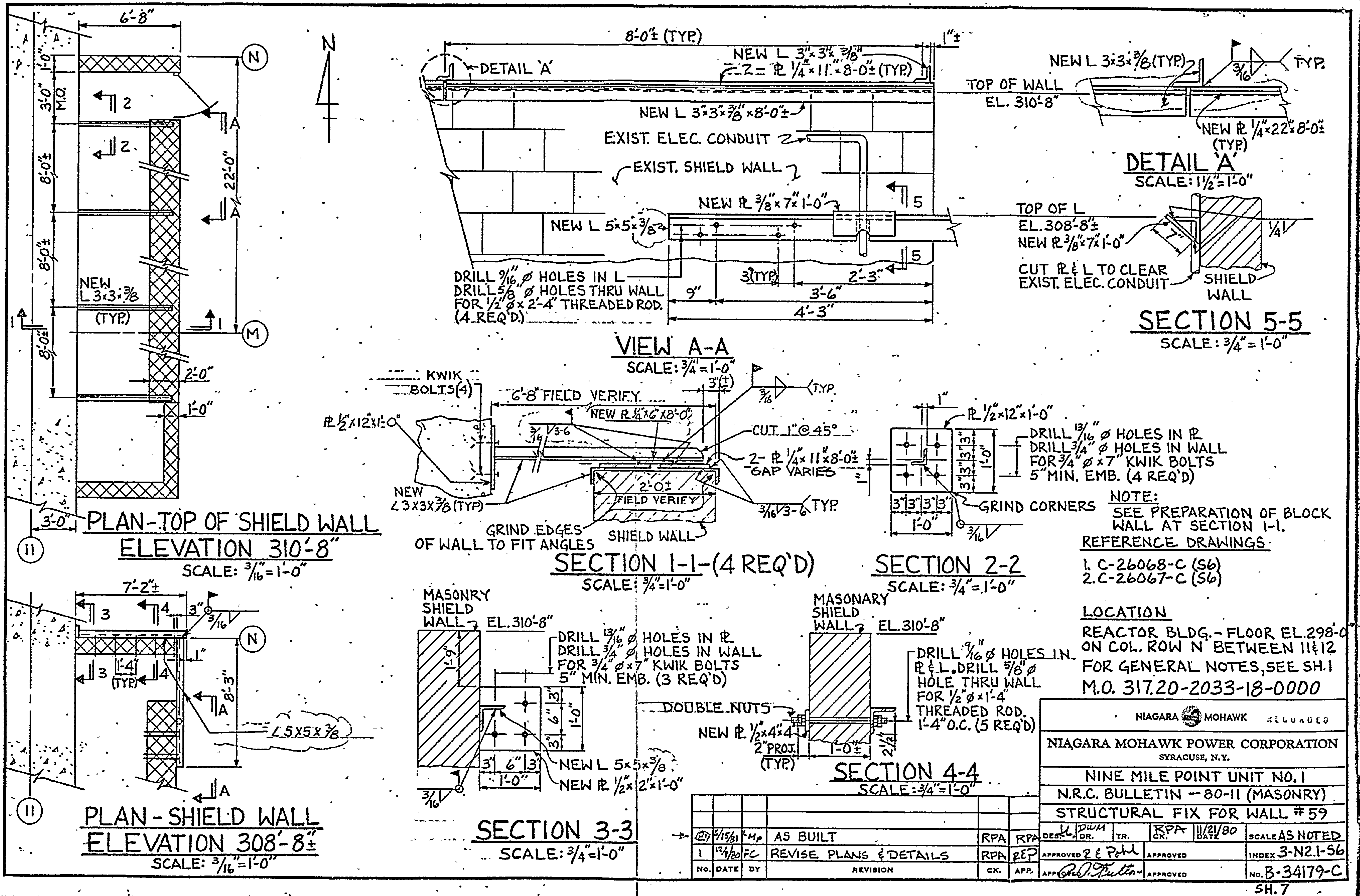
NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

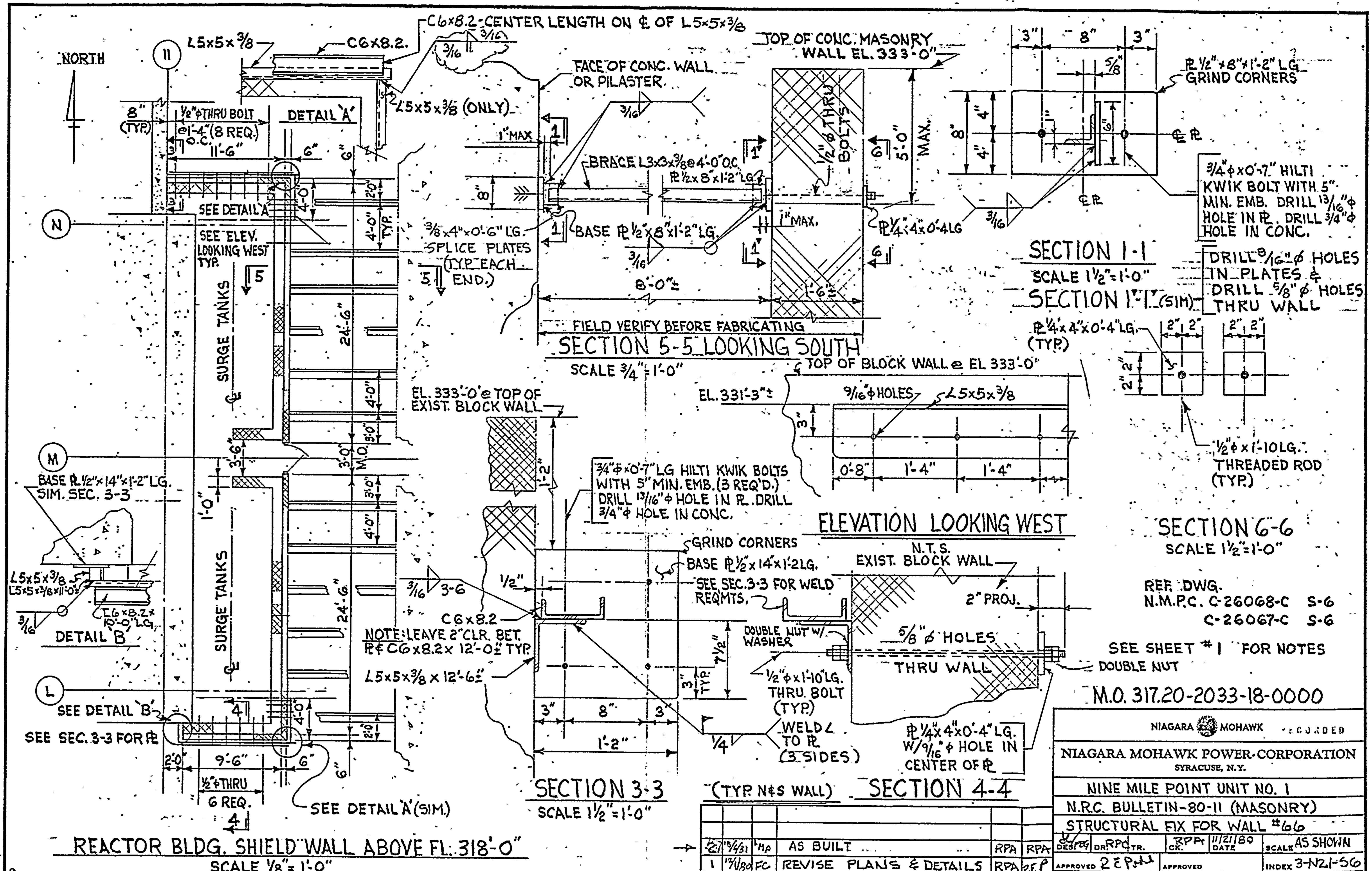
NINE MILE POINT UNIT #1
NRC. BULLETIN 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL # 35

NO.	DATE	BY	REVISION	CK.	APP.
2	5/14/81	LMP	AS BUILT	RPA	RPA
1	12/1/80	BAB	REVISE PLANS & DETAILS	RPA	REP

DES. SK | DR. BAB | TR. | CK. MAR | DATE 11-21-80 | SCALE AS NOTED
APPROVED R E P | APPROVED
APPROVED [signature] | APPROVED
INDEX 3-N2.1-S6
NO. B-34179-C

SHEET # 6


PLAN-TOP OF SHIELD WALL
ELEVATION 310'-8"
SCALE: 3/16"=1'-0"
PLAN-SHIELD WALL
ELEVATION 308'-8"±
SCALE: 3/16"=1'-0"
VIEW A-A
SCALE: 3/4"=1'-0"
DETAIL 'A'
SCALE: 1 1/2"=1'-0"
SECTION 5-5
SCALE: 3/4"=1'-0"
SECTION 1-1-(4 REQ'D)
SCALE: 3/4"=1'-0"
SECTION 2-2
SCALE: 3/4"=1'-0"
SECTION 3-3
SCALE: 3/4"=1'-0"
SECTION 4-4
SCALE: 3/4"=1'-0"
NEW L 3"x3"x3/8"
2- PL 1/4"x11"x8'-0"± (TYP.)
NEW L 3"x3"x3/8"x8'-0"±
EXIST. ELEC. CONDUIT
EXIST. SHIELD WALL
NEW PL 3/8"x7"x1'-0"
NEW L 5x5x3/8"
DRILL 9/16" Ø HOLES IN L
DRILL 5/8" Ø HOLES THRU WALL
FOR 1/2" Ø x 2'-4" THREADED ROD.
(4 REQ'D.)
TOP OF WALL EL. 310'-8"
NEW L 3x3x3/8 (TYP.)
NEW PL 1/4"x22"x8'-0"± (TYP.)
TOP OF L EL. 308'-8"±
NEW PL 3/8"x7"x1'-0"
CUT PL & L TO CLEAR EXIST. ELEC. CONDUIT
SHIELD WALL
KWIK BOLTS (4)
6'-8" FIELD VERIFY
NEW PL 1/4"x6"x8'-0"
PL 1/2"x12"x1'-0"
CUT 1" @ 45°
2- PL 1/4"x11"x8'-0"±
GAP VARIES
2'-0"± FIELD VERIFY
NEW ∠3x3x3/8 (TYP)
GRIND EDGES OF WALL TO FIT ANGLES
SHIELD WALL
PL 1/2"x12"x1'-0"
DRILL 13/16" Ø HOLES IN PL
DRILL 3/4" Ø HOLES IN WALL
FOR 3/4" Ø x 7" KWIK BOLTS
5" MIN. EMB. (4 REQ'D)
GRIND CORNERS
NOTE:
SEE PREPARATION OF BLOCK WALL AT SECTION 1-1.
REFERENCE DRAWINGS
1. C-26068-C (S6)
2. C-26067-C (S6)
MASONRY SHIELD WALL
EL. 310'-8"
DRILL 13/16" Ø HOLES IN PL
DRILL 3/4" Ø HOLES IN WALL
FOR 3/4" Ø x 7" KWIK BOLTS
5" MIN. EMB. (3 REQ'D)
NEW L 5x5x3/8
NEW PL 1/2"x12"x1'-0"
MASONARY SHIELD WALL
EL. 310'-8"
DRILL 9/16" Ø HOLES IN PL & L. DRILL 5/8" Ø HOLE THRU WALL
FOR 1/2" Ø x 1'-4" THREADED ROD.
1'-4" O.C. (5 REQ'D)
DOUBLE NUTS
NEW PL 1/2"x4"x4"
2" PROJ. (TYP.)
∠5x5x3/8
NEW L 3x3x3/8 (TYP.)
LOCATION
REACTOR BLDG. - FLOOR EL. 298'-0"
ON COL. ROW N BETWEEN 11 & 12
FOR GENERAL NOTES, SEE SH. 1
M.O. 317.20-2033-18-0000
NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.
NINE MILE POINT UNIT NO. 1
N.R.C. BULLETIN — 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL # 59
2 | 4/15/81 | MP | AS BUILT | RPA | RPA
1 | 12/4/80 | FC | REVISE PLANS & DETAILS | RPA | REP
NO. | DATE | BY | REVISION | CK. | APP.
DR. DWM | CK. RPA | DATE 11/21/80
SCALE AS NOTED
INDEX 3-N2.1-S6
NO. B-34179-C
SH. 7



M.O. 317.20-2033-18-0000

NO.	DATE	BY	REVISION	CK.	APP.
2	5/4/81	MP	AS BUILT	RPA	RPA
1	12/1/80	FC	REVISE PLANS & DETAILS	RPA	2EP

NIAGARA MOHAWK RECORDED

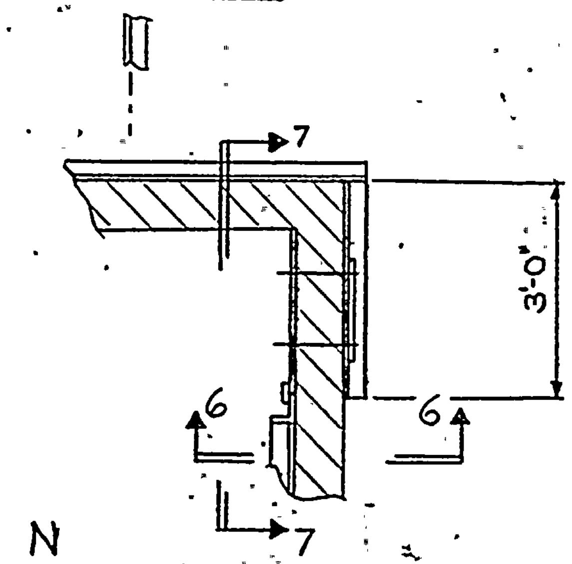
NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

NINE MILE POINT UNIT NO. 1
N.R.C. BULLETIN-80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #66

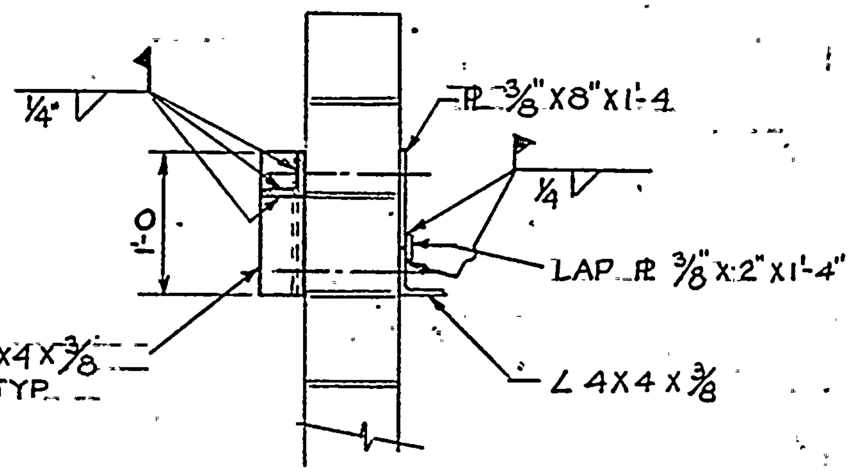
DES. DR. RPC TR. CK. RPA DATE 11/21/80 SCALE AS SHOWN
APPROVED 2EP APPROVED INDEX 3-N21-56
APPROVED APPROVED NO. B-34179-C

SHEET 8

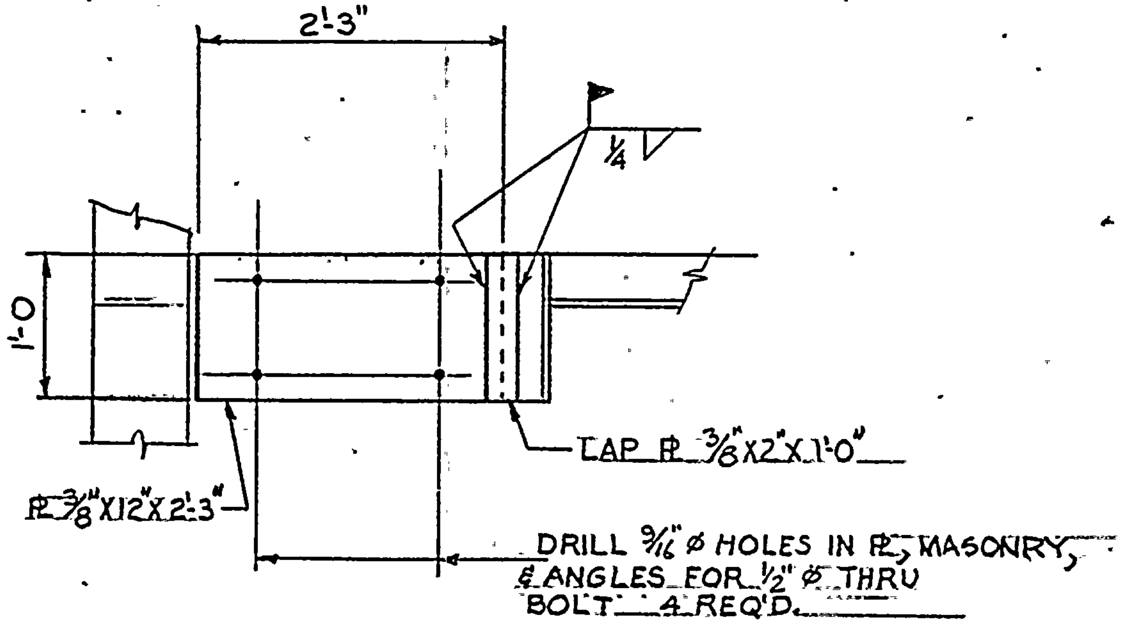
B-34179-C SHEET 9



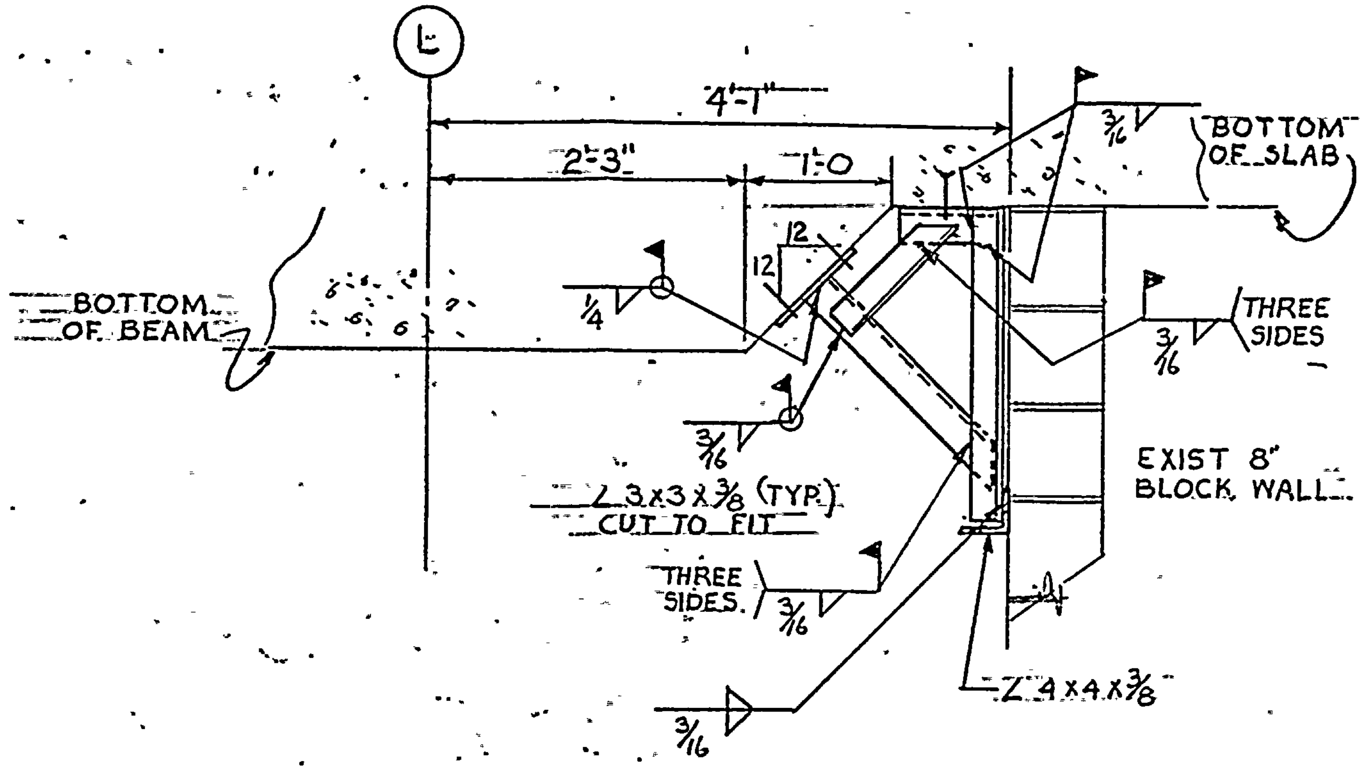
DETAIL "A"
PARTIAL PLAN
SCALE 3/8"=1'-0



SECTION 6-6
SCALE 3/4"=1'-0"



SECTION 7-7
SCALE 3/4"=1'-0"



SECTION 5-5
LOOKING WEST
SCALE 3/4"=1'-0"

SEE SHT. 5 B-34179-C

ACC'T. NO. 317.20-2033-18-0000

NIAGARA MOHAWK RECORD

NIAGARA MOHAWK POWER CORPORATION
SYRACUSE, N.Y.

NINE MILE POINT STA. UNIT NO. 1.
NRC. BULLETIN 80-11 (MASONRY)
STRUCTURAL FIX FOR WALL #45

DES.	DR.	TR.	CK.	DATE	SCALE
RPA	LMP		RPA	7-7-81	AS NOTED

APPROVED R.P. Aupperle | APPROVED | INDEX 3-N2.1-S6
APPROVED [signature] | APPROVED | NO. B-34179-C

NO.	DATE	BY	REVISION	CK.	APP.

SHEET 9