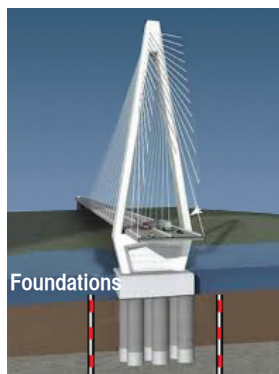


## Lingacom's civil underground foundations imaging

### Underground foundation imaging of Bridges, Towers and Dams

Civil engineering foundations and abutments must be extremely solid to ensure a good bearing capacity under the construction weight and load. Major collapses of bridges, towers and dams caused severe loss of lives due to poor foundation and abutment rock conditions. Therefore a high demand exists for reliable underground mapping technologies in civil engineering in order to track the formation of cavities, sinkholes and any deformation following earthquakes.



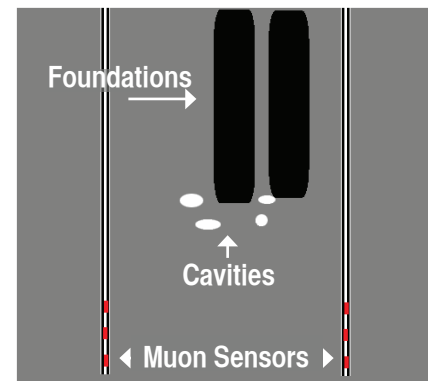
Muon borehole sensors

Lingacom's civil underground foundations imaging relies on cosmic ray muon solutions that perform a non-destructive imaging of underground soil densities and foundations. The concept is based on high-energy cosmic ray muons penetrating the earth. The cosmic ray muons are part of the naturally occurring cosmic radiation and are the highest-penetrating charged particles on earth. The data is collected by dedicated muon borehole detectors.

Our muon detectors can be applied at the following stages as (1) underground borehole sensors for surveying and mapping civil construction sites (2) exploratory boreholes' sensors as a safe guard for monitoring in strategical positions, attached to the abutments at the foundation to scan possible cavities and weaknesses in the rock mass that might affect long term stability of civil constructions (3) boreholes' sensors to image sensitive / critical foundations of civil structures after earthquakes.

### How does it work?

The muons arrive at the earth's surface with energies ranging from less than one GeV to thousands of GeVs. The muons lose energy as they travel through matter, with the energy loss proportional to the transverse mass. A denser object results in larger energy loss and in fewer muons that penetrate through these materials. Mapping the muons arrival rate from different directions by these underground detectors provide a map of the ground weight above the detectors. The data is collected by dedicated muons' detectors inside the boreholes. The collected data is used to perform muon tomography of the foundations and its surrounding soil to localize cavities and denser objects. This solution radically changes the underground mapping that is currently employed.



### Lingacom borehole mapping solution

Lingacom develop and fabricate cylindrically-shaped (PQ) detectors that are based on ionization and electron multiplication in a gas device. Key advantages of Lingacom's detector technology are:

- ❖ Simple production process (PCB based).
- ❖ Low cost.
- ❖ Support high spatial resolution.
- ❖ Not require ongoing gas flow.
- ❖ The gas mixture used is safe and chemically stable.
- ❖ Not sensitive to temperature.

