

Displacements in Beas Dam*

by

N.K. Berry

A K. Bagchi**

According to the recommendation of the International Association of large Dams (Paris) 0.7 per cent of the total cost of construction of the dam should be spent on instrumentation and control subsequent to the construction. This is indeed a large sum and is indicative of the importance placed on study of the performance of the dam.

The purpose of the study of the deformation characteristics of large dams may be two fold

- (i) Safety of the dam and hence of the locality
- (ii) Checking of the design criteria

We have now a large number of dams involving investment of thousands of crores of rupees. With the safety of these dams is linked up the question of lives of thousands. The exact reason of the Koyna dam disaster has not yet been found, perhaps it will never be found. But a suitable sequential study of the deformation and displacement data could have possibly done it.

We are required to find out two types of movements in such cases :

- (i) Displacement of the dam as a body, probably due to effect on the bed rock.
- (ii) Relative displacement of the different parts of the dam under various degree of loading, which we may term as deformation.

The various instruments embedded inside the dam can help monitoring the second component; the first set of movement has to be found by precise traverse, triangulation, trilateration (or combination of these).

Berry's view that this is the simplest and easiest may not be correct. Perhaps he is referring to a crude form of measurement, in which case the measuring error will of course be more than the movements associated with the dams. However, refinements are possible—by use of precise theodolite (Wild T₃) improved and repeated observation, better layout of triangles, refined computation, adjustment and statistical evaluation of the reliability of observation.

* Published in Indian Geotechnical Journal Vol. 5, No. 3 July 1975, pp. 151-168.

** Lecturer in Civil Engg., University of Roorkee, U.P.

Statistical evaluation of small distances (and shifts) is now very common in disciplines like geodesy and geophysics. If we measure the co-ordinates of a number of targets on the dam carefully and at regular interval the pattern of deformation and shift may be found. As a matter of fact this constitutes a more complete investigation of the behaviour of the dam.

In India work in this direction has been undertaken in a number of dams results of which are yet to be announced. In some countries this method is being followed as a regular practice (Keene 1974).

Use of Photogrammetry

Measurement of co-ordinates using theodolites, electronic distance measuring instruments, invar tapes etc. may be too elaborate in exercise to be performed at regular intervals. Photogrammetric method has some methodological advantage over geodetic method and has been attempted (Brandenberger 1974). However this technique has not yet been able to match the accuracy attainable from geodetic methods. A search is on for improving the technique so that the accuracy of photogrammetric method can match its methodological advantage.

References

- BRANDENBERGER, A.J. (1974), "Deformation Measurement of Power Dams", *Photogrammetric Engineering*.
- KEENE, DON F., (1974), "Precise Dam Surveys—Los Angeles Country Flood Control : District", *Journal of the Surveying and Mapping Divison, Proceeding of American Society of Civil Engineers, Vol. 100, No. SU2*.