

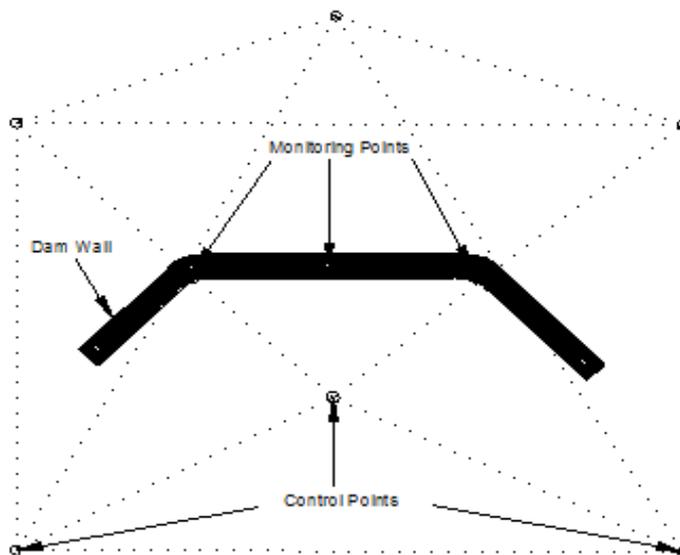
DEFORMATION SURVEYING

(MONITORING)

Monitoring is the determination of movements of a structure obtained by referring those movements to a network of control points outside the structure. However, this method is not the only means of monitoring. Other techniques can measure relative movement with greater accuracy as well.

The size of the structure will determine the size of the network points around it. A guideline is that a network must form a square shape around the structure with its sides approximately the length of the structure monitored.

Sketch A :



Shown on Sketch A is how a network of control points can be placed such that a dam wall being monitored is entirely within the network. Placed on the dam wall are monitoring points, from which observations will be taken to determine any deformation of the structure.

Since the movement of the structure is referenced to permanent fixed control points away from the structure, it is therefore important that such fixed points are built on stable geological formation.

The topography plays an important role in the choice of network beacons, since intervisibility between control points as well as visibility of monitoring points have to be taken to account.

Three types of monitoring:

1. Permanent monitoring

2. Semi-permanent monitoring

3. Epoch monitoring

- **Permanent monitoring** refers to a longer period of continuous observation. Permanent observation of a structure requires permanently installed instruments with continuous recording facilities. Permanent instruments require frequent and regular calibration for eliminating external systematic factors such as ageing and drift.
- **Semi-permanent monitoring** is in all respects identical to permanent monitoring with the exception that intervals between recordings are no longer practically zero but of notable quantity. The decision between the two methods must be based on the type of deformation expected and on economical considerations. Instruments like digital scanners and cameras, target tracking and distance measuring devices can all be permanently installed for use in permanent and semi-permanent monitoring.
- **Epoch monitoring** differs in principle from the two above mentioned methods in that geodetic or photogrammetric methods are used to determine the relative and/or absolute positions of object points at a specific moment in time. The survey is then repeated after some constant time and a statistical analysis is carried out to detect and quantify position changes of points from comparing measured data by using conventional survey instruments, epoch monitoring is not as accurate as the above two mentioned methods which normally uses electrical and electronic equipment. Also with epoch monitoring, movements can only be detected at the time of survey, and unlike permanent monitoring where dangerous and sudden movements can be determined in real time. Instruments such as total stations and GPS can be used to carry out this type of monitoring.

In conclusion, we must note that the Instruments and equipment choice, building of control points and the position of monitoring points, as well as the method of monitoring to be adopted will all influence the accuracy which depends on the requirements of the design.