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July 1, 1981
EF2 - 53812

Mr. L. L. Kintner
Division of Project Management
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: Enrico Fermi Atomic Power Plant Unit 2
NRC Docket No. 50-341

Subject: Geotechnical Branch Position GB-1
Lateral Pressure Computations

Dear Mr. Kintner:

To supplement Detroit Edison's response to the NRC staff concerns, we are sending the "Dynamic Rigid Wall Lateral Pressure Computations". This material was discussed with your Dr. Jagannath in a telephone call with our Yogi Anand.

Sincerely,

W Colbert/EL

William F. Colbert
Technical Director
Enrico Fermi 2

WFC/YNA/jlj

Attachment

Bool
5/1

JUNE 30, 1981

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DYNAMIC RIGID WALL LATERAL PRESSURE COMPUTATIONS

Y. ANAND

THE LATERAL PRESSURE VALUES PRESENTED IN TABLE 2.5-18 IN THE FSAR WERE TAKEN FROM DAMES & MOORE'S REPORT - STATIC AND DYNAMIC SOIL AND ROCK STUDIES, FEB. 3, 1970.

A REVIEW OF THE ANALYSIS PERFORMED IN 1970 INDICATES (LETTER FROM MIKE KIEFER OF DAMES & MOORE TO LARRY HOLISH OF S&L : JUNE 26, 1981) THAT THE RIGID WALL (PASSIVE) PRESSURES WERE EVALUATED UTILIZING SEVERAL THEORIES. THE FINAL RECOMMENDATIONS APPROXIMATE THE VALUES CALCULATED UTILIZING THE THEORY DEVELOPED BY MONONOBE (1929).

THE ANALYSIS WAS BASED ON THE FOLLOWING EQUATIONS:

$$P_{PEH} = \frac{1}{2} \gamma H^2 (1 - K_V) K_{PE} \cos \delta$$

EQUIVALENT FLUID PRESSURE $= \gamma (1 - K_V) K_{PE} \cos \delta$ . . . . PER FT

H = DEPTH
γ = UNIT WEIGHT OF SOIL
K_H = HORIZONTAL GROUND ACCELERATION / g
K_V = VERTICAL GROUND ACCELERATION / g
δ = ANGLE OF WALL FRICTION (20 DEGREES)

$$K_{PE} = \frac{\cos^2(\phi + \beta - \theta)}{\cos\theta \cos^2\beta \cos(\delta - \beta + \theta) \left\{ 1 - \left\{ \frac{\sin(\phi - \delta) \sin(\phi + i - \theta)}{\cos(i - \beta) \cos(\delta - \beta + \theta)} \right\}^{1/2} \right\}^2}$$

ϕ = ANGLE OF INTERNAL FRICTION (40 DEGREES)
i = SLOPE OF GROUND SURFACE (0)
β = SLOPE OF BACK OF WALL TO VERTICAL (0)

$$\theta = \tan^{-1} \frac{K_H}{1 - K_V}$$

F. Colandrea

CALCULATION OF EQUIVALENT FLUID PRESSURE

GIVEN: $K_H = 0.15g$
$K_V = 0.10g$

$$\Theta = \tan^{-1}\left(\frac{K_H}{1-K_V}\right) = \tan^{-1}\left(\frac{.15}{.90}\right) = 9.46^\circ$$

ALSO GIVEN: $\phi = 40^\circ$ & $\delta = 20^\circ$
$i = 0^\circ$
$\beta = 0^\circ$

$$\therefore K_{PE} = \frac{\cos^2(\phi+\beta-\Theta)}{\cos\Theta\cos^2\beta\cos(\delta+\beta+\Theta)\left\{1-\left\{\frac{\sin(\phi-\delta)\sin(\phi+i-\Theta)}{\cos(i-\beta)\cos(\delta-\beta+\Theta)}\right\}^{\frac{1}{2}}\right\}^2}$$

$$= \frac{\cos^2(30.54)}{\cos(9.46)\cos(29.46)\left\{1-\left[\frac{\sin(20^\circ)\sin(30.54)}{\cos(29.46^\circ)}\right]^{\frac{1}{2}}\right\}^2}$$

$$= \frac{0.7418}{(0.9864)(.8707)\left[1-(0.1996)^{\frac{1}{2}}\right]^2}$$

$$K_{PE} = 2.822$$

$\therefore$

EQUIV. FLUID PRESSURE $= \gamma H (1-K_V) K_{PE} \cos\delta$

$= \gamma(1-K_V) K_{PE} \cos\delta$ (PER FT.)

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DYNAMIC RIGID WALL LATERAL PRESSURE COMPUTATIONS

Y. ANAND

EQUIVALENT FLUID PRESSURE (EFP) $= \gamma H (1 - K_v) K_{PE} \cos\delta$

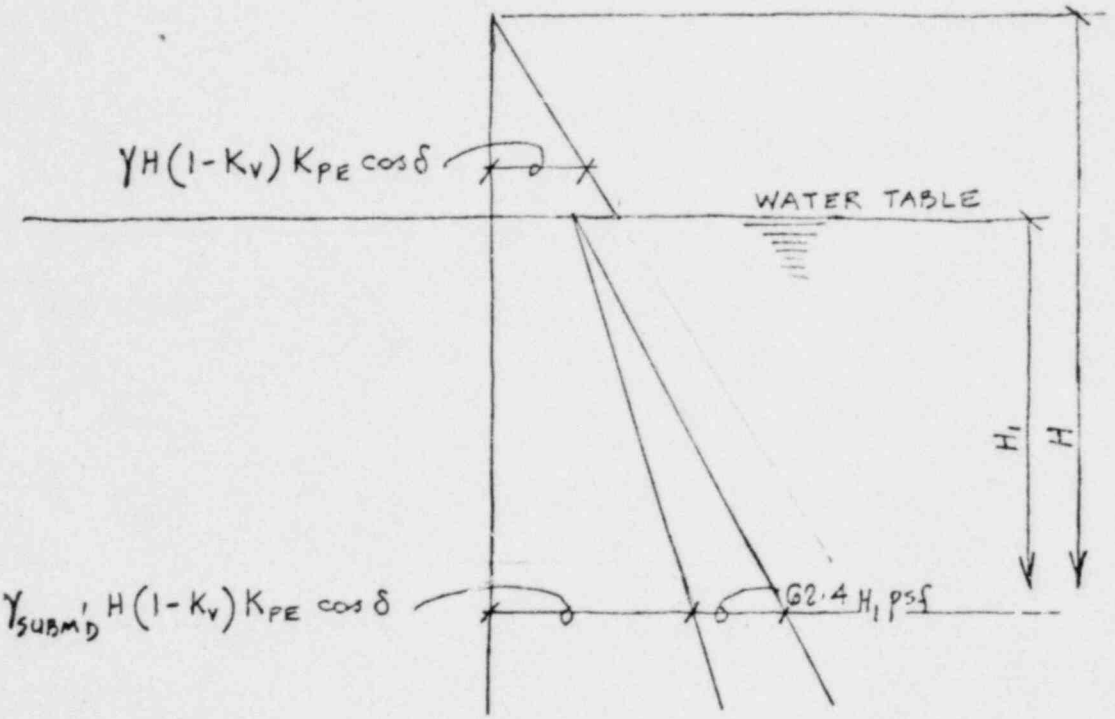
$= \gamma H (1 - 0.10)(2.822) \cos(20^\circ)$

$= \gamma H (2.387)$ psf

USING $\gamma = 135$ pcf, EFP $= 135(2.387) = 322$ psf/FT. ... ABOVE WATER

USING $\gamma = 90$ pcf (SUBMERGED DENSITY),

EFP $= 90(2.387) + 62.4 = 277$ psf/FT. ... BELOW WATER



LATERAL PRESSURE DIAGRAM