Wave Forces Prediction on Vertical Walls by Hurricane

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If a vertical wall breakwater is founded in water deep enough, it will completely reflect incident waves, it will completely reflect incident waves, provided that the horizontal angle between the breakwater and the waves is less than some limiting angle. The assumption is made that waves reflecting from a vertical wall form a standing wave pattern which are commonly called a clapotis. The validity of this assumption has not been proved for periodic incident waves and if one considers the irregularity of ocean waves the assumption is open to considerable doubt. Measurements of pressure distribution on model and prototype breakwaters, however, show that use of this assumption leads to reliable results.

The pressure which is given as the second-order theory (Miche, 1944) in a standing wave is given as

$$\frac{p}{\rho g} + y = \frac{H}{2}\frac{\cosh 2\pi(y+d)/L}{\cosh 2\pi d/L}\sin\frac{2\pi x}{L}\sin\frac{2\pi t}{T} - \frac{\pi H^2}{8L}\frac{\cos^2 2\pi t/T}{\sinh 2\pi d/L\cosh 2\pi d/L}$$
$$\left[\cosh\frac{4\pi}{L}(y+d) + \cos\frac{4\pi x}{L} - 1\right] + \frac{3\pi H^2}{16L}\frac{\cosh 4\pi(y+d)/L}{\sinh^3 2\pi d/L\cosh 2\pi d/L}\cos\frac{4\pi x}{L} \qquad (1)$$
$$\cos\frac{4\pi t}{T} + \frac{\pi H^2}{4L}\tanh\frac{2\pi d}{L}\cos\frac{4\pi t}{T}$$

At very great depths in deep water (Wiegel, 1964)

$$\frac{p}{\rho g} + y \cong \frac{\pi H^2}{4L}\cos\frac{4\pi t}{T} \qquad (2)$$

This is a dynamic pressure which has a period of one-half that of the standing wave.