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SUMMARY An analytical study of the pattern of variation in the pore pressures within an embankment during earthquake, based upon seismic analysis by the rigid body response method and by the elastic body response method using ICL 1901 A computer is presented herein. The pore pressure contours before and during an earthquake are presented for an upstream slope of Tapar dam situated in seismically active zone in West India.

SEISMIC ANALYSIS

For rigid body response analysis a uniform seismic coefficient 0.15 is adopted. For elastic body response analysis the acceleration distribution obtained is incorporated in the pseudostatic analysis and the seismic coefficient is obtained by the relation :

$$\alpha_h = (2.5 - 1.5\frac{y}{H})\alpha_b \qquad \ldots \qquad (1)$$

Where H is height of embankment, y is distance of lowest point on slip surface from the crest of the dam and α_b is a parameter dependent on average acceleration, natural period of vibration and percentage damping.

CHANGE IN PORE PRESSURES

The earthquake causes an additional external force on the soil mass of the embankment. When this is acted upon, two phenomena take place simultaneously. In the first instance excess hydrostatic pressures are generated and in the subsequent instance these excess hydrostatic pressures tend to dissipate with accompanying volume changes in accordance with the normal laws of one dimensional consolidation. The magnitude of the excess hydrostatic pressures and the rate of dissipation depends upon the permeability of the material.

Thus the total boundary neutral force Ue during an earthquake can be expressed as

$$Ue = U + A \qquad \ldots \qquad (2)$$

Where U is the neutral force before earthquake and A is excess force due to earthquake.

The pore pressures before an earthquake are obtained by a steady state seepage flownet where as those during an earthquake are obtained by equation (2) using a computer. The pore pressure contours are presented in Fig.1.

RESULTS AND OBSERVATIONS

It is evident from Fig.1 that there is a considerable increase in the pore pressures during an earthquake. There is concentration of high pore pressures near the toe of the impervious core.

It is observed that the percentage increase in the pore pressures during earthquake is more near the crest as compared to the base. This holds good for both the cases of rigid body and elastic body. This fairly agrees with the general concept of the settlement of the crest after an earthquake as the dissipation of pressures will cause more volume changes near the top.

The possibilities of failure increase in the zone near the phreatic line due to sudden increase in pore pressure s. The pore pressure variations obtained by the rigid body and elastic body analyses do not show noticeable difference. The change in pore pressures during an earthquake varies from 1% near the base to 75% near the top of the dam.

CONCLUSION

The pore pressures within an embankment before earthquake change materially during an earthquake especially near the crest. The major factors affecting the variations are the physical properties of the embankment materials, seismic co-efficient and the geometry of the dam section. The critical time will be immediately at the time of earthquake; the dam will be safe in the subsequent condition.

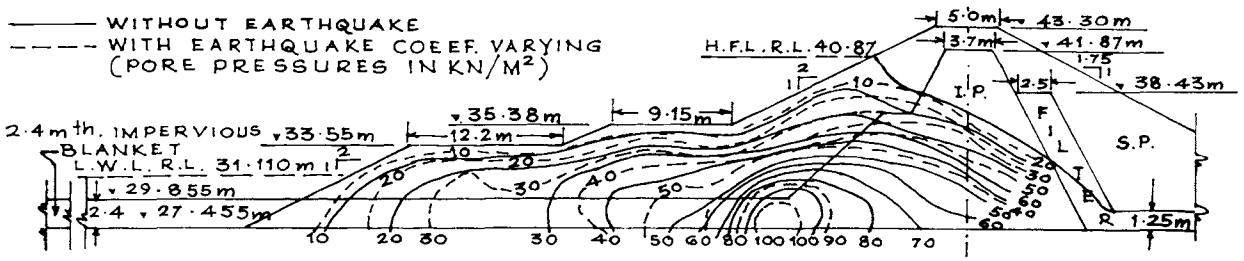

FIG. 1 Pore Pressures contours on U/S slope of Tapar Dam