SAAV for Lateral Deformation

SAAX for Settlement and Heave

SAASCAN for Borehole Deviation

Shape Arrays

A shape array is an advanced inclinometer-like instrument, consisting of a chain of rigid segments connected by flexible joints. The joints are designed to resist twist but allow the segments to tilt in any direction.

Each segment is instrumented with three orthogonally mounted tilt sensors and a microprocessor. The microprocessor calculates the XYZ position of the segment relative to the next segment. The overall "shape" of the array is found by cumulating the XYZ positions of the connected segments.

Initial measurements serve as a baseline. Subsequent measurements, obtained at regular intervals, are compared to the baseline. Changes from the baseline indicate that deformation has occurred and reveal the direction and magnitude of deformation.

Vertical Applications

- Monitoring lateral deformation or displacement of diaphram walls, sheet pile walls, and other earth retention systems.
- Monitoring subsurface movements in landslide areas, highway cuts, and embankments.
- Monitoring convergence in tunnels and other underground openings.

Horizontal Applications

- Monitoring settlement or heave of foundation soil during tunneling or jet grouting operations.
- Monitoring foundations of storage tanks.
- Monitoring settlement of roadways and railroad tracks.
- SAAX have been installed in horizontal boreholes above the path of a TBM, in trenches under roads, railroad tracks and embankments, and under storage tanks.

Deployment

Vertical shape arrays are typically installed into PVC pipe or inclinometer casing that has been installed in boreholes. Because of their extended tilt range, these shape arrays can be installed horizontally or in arcs to monitor tunnel deformation.
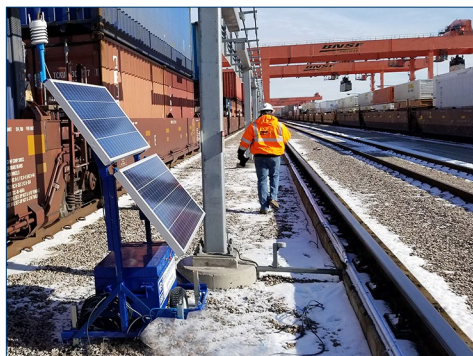
Horizontal shape arrays are typically installed into PVC pipe and embedded in shallow trenches or inserted into cased horizontal boreholes. They can also be fixed to railroad ties and other surface structures. Longer segments help reduce the cost for a given span.

Data acquisition: Both vertical and horizontal shape arrays are connected to wireless loggers. Reading time for a 100 foot array (50 segments) is approximately 10 seconds.

The wireless loggers relay the measurements to the internet for processing and graphical display on GeoCloud websites.

SAAV monitoring landslide remediation

SAAX monitoring track deflection

SAASCAN monitoring borehole deviation

SAAV Specifications

SAAV shape arrays are designed for installation into vertical inclinometer casing or void-forming pipe.

Deployment: Vertical, horizontal, arc.

Segment length: 2 feet, 0.5m, or 0.25m.

Max array length: 600 ft, longer on special order.

Range: +/- 60 deg from vertical.

Resolution: 0.0003 inch per segment.

Precision: +/- 0.02 inch per 100 foot array.

Protective Pipe: 2 to 4 inch ID, also electrical conduit: 1 inch, schd 40.

Temperature rating: -4 to +140 F.

Pressure rating: 290 psi.

SAAX Specifications

SAAX shape arrays are designed for horizontal installation and provide measurements only for the vertical plane (settlement or heave).

Deployment: Horizontal.

Segment length: 1 m.

Max array length: 200m, longer special order.
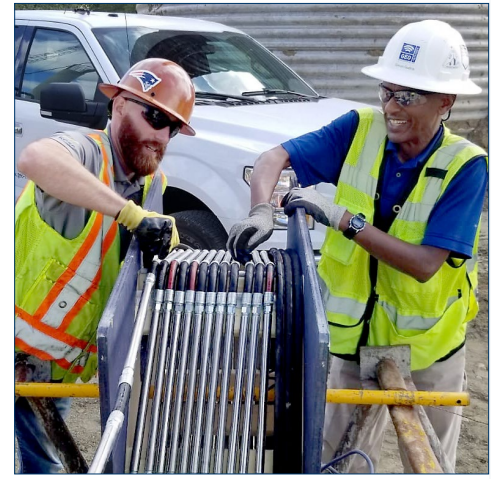
Range: +/- 30 deg from horizontal.

Resolution: 0.012 mm/ m.

Precision: +/- 0.5 mm for 30m array.

Protective Pipe: 2 inch Sch 80.

Temperature rating: -4 to +140 F.

Pressure rating: 290 psi.

SAASCAN Specifications

SAASCAN shape arrays are designed for repeated insertions into drill casing to provide on-site measurements of borehole deviation.

Deployment: Vertical to near horizontal.

Segment length: 0.5m.

Max array length: 50m.

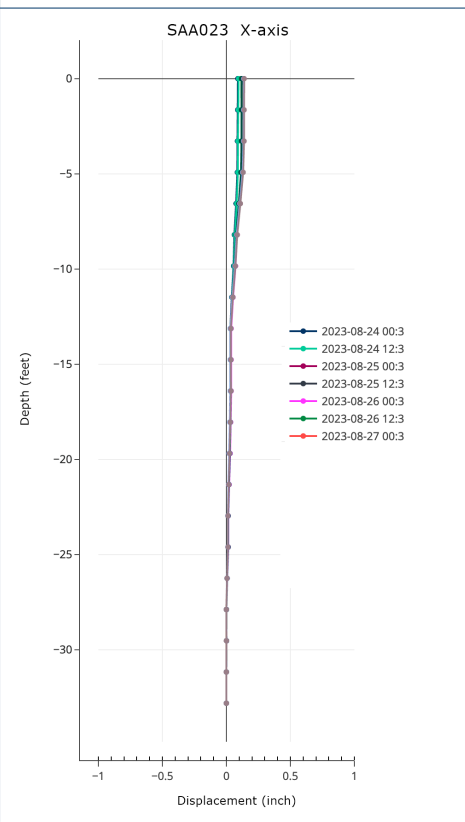**Range:** +/- 60 deg from vertical.

Resolution: 0.012 mm/ m.

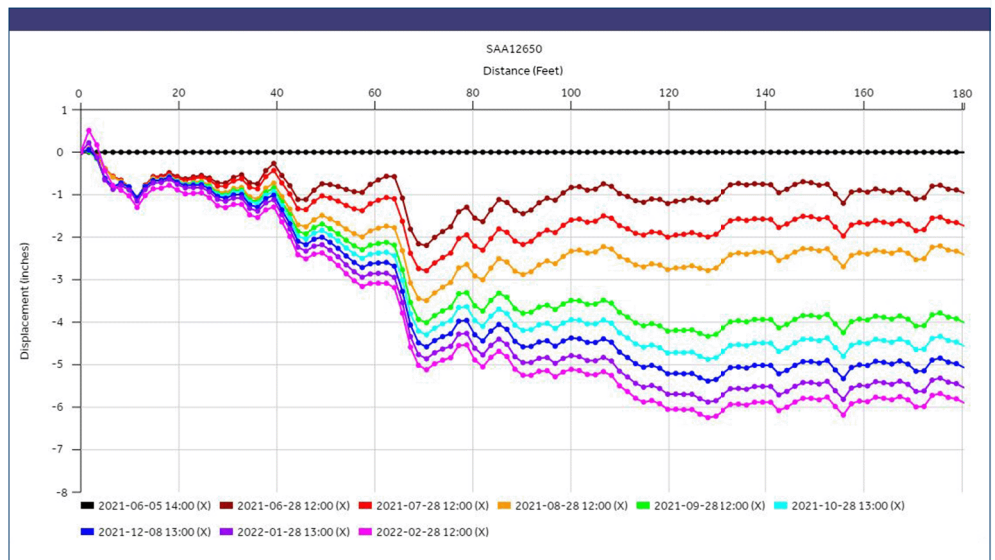**Precision:** +/- 0.05 mm per 30m array.

Protective Pipe: none.

Temperature rating: -4 to +140 F.

Pressure rating: 290 psi.

SAAV displacement profile plot

SAAX settlement profile plot

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