Seismic Vaults

Introduction:

The construction of the vault for broadband seismometers has a direct impact on the data quality. The principle of broadband sensor vault design is to minimize temperature changes, and to distance the sensor pad from the surficial layer which tilts due to temperature, precipitation, solar insolation, wind, etc.

Nearby sources of ground noise, like footsteps or acoustic noise, are reduced by shallow burial (2-5 ft.) The construction must be adapted to the site and materials available. A decision will have to be made to balance the cost and labor of different vault designs against the length of deployment, resources available, and quality of data expected.

Finding a pre-existing enclosure is a tremendous savings in time and effort. This might include missile silos, power stations, abandoned mines, caves, or root cellars. Consider the details of cables, power, and locating a GPS antenna for timing at these sites.

In addition to providing the best seismic environment for the sensor, the vault must defend the sensor from two hazards; flooding and vandalism. (Refer to Site Location for Security considerations).

Sometimes a site can flood because the water table rises. In this situation, the vault must be airtight to survive. This is very difficult to achieve. Alternatively, the sensor must be enclosed in a submersible pressure case and the remaining station equipment would be installed above grade. If you encounter a site which has flooded in the past, or has a possibility of flooding, find another site.

Flooding as a result of precipitation is caused by insufficient drainage, usually abetted by ill-fitting vault covers. Attempts to make a sealed cavity (from concrete, barrels, bricks, plastic, etc.) fail because something leaks. Even if it is only a small amount, it has nowhere to go. Equipment is often ruined. A better design is to divert water from the top of the vault (extending a cover over a large area on the surface) and allowing the vault itself to drain via drain holes or pump, should it collect any water. It’s a flow problem, not a sealing problem. Some soil conditions still make it difficult to drain water. An automatic sump pump is one solution (12VDC models are about $40.00).

More Information:

- Broadband Vault Construction Manual
- Flexible Array (FA) Vault Construction