CONTRIBUTION TO THE SHEAR RESPONSE OF A TWO DIMENSIONAL TRUNKATED WEDGE WITH TRAPEZOIDAL BOUNDARIES

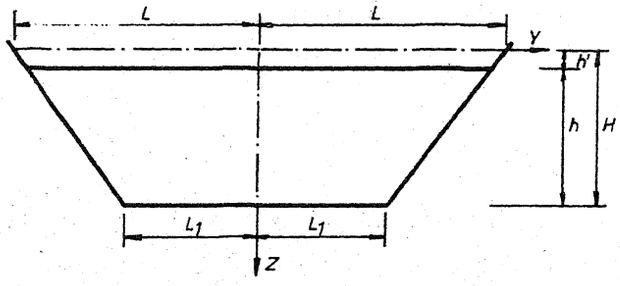
by

Trifun A. Paskalov [I]

In order to evaluate the dynamic response to actual earthquakes of a particular structural system, the natural frequencies and corresponding mode shapes as well as the damping parameters should be calculated first. In other words, the eigen value problem of the structure should be solved. Therefore, this paper deals with the definition of the dynamic characteristics of arth-fill dam structures.

A free - vibration problem of such a structure has been treated and boundary conditions very close to the actual ones have been considered. It is a unique case that such a problem is solved for trapezoidal section of a river canyon in which the dam is constructed. A close form solution of differential equations is obtained which is a quick and simple method for definition of natural frequencies (1) and mode shapes (2) of free vibrations for such type of structures.

Having in mind the symbols used on fig.1 the following expressions for natural frequencies and modes shapes respectively are obtained.



$$k = \frac{L_1}{L}\,;\quad \vartheta = (1-k)\eta + \xi$$

$$\xi = \frac{Y}{L}\,;\quad \lambda = (1-k)\eta - \xi$$

$$\eta = \frac{Z}{L}\,;\quad \nu = \frac{1}{2}\,\frac{\left(\frac{H}{L}\right)^2 + (1-k)}{\left(\frac{H}{L}\right)^2 + (1-k)}$$

$$\omega_{ij} = \frac{b_i}{H}\left\{\frac{1}{2}\left[1 + \frac{j^2\pi^2}{\left[1-(1-k)\frac{h'}{H}\right]^2}\right]\left[\left(\frac{H}{L}\right)^2 + (1-k)^2\right]\right\}^{1/2} \qquad \cdots (1)$$

$$\Phi(\vartheta,\lambda) = \left(b_i\,\frac{\vartheta+\lambda}{2}\right)^{\nu}\left\{ Y_{\nu-1}\left[b_i(1-k)\frac{h'}{H}\right] J_{\nu}\left(b_i\,\frac{\vartheta+\lambda}{2}\right) - \right.$$

$$\left. - J_{\nu-1}\left[b_i(1-k)\frac{h'}{H}\right] Y_{\nu}\left(b_i\,\frac{\vartheta+\lambda}{2}\right)\right\} \sin\left\{\frac{j\pi}{2}\left[1 + \frac{\vartheta-\lambda}{2-(\vartheta+\lambda)}\right]\right\}$$

and the "b_i" coefficients are obtained from the following characteristic equation. $\cdots (2)$

$$J_{\nu}[b_i(1-k)]\,Y_{\nu-1}\left[b_i(1-k)\frac{h'}{H}\right] - Y_{\nu}[b_i(1-k)]\,J_{\nu-1}\left[b_i(1-k)\frac{h'}{H}\right] = 0 \qquad \cdots (3)$$

I Professor, Head of Earthquake Engineering Departament, Institute of Earthquake Engineering and Engineering Seismology, University "Kiril and Metodij" - Skopje, Yugoslavia.