SEISMOTECTONIC FEATURES AS GUIDE TO DESIGN OF A HIGH DAM ACROSS NARMADA RIVER IN GUJARAT, INDIA.

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SYNOPSIS

The faults proved at the alternative sites for the proposed 167m high dam across the Narmada river between Gora and Mokhdi are part of Narmada fault system, considered to be active on the basis of physiographic and seismotectonic evidences. The sites are located within 80km of the Cambay graben. The final site on Deccan traps is traversed by a 14 metre-wide river channel fault and intruded by dyke swarms. This alignment located on the western margin of the Peninsular Shield may activate and trigger of earthquakes of magnitude upto 6.5 on reservoir impounding. Hence a flexible dam to suit the potentially active foundation is preferred.

INTRODUCTION

The importance of the seismotectonic framework of the area to the proposed 167m high dam across Narmada river between Mokhdi and Gora is stressed. Horizontal Deccan basatic flows, unconformably overlying Bagh sandstones, limestones and shales which are traversed by shears, fractures and numerous faults including the significant E-W river channel fault, comprise the area. At the finally selected site the channel fault is 14m wide, the trap flows lack contiguity on either bank and the Bagh, below the traps, and a red bole bed are restricted to the right bank. These faults form part of the Narmada fault system. The fault system is reported upto the river mouth at Broach about 80km downstream and must have guided the swarm of ENE- WSW, basic dykes, their off-shoots and the straight course of Narmada river. The structurally complex and active (?) Cambay graben a deep seated crustal weakness, is about 80km away from the site.

Physiographic and seismotectonic evidences reveal that the Narmada fault system is active. The off-setting of northerly flowing tributaries of Narmada, the two terrace levels and their tilting, the local convexities of the thalweg of Narmada, the attitude and thickness of post trappean marine sediments etc. imply rejuvenation and gradual uplift of this region even in recent times.

The Broach earthquake of 1970 of intensity + VII is attributed to seismic adjustments along the Narmada-Sone fault. Besides Rewa earthquake of 1927, Satpura earthquake of 1938 and other minor shocks indicate the seismic instability of the Narmada valley.

It has been statistically shown that reservoirs based on the margin of the Peninsular Shield such as Sarawati, Koyna and Ukai have been frequently visited by earthquakes. The Narmada reservoir, when constructed, will be a similar case. On reservoir impounding, pore pressure development along structural discontinuities like faults, shears, fractures etc. and loss in strength of weaker beds such as Bagh shales and red boles may occur which are conducive to recurrence of earthquakes.

Thus the Narmada dam alignment sited on hetrogeneous rocks and structural complexities with active lineament on the Margin of the Peninsular Shield, may trigger of earthquakes of magnitude upto 6.5, especially under impounded conditions. Considering the above geoseismological conditions, it is cautioned to design a gravity dam with sufficient seismic factor or, preferably, a self healing flexible earth or rock fill dam, to meet any eventuality.

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