LOFT TECHNICAL REPORT LTR 1310-24
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LOFT DIESEL GENERATOR "A" EXHAUST STACK
SEISMIC ANALYSIS

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DEPARTMENT OF ENERGY

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LOFT TECHNICAL REPORT LTR 1310-24
RE&C Report # RE-A-77-154
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RESEARCH, ENGINEERING AND CONSTRUCTION REPORT ENGINEERING ANALYSIS DIVISION

APPLIED MECHANICS BRANCH

LOFT DIESEL GENERATOR "A" EXHAUST STACK
SEISMIC ANALYSIS

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<u>ABSTRACT</u>		

A stress analysis of the LOFT Diesel Generator "A" Exhaust Stack was performed to determine its reaction to SSE loads. The exhaust stack silencer and supporting foundation was found to be inadequate for the postulated seismic accelerations. Lateral support is required to prevent overturning of the silencer pedestal and reinforcement of the 4" x .5" silencer base straps is necessary. Basic requirements for this additional support are discussed herein.

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1. Diesel "A" Exhaust Stack Schematic	2
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LOFT DIESEL GENERATOR "A" EXHAUST STACK SEISMIC ANALYSIS

I. INTRODUCTION

Diesel Generator "A", located in LOFT Hanger Building TAN 629, is exhausted to the outside by a 12-inch pipe (12"-GE-2-A) and connecting silencer (GE-F7). A schematic of the system is shown in Figure 1. The 12-inch exhaust pipe contains 2 flexible expansion joints and is flange connected to the silencer. The silencer, weighing 1350 lbs, stands 12 feet off the ground on an 8WF17 wide flange column which in turn is bolted to a concrete foundation (see geometry details, Appendix B, Pages B1 and B2).

An analysis of the exhaust stack and silencer support was conducted to determine the structural adequacy of the system in response to postulated LOFT Safe Shutdown Earthquake (SSE) accelerations. This report contains the details of that analysis along with recommendations.

FIGURE 1
DIESEL A EXHAUST STACK SCHEMATIC

II. METHOD OF ANALYSIS

The structural integrity of the diesel generator "A" exhaust stack was determined using the criteria of Section III, Article XVII-2000 of the 1974 ASME Boiler and Pressure Vessel Code^[1]. Linear elastic analysis was used to calculate component stresses which were then compared to allowables established per Article XVII-2000.

The analysis considered only the loads resulting from the Safe Shutdown Earthquake (SSE). Static equivalent conditions were assumed and loads were determined per RDT-F9-2T^[2]. Calculation of the static equivalent loads, including dead weight, can be found in Appendix A. The SSE loading was considered an Emergency condition and, as stated in Article XVII-2110-a of the Code, the allowable stresses, as calculated per Article XVII-2000, were increased by 1/3 for comparison to applied stresses.

The 12" GE-2A exhaust pipe is supported at only two points where loads due to seismic ground motion can be introduced: (1) at the silencer and (2) at the diesel generator. In analyzing the system, the two expansion joints contained in the 12" exhaust pipe were considered to have sufficient flexibility to prevent over stressing of the pipe under SSE loads. The silencer and its supporting pedestal were analyzed as a cantilevered beam with loads applied at the center of gravities of the component parts. Details of the analysis can be found in Appendix B.

III. RESULTS AND CONCLUSIONS

The analysis performed on the diesel generator "A" exhaust stack and silencer showed that the system will fail under an SSE loading as presently installed. The critical condition results from the large overturning moment occurring at the silencer foundation due to the heavy silencer located some 12 feet above the ground. It was found that the foundation could not resist the resulting moment and that the entire pedestal would overturn. To prevent this collapse, side support is needed. The addition of side support will reduce critical stresses found in excess of allowables in other components. The only other necessary modification is reinforcement of the 4" x .5" straps on the bottom of the silencer.

IV. RECOMMENDED MODIFICATIONS

To prevent collapse of the exhaust stack silencer stand during the occurrence of an SSE, additional support is required. Two methods of support are suggested with the final design being left for LOFT personnel:

- (1) Three guy wires spaced at 120° around the periphery of the silencer and anchored to the ground
- (2) A wide flange side support attached to the pedestal wide flange and anchored to a poured concrete foundation.

Basic requirements for both methods of support are discussed in Appendix B. The final design should be reviewed by the Applied Mechanics Branch for adequacy.

It is noted that for both modifications, it still remains necessary to reinforce the 4" x .5" straps at the base of the silencer (see details, page B4 of Appendix B). If the guy wires of modification 1 can be located near the center of gravity of the silencer, this strap reinforcement would not be necessary.

Details of the modifications discussed above can be found on pages B13 and B14 of Appendix B.

V. REFERENCES

1. American Society of Mechanical Engineers, ASME Boiler and Pressure Vessel Code, "Nuclear Power Plant Components", Section III (1974).
2. RDT Standard, RDT F9-2T, "Seismic Requirements for Design of Nuclear Power Plants and Test Facilities" (January 1974).

EXHAUST STACK ANALYSISSTATIC EQUIVALENT LOADS

THE EQUIVALENT STATIC LOADS USED FOR THE ANALYSIS OF THE DIESEL GENERATOR A EXHAUST STACK SUBJECTED TO SSE INDUCED ACCELERATIONS WERE DETERMINED PER RDT F9-2T C'7

$$F_{HEQ} = 1.5 \times W_c \times S_a / g$$

$$F_{VEQ} = 0.667 F_{HEQ}$$

WHERE:

F_{HEQ} = EQUIVALENT HORIZONTAL STATIC LOAD
 F_{VEQ} = EQUIVALENT VERTICAL STATIC LOAD
 S_a = PEAK BEDROCK DESIGN RESPONSE SPECTRAL ACCELERATION (LTR-10-19)
 g = ACCELERATION DUE TO GRAVITY
 W_c = COMPONENT WEIGHT

FOR 7% CRITICAL DAMPING (BOLTED STEEL STRUCTURES) $S_a = 16 \text{ g}/\text{sec}^2$, FIG A-1.

$$F_{HEQ} = 1.5 \times W_c \times 16/32.2 = .75 W_c$$

$$F_{VEQ} = .667 (.75 W_c) = .50 W_c$$

INCLUDING DEAD WEIGHT IN THE VERTICAL DIRECTION;

$$F_{VEQ} = .50 W_c + W_c = 1.50 W_c \text{ (DOWN)}$$

COMPONENT WEIGHTS, W_c

$$W_c = \text{VOLUME (IN}^3) \times \text{DENSITY (LB/IN}^3)$$

SILENCER (REF 2)	1350	16
TOP PL (.75)(π)(18 ²)(.2916/IN ³)	221	16
GUSSETS (4)(.5)(15)(12)(.75)(.2916/IN ³)	78	16
8 WF 17 (12.21 ft)(1716/ft)	208	16
	1857	16
12" GE-2-A (SCH 40)	53.5	16/ft
BASE (36)(41)(36)(.086816/IN ³)	4612	16

EXHAUST STACK ANALYSISSTATIC EQUIVALENT LOADS

SILENEXER (1350 lb)

$$F_{HEQ} = .75(1350) = 1013 \text{ lb}$$

$$F_{VEQ} = 1.5(1350) = 2025 \text{ lb}$$

GUSSETS Plus TOP PL (221 + 78) = 299 lb

$$F_{HEQ} = .75(299) = 224 \text{ lb}$$

$$F_{VEQ} = 1.5(299) = 449 \text{ lb}$$

WIDE FLANGE (208 lb)

$$F_{HEQ} = .75(208) = 156 \text{ lb}$$

$$F_{VEQ} = 1.5(208) = 312 \text{ lb}$$

12" GE-2-A (53.5 lb/ft)

$$F_{HEQ} = .75(53.5) = 40 \text{ lb/ft}$$

$$F_{VEQ} = 1.5(53.5) = 80 \text{ lb/ft}$$

DETERMINE LOADS AT FLANGE (POINT 2)

$$V_2 = \frac{5}{8}(wL) = \frac{5}{8}(32)(80) = 1600 \text{ lb}$$

$$M_2 = \frac{8}{8}(wL)L = \frac{8}{8}(80)(32)^2 = 10240 \text{ in/lb}$$

$$AXIAL_2 = (40 \text{ lb/ft})(32) = 1280 \text{ lb}$$

$$P_1 = 1600 \text{ #}$$

$$P_2 = 1280 \text{ #}$$

$$M_1 = 10240 + 1280(24) + 1600(18)$$

$$M_1 = 69760 \text{ in/lb}$$

SINCE LOADS ARE SEISMIC, WORSE LOAD DIRECTIONS ARE ASSUMED

EXHAUST STACK ANALYSISSTATIC EQUIVALENT LOADS

EXHAUST STACK ANALYSISSTATIC EQUIVALENT LOADS

REFERENCES

- 1) SEISMIC REQUIREMENTS FOR DESIGN OF NUCLEAR POWER PLANTS AND TEST FACILITIES, RDT STANDARD F9-2T, JANUARY 1974
- 2) A.G. SCHOONMAKER CO, INC., DWG 1386-8, 12" EXHAUST SILENCER, A.G. SCHOONMAKER CO., INC., SAUSALITO, CALIFORNIA

APPENDIX A
STATIC EQUIVALENT LOADS

APPENDIX B
ANALYSIS

EXHAUST STACK ANALYSIS

GEOMETRY

EXHAUST STACK ANALYSIS

GEOMETRY

EXHAUST STACK ANALYSISSILENCER TO STAND TOP PLATE

$$M = (1013)(54) + 69760 = 124462 \text{ in/lb}$$

$$V = 1013 + 1280 = 2293 \text{ lb}$$

CHECK BOLTS

$$\text{BOLT SHEAR LOAD } P_{BV} = 2293/4 = 573 \text{ lb}$$

BOLT TENSION LOAD

$$P_{BT} = (124462/30) - (2025 + 1600)/4$$

$$P_{BT} = 3242 \text{ lb}$$

EXHAUST STACK ANALYSISSILENCER TO STAND TOP PLATE

SA-307 BOLTS ARE ASSUMED

THE ALLOWABLE BOLT STRESS IS EXPRESSED

$$F_t = 28000 - 1.6 f_u \leq 20000$$

$$f_u \leq 30\% \text{ YS}$$

$$\text{YS} = 36000 \text{ PSI}$$

$$f_v = (30)(36000)(1.33) = 14364 \text{ PSI}^*$$

BOLT SHEAR STRESS

$$\text{BOLT STRESS AREA } A_b = 1.404 \text{ in}^2$$

$$f_{vB} = 573 / 1.404 = 408 \text{ PSI} < 14364 \text{ PSI} \quad \text{OK}$$

ALLOWABLE TENSION STRESS

$$F_t = 28000 - 1.6(408) = 27347 \text{ PSI}$$

$$f_t = 3242 / 1.404 = 2309 \text{ PSI} < 27347 \text{ PSI} \quad \text{OK}$$

CHECK SILENCER BOTTOM BRACING

$$I = \frac{1}{12}(4.0)(.5)^3 = .0417 \text{ in}^4$$

$$M_{\text{max}} = 3242(3) = 9726 \text{ in} \cdot \text{lb}$$

$$\sigma_b = M_c / I = \frac{9726(.25)}{.0417} = 58309 \text{ PSI}$$

$$F_b = .66 S_y(1.33)$$

$$F_b = .66(36000)(1.33) = 31600^*$$

INCREASE BRACE THICKNESS TO .75 IN

$$I = \frac{1}{12}(4.0)(.75)^3 = .1406 \text{ in}^4$$

$$\sigma_b = \frac{(9726)(.75/2)}{.1406} = 25940 \text{ PSI}$$

$$31600 > 25940 \quad \text{OK}$$

WELD .25" STRAP TO SILENCER BOTTOM BRACING; WELD ALL AROUND

* ALLOWABLES MAY BE INCREASED BY 3 FOR EMERGENCY CONDITIONS

EXHAUST STACK ANALYSISSILENCER TO STAND TOP PLATE

LOOK AT SECTION A; JUST BEFORE GUSSET
ASSUME A 4" WIDE STRIP OF
PLATE TO TRANSMIT LOAD

$$I = \frac{1}{12}(4)(.75)^3 = .1406 \text{ in}^4$$

$$M = 3(3242) = 9726 \text{ in} \cdot \text{lb}$$

$$\sigma_b = \frac{(9726)(.375)}{.1406} = 25940 \text{ psi}$$

$$F_b = .66 S_y (133) = 31600 \text{ psi}$$

$$31600 > 25940 \quad \underline{\text{OK}}$$

LOOK AT SECTION B

CALCULATE NA

SECT	A	Y	AY	I _o
1	6.0	6.0	36.0	72.0
2	3.0	12.38	37.0	.14
	9.0		73.0	

$$\bar{Y} = \frac{73}{9} = 8.11$$

$$I_{NA} = 72 + (6)(2.11)^2 + .14 + (3)(4.64)^2$$

$$c = 5.16$$

$$\sigma_b = \frac{(3242)(15)(5.16)}{163}$$

$$\sigma_b = 1539 \text{ psi}$$

$$31600 > 1539 \quad \underline{\text{OK}}$$

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EXHAUST STACK ANALYSISTOP PLATE TO 8-WF-17

CHECK GUSSET TO 8-WF17 WELD

$$P_D = 124462/30 + (2025 + 1600)/4$$

$$P_D = 5054 \#$$

$$R_w = 5054 \#$$

$$M_w = 5054(12) = 60648 \text{ in-lb}$$

$$S_w = 12^3/3 = 48$$

$$f_b = 60648/48 = 1264 \text{ lb/in}$$

$$f_s = 5054/24 = 211 \text{ lb/in}$$

$$f_w = \sqrt{(1264)^2 + (211)^2} = 1281 \text{ lb/in}$$

$$\sigma_w = 1281/(.707)(.19) = 9536 \text{ PSI}$$

$$\sigma_{\text{ALL}} = 18000 \text{ PSI}$$

$$18000 > 9536$$

OK

EXHAUST STACK ANALYSIS8 WF17 WIDE FLANGECHECK WIDE FLANGE AT BASE

$$P_R (\text{COMPRESSION}) = 4386 \#$$

$$V_R = 2673 \#$$

$$M_R = 507626 \text{ in-lb}$$

SECTION PROPERTIES FROM AISC

$$A = 5.01 \text{ in}^2$$

$$I_{yy} = 7.44 \text{ in}^4$$

ASSUME A36 MATERIAL

$$S_y = 36000 \text{ PSI}$$

$$E = 29 \times 10^6 \text{ PSI}$$

STRESS IN SHEAR

$$V_R = 2673 \#$$

$$A_s = (2)(.308)(5.25) = 3.23 \text{ in}^2$$

$$f_v = 2673 / 3.23 = 827 \text{ PSI}$$

$$F_y = .40 S_y = .40 (36000) = 14400 \text{ PSI}$$

$$14400 > 827 \text{ OK}$$

COMBINED AXIAL COMPRESSION & BENDING

$$f_a = 4386 / 5.01 = 875 \text{ PSI}$$

COMPUTE Kl/r

$$K = 2.10$$

$$l = 148 \text{ in}$$

$$r = 1.22 \text{ in}$$

$$Kl/r = \frac{(2.1)(148)}{1.22} = 254.7$$

COMPUTE C_c

$$C_c = \sqrt{\frac{2\pi^2 E}{S_y}} = \sqrt{\frac{2\pi^2 (29 \times 10^6)}{36000}}$$

$$C_c = 126$$

EXHAUST STACK ANALYSIS8WF 17 WIDE FLANGE

$$KL/r > C_c \therefore$$

$$F_a = \frac{12\pi^2 E}{23(KL/r)^2}$$

$$F_a = \frac{12\pi^2 (29 \times 10^6)}{23(2547)^2} = 2299.6$$

$$f_a/F_a = 875/2299.6 = .38$$

FOR THE COMBINED LOADING THE ALLOWABLE IS EXPRESSED

$$\frac{f_a}{F_a} + \frac{C_{my} f_{by}}{\left(1 - \frac{f_a}{F_{ex}}\right) F_{by}} \leq 1.0 \quad (1)$$

$$\frac{f_a}{.60S_y} + \frac{f_{by}}{F_{by}} \leq 1.0 \quad (2)$$

CHECK (2)

$$f_{by} = \frac{M_x}{I} = \frac{(507626)(2.625)}{7.44} = 179101 \text{ PSI}$$

SINCE THE BENDING STRESS ALONE IS MUCH GREATER THAN 1.3* TIMES YIELD, ADDITIONAL SUPPORT WILL BE REQUIRED TO MEET ALLOWABLES. CONSIDER THE FOLLOWING SECTION: (SEE Pg. B-13)

$$A_s = 5.01 + 2(8)(.31) = 9.97 \text{ in}^2$$

$$I_{yy} = 7.44 + 2 \left\{ \frac{1}{12} (8)(.31)^3 + (8)(.31)(2.70)^2 \right\}$$

$$I_{yy} = 15.8 \text{ in}^4$$

$$r = \sqrt{\frac{I_{yy}}{A_s}} = \sqrt{\frac{15.8}{9.97}} = 2.14 \text{ in}$$

$$KL/r = (2.1)(148)/2.14 = 145$$

$$KL/r > C_c$$

$$F_a = \frac{12\pi^2 (29 \times 10^6)}{23(145)^2} = 7095 \text{ PSI}$$

* FOR SEISMIC LOADING ALLOWABLES MAY BE INCREASED BY $\frac{1}{3}$ OVER THOSE GIVEN IN XVII-2000

EXHAUST STACK ANALYSIS8 WF 17 WIDE FLANGE

$$f_a = 4386 / 9.97 = 439 \text{ PSI}$$

$$f_a / F_a = 439 / 7095 = .06$$

SINCE $.06 \leq .15$ THE ALLOWABLE IS EXPRESSED

$$f_a / F_a + f_{by} / F_{by} \leq 1.0 \quad (3)$$

$$f_{by} = M_c / I = \frac{(507626)(2.625 + .31)}{45.8} = 32530 \text{ PSI}$$

$$F_b = .60 S_y = (.60)(36000)(1.33) = 28728 \text{ PSI}$$

ADDITIONAL SUPPORT STILL REQUIRED; CHECK OTHER COMPONENTS FIRST TO SEE IF SIDE SUPPORT REQUIRED.

CHECK WIDE FLANGE WELD TO BASE PLATE

APPLIED LOADS AT BASE
 AXIAL 4386 lb (Down)
 SHEAR 2673 lb
 BENDING 507626 in lb

AXIAL LOAD IS ALWAYS DOWN AND IS ASSUMED CARRIED BY BEARING

$$f_s = 2673 / (2 \times 5.8) = 230 \text{ lb/in}$$

$$S_w = 8\frac{2}{6} + (5.8 \times 8.0) + 8\frac{4}{3} = 78.4$$

$$f_b = 507626 / 78.4 = 6474 \text{ lb/in}$$

$$f_w = \sqrt{230^2 + 6474^2} = 6478 \text{ lb/in}$$

$$\sigma_w = 6478 / (.707)(.31) = 29557 \text{ PSI}$$

$$\sigma_{wall} = (1.33)(18800) = 25004 \text{ PSI}$$

WELD PATTERN AT BASE

WELD IS WEAK

* ALLOWABLES MAY BE INCREASED BY 1/3 FOR EMERGENCY CONDITIONS

EXHAUST STACK ANALYSISBASE PLATE ATTACHMENT

CHECK LOAD IN BOLTS (ASSUME BOLT FAILS BEFORE PULLOUT)

$$\text{SHEAR LOAD} = 2673/4 = 668.16$$

$$\text{TENSION LOAD} = (507.626/10)/2 - 4386/4 = 24285/16$$

BOLTING MATERIAL IS ASSUMED EQUIVALENT TO A307
THE ALLOWABLE IS EXPRESSED

$$F_t = 28000 - 1.6 f_v \leq 20000$$

$$F_{v, \text{ALL}} = 16\% \text{ YS} = .16 (36000) = 5760 \text{ PSI}$$

$$\text{BOLT STRESS AREA} = .334 \text{ IN}^2$$

$$f_s = 668/.334 = 2000 \text{ PSI} \leq 5760 \text{ PSI} \quad \text{OK}$$

$$F_t = \{28000 - 1.6(2000)\} 1.33^* = 32984 \text{ PSI}$$

$$f_t = 24285/.334 = 72709 \text{ PSI}$$

* ALLOWABLES FOR SEISMIC MAY BE INCREASED
BY $\frac{1}{3}$ FROM THOSE GIVEN IN XVII-2000

BOLTS ARE INADEQUATE

CHECK COLUMN BASE

EXPRESS THE COMBINED APPLIED AXIAL AND
MOMENT LOADS AS THE AXIAL LOAD APPLIED
AT AN ECCENTRIC LOAD (REF BLODGETT, DESIGN OF WELDED
STRUCTURES)

$$e = M/P_c = 507.626/4386 = 116 \text{ IN}$$

$$f = 5 \text{ IN}$$

$$D = 15 \text{ IN}$$

$$K_1 = 3 \left(e - \frac{D}{2} \right) = 3 \left(116 - \frac{15}{2} \right) = 325$$

$$K_2 = \frac{6 \eta A_s}{b} (f + e)$$

$$n = \frac{\text{MODULUS OF BOLT}}{\text{MODULUS OF CONCRETE}} = \frac{29}{3} = 9.67$$

EXHAUST STACK ANALYSISBASE PLATE ATTACHMENT

$$A_s = 2(.334) = .668 \text{ in}^2$$

$$B = 15 \quad (B \times D = \text{AREA OF PLATE})$$

$$K_2 = \frac{6(9.67)(.668)}{15} \{5 + 116\} = 313$$

$$K_3 = -313 \left(\frac{15}{2} + 5 \right) = -3913$$

$$Y^3 + K_1 Y^2 + K_2 Y + K_3 = 0$$

$$Y^3 + 325 Y^2 + 313 Y + 3913 = 0$$

SOLVING $Y \approx 3 \text{ in}$

$$P_z = -4386 \left[\frac{\frac{15}{2} - \frac{3}{3} - 116}{\frac{15}{2} - \frac{3}{3} + 5} \right] = 41762 \text{ lb (2 Bolts)}$$

$$\text{BOLT LOAD} = 41762/2 = 20881 \quad (\text{APPROX AGREEMENT WITH PREVIOUS LOAD})$$

$$\sigma_c = \frac{20881(3)}{.668(9.67) \left(\frac{15}{2} - 3 + 5 \right)} = 1021 \text{ PSI}$$

σ_c = BEARING STRESS IN MASONRY

$$\sigma_{\text{CALL}} = .25 f_c$$

ASSUME $f_c' = 3000 \text{ PSI}$ (TYPICAL VALUE)

$$\sigma_{\text{CALL}} = .25(3000) = 750 \text{ PSI}$$

$$750 < 1021$$

MASONRY BEARING IS INADEQUATE

CHECK BASE PLATE BENDING

$$f_b = \frac{(15.0 - 2.9)(41762)(.38)}{\frac{1}{12}(15)(.75)^3} = 63196$$

BENDING IN PLATE TOO HIGH

EXHAUST STACK ANALYSIS

$$P_v = 4386 \text{ lb}$$

$$P_h = 2673 \text{ lb}$$

$$M = 5076.26 \text{ in lb}$$

REF: "FOUNDATION ENGINEERING"
by ALFRED R. JUMIKIS

DEPTH of FOUNDATION $d = 36''$
WIDTH of FOUNDATION $B = 36''$

$$d < 2B$$

$$36 < 2(36)$$

SINCE THE FOUNDATION DEPTH IS NOT GREATER THAN TWICE THE FOUNDATION WIDTH THE FOUNDATION IS NOT CONSIDERED "DEEP" AND THE MAGNITUDES OF THE LATERAL EARTH PRESSURES ARE CONSIDERED INSIGNIFICANT IN ADDING TO THE STABILITY OF THE FOUNDATION AGAINST ROTATION.

FOUNDATION LOADS MUST BE RESISTED BY BEARING ON THE SOIL AT THE BASE.

CALCULATING THE ECCENTRICITY OF THE FOUNDATION LOADS:

$$e = \frac{M + (P_h)(41 - 36)}{4386} = \frac{5076.26 + 2673(5)}{4386}$$

$$e = 118 \text{ in.}$$

SINCE e FALLS OFF THE FOUNDATION, ROTATION CANNOT BE RESISTED AND SUPPORT WILL BE REQUIRED.

EXHAUST STACK ANALYSISSIDE SUPPORT

BASIC REQUIREMENTS FOR TWO METHODS OF BRACING THE SILENCER FOLLOW. BECAUSE OF THE SIDE SUPPORT NEEDED TO BRACE THE SILENCER THE SIDE PLATES WELDED TO THE I BEAM SECTION (PAGE B-8) ARE NO LONGER NECESSARY.

1) GUY WIRE SUPPORT

A SYSTEM OF THREE GUY WIRES SPACED AT 120° AROUND THE SILENCER AND ANCHORED TO THE GROUND WITH THE USE OF DEAD-MAN TYPE ANCHORS. ALL COMPONENTS SHOULD BE DESIGNED TO CARRY A 2500# HORIZONTAL LOAD NOTING THAT THE LOAD P IN THE GUY WIRE IS A FUNCTION OF THE ANGLE θ

$$P = 2500 / \sin \theta$$

ATTACH CABLE AT TOP TO $3/4$ " TOP PLATE; USE WELDED LUG OR BOLTED CONNECTION.

DEAD-MAN AT BASE SHOULD HAVE PULL OUT CAPABILITY GREATER THAN LOAD P

NOTE: IF GUY WIRES CAN BE ATTACHED TO THE SILENCER AT ITS CG THE NEED FOR THE .25" REINFORCEMENT OF THE SILENCER BASE STRAPS AS DISCUSSED ON PAGE B4 IS NOT NECESSARY

EXHAUST STACK ANALYSISSIDE SUPPORT2) SIDE SUPPORT I BEAM

INSTALL 8WF17 SIDE BRACE

INSTALL SIDE BRACE TO CARRY 1400# LOAD. SUGGESTED JOINT DETAILS ARE SHOWN. THE ANGLE θ SHOULD BE $\leq 60^\circ$

NOTE: WITH THIS ARRANGEMENT THE .25" STRAP REINFORCEMENT DISCUSSED ON PAGE B4 IS NECESSARY.

INTEROFFICE CORRESPONDENCE

NO. R-3560

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LTR 1310-24	0		5-12-78
"LOFT Diesel Generator "A" Exhaust Stack Seismic Analysis"			

REMARKS: The recommendations of this LTR are being incorporated under GWA 52182-800-006. The necessary structural design details, drawings and SWR will be completed by 15 June, 1978.

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