Form GO-3.08.1 Rev. 2

SARGENT & LUNDY ENGINEERS
Client: CECO
Project: LaSalle
Proj. No. 9066-272
Equip. No.
Calcs. For
X Safety-Related
Non-Safety-Related
Prepared by
Reviewed by
Approved by
Date
Calc. No. L-00019
Rev. 0 Date
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Attachment 2-4
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	1	2	3	4	
	+826	+726	+726	+826	DL
	-313	-710	-710	-313	Suction
	+325	+146	-25	+7	Circ. Nozzle
	+188	+162	-9	+520	ΣO. Loads
	-157	-138	-138	-157	VS
	—	—	—	—	EW S
	-225	-101	+101	+225	NS S
	±274	±171	±171	±274	SRSS
	(-86)	(-9)	(-180)	(+246)	ΣO. Loads +SRSS

INLET → 1 2 3 4 OUTLET →

$V_{S,NS} = 1862^k$ →

Reactions are Obtained from SAP90 Analysis

Anchor Point

	1	2	3	4	
	+826	+726	+726	+826	
	-313	-710	-710	-313	
	+325	+146	-25	+7	
	+188	+162	-9	+520	ΣO. Loads
	±274	±171	±171	±274	SRSS
	(-86)	(-9)	(-180)	(+246)	ΣO. Loads +SRSS

Figure II.2

N →

Notes :
1. ΣO. Loads = Summation of Operating Loads
2. VS = Vertical Seismic ; EWS = E-W Seismic , NSS = North-South Seismic, SRSS = SRSS of seismic forces.
3. ΣO. Loads + SRSS = Operating loads plus Seismic loads (Design Loads).

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Anchor Bolts Shear Resistance

@ Piers Type [1]

Each under Tension T = 86 kips

6 - $1\frac{5}{8}$" φ A36 anchor bolts for each pier (all 8 piers).

Tensile area of anchor $A_t = 1.655 \text{ in}^2$ (average of $1\frac{1}{2}$" φ & $1\frac{3}{4}$" φ from AISC Manual page 4-147 9th Edition).

$$t_a = \frac{86}{6 \times 1.655} = 8.66 \text{ ksi}$$

$$T_a = 0.95 F_y = 0.95 \times 36 = 34.2 \text{ ksi}$$

$$V_a = \frac{0.95 F_y}{\sqrt{3}} = \frac{0.95 \; 36}{\sqrt{3}} = 19.745 \text{ ksi}$$

Calculate allowable shear (v_a) stress using the following elliptical equation:

$$\left(\frac{v_a}{V_a}\right)^2 + \left(\frac{t_a}{T_a}\right)^2 = 1.0$$

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or $\left(\frac{v_a}{19.745}\right)^2 + \left(\frac{8.66}{34.2}\right)^2 = 1.0$

$v_a = 19.102$ ksi

Shear Resistance of anchors @ two piers of type [1] is

$= 2 \times [19.102 \times 6 \times 2.07^{*}]$

$= 474$ kips

* Gross area; allowed in shear evaluation.

@ Piers Type [2]

$\overline{T} = .9$ very small, it has no effect on the shear resistance. Use full shear allowable.

Shear Resistance of anchors @ two piers of type [2] is

$= 2[19.745 \times 6 \times 2.07] = 490$ kips

@ Piers Type [3]

$$T = 180 \text{ k}$$

$$t_a = \frac{180}{6 \times 1.655} = 18.127 \text{ ksi}$$

$$\left(\frac{v_a}{V_a}\right)^2 + \left(\frac{t_a}{T_a}\right)^2 = 1$$

$$\left(\frac{v_a}{19.745}\right)^2 + \left(\frac{18.127}{34.2}\right)^2 = 1.0$$

$$v_a = 16.743 \text{ ksi}$$

Shear Resistance of anchors @ two piers type [3] is :

$$= 2\left[16.743 \times 6 \times 2.07\right] = 416 \text{ kips}$$

@ Piers Type [4]

T = No tension

Shear Resistance of anchors @ two piers type [4] :

$$= 2\left[19.745 \times 6 \times 2\right] = 490 \text{ kips}$$

Total anchor bolts Shear Resistance in the N-S direction

$$V_{R,A} = 474 + 490 + 416 + 490$$
$$= 1870 \text{ kips}$$

The above capacity is based on all the 48 anchors are ingaged in resisting the Shear. If the anchors of the pedestal, which is used as an anchor point for thermal expansion, is excluded, the shear capacity will be :-

$$V_{R,A} = 1870 - 490/2$$
$$= 1625 \text{ kips}$$