RELEASE AUTHORIZATION

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Down Evaluation

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242 -A EVAPORATOR
ION EXCHANGE COLUMN (IX-D-1)
TIE DOWN EVALUATION

November 1994

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WESTINGHOUSE HANFORD COMPANY
Hanford Operation and Engineering Contractor
for the US Department of Energy

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DESIGN CALCULATION

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(1) Drawing H-2-69359 (2) Doc. No. _____ (3) Page _____ of _____
(4) Building 242-A (5) Rev. _____ (6) Job No. _____
(7) Subject ION EXCHANGE COLUMN (IX-D-1) - HOLD DOWN ANCHORS
(8) Originator P. Stumdel Date 11-16-94
(9) Checker RC Y. J. ... Date 11-18-94

(10)

PROBLEM STATEMENT

THE EXISTING ION EXCHANGE COLUMN (IX-D-1) IS NOT ANCHORED TO THE FLOOR SLAB. THIS COL. IS A SC-3 EQUIP. SITTING IN A SC-2 BLDG. DESIGN APPROPRIATE ANCHORING SYSTEM TO WITHSTAND SEISMIC LOADS.

DESIGN BASIS

SEE REFERENCES

ASSUMPTIONS

1. ASSUME COL. IS Laterally supported at top by the piping & at bottom by the 4 support legs.
2. ASSUME THAT THE COLUMN IS PRE-QUALIFIED TO WITHSTAND SEISMIC LOADS.

CONCLUSIONS & RECOMMENDATIONS

THE ION EXCHANGE COLUMN IS CAPABLE TO WITHSTAND SEISMIC LOADS WITH ANCHORS SHOWN ON PAGE 6.

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 (9) Checker BC [Signature] Date 11-16-94

(10)

REFERENCES

1. WHC-SD-GN-DGS-30006, REV. 1, GUIDELINES FOR ASSESSING THE SEISMIC ADEQUACY OF SAFETY CLASS 3 & 4 EQUIPMENT AT THE HANFORD SITE.
2. AISC MANUAL OF STL. CONST. 8th ED.
3. DRAWINGS:
 - H-2-69359 SH. 1 THRU 4
 - H-2-69336
 - H-2-69277
 - H-2-69278 SH. 1 & 2
 - H-2-69343

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ION EXCHANGE COLUMN (IX-D-1)

WEIGHT

VOLUME = 1124 GALS.

ESTIMATE WT.

EMPTY = 5000 #

W/RESIN = 12000 #

FILLED W/WATER = 15000 #

APPROX. C.G. LOC. FROM FLR.

$$Y = 41" + \frac{11'4"}{2} = 9.4'$$

ASSUME THAT THE COL. IS LAT.
 RESTRAINED AT TOP BY THE
 PIPING & AT BOT. BY THE
 4 SUPPORT LEGS

USING TABLE 2.5 of REF.1

$$A_h = .5$$

∴ HORIZ. FORCE DUE TO
 SEISMIC EVENT

$$F_h = 15 \times .5 = 7.5 \text{ K}$$

REACTION @ TOP & BOT.

$$R_h = 7.5 / 2 = 3.75 \text{ K}$$

$$A_v = -.3(2/3) = .2 \text{ (Ref.1 Table 2.2)}$$

REACTION @ SUPT. LEG ANCHOR

$$R_T = \frac{3.44}{48} + \frac{.75}{4} - \frac{3.75}{4}$$

$$= 3.44 + .75 - 3.75$$

$$R_T = .44 \text{ K (TEN.)}$$

$$R_c = 3.44 + .75 + 3.75$$

$$= 7.94 \text{ K (COMP.)}$$

$$R_s = \sqrt{2(3.75/2)^2} = 1.33 \text{ K (SHEAR)}$$

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CHECK SUPPORT LEGS ($2 \times 4 \times 4 \times 1/2$) $A = 3.75 \text{ in}^2$

$$L = 44", \quad r = .782 \quad K L / r = 44 / .782 = 56 \Rightarrow F_a = 17.81 \text{ ksi}$$

$$M = .94 \times 44 = 41.4 \text{ k-in}$$

$$f_a = 7.94 / 3.75 = 2.1 \text{ ksi}$$

$$S = 1.97 \text{ in}^3$$

$$f_b = 41.4 / 1.97 = 21 \text{ ksi} < (1.33 \times 27 = 36 \text{ ksi})$$

$$f_a / F_a + f_b / F_b < 1.0$$

$$2.1 / 17.81 + 21 / 36 = .71 < 1.0 \quad \therefore \text{OK}$$

ANCHOR SIZE & DETAILS

TRY $5/8" \Phi$ HKB-II w/ $4"$ EMB.

$$T_A = 1.335^k \quad S_A = 3.125^k$$

(TABLE 4.5 REF. 1)

CHECK UNITY RELATION

$$R_T / T_A + R_S / S_A < 1.0$$

$$.44 / 1.335 + 1.33 / 3.125 = .76 < 1.0 \quad \therefore \text{OK}$$

CONC. $f'_c = 3000 \text{ psi}$
 SLAB THICKNESS = $20"$
 Ref. DWG. H-2-69277
 H-2-69278

USE $1 - 5/8" \Phi \times 6"$ HKB-II, w/ $4"$ MIN. EMB
 @ EA. LEG.

USE EXIST. HOLE IN EA. $\angle$ BASE PL