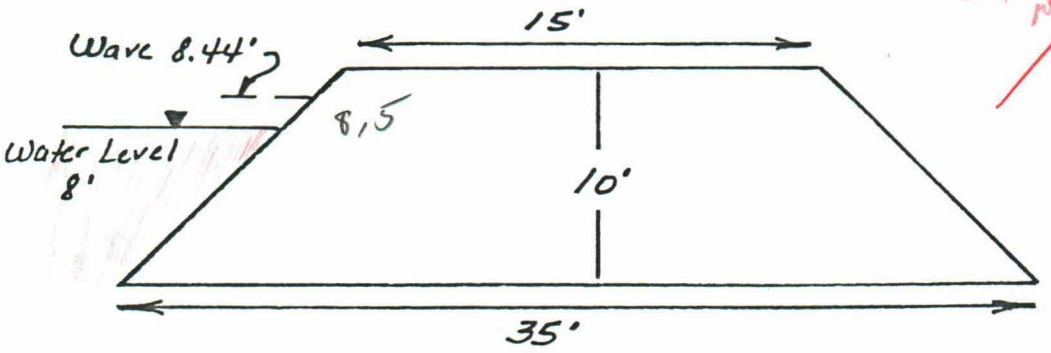
HYDROSTATIC FORCES AND WAVE HEIGHT

calculation w/ 100 year wave.



AVERAGE HORIZONTAL STATIC PRESSURE = $\frac{1}{2}(8')(\gamma)$

(A) S.G = 1.0707; γ = 66.812 LB/FT^3 (100,000 PPM NaCl)

$PX = \frac{1}{2}(8')\ (66.812\ LB/FT^3)$

$= 267.25\ LB/FT^2$ (HORIZONTAL PRESSURE)

(I) $FX = 267.25\ LB/FT^2 \times 8\ FT^2 = 2138$ LB PER LINEAR FOOT
(HORIZONTAL HYDROSTATIC FORCE AGAINST DIKE)

(II) OTHER HORIZONTAL FORCES (HYDRODYNAMIC PLUS EXCESS STATIC)

SHALLOW WATER WAVE CHARACTERISTICS:

ASSUME THE FOLLOWING:

WIND SPEED = 50 MPH

? FETCH = 500 FEET

DEPTH OF WATER = 5 FEET

THEN, WAVE HEIGHT = 0.875 FEET

PERIOD = 1.62 SEC.

WATERLENGTH, $L = 5.12T^2 = 13.44$ FEET
BREAKING DEPTH = 1 FOOT (SEE P. 4)

EXHIBIT 4

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THUS HYDRODYNAMIC FORCES ARE NEGLIGIBLE

TOTAL HORIZONTAL FORCES = HORIZONTAL HYDROSTATIC FORCES

= 2138 LB/FOOT

SHEARING FORCES = F(W+V+U+X)

WHERE, W = WEIGHT OF STRUCTURE

V = WEIGHT OF WATER BEARING VERTICALLY DOWNWARD ON STRUCTURE

U = UPLIFT FORCES

X = SUM OF OTHER VERTICAL FORCES

F = FRICTION FACTOR (ASSUMED = .4)

$$\text{WEIGHT OF STRUCTURE} = \frac{(15 + 35)}{2} (10') (1') (112 \text{ LB/FT}^3)$$

= 28,000 LB/LINEAR FOOT

$$\text{WEIGHT OF WATER} = \frac{8'}{2} (8') (1') (66.812 \text{ LB/FT}^3)$$

= 2,138 LB/FT

UPLIFT FORCES = 0

OTHER VERTICAL FORCES = 0

THEREFORE S = 0.4 (28,000 + 2138 + 0 + 0)

= 12,055 LB/FT

*SAFETY FACTOR = SHEARING FORCES/HORIZONTAL FORCES

= 12,055/2138

= 5.64

AT S.G. = 1.1478; γ = 71.623 LB/FT^3 (200,000 PPM NaCl)

PX = 4' x 71.623 LB/FT^3

= 286.5 LB/FT^2

$$FX = 286.5 \text{ LB/FT}^2 \times 8 \text{ FT}^2$$

$$= 2292 \text{ LB/LINER FOOT}$$

$$\text{SHEARING FORCES, } S = 0.4 \text{ (28,000 LB/FT + 2292 LB/FT)}$$

$$= 12{,}117 \text{ LB/FT}$$

$$\text{*SAFETY FACTOR} = 12{,}117/2292$$

$$= 5.27$$

$$\frac{Ho'}{Lo} = \frac{.875'}{13.44'} = .0651$$

FROM FIG 2-65, P 2-122 SHORE PROTECTION MANUEL

$$\frac{H_B}{Ho'} = 1.12 \text{ (FOR BEACH SLOPE OF 1:10)}$$
$$= 1.18 \; H_B/Ho' \text{ WOULD BE GREATER FOR SLOPE OF 1:1}$$

$H_B = 1.18 \times .875' = 1.033$

$$\frac{H_B}{GT^2} = \frac{1.033}{32.2\ (1.62)^2} = 0.0122$$

FROM FIG 2-66, P 2-123

$$\frac{D_B}{H_B} = 0.98$$

$DB = 98\ (1.033') = 1.01'$ (SPILLING OCCURS)