S&A
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SUBJECT C15-0-3216 JOB No. 932787 SHEET 1 OF 8

LAR 016 (PASS ID RB23GENCALC)

RB BLDG EL. 23'-0"

REVISIONS 0 TBD 11/11/93 A.K. 11/12/93

RBF PASS LAR 016 6.5

LOAD CALCULATIONS (ALL TRIBUTARY SPANS = 8')

WT. 24" TRAYS = 45 PSF x 8' = { 360# FULL / 180# ½ FULL

WT. CONDUIT

6.4 Sect 8.3.9

3/4" ϕ	= 1.4# x 8'	=	11#
1" ϕ	= 2.2# x 8'	=	18#
1½" ϕ	= 3.6# x 8'	=	29#
2" ϕ	= 5.1# x 8'	=	41#
3" ϕ	= 12.8# x 8'	=	102#
4" ϕ	= 16.5# x 8'	=	132#

6.4 Sect 8.3.1

DEAD LOAD CHECK

(SEE LOADING DIAGRAM ON NEXT SHEET)

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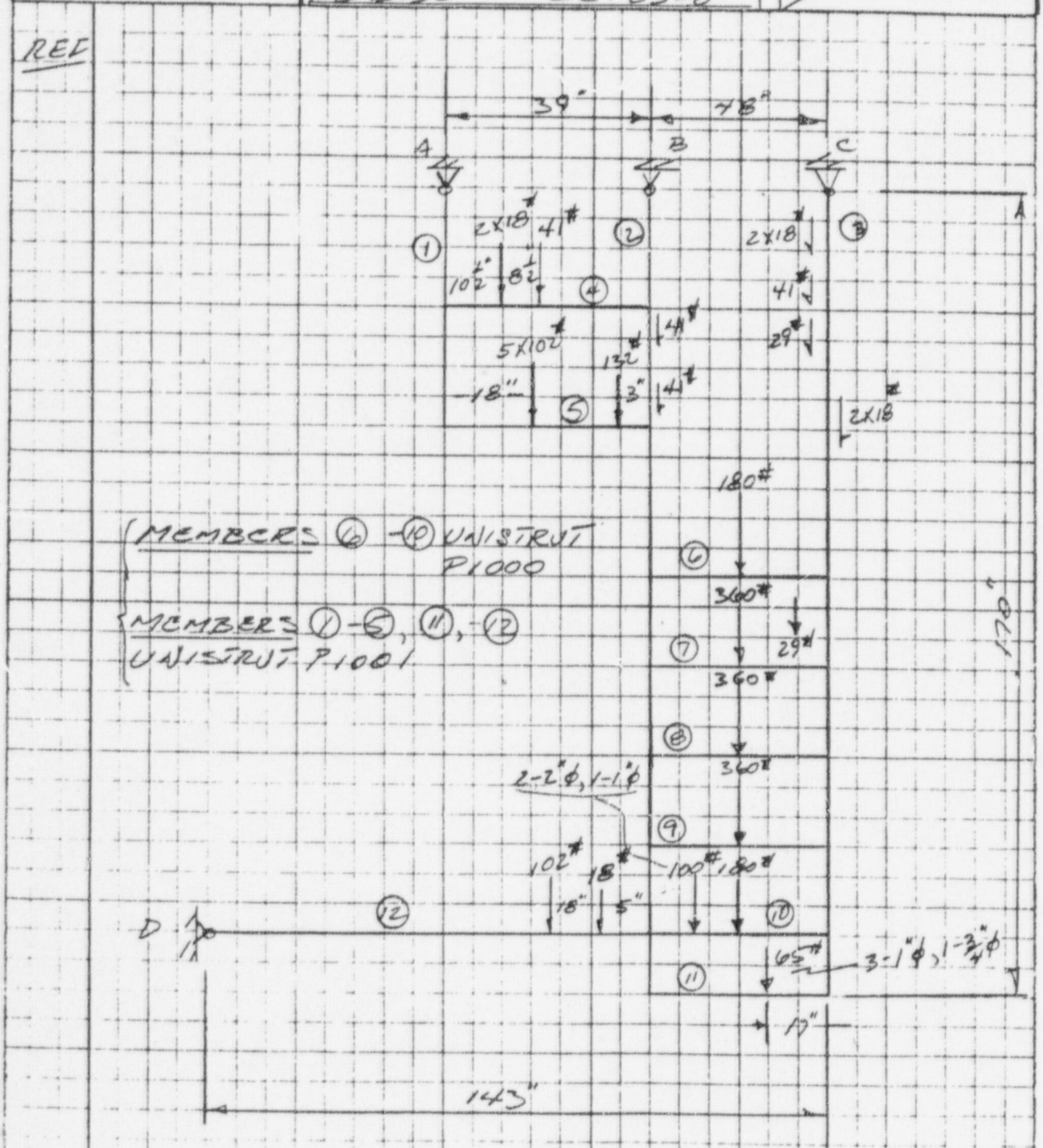
SUBJECT C15.0.3216 JOB No. 932787 SHEET 2 OF 8

LAR016 (PASS ID RB23GENERAL)

RB BLDG EL. 23'-0"

REVISIONS
0 FBA 11/11/93
A.F. 11/12/93

REF



STEVENSON & ASSOCIATES a structural-mechanical consulting engineering firm	SUBJECT C15.0.3216 JOB No. 93C2787 SHEET 3 OF 8 LAZOVC (DASSID RB23 GENERAL) RB BLDG EL. 23'-0"
REVISIONS	0 ORS 11/11/93 A.K. 11/12/93

REF

$\underline{V_1} = \left(2 \times 18^{\#} \times 28\tfrac{1}{2}'' + 41^{\#} \times 20'' + 5 \times 102^{\#} \times 21'' + 132^{\#} \times 3''\right) / 39''$

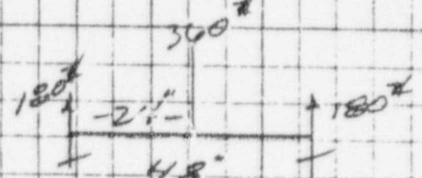
$= \underline{322^{\#}}$

$\underline{V_2} = 2 \times 41^{\#} + \left(2 \times 18^{\#} \times 10\tfrac{1}{2}'' + 41^{\#} \times 19'' + 5 \times 102^{\#} \times 18'' + 132^{\#} \times 36''\right) \tfrac{1}{39''} + \left(180^{\#} \times 2 + 360^{\#} \times 3\right) \tfrac{1}{2} + 100^{\#}/2 + 29^{\#}/2 + \frac{17}{48} \times 65^{\#} + \left(102^{\#} \times 72'' + 18^{\#} \times 90''\right) / 95'' = \underline{1374^{\#}}$

$\underline{V_3} = 2 \times 18^{\#} + 41^{\#} + 29^{\#} + 2 \times 18^{\#} + \left(2 \times 180^{\#} + 360^{\#} \times 3\right) \tfrac{1}{2} + 100^{\#}/2 + 65^{\#} \times 31''/48'' = \underline{954^{\#}}$

CL MEMBERS

P1000 : MEMBER ⑦ & ⑧

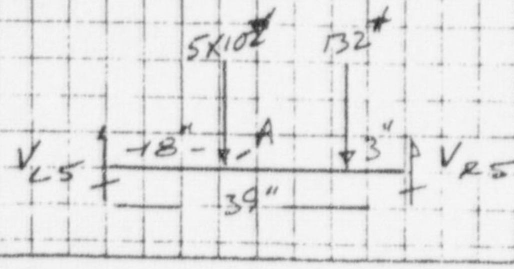


$\text{MAX MOMENT} = \frac{360^{\#} \times 48}{4} = 4320^{\#}$

6.2
P.8
6.3
P.25

$f_b = \frac{4320''^{\#}}{0.202 \text{ in}^3} = 21{,}386 \text{ PSI} < 25000 \text{ PSI O.K.}$

P1001 : MEMBER ⑤



REF.

$V_{L5} = \frac{5 \times 102^{\#} \times 21'' + 132^{\#} \times 3''}{39''} = 285^{\#}$

$V_{R5} = 5 \times 102^{\#} + 132^{\#} - 285^{\#} = 357^{\#}$

MAX MOMENT @ A = $285^{\#} \times 18'' = 5130''^{\#}$

6.2 p.8; 6.3 p.25 — $f_b = \frac{5130}{0.572\,IN^3} = 8969\,PSI < 25000\,PSI$ O.K.

ALL OTHER MEMBERS HAVE LOWER LOAD/CAPACITY RATIO BY COMPARISON O.K.

CK. FITTINGS

MAX FITTING LOAD @ TOP OF MEMBER (2)

$= 1374^{\#}/2$ /FITTING < B-144 (P2484 EQUIV) CAPACITY = $3000^{\#}$ O.K.

CK ANCHORAGE

TOP ANCHORAGE WELDS:

CAPACITY = 4 (2" × .707 × .101" × .3 × 60,000 PSI)

$= 10,283^{\#} > MAXLOAD = V_2 = 1374^{\#}$

O.K.

∴ ANCHORAGE @ BLOCK WALL LIGHTLY LOADED < $100^{\#}$ AND O.K.

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SUBJECT C15.0-3216 JOB No. 93C2787 SHEET 5 OF 8

LAR OK (PASS ID RB23GENION

REVISIONS 0 GBA 12/30/93 P.V. 1/8/94

RB BLDG EL 23'-0"

REF

CONCLUSION: SUPPORT MEETS DEAD LOAD CHECK O.K.

6.4 SECT 6.3.2

VERTICAL CAPACITY CHECK

3 X DL = 3 X 1372# = 4116# < 10,203# WELD CAPACITY

< 2 X 3000# P2484 CAPACITY

O.K.

CONCLUSION:

SUPPORT MEETS VERTICAL CAPACITY CL O.K.

6.4 SECT. 6.3.4

LATERAL LOAD CHECK (SEE FOOTNOTE)

SUPPORT IS BELOW 40' ABOVE PLANT GRADE

A COMPARISON OF THE FIRST & THIRD TRANSVERSE LOAD CONDITIONS SHOWS THE THIRD CONDITION TO BE APPLICABLE AND LEAST SEVERE

LATERAL G RESPONSE = 0.76

(REF SECTION 7.0, THIS CALCULATION)

WORST CASE LOADING FOR SUPPORT IS IN RIGHT HAND DIRECTION (SEE SKETCH FOLLOWING)

THE STRUCTURE WILL REACT THE LATERAL LOADING AT THE STEEL BEAM ATTACHMENTS AND AT THE BLOCK WALL. IT WILL BE ASSUMED FOR EASE OF ANALYSIS & CONSERVATISM THAT MEMBERS ② & ③ WILL SHEAR

* ALTHOUGH THE TOP POST CONNECTIONS ARE DUCTILE AND THE 3 X DL CK IS OK, A LAT. LOAD CL IS PERFORMED BECAUSE OF THE LOADING ON THE LONG POSTS.

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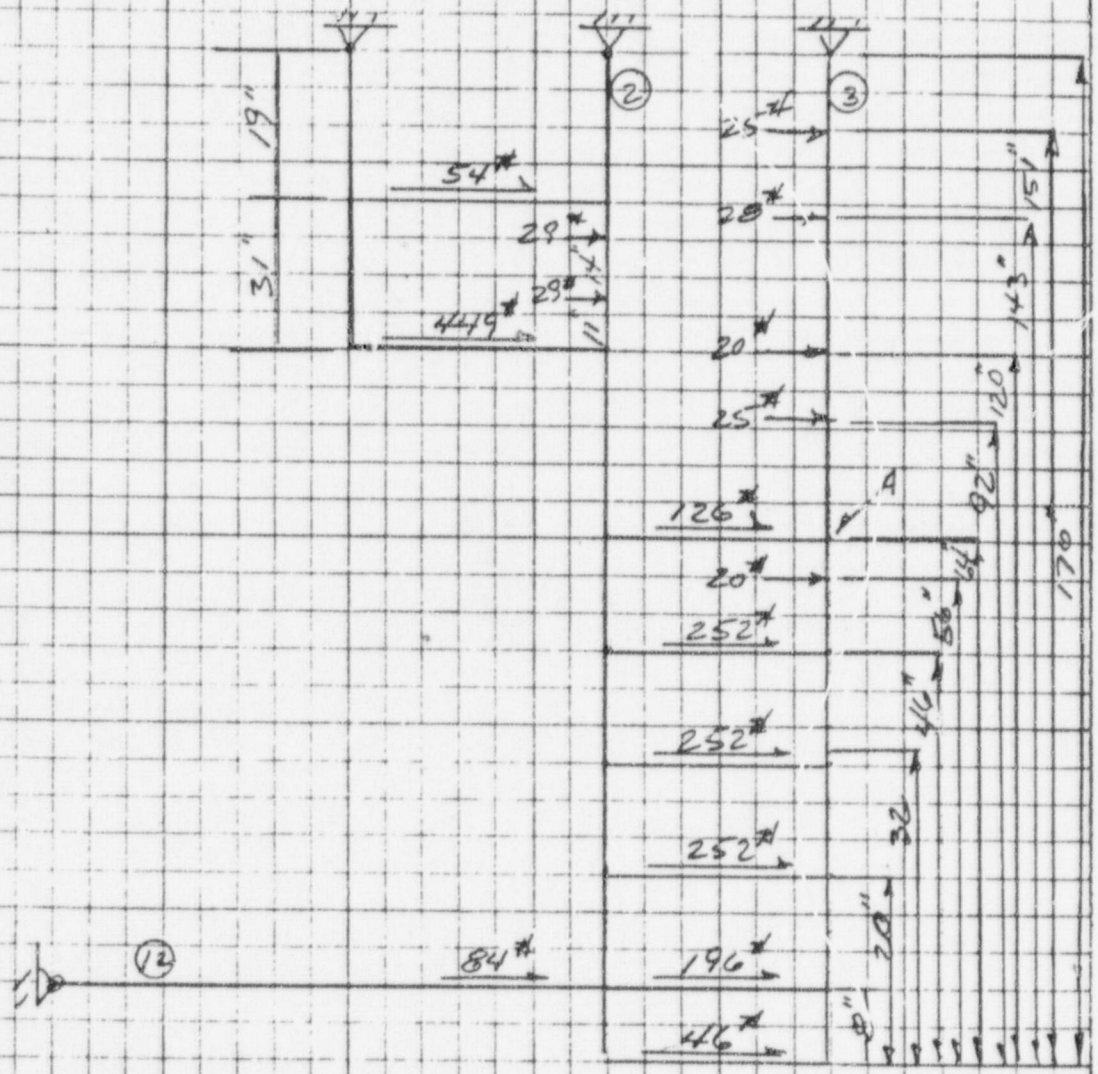
SUBJECT C15.0.3216 JOB No. 93C2787 SHEET 6 OF 8

LAR016 (PASS ID RB23GENERA)

R3 BLDG EL 23'-0"

REVISIONS 0 FRA 11/11/93 A.K. 11/12/93

REF. THE LATERAL LOAD TO THEIR SUPPORT POINTS AND ACT AS INDEPENDENT BEAMS.



CONSERVATIVELY ASSUME THAT MEMBER (3) WILL CARRY $\frac{1}{2}$ THE LATERAL LOAD BETWEEN IT AND MEMBER (2):

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SUBJECT C15.0.3216 JOB No. 93C787 SHEET 7 OF 8

LAR016 (PASS ID RB23 GENERAL)

RB BLDG EL 23'-0"

REVISIONS: 0 PBA 11/11/93, A.K 11/12/93

REF

$$H_{3TOP} = \frac{1}{2}\left(-46^{\#}\times 8'' + 252^{\#}(12''+24''+38'') + 20^{\#}\times 48'' + 126^{\#}\times 56'' + 25^{\#}\times 84''\times 2 + 20^{\#}\times 112''\times 2 + 28^{\#}\times 135''\times 2 + 25^{\#}\times 143''\right]_{1/16''}$$

$$= \underline{153^{\#}} \leftarrow$$

$$H_{3\,BOTTOM} = 25^{\#} + 28^{\#} + 20^{\#} + 25^{\#} + (126^{\#} + 20^{\#} + 252^{\#}\times 3 + 196^{\#} + 46^{\#})\frac{1}{2} - 153^{\#}$$

$$= \underline{517^{\#}} \leftarrow$$

MAX MOMENT @ A (SEE PREVIOUS SHEET)

$$= 153^{\#}\times 108'' - 25^{\#}\times 87'' - 28^{\#}\times 79'' - 20^{\#}\times 56'' - 25^{\#}\times 28'' = \underline{10,317''^{\#}} \leftarrow$$

6.2 p.8 6.3 p.25

$$f_b = \frac{10,317''^{\#}}{0.572\,IN^3} = \underline{18,037\,PSI} < \sim .76\times 25000 \; (=19000\,PSI)$$

GIVEN ACTUAL TRIBUTARY LENGTH = $\frac{92''+93''}{2}$ = 7.7' < 8', ACTUAL RELATIVE LOAD DISTRIBUTION BETWEEN MEMBERS 2 & 3 IS DISPROPIONATE (STIFFER LATERAL LOAD PATH IS MEMBER 2).

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SUBJECT C15.0.3216 JOB No. 93C2787 SHEET 8 OF 8

LAR 016 (PASS ID RB23CENTA)

RB BLDG EL. 23'-0"

REVISIONS: 0 11/11/93 A.K. 11/12/93

REF. CK. ANCHORAGE @ BLOCK WALL:

TAKING MOMENTS ABOUT TOP ANCHORAGE*:

$(54^{\#} \times 19" + 449^{\#} \times 50" + 29^{\#}(25" + 39") + 25^{\#} \times 19" + 28^{\#} \times 27" + 20^{\#} \times 50" + 25^{\#} \times 78" + 126^{\#} \times 106" + 20^{\#} \times 114" + 252^{\#}(124" + 138" + 150") + 196^{\#} \times 162" + 84^{\#} \times 162" + 46^{\#} \times 100")/162" = H_{12}$

$H_{12} = 1242^{\#}$ →

SLIP CAPACITY OF 4 BOLTS ON P1001 MEMBER

(12) $= 4 \times 1500^{\#} = 6000^{\#} > 1242^{\#}$

6.15 TABLE 11.1 2-3/4" Φ ANCHOR BOLT CAPACITY $= 2 \times 1390^{\#}$

$= 2780^{\#} > 1242^{\#}$ O.K. →

(NOTE: 1/2" Φ ANCHOR NEEX)

CONCLUSION: SUPPORT MEETS LATERAL LOAD CK

O.K →

OVERALL CONCLUSION

SUPPORT MEETS LAR GUIDELINES STATED IN SECTION 8.3 OF REFERENCE 6.4. O.K →

* CONSERVATIVE FOR DETERMINING BLOCK WALL REACTION