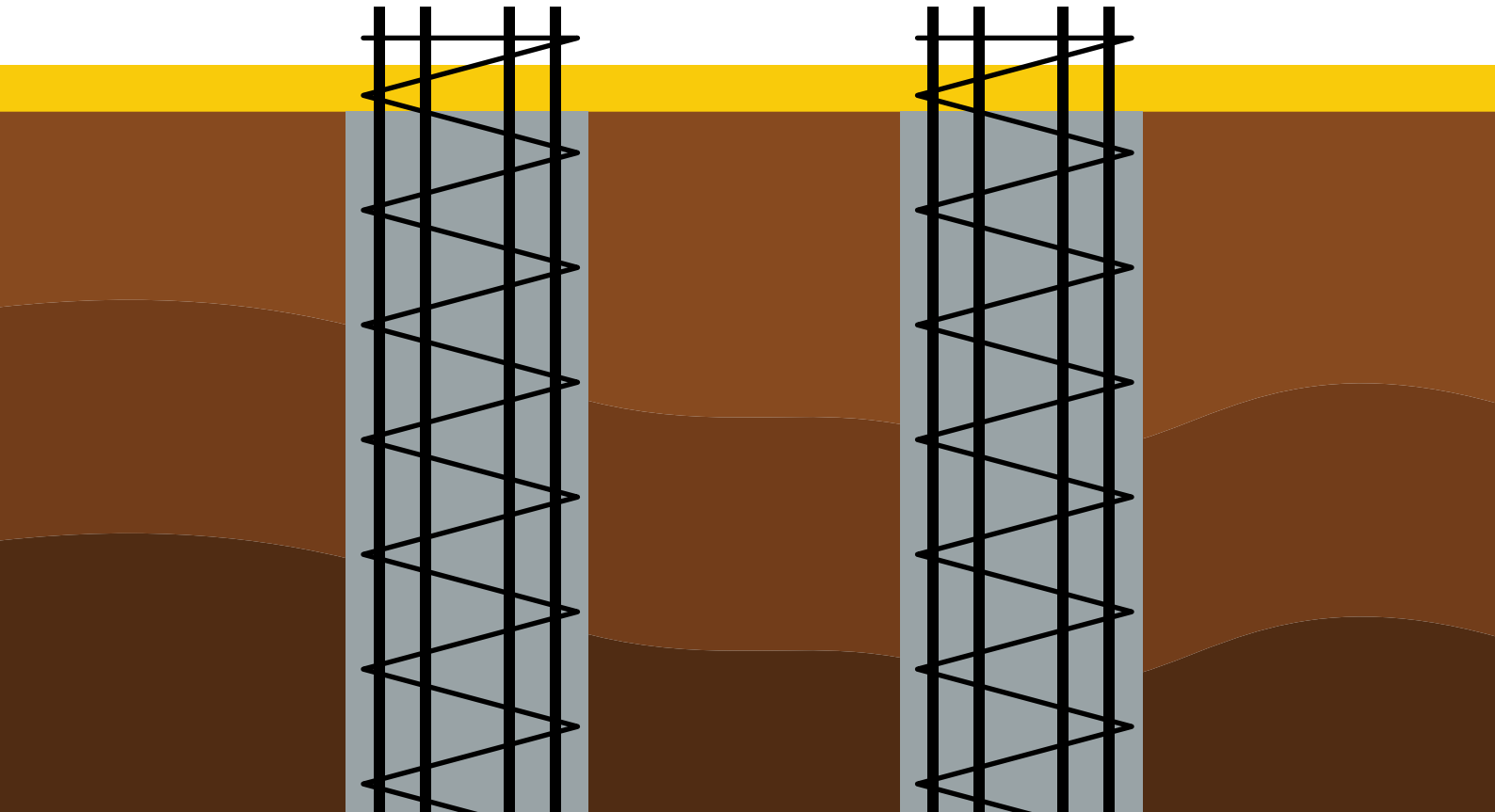
APPLICATION NOTE

Foundation Piles Monitoring



Introduction

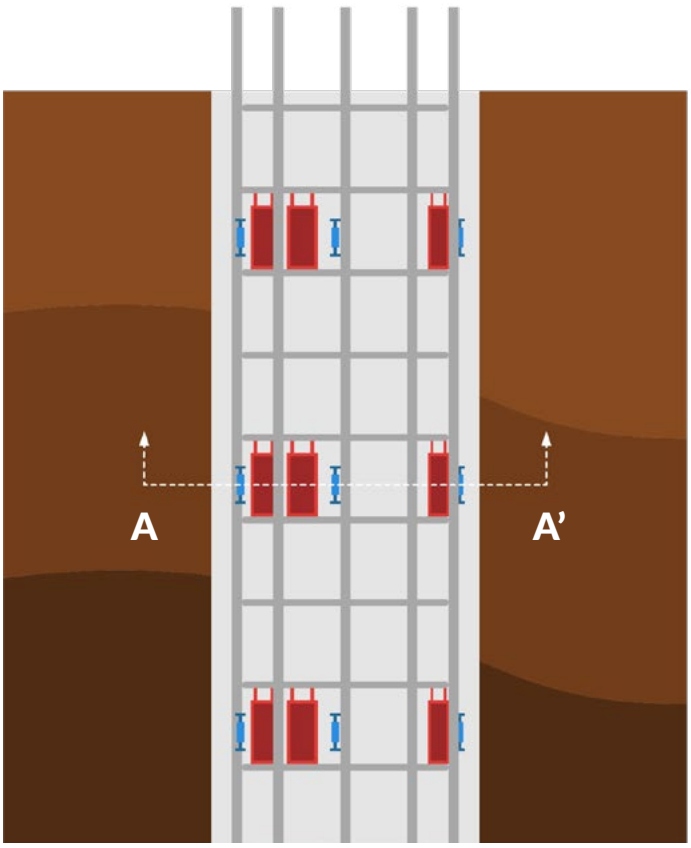
The monitoring of the foundation piles is necessary to control their **behaviour over time** and their quality, which it is gotten from the **ground characteristics** and from the **execution techniques**.
For this type of monitoring, it is sufficient to install the **embedment strain gauges**, fixed to the reinforcement or embedded in the cement. Using this method the **load** is monitored at different depths, at each one, 2 to 4 embedment strain gauges are installed, depending on the diameter of the pile.

The **data** from the embedment strain gauges is acquired during all the phases of the project: in the **load test** (if scheduled), in the **construction** (bridge, building, etc.) and in the **operation phase** of the structure.

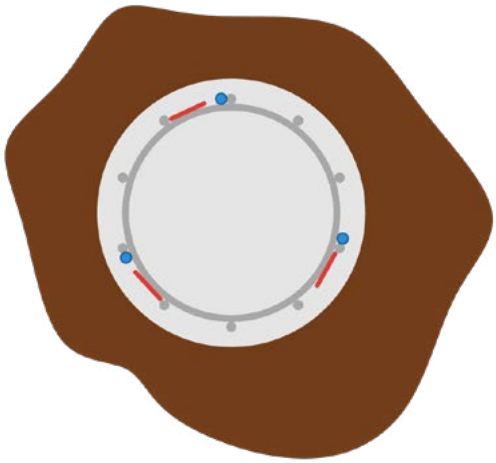
For a more in-depth control of the piles, it is possible to use the **pressure cells**, controlling at different depths the load exerted between the ground and the pile.

For a **load test**, in addition to the strain gauge rods and pressure cells, it is possible to equip the pile with a **multipoint borehole extensometer** or a **chain of fixed depth extrude meter**, to control the distance from the pile head to different depths.
Besides **load cells** can be used to control the load exerted during the test and **displacement sensors** to control settlements. These same instruments can be used for a **pile extraction test**.

For a **lateral load test**, it is necessary to use also **inclinometers**: inside the pile is inserted an inclinometer casing, equipped with a chain of fixed depth inclinometers or with a traditional inclinometric system.



Section AA'



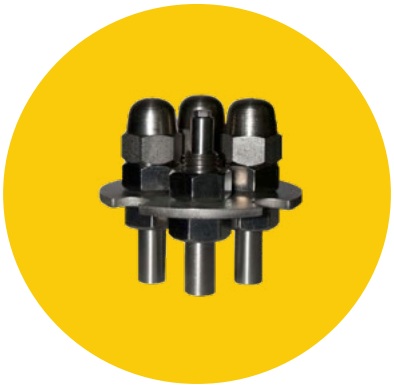
Our solutions

SIM STRUMENTI provides all the necessary facilities for the monitoring (**sensors**, **data acquisition units**, **modem**, **cables**, etc...) as well as **personal assistance on-site or by phone** if needed, during the entire project and monitoring process. In this way, the professional will be able to evaluate the available instrumentation and the data over time.

Monitoring systems can be **manual** or **automatic** and **centralized** or **decentralized**. They can be equipped with **alarm systems** both local and distant. Moreover the acquired data can be sent via **FTP** to a server.

Topic	Instrumentation
Measurement of the variation of the distance between the pile head and a specific depth	Joint meter **DS810** + Multipoint borehole extensometer **DS830**
Control of settlement between the pile head and a reference beam	Joint meter **DS811**
Measurement of the load (deformation) at different depths	Embedment strain gauges **LC220**
Measurement of the pressure between the pile and the surrounding ground	Pressure cells **PR310**
Measurement of the load exerted on the pile	Load cells **LC255**

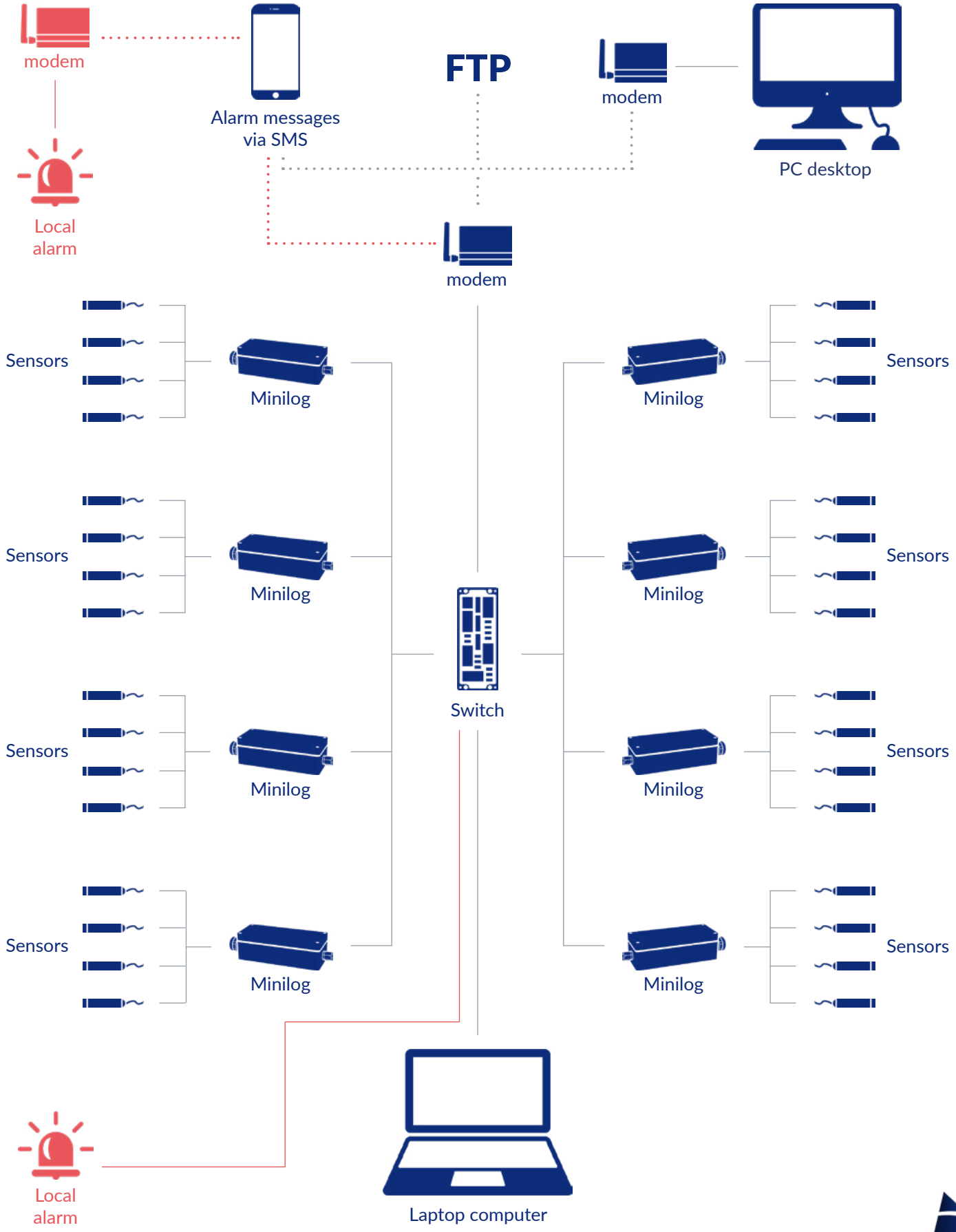
Embedment strain gauge
LC220



Multipoint borehole extensometer
DS830

Pressure cell
PR310

Monitoring system



Case study: Gindi Sitonai Market 2

Description

In the “Gindi Sitonai Market 2” (Tel Aviv, Israel) residential complex, consisting of 49 floors and 160 meters high, **ten piles** are monitored with **embedment strain gauges**.

The purpose of this monitoring was to keep the load under control during both the **construction** and **operation phases**.

Case study: Silos for cement

Description

In a silos for cement built on a **platform resting on piles**, due to the **silos load** and the **ground composition**, it was necessary to control not only the **load exerted at various depths on the piles** (with embedment strain gauges), but also the **support of the platform on the piles** (with load cells and displacement sensors).

Since that the silos was loaded and emptied several times a day and that the **piles and platform settlement were differently**, it was necessary to keep the system under **control** for **7 years** until everything was stabilized.

Case study: Azrieli Center

Description

For the three skyscrapers construction (187 meters, 49 floors) of the Azrieli complex in Tel Aviv (Israel), a 2000-ton **load test** was carried out on a **2000 pole to destruction** with a depth of 40 meters.

Installed instrumentation

Embedment strain gauges - LC220

For **load** measurement at different depths. 4 units every 5mt.

Multipoint borehole extensometers - DS830

For the variation of the distance between the pile head and a specific depth. Anchoring every 5mt.

Joint meter - DS810

For the control of the **multipoint borehole extensometers**. 10 units.

Joint meter - DS811

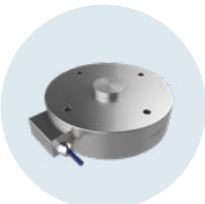
For the control of **settlement** between the pile head and a reference beam.

Radial pressure cells - PR310

For the measurement of the pressure between the pile and the surrounding ground.

Pressure cell at the bottom of the pile - PR310

For the control of **vertical settlements**.



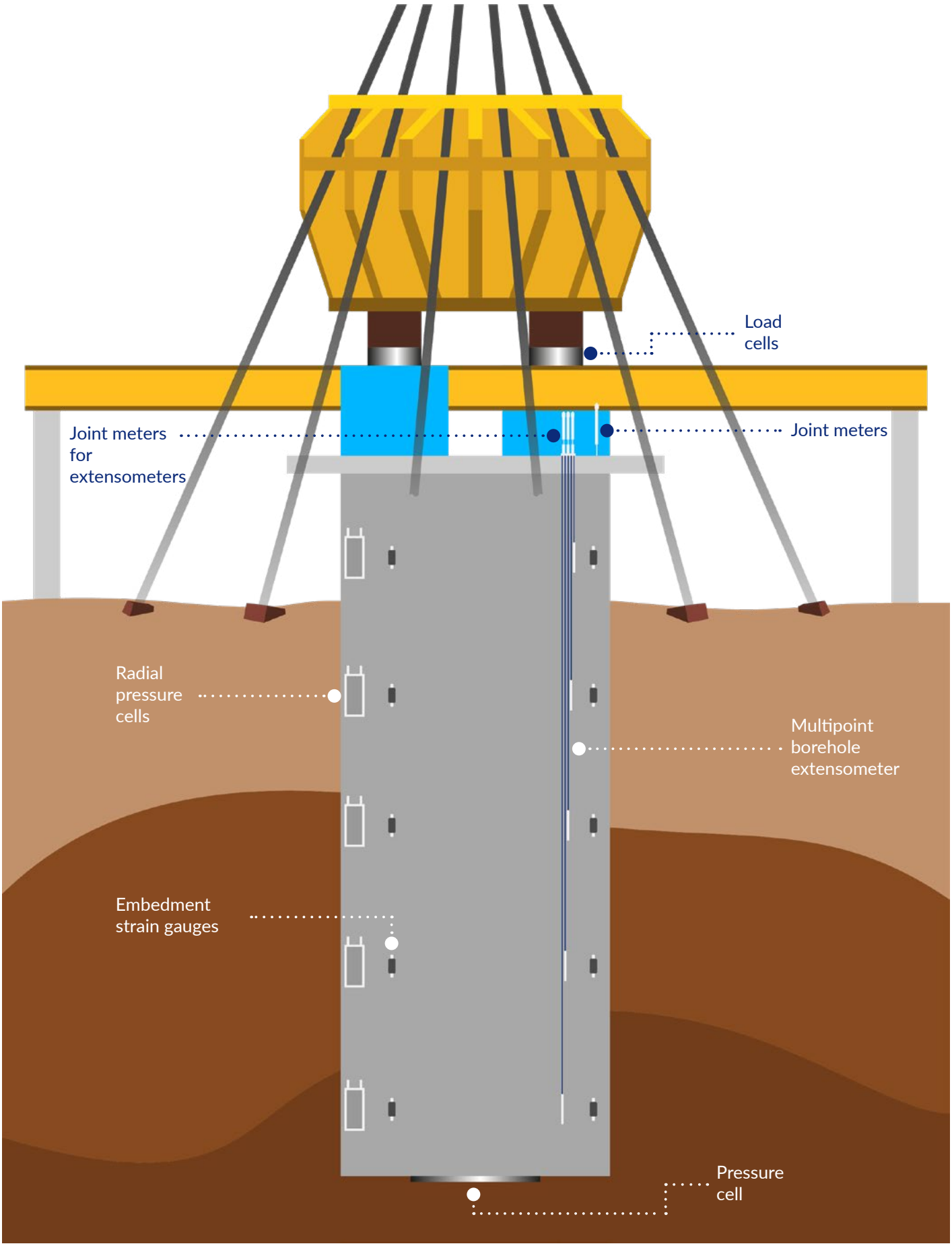
Load cells - LC255

Measurement of the **load** exerted on the pile.

Data acquisition unit - MINILOG

For the **Data** control.
Links:
- via USB cable
- via modem GSM / GPRS

Explanatory board



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