GEOSENSE

Case Study - Earthworks Monitoring

IPI-X - two key measurements, one borehole

Standard sized boreholes (120mm diameter) were drilled relevant to the 70mm inclinometer casing and magnets, the annulus grouted in place - https://www.geosense.co.uk/grout-calculator - datalogged via a digitial node into a position of safety.

PROJECT SUMMARY

NAME: IPI-X Installation, Ireland

YEAR: 2022

INSTRUMENTATION SPECIALIST:
Lloyds Datum Group T/A Datum Monitoring Ireland Ltd

The simple connection is the same as for Geosense IPIs. This 'snaps' in-place bringing a proven and reliable performance. One cable per string.

Cables were protected, trenched and datalogged via a digitial node into a position of safety.

OVERVIEW

An historic operational sewer runs 10m below this development site. The public body that owns the sewer required monitoring throughout the piling stage to alert if ground displacement at the sewer reaches or exceeds a threshold.

This project was the first time the combined instruments had been installed in this country.

The interchangeable sensor design provides many configuration options and the targeting of specific areas of concern/movement/strata.

Consultation at bid stage ensured site-specific configurations were selected and the relevant borehole diameter and depth planned for.

The 400mm extensometer sensor range was beneficial to both installation and expected movements.

Before installation, online training with the site team was undertaken ensured familiarity. This was delivered via an independent I&M expert, sharing installation knowledge, site considerations, and experiences.

MONITORING

IPI-X was selected to provide settlement, heave, and inclination monitoring for full 3D profiling per borehole.

The gateway provided remote data access in common formats;
.csv files
IPI outputs sine of angle converted to degrees
IPX (extensometer instrument) outputs engineering units in metres

The inclinometer and extensometer data sets were graphed separately. This was presented and analysed via the specialist's preferred visualisation platform.

PRODUCTS USED

QJ Inclinometer casing
With three-leaf spider magnets, datum magnet

IPI-X
Combined in-place-inclinometer & automated magnetic extensometer.
(See next page for diagram of IPI-X system components)

Wi-SOS 480
Single Wi-SOS 480 digital node per borehole
Single Wi-SOS 480 gateway (mains powered) at site

LDG Director's comments:

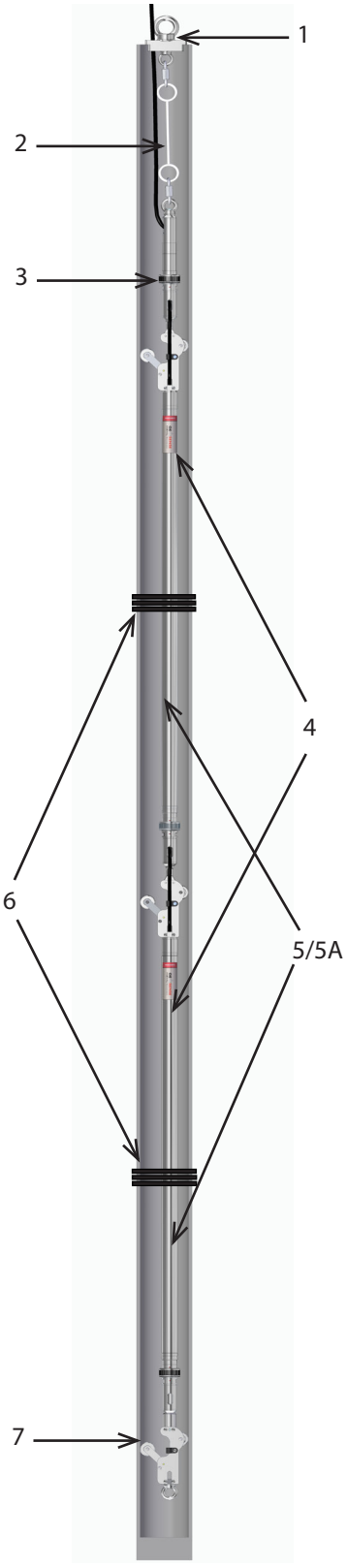
"Each sensor array records at 5min intervals. All information is presented via LDG's presentation suite.

"The results from the sensors have been instrumental in understanding active ground displacements enabling controls to minimise the impact of construction. This included text and email alarms sent to the project design team.

"The sensitivities, accuracies, and near real-time information proved automated measurements to be the best solution for this project."

IPI-X

System Components



SECURITY COVERS

A range of special covers placed over the top of the installation for protection.

1 - TOP HANGER

Used to suspend the complete string. Placed on the top of the 70mm inclinometer casing. Weight 0.3kg

INSTALLATION FORK

Used to support the string during installation. It fits into two slots on top of the IPI sensor and is placed on top of the inclinometer casing.

2 - WIRE HANGER EXTENSION

A 3mm wire suspension rope used to position the first sensor at the required depth and is connected to the top collar hanger and the IPI top fly lead assembly. Available either as pre-assembled lengths (1, 2, 3, 4m) or supplied as site adjustable. Weight 0.05kg/m

3 - IPI TOP FLY LEAD ASSEMBLY

A universal component which acts as top suspension adaptor and cable connector. Fitted as standard with 4.5m of digital BUS cable for connection to a readout or data logger. Other cable lengths available on request. Weight 0.5kg

4 - IN-PLACE INCLINOMETER PROBE

Instrument fitted with two (Biaxial) MEMS sensors. It is mounted within a watertight stainless steel tube fitted with two wheel sets that run in the internal grooves of inclinometer casing. One set has a fixed wheel and the other is sprung loaded. The output from the sensors is digital RS-485 BUS so that several IPIs can be connected together on one single cable. Weight 1.3kg

5 - EXTENSION ROD

Used to connect each IPI sensor together to create a full tilt profile.
Specially designed quick connecting fittings on each end, together with an integral internal signal cable. Available in 0.5, 1, 1.5, 2, 2.5m lengths. (Special lengths are available on request).
Weights: 0.5m - 0.75kg; 1m - 1kg; 1.5m - 1.45kg; 2m - 1.9kg; 2.5m - 2.35kg

5A - EXTENSION ROD WITH SETTLEMENT SENSOR

Extension Rod with internal Positional Sensor to create a full settlement profile.

6 - MAGNETIC TARGETS

Attached to the outside of the casing to measure vertical displacement.

7 - BOTTOM WHEEL/TERMINATION ASSEMBLY

Fitted with a rigid joint, the bottom wheel assembly acts as the base reference from which all other readings are taken. It is fitted with an integral end termination resistor which is required at the end of the RS-485 string. Fitted with an eye bolt for support rope. Weight 0.5kg.