SISGEO®

— BRIDGES AND VIADUCTS MONITORING

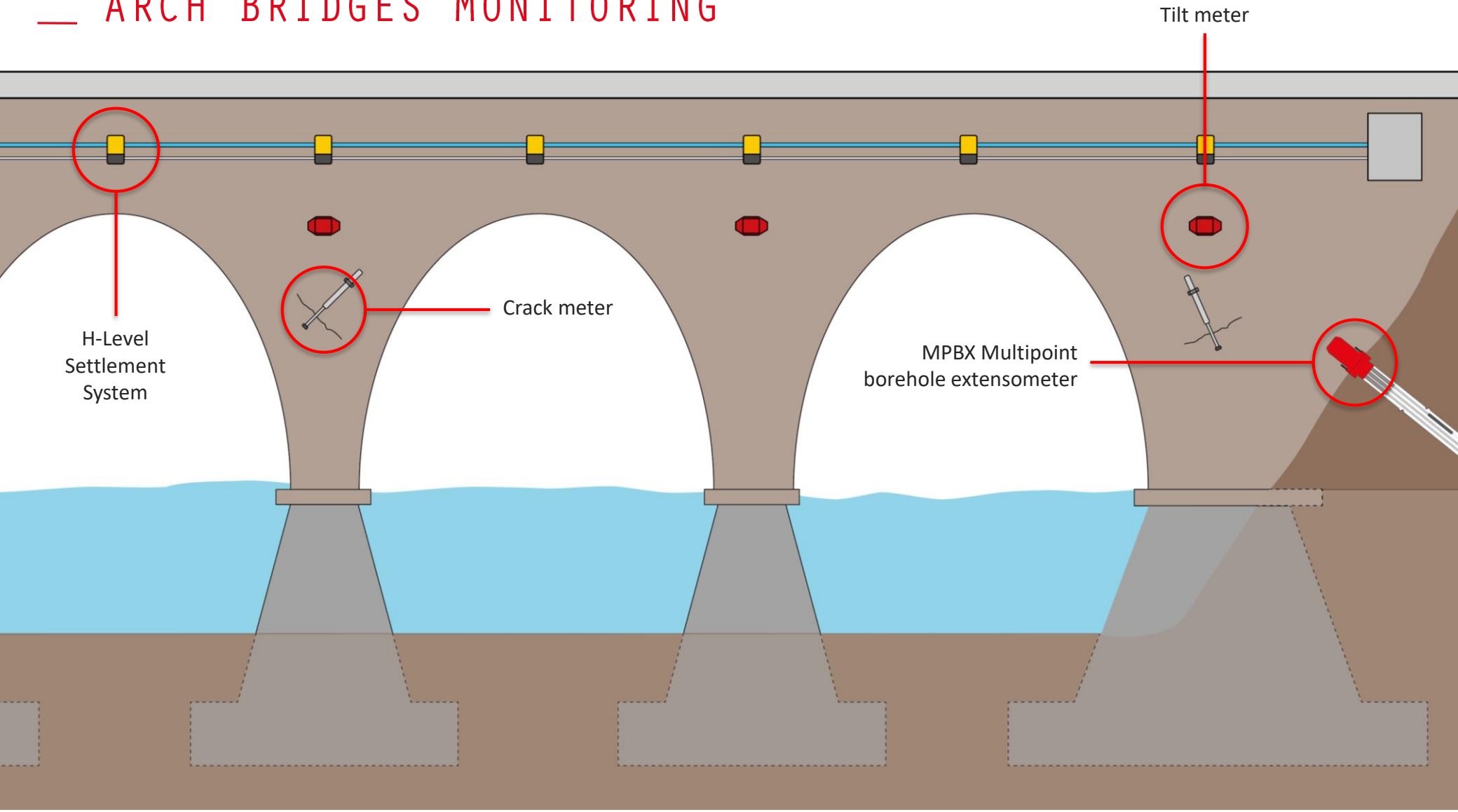
GIOVANNI CALONI M.Sc.Eng.

INDEX

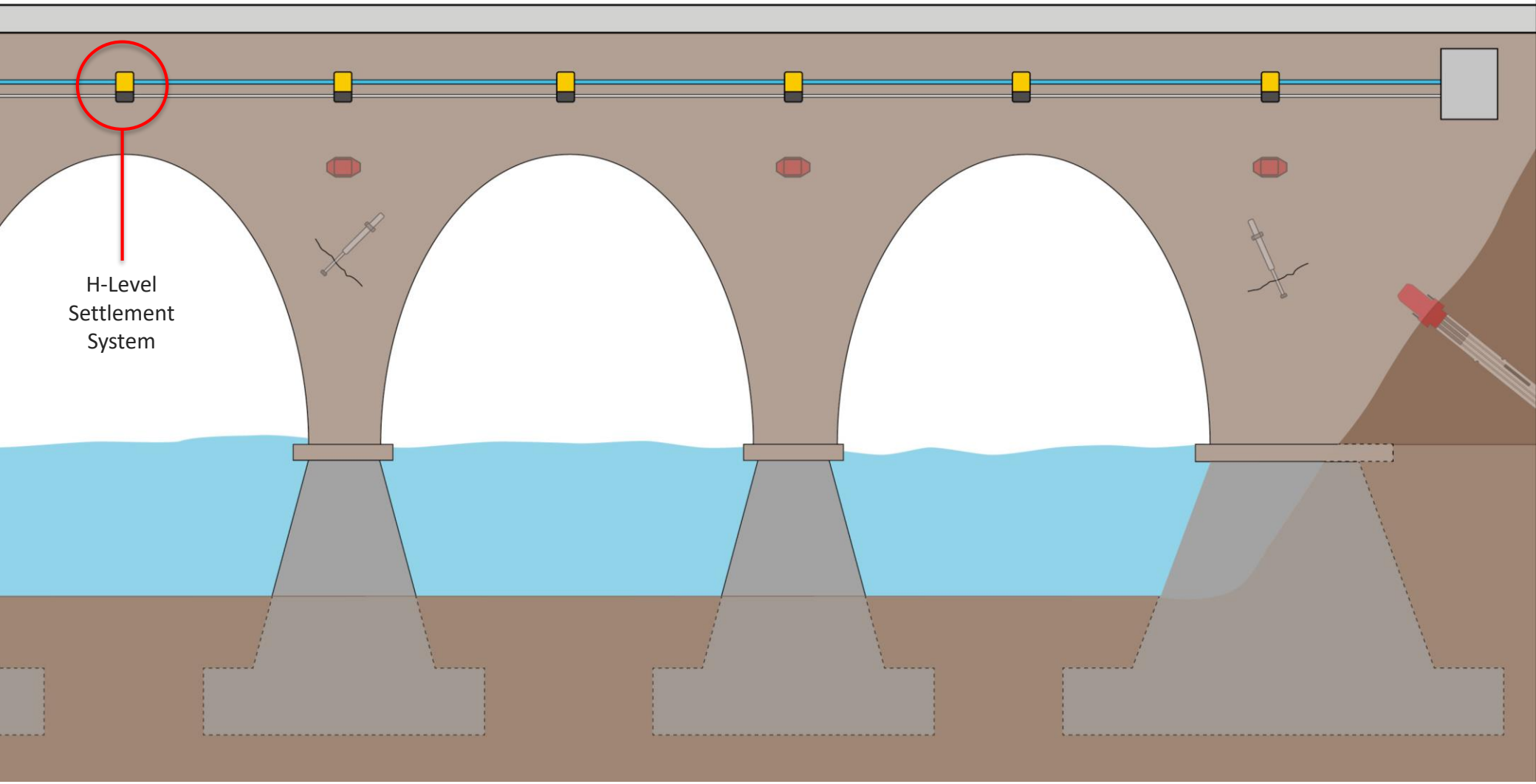
ARCH BRIDGES

SISGEO

ARCH BRIDGES MONITORING



H-LEVEL LIQUID LEVEL SYSTEM



H-LEVEL LIQUID LEVEL SYSTEM

AIM:

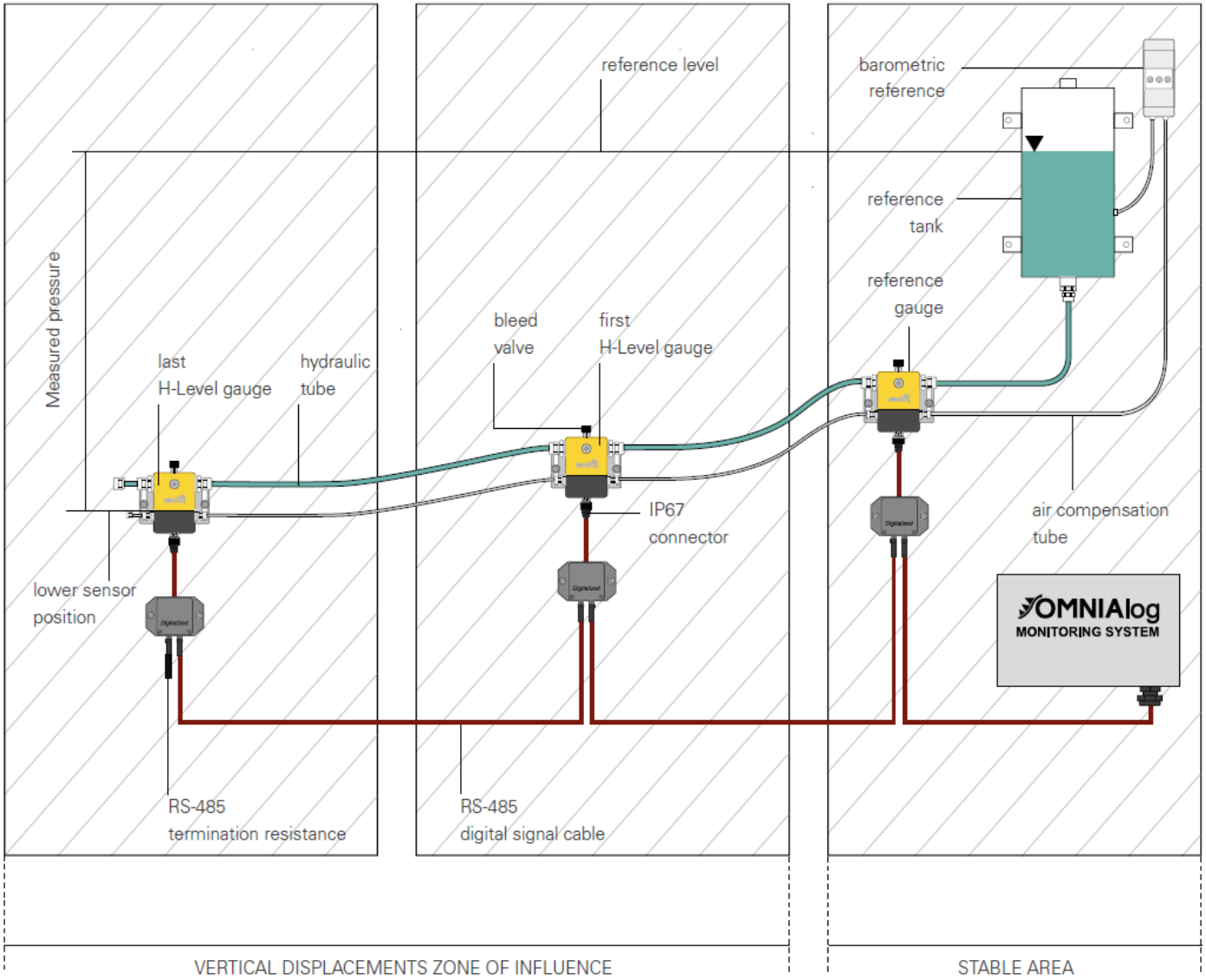
Monitor deck or pillar settlement

INSTALLATION:

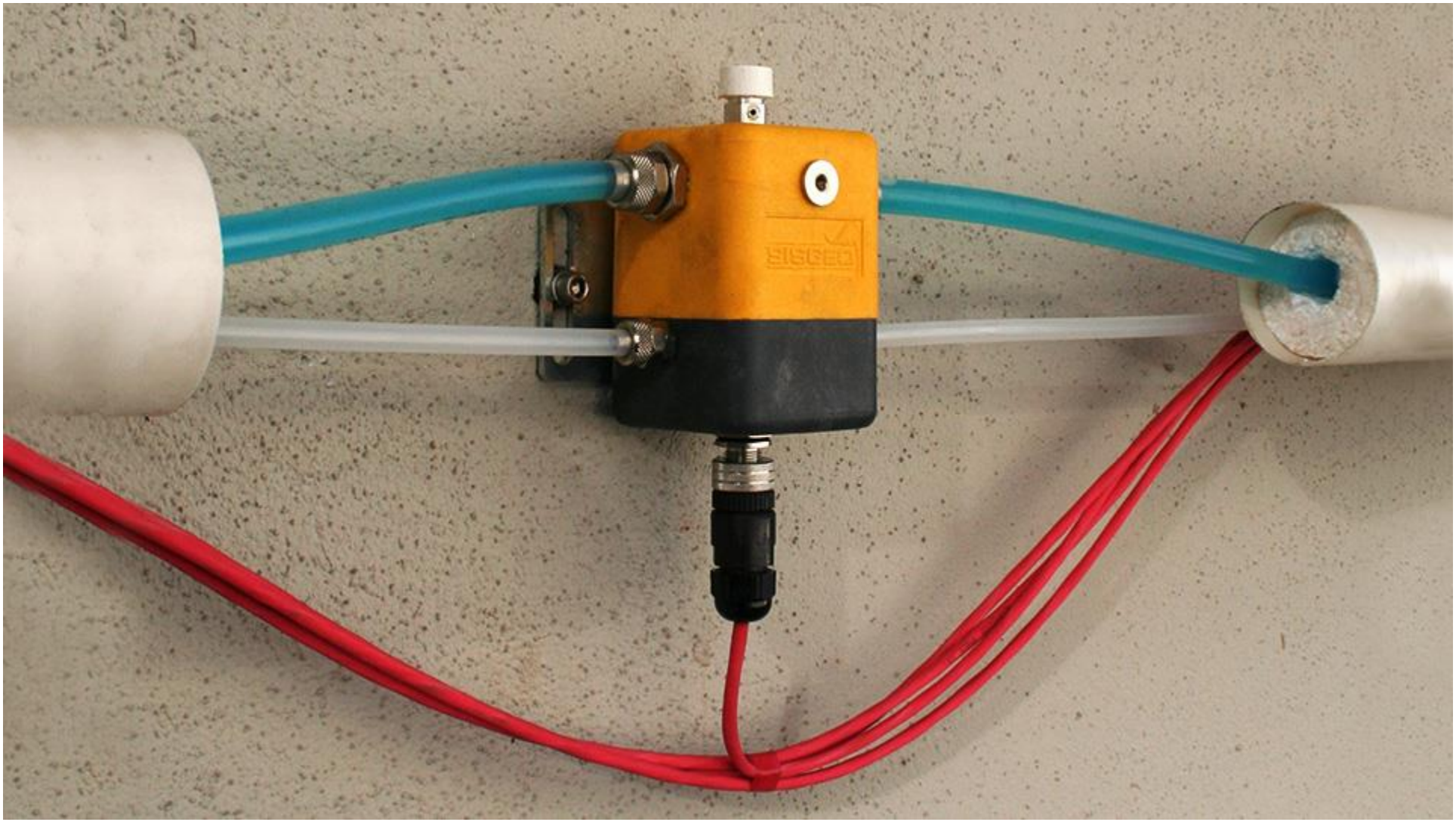
- Construction

- Rehabilitation

H-LEVEL SYSTEM – WORKING PRINCIPLE

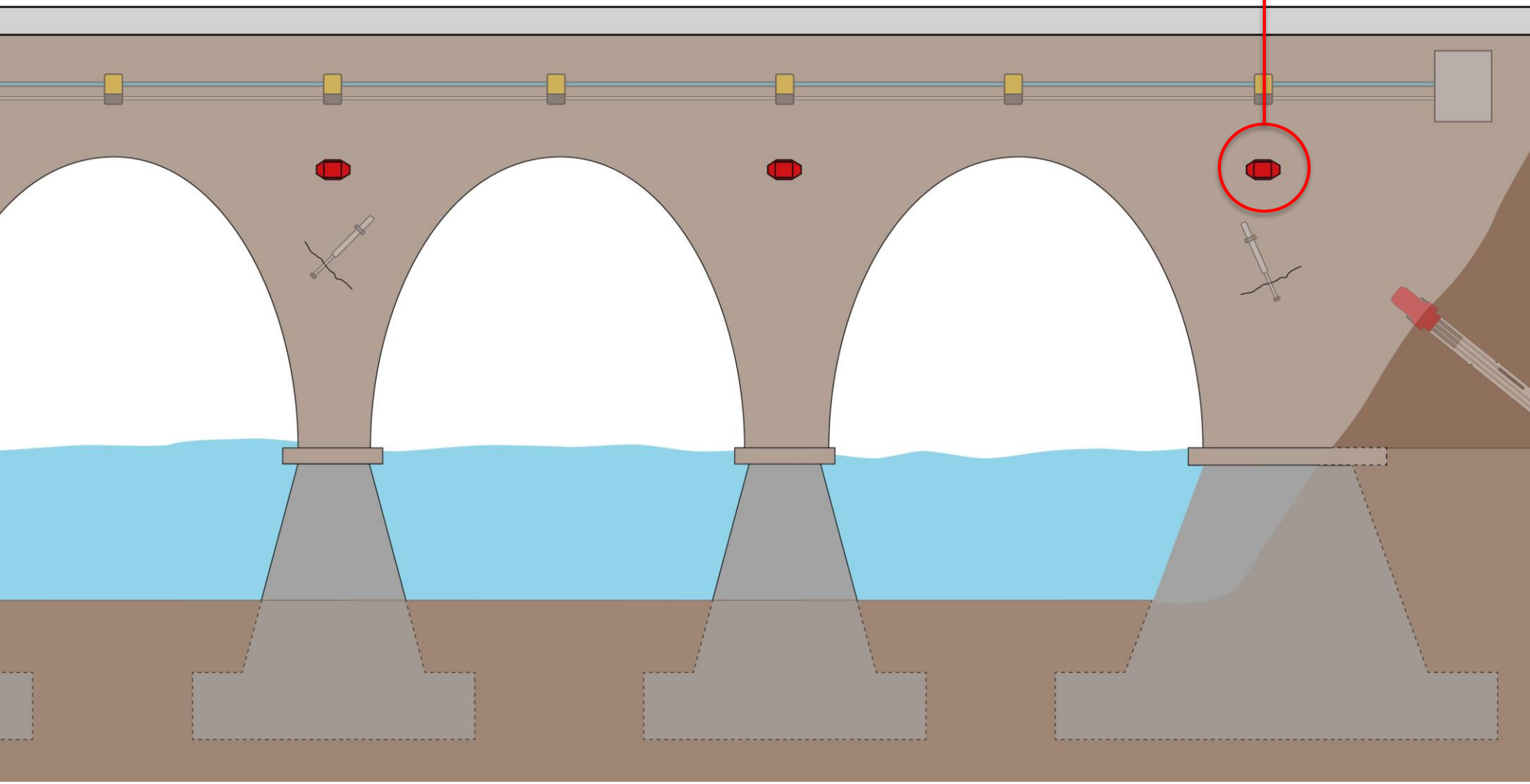


H-LEVEL LIQUID LEVEL SYSTEM



H-LEVEL GAUGE AND TILT METER INSTALLED INSIDE DECK

BIAXIAL TILT METERS



BIAXIAL TILT METERS

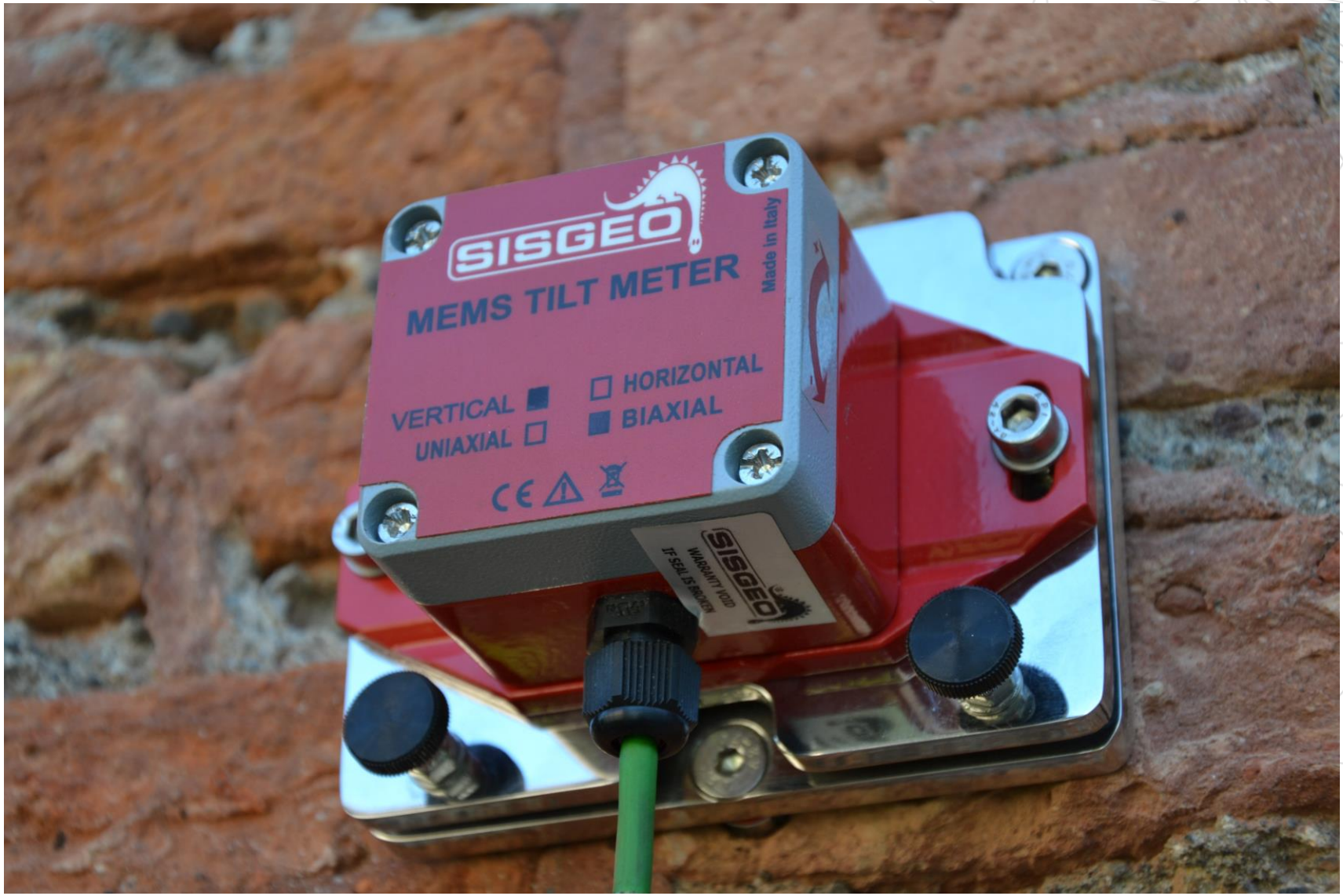
AIM:

monitor the inclination in X and Y directions of deck or pillar.

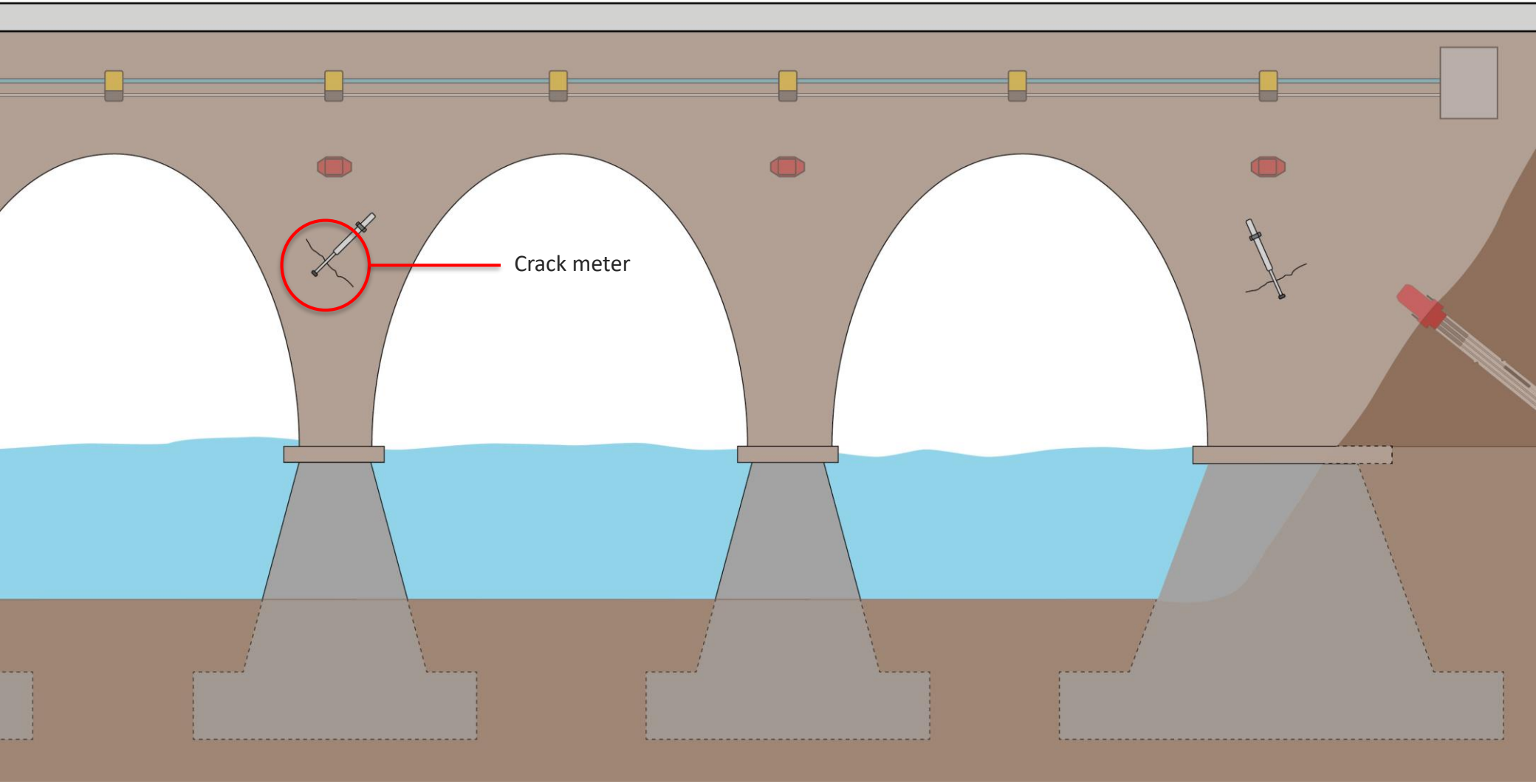
INSTALLATION:

- **Construction**
- **Rehabilitation**

BIAXIAL TILT METER WITH ADJUSTABLE PLATE



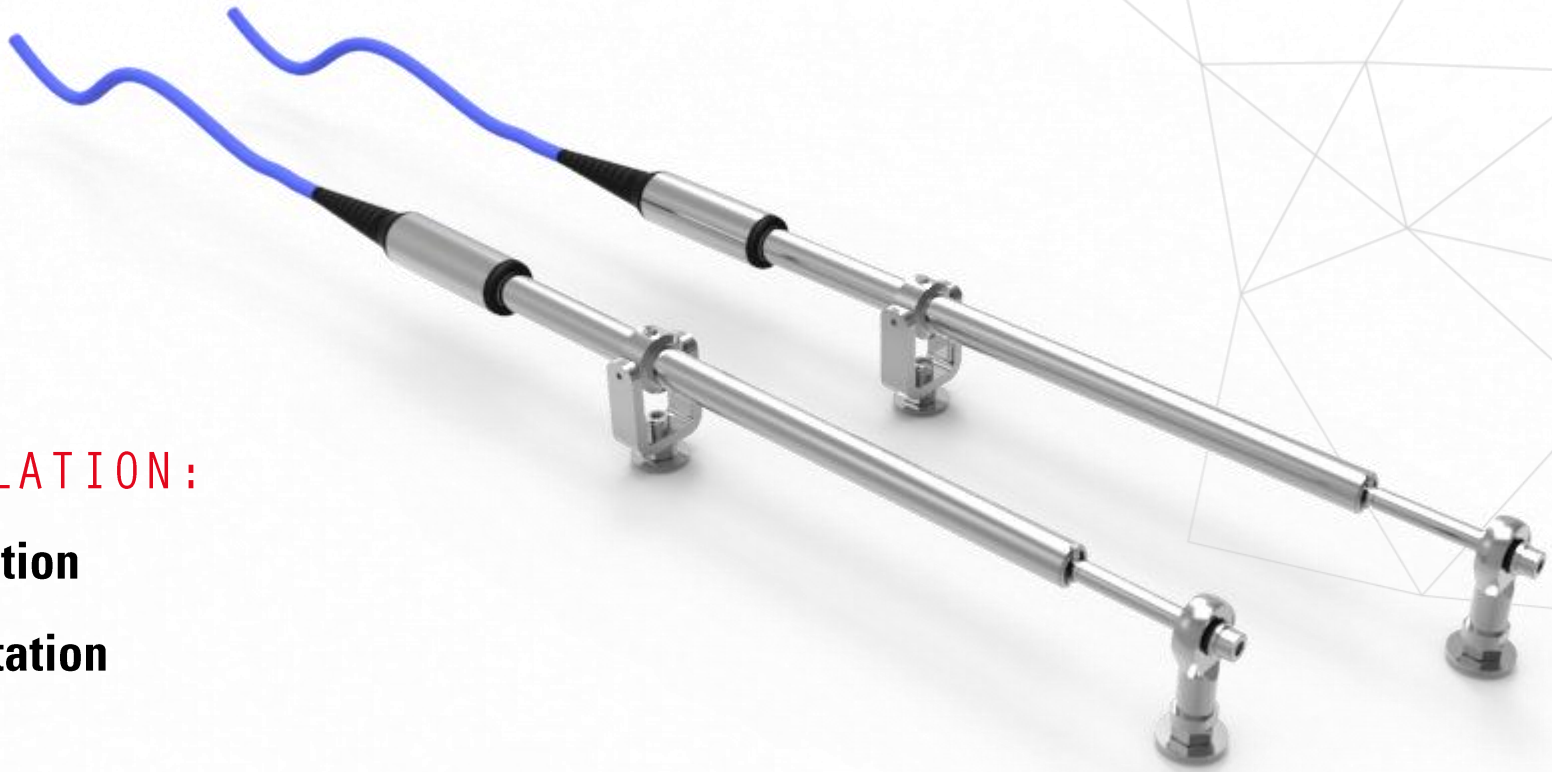
CRACK METERS



CRACK METERS

AIM:

monitor cracks on pillar or other structural parts

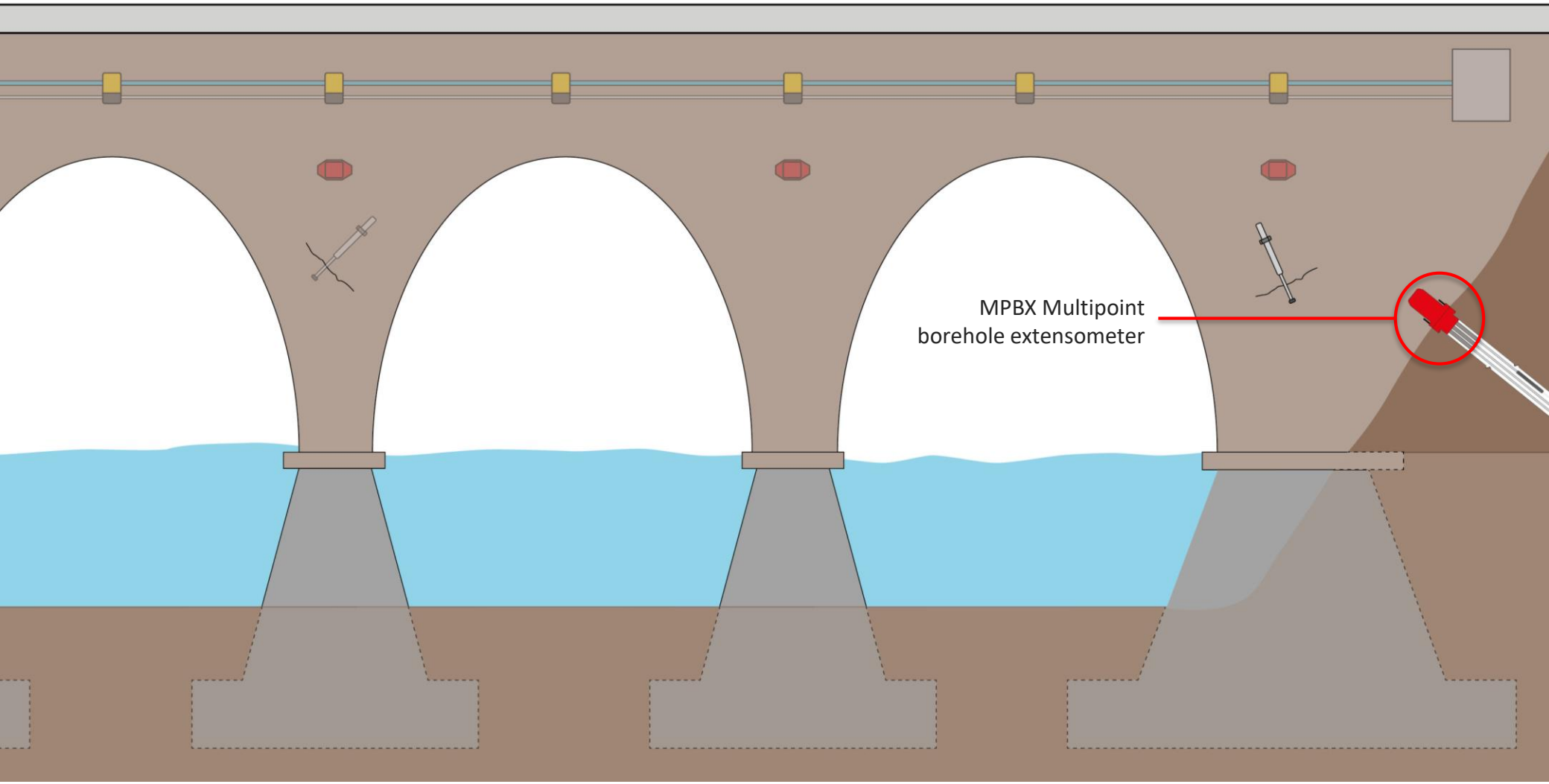


INSTALLATION:

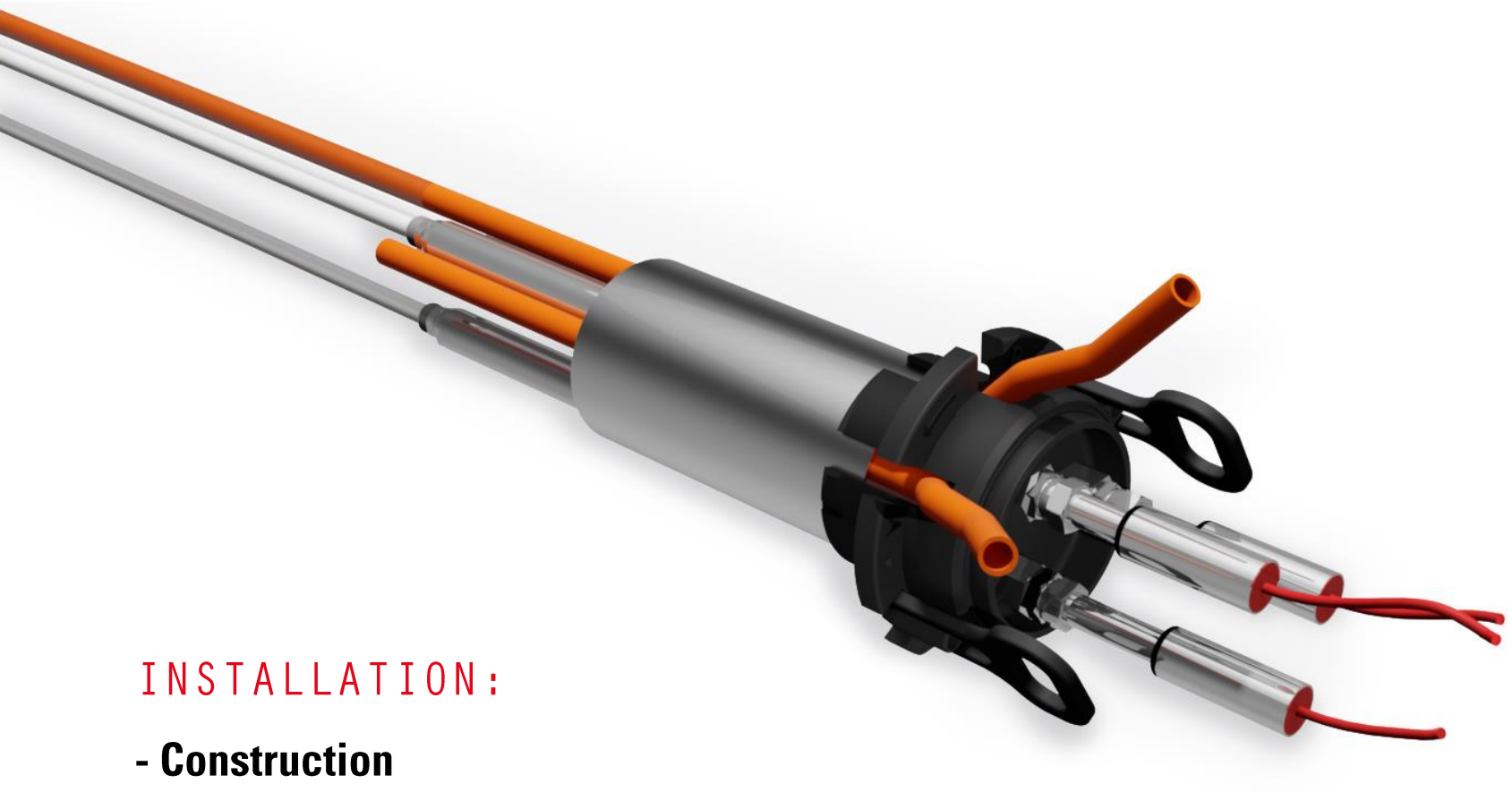
- **Construction**
- **Rehabilitation**

CRACK METER

MPBX MULTIPOINT BOREHOLE EXTENSOMETERS



MPBX MULTIPOINT BOREHOLE EXTENSOMETER



INSTALLATION:

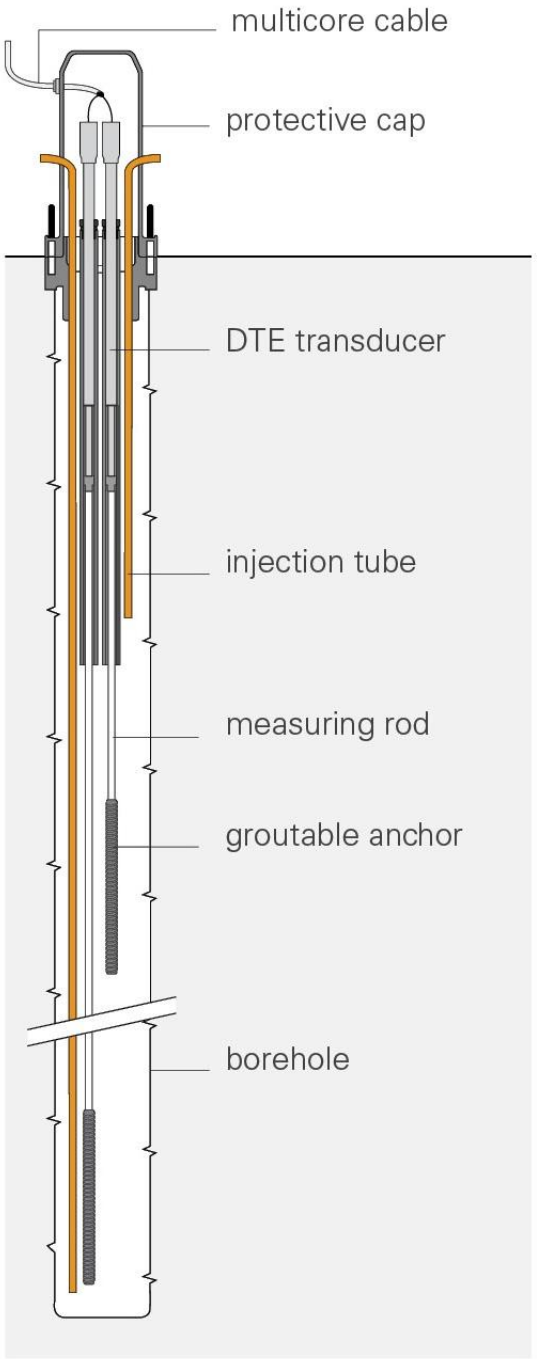
- **Construction**
- **Rehabilitation**

MPBX MULTIPOINT BOREHOLE EXTENSOMETERS

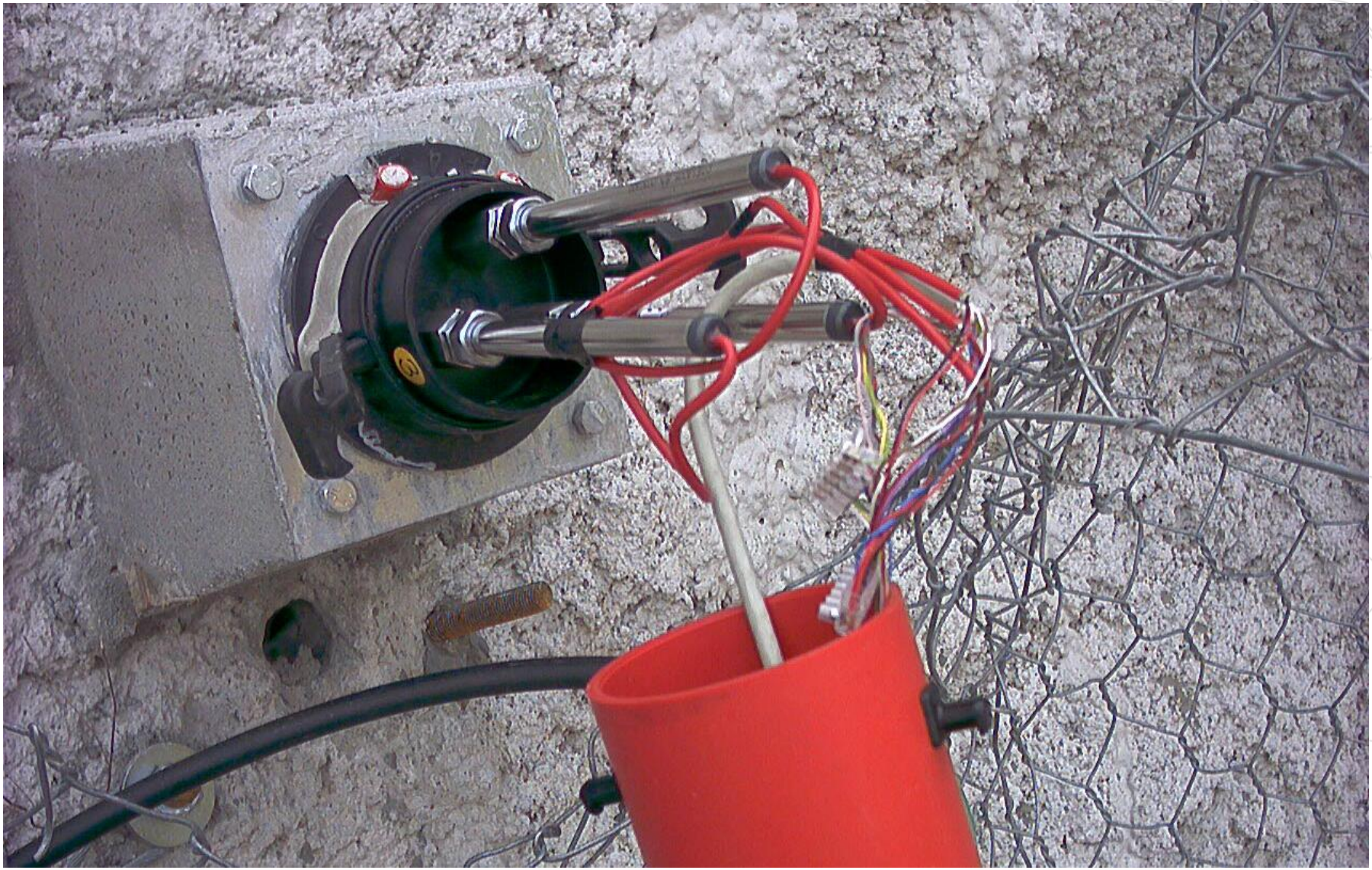
Aim: monitor ground/rock displacements in the abutments

Available with:

- ***groutable or packer anchors***
- ***vibrating wire or potentiometric displacement transducers***
- ***fiber glass or stainless steel rods***



MPBX MULTIPOINT BOREHOLE EXTENSOMETERS



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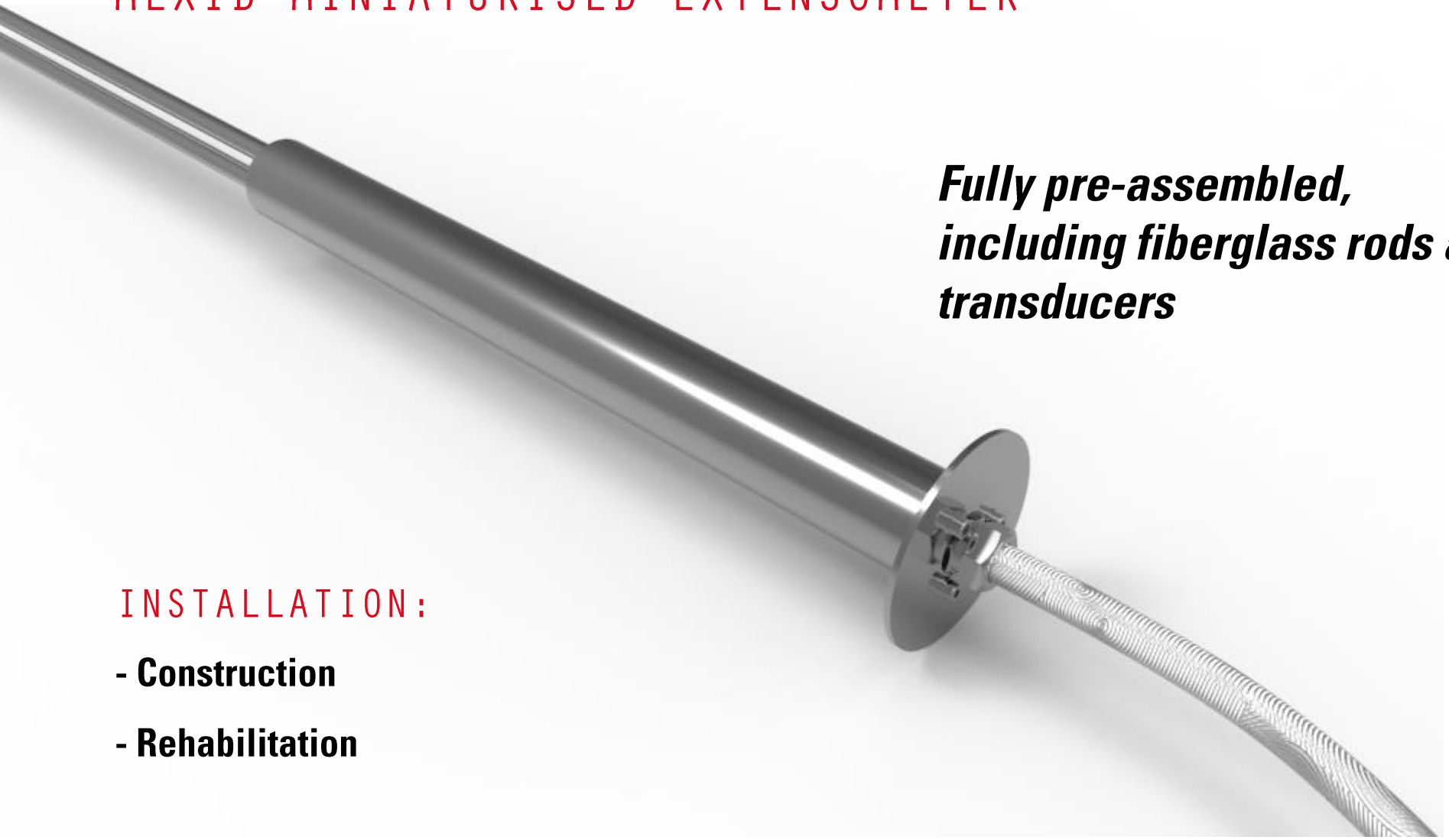
ALTERNATIVE TO MPBX:
MEXID MINIATURISED EXTENSOMETER

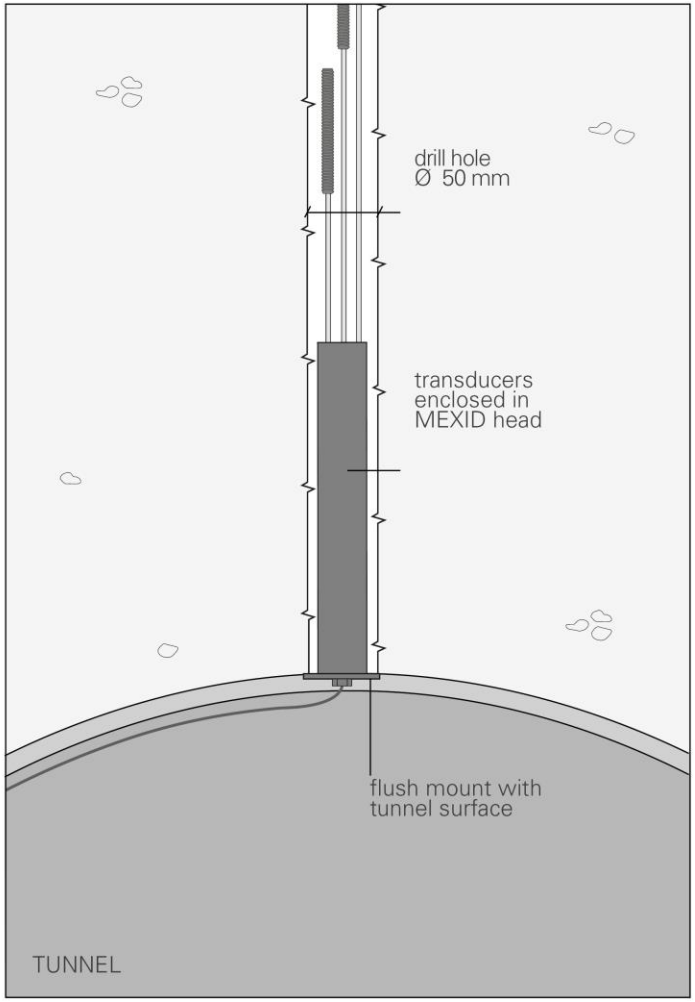


Fully pre-assembled, including fiberglass rods and transducers

INSTALLATION:

- **Construction**
- **Rehabilitation**

COMPARISON MEXID VS MPBX

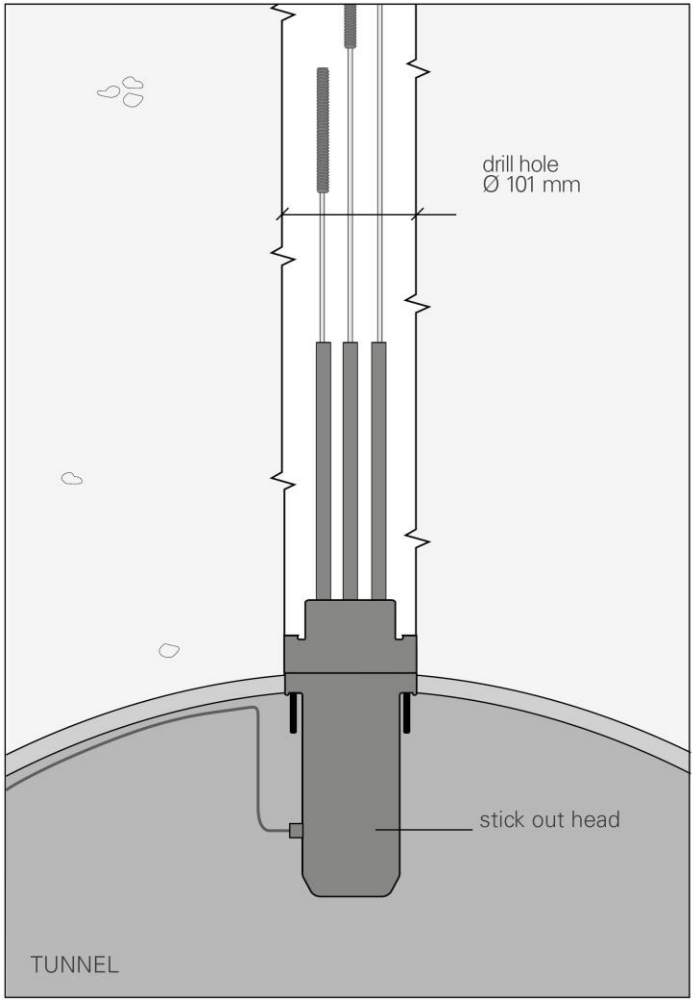


MEXID

Required drill hole: Ø 50 mm (2"), Ø 75 mm (3") first meter

Flush mount maximizes clearance

Enclosed transducers



MPBX MULTIPOINT BOREHOLE EXTNSOMETER

Required drill hole: Ø 101 mm (4"), Ø140 mm (5.5") first meter

Stick out reduces clearance up to 510 mm

Transducers installed at site

MEXID MINIATURISED EXTENSOMETER

TRUSS BRIDGES

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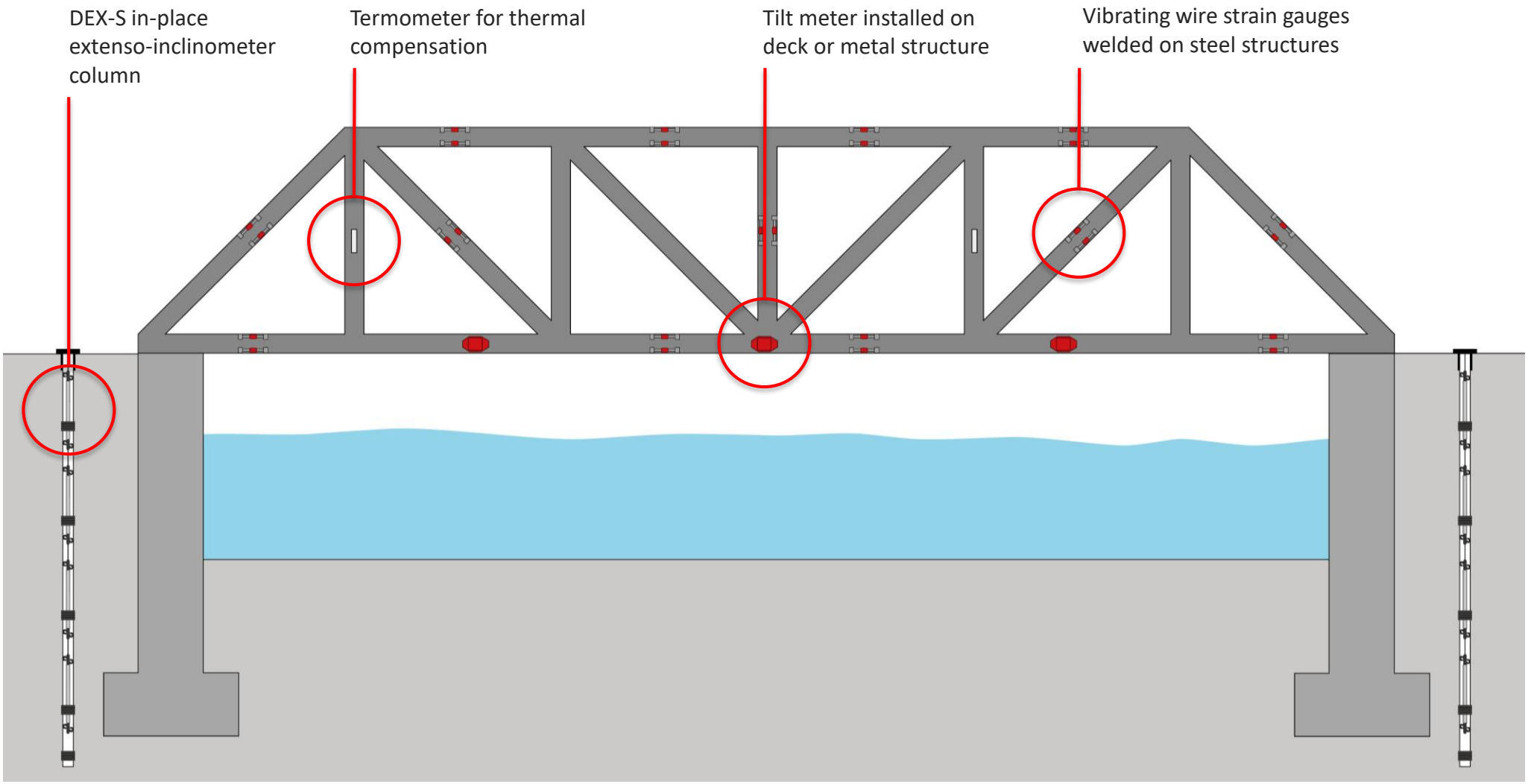
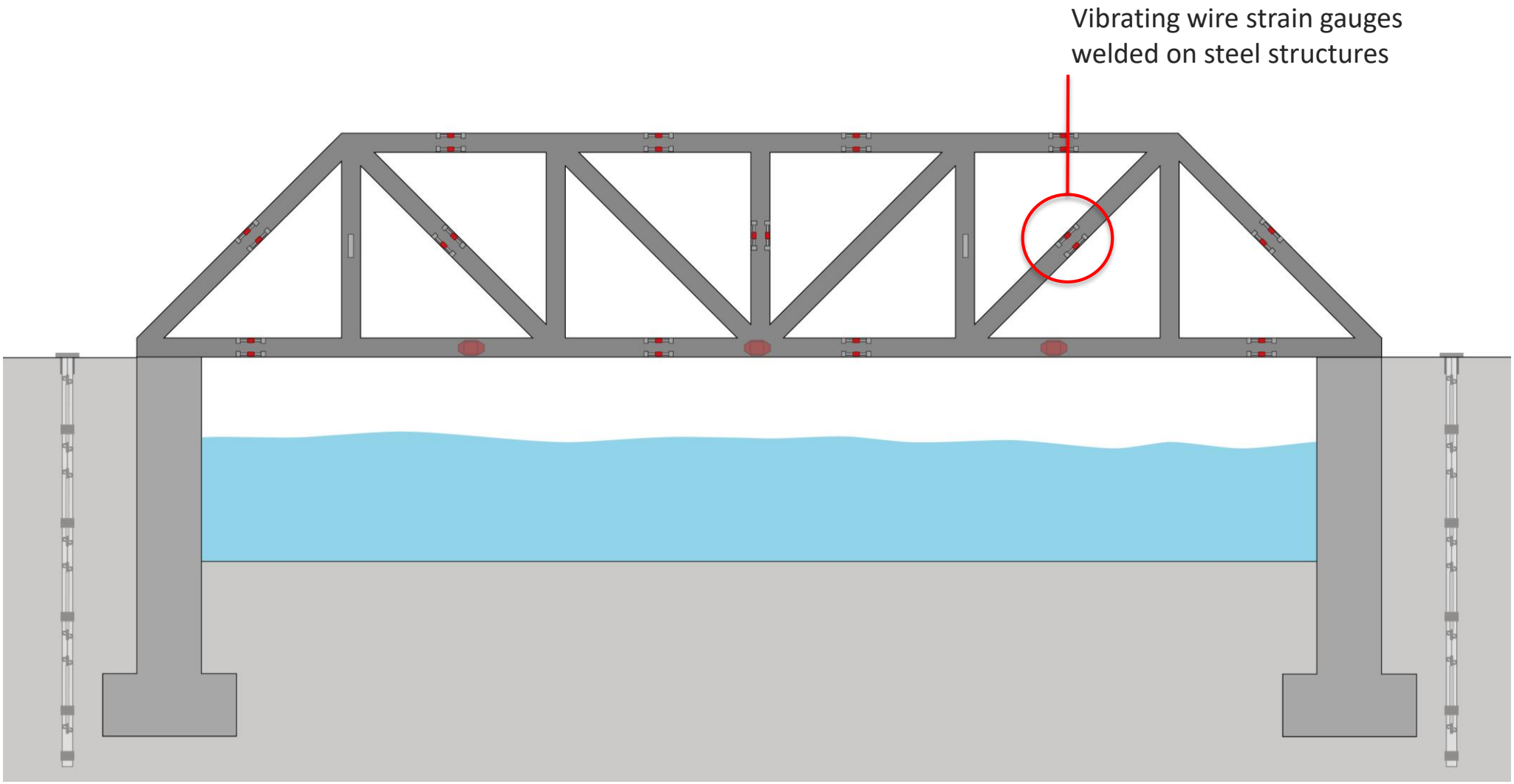
TYPICAL TRUSS METAL BRIDGE MONITORING



VIBRATING WIRE STRAIN GAUGES



VIBRATING WIRE STRAIN GAUGES

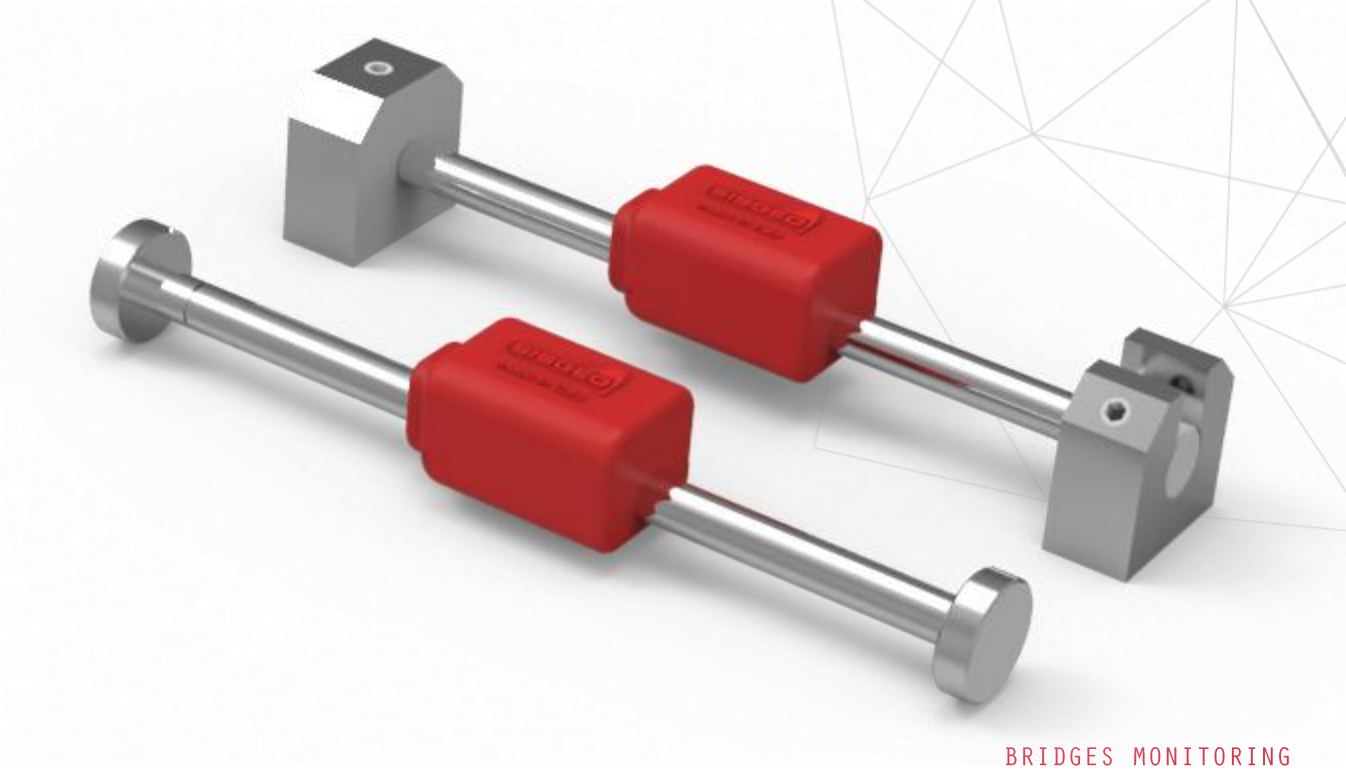
AIM:

monitor stress on metal structure

INSTALLATION:

- Construction

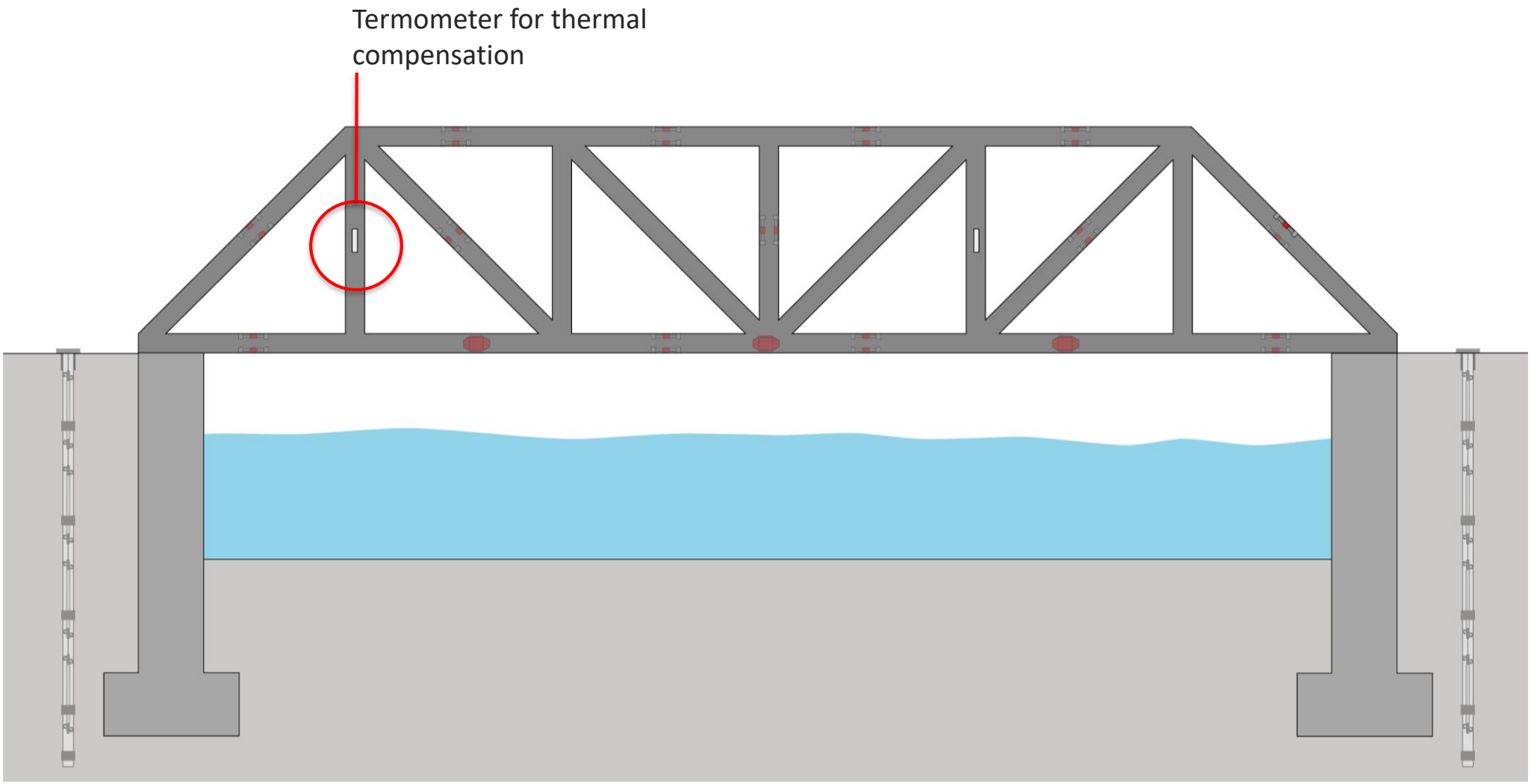
- Rehabilitation



VIBRATING WIRE STRAIN GAUGES

VIBRATING WIRE STRAIN GAUGES

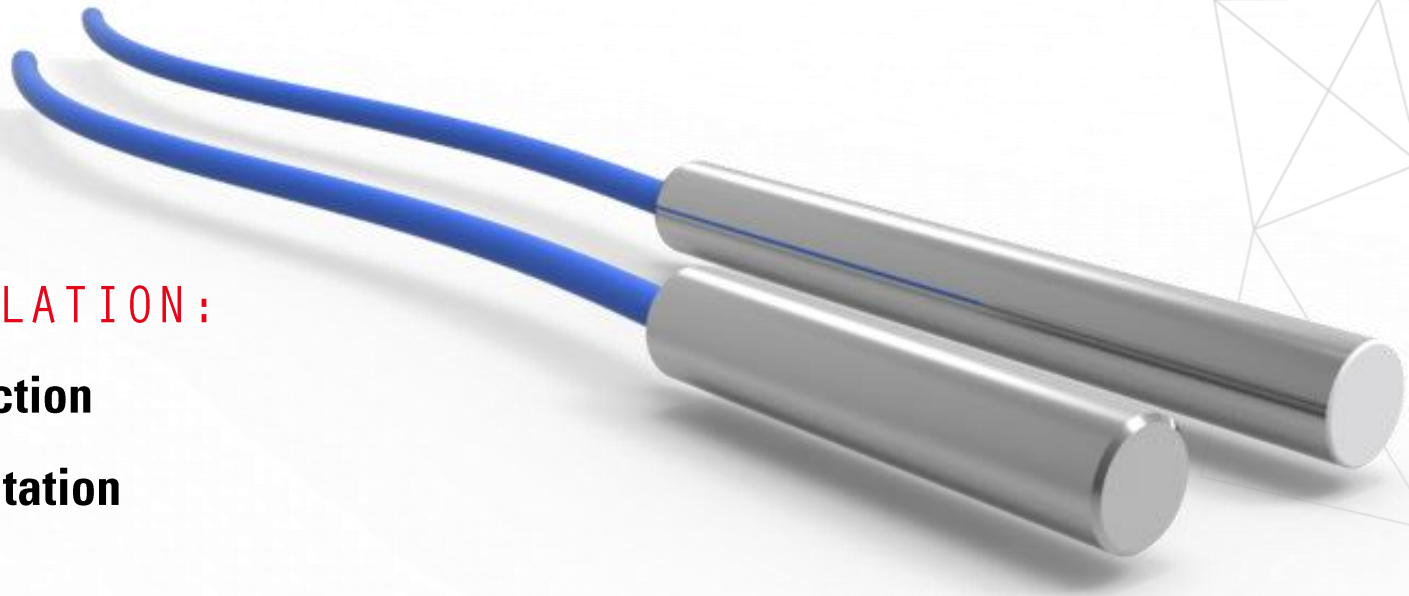
TERMOMETER SENSORS



THERMOMETER SENSORS

AIM:

accurate monitoring of temperature changes for thermal compensations



INSTALLATION:

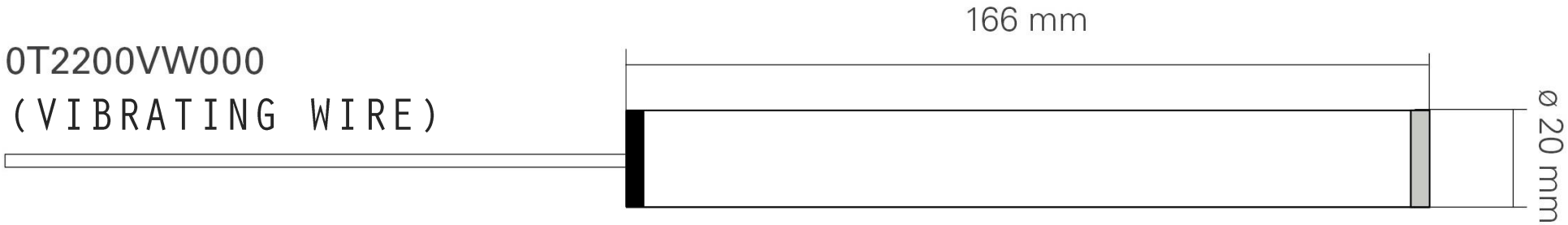
- **Construction**
- **Rehabilitation**

AVAILABLE TEMPERATURE SENSORS

0T3800GKA00
(THERMISTOR)

0T111PT1000
(PT-100)

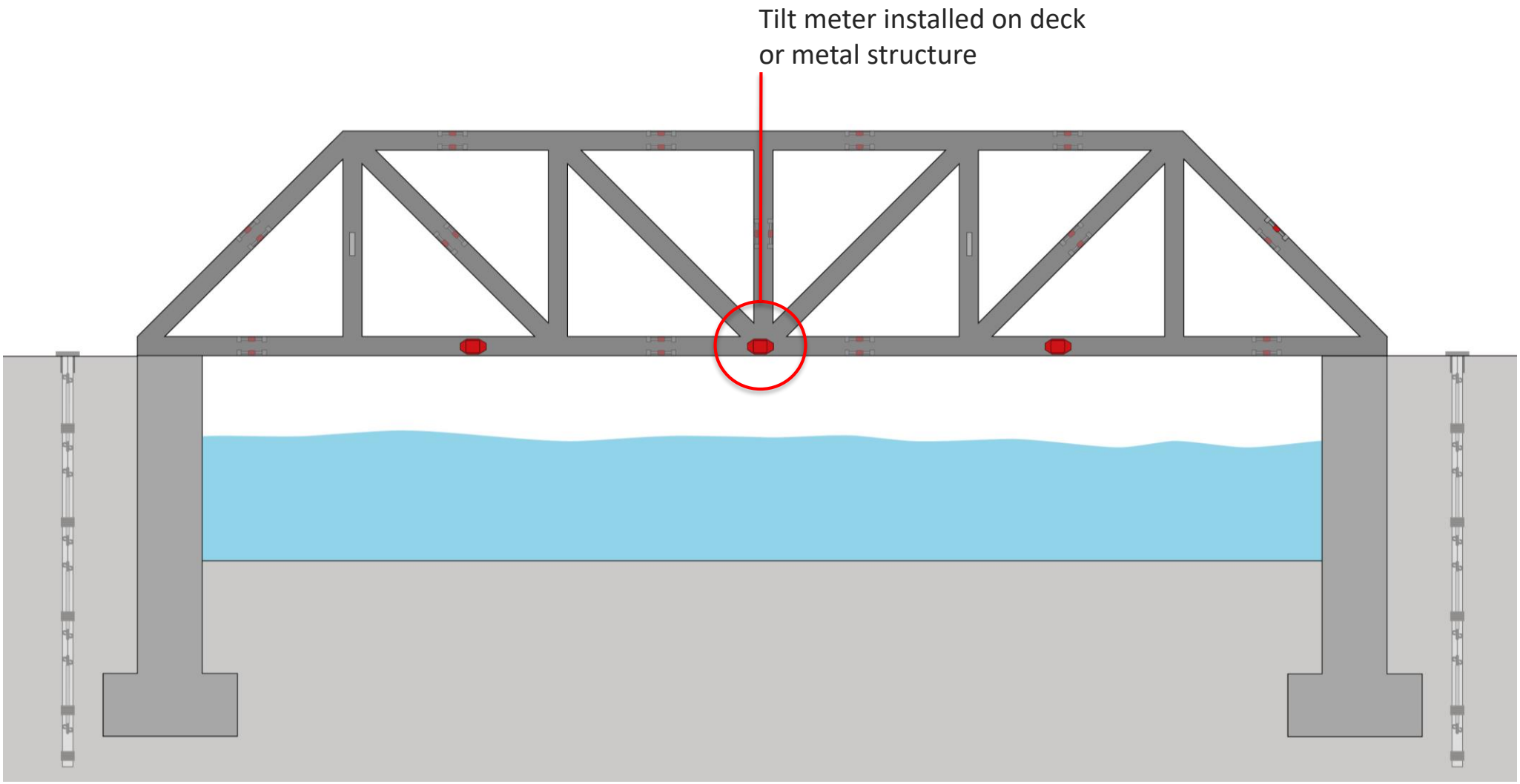
0T2200VW000
(VIBRATING WIRE)



THERMOMETER SENSORS (PT-100)

THERMOMETER SENSORS AND VW STRAIN GAUGE

TILT METERS



BIAXIAL TILT METERS

AIM:

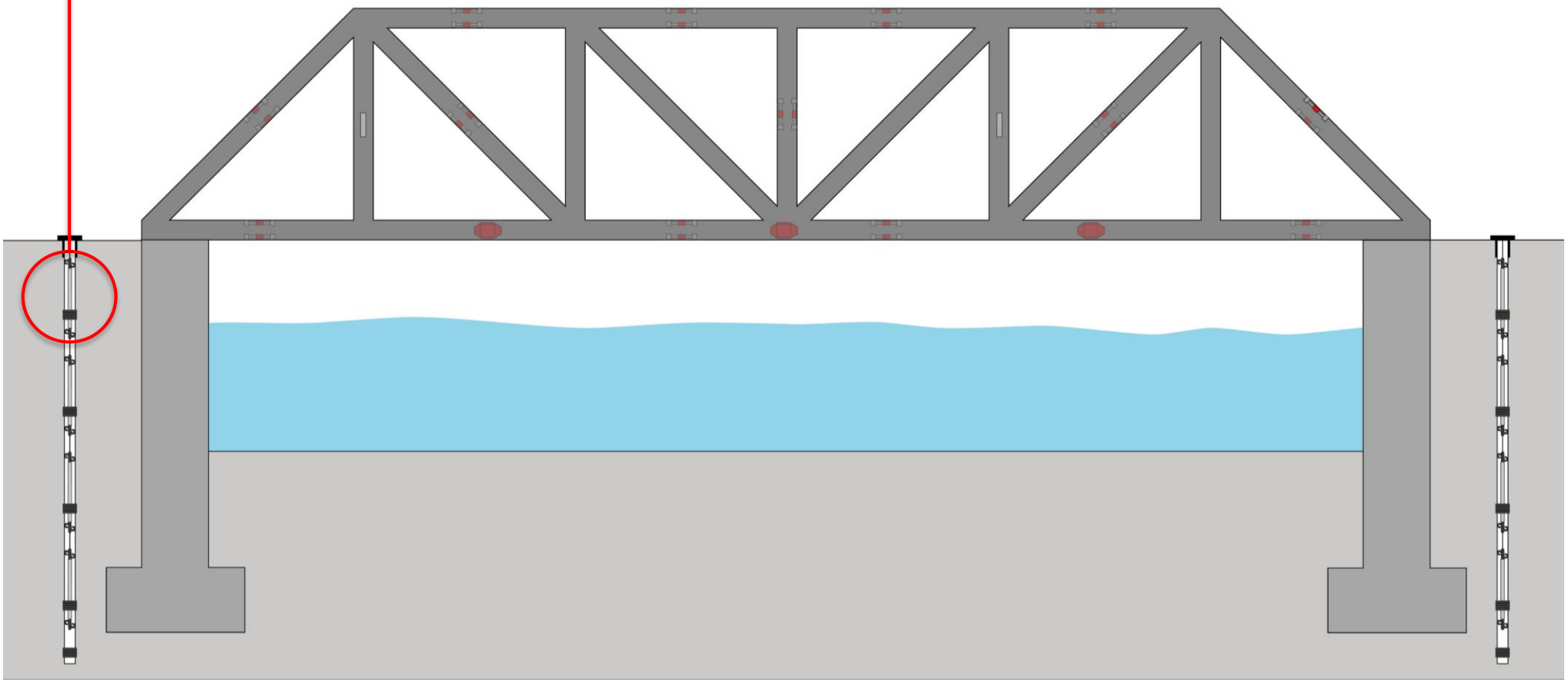
monitor the inclination in X and Y directions of metal structures / deck

INSTALLATION:

- **Construction**
- **Rehabilitation**

DEX-S 3-D EXTENSO-INCLINOMETER COLUMNS

DEX-S in-place
extenso-inclinometer column



DEX-S EXTENSO-INCLINOMETER COLUMNS

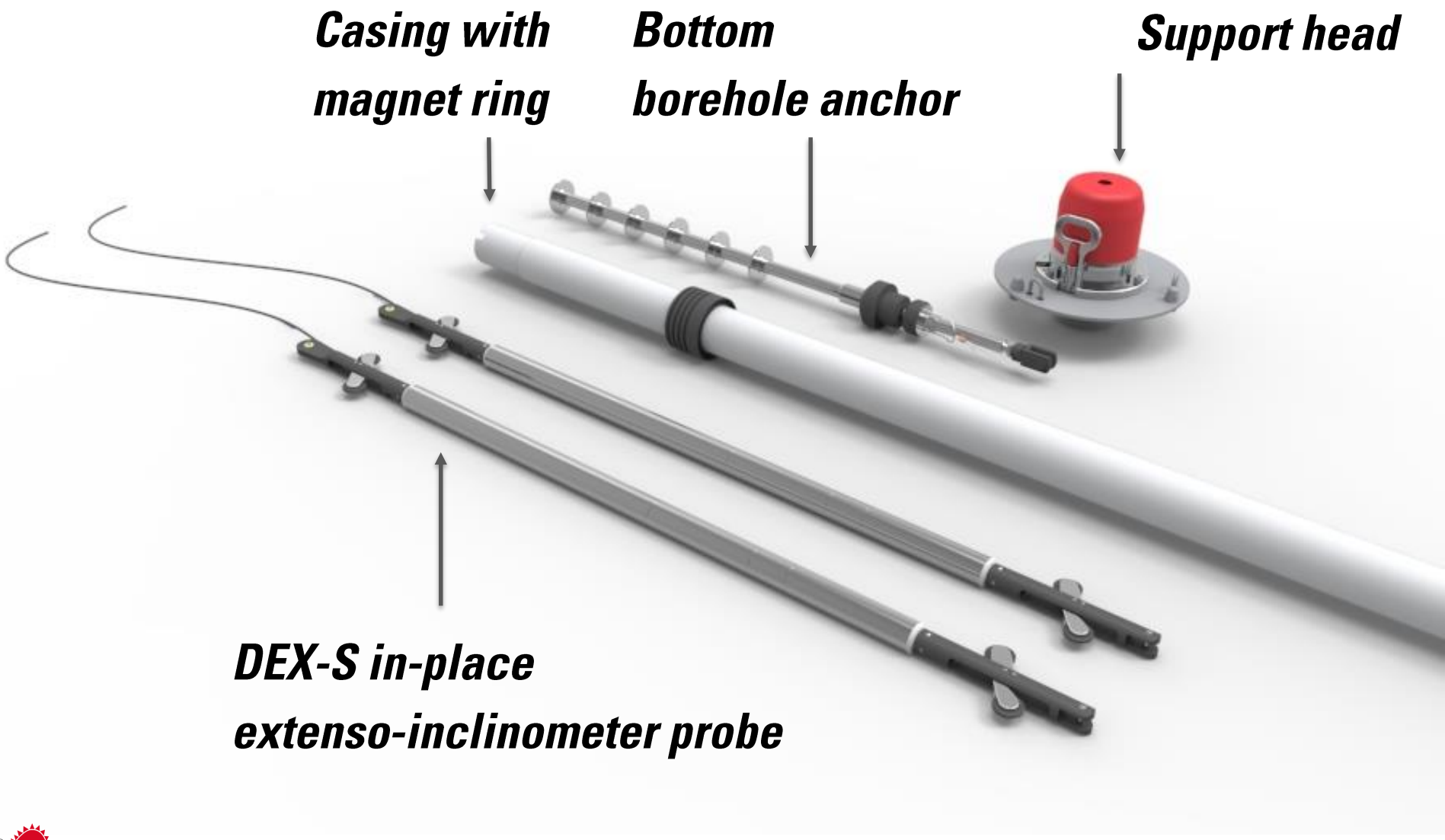
AIM:

monitor both horizontal and vertical displacement along bridge abutments → 3-D borehole monitoring

INSTALLATION:

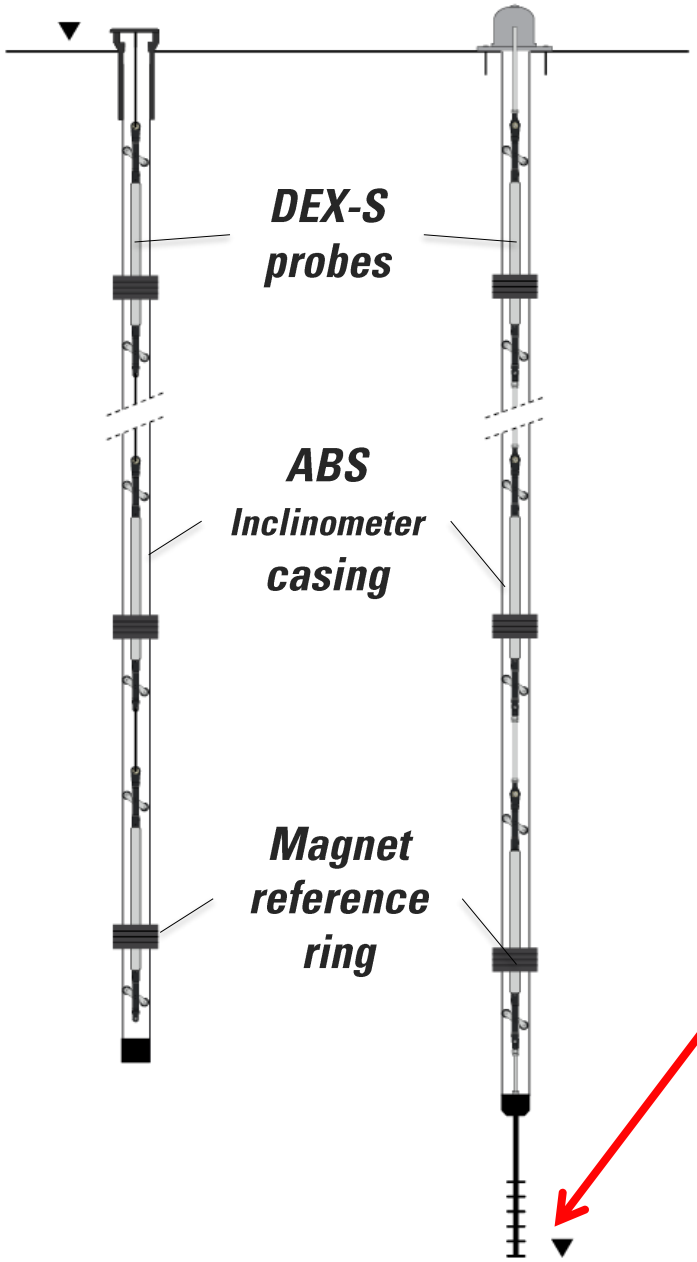
- **Construction**
- **Rehabilitation**

DEX-S EXTENSO-INCLINOMETER COMPONENTS



DEX-S: INSTALLATION METHODS

DEX-S chain with upper reference (hanging from the top)



WHAT'S NEW:
3D deformation within only one borehole
Upper or bottom reference
High accuracy
Cheaper than Competitors
NO specific software needed

DEX-S chain with lower reference (stiff chain connected to the bottom anchor)

INSTALLATION OF DEX-S EXTENSO-INCLINOMETER CASING

INSTALLATION OF DEX-S EXTENSO-INCLINOMETERS

CABLE-STAYED BRIDGES

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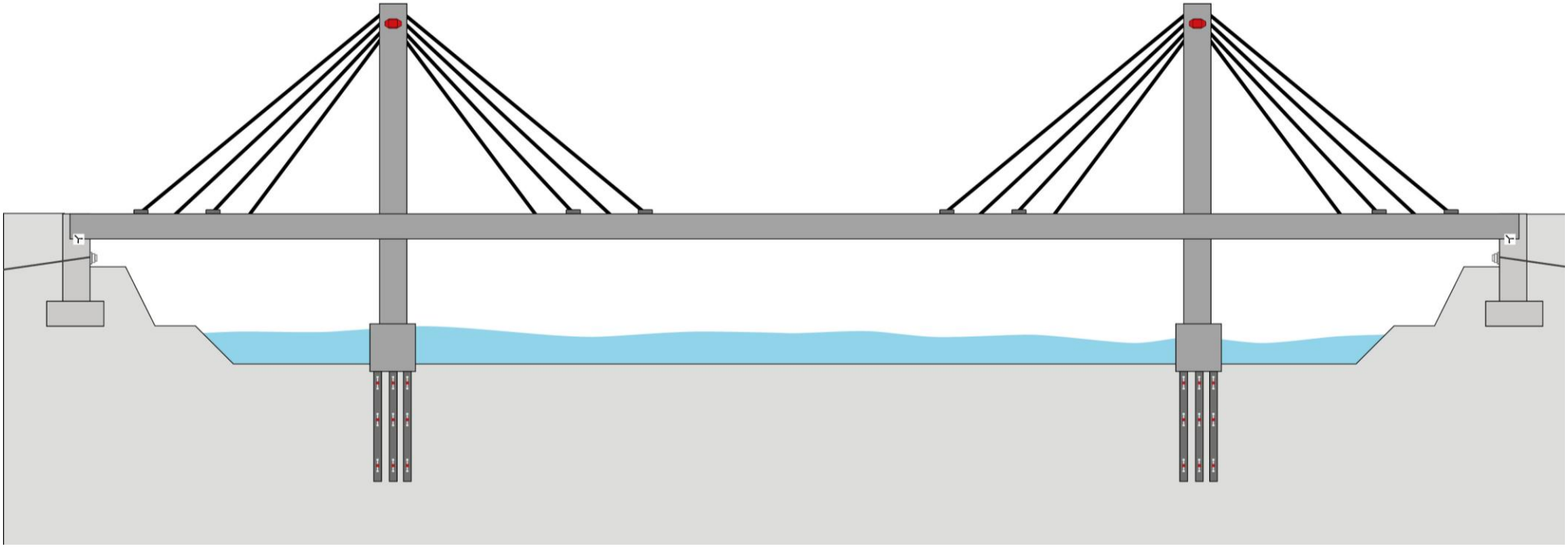
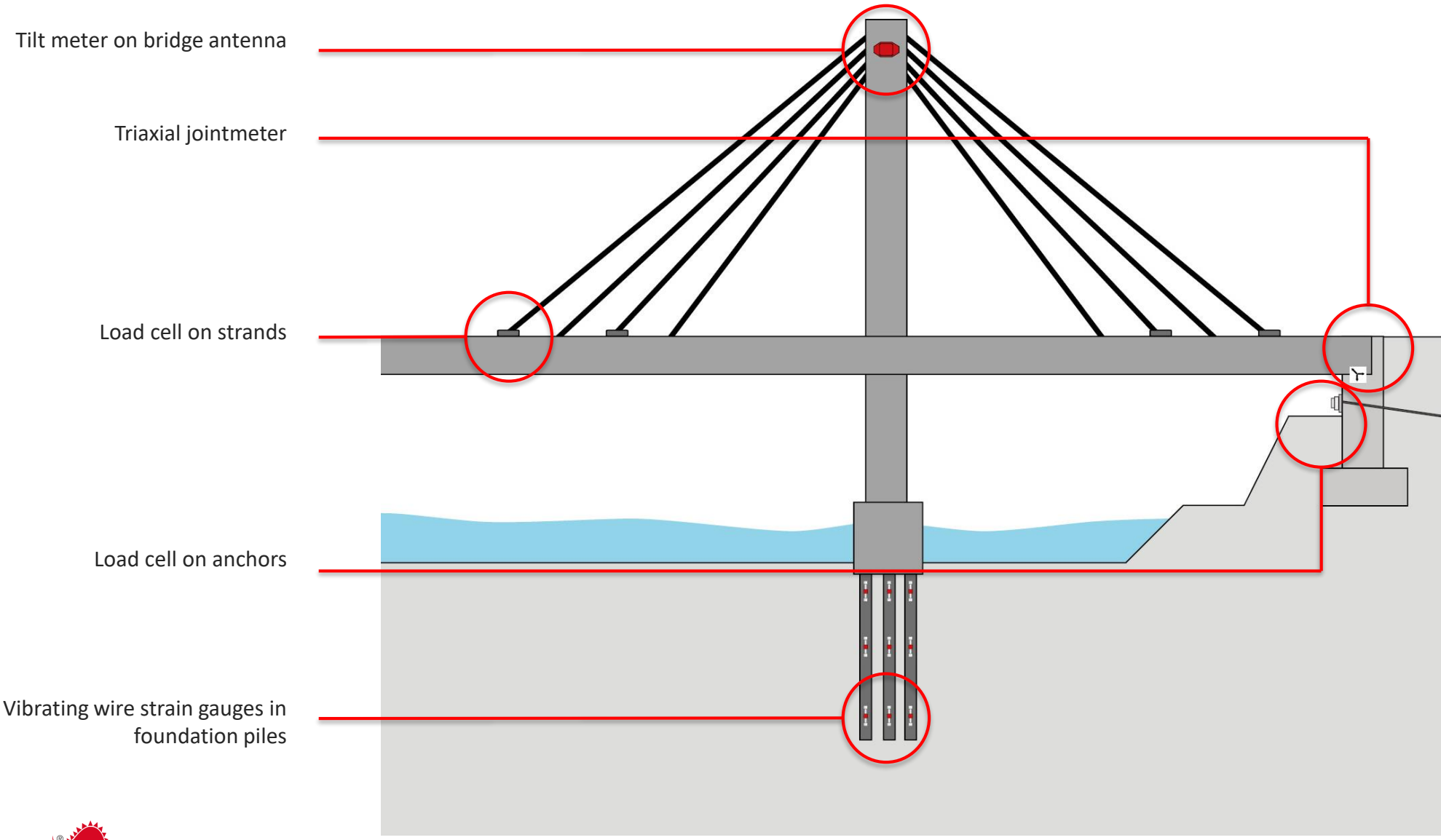
TYPICAL CABLE-STAYED BRIDGE MONITORING

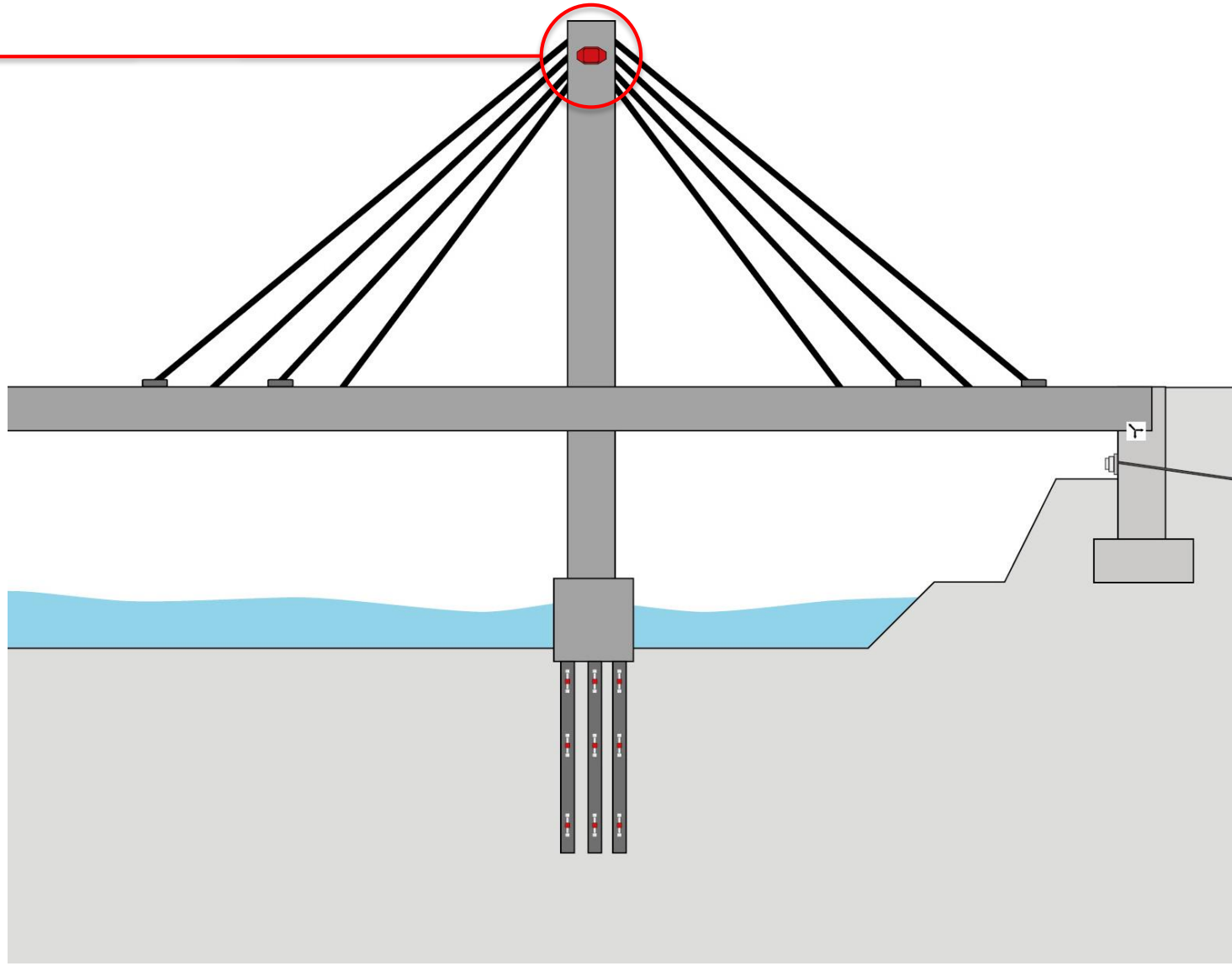


TYPICAL CABLE-STAYED BRIDGE MONITORING - DETAIL



TILT METERS

Tilt meter
on bridge antenna



BIAXIAL TILT METERS

AIM:

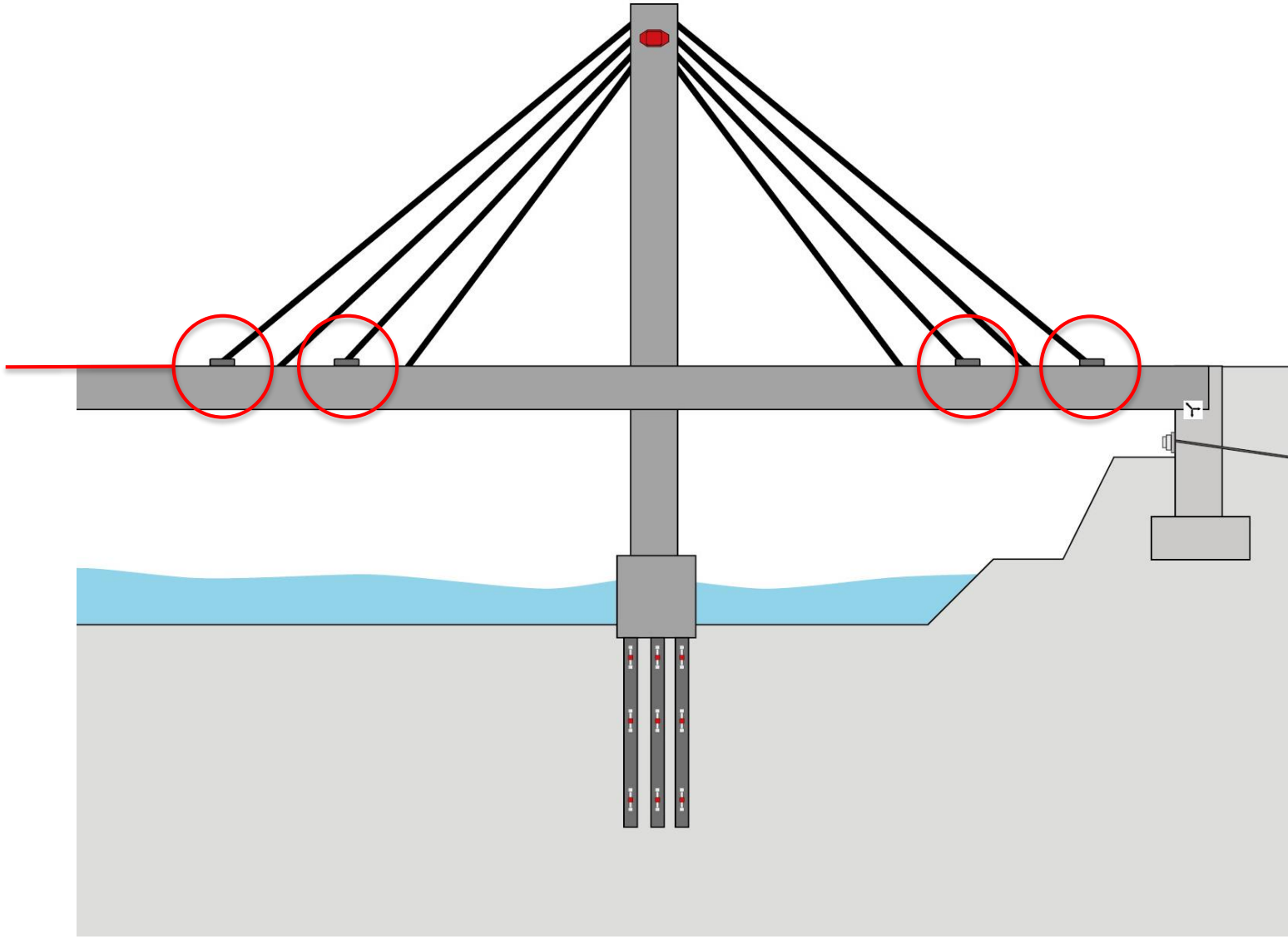
monitor the inclination in X and Y directions of the main strands support

INSTALLATION:

- **Construction**
- **Rehabilitation**

LOAD CELLS ON STRANDS

Load cells on strands



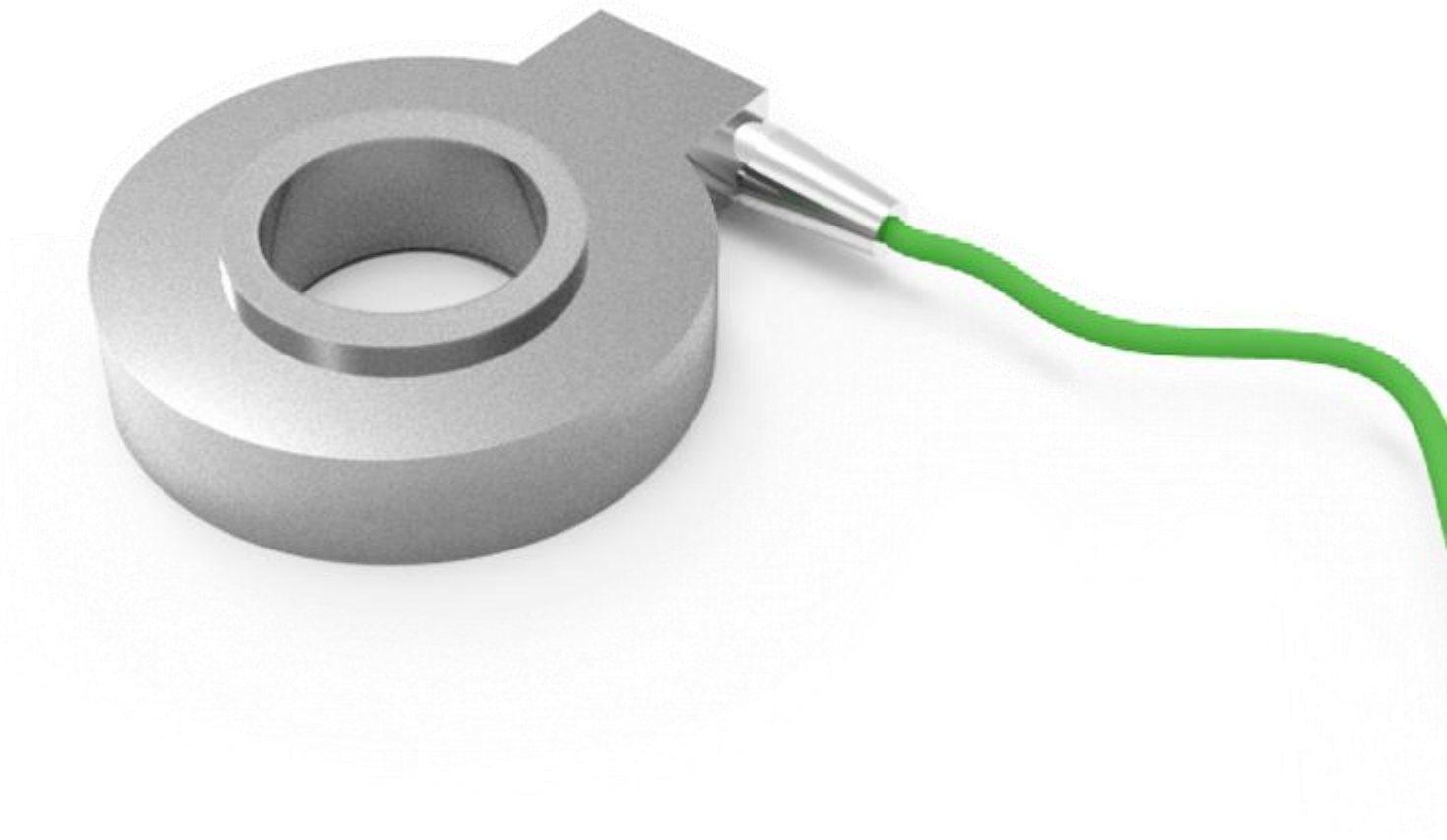
LOAD CELLS ON STRANDS

AIM:

monitor strand transmitted load

INSTALLATION:

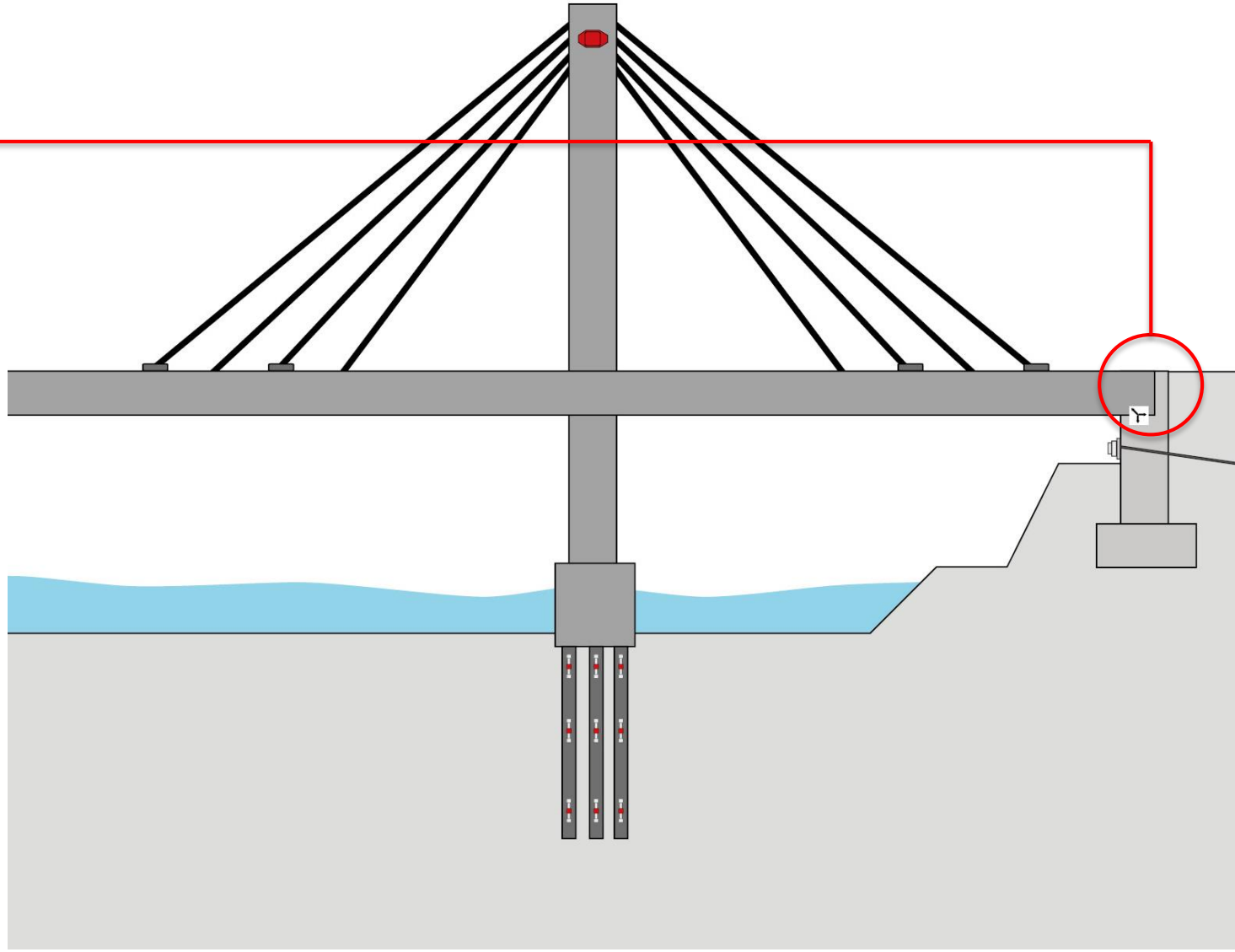
- Construction



LOAD CELLS ON STRANDS

TRIAXIAL JOINT METERS

Triaxial jointmeter



TRIAXIAL JOINT METERS

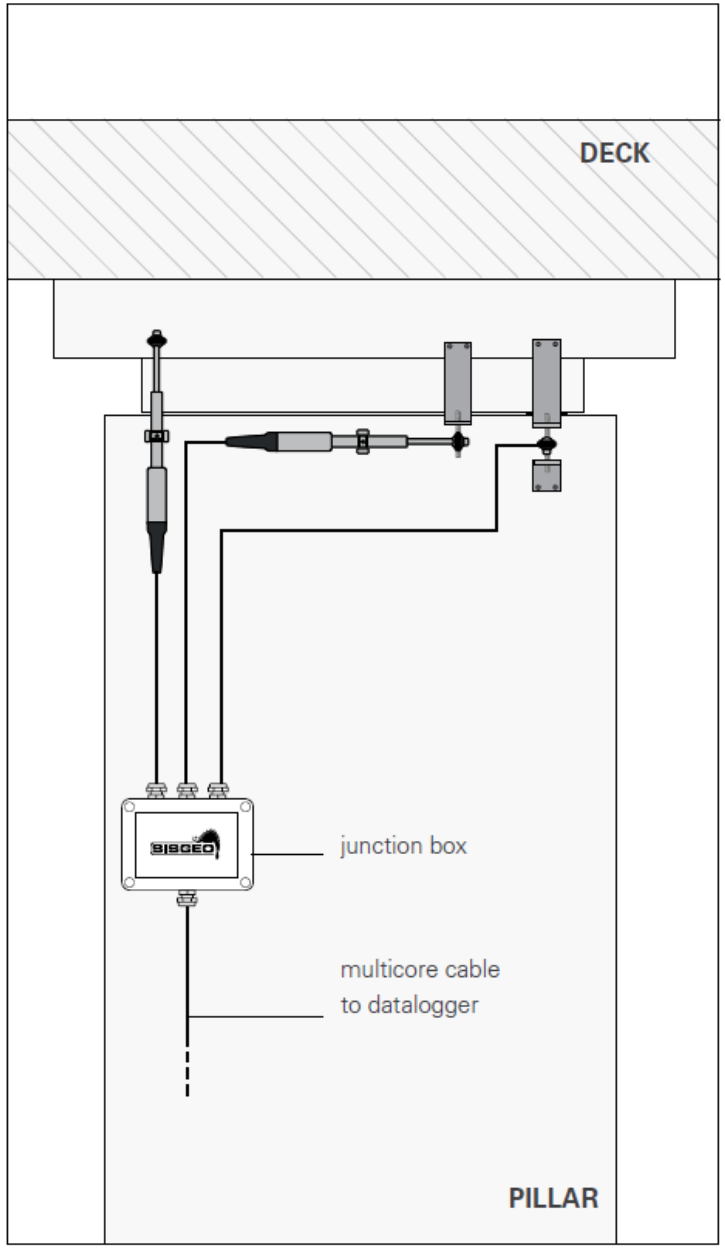
AIM:

monitor the relative movement/displacement on abutment

INSTALLATION:

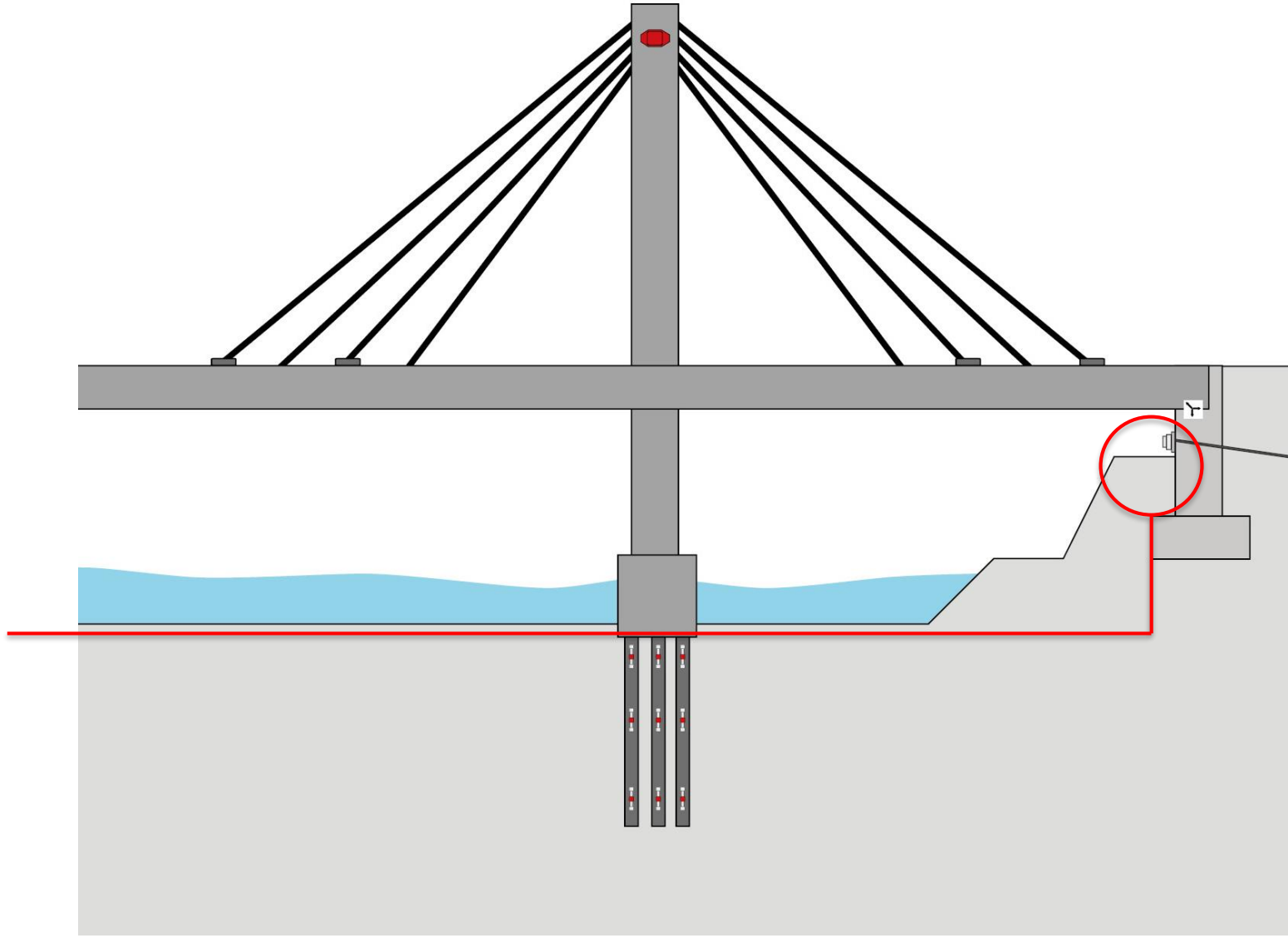
- Construction

- Rehabilitation



ANCHOR LOAD CELLS

Load cell on anchors



ANCHOR LOAD CELLS

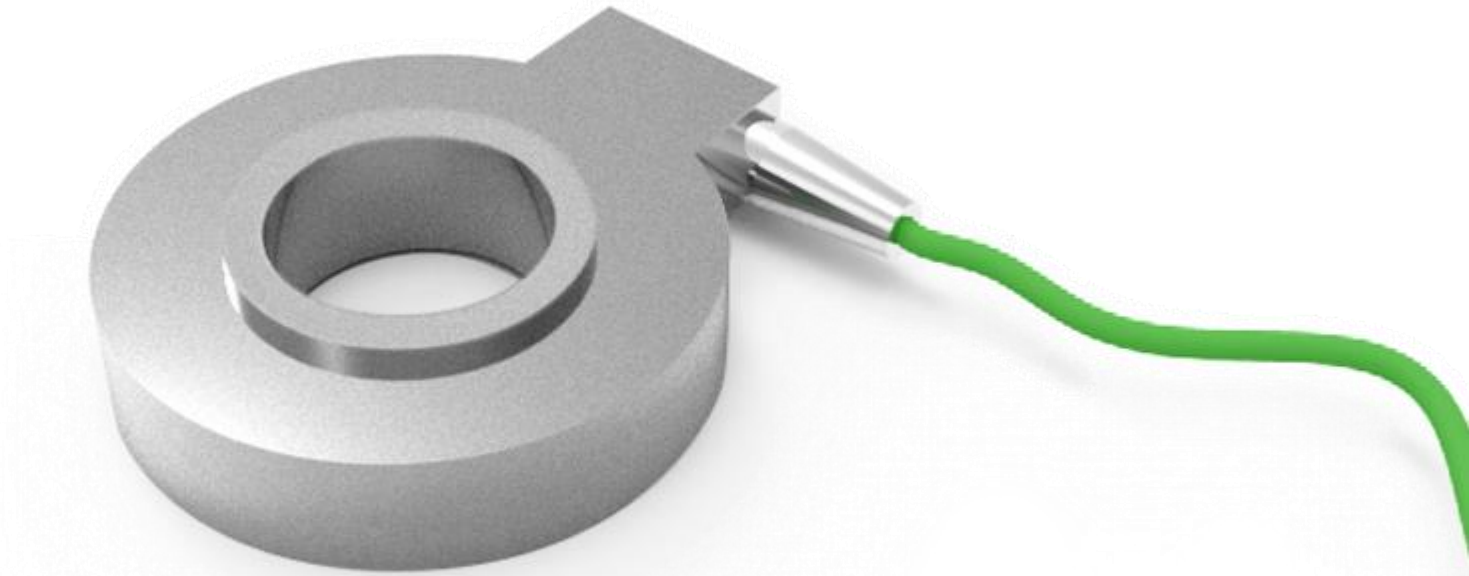
AIM:

monitor
anchors load

INSTALLATION:

- Construction

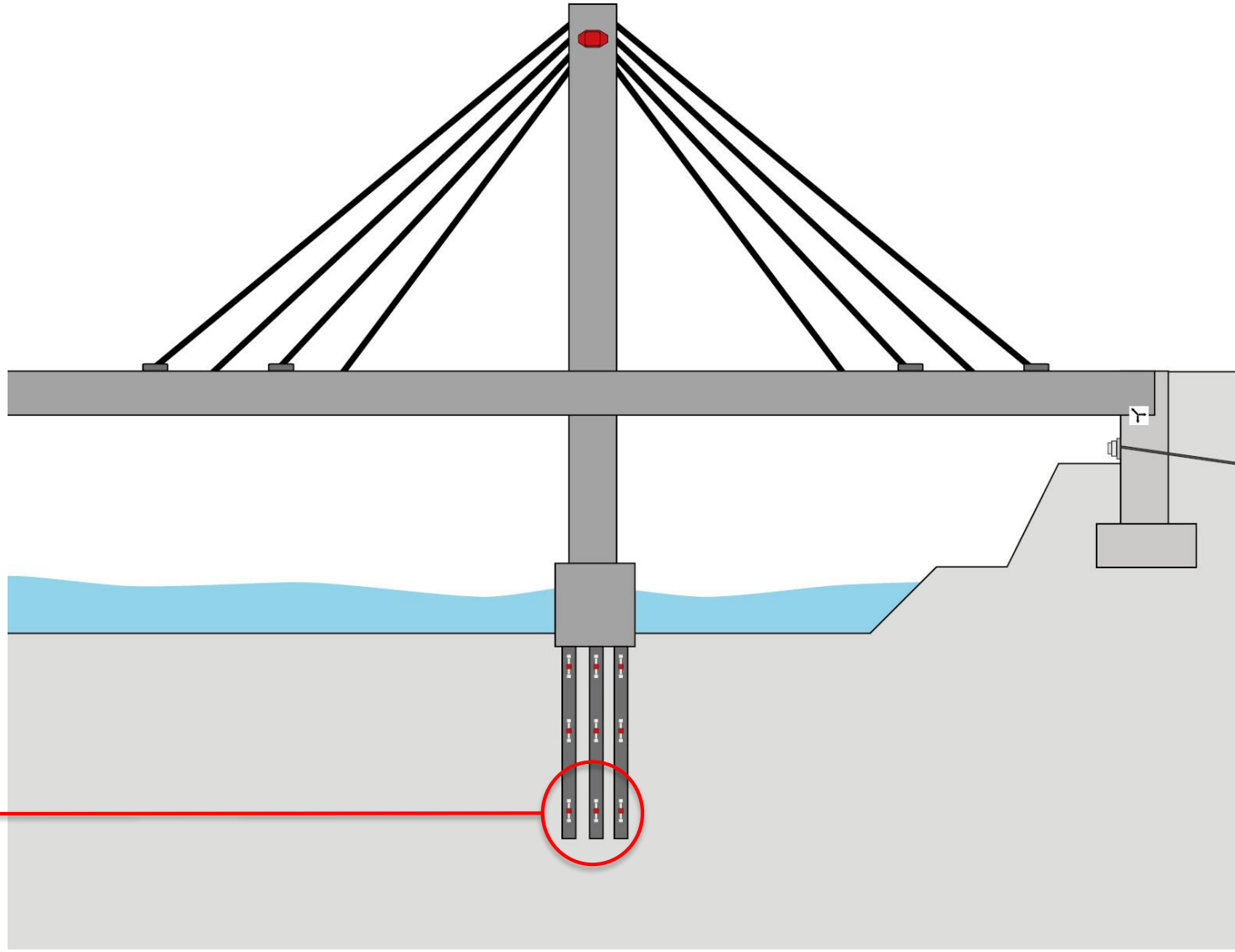
- Rehabilitation



ANCHOR LOAD CELLS

VIBRATING WIRE STRAIN GAUGES

Vibrating wire
strain gauges
in foundation piles



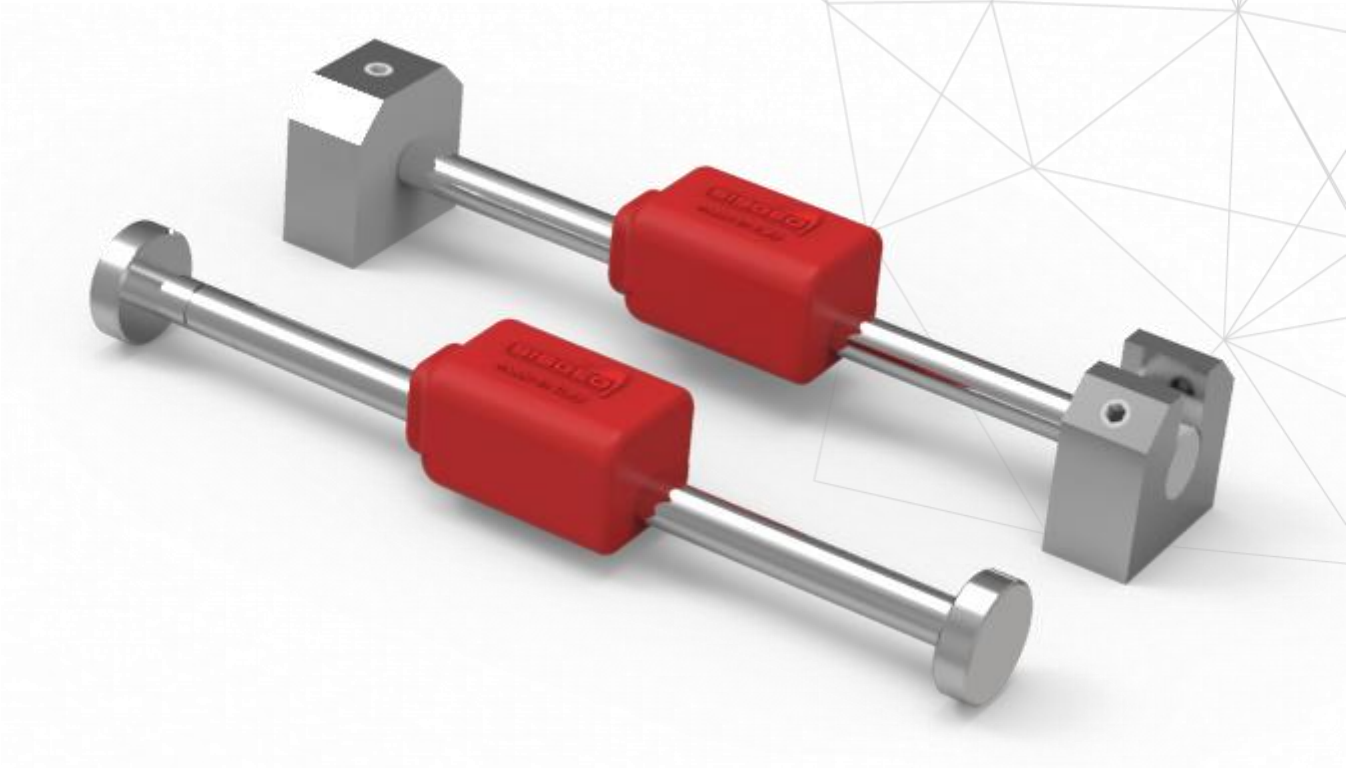
VIBRATING WIRE STRAIN GAUGES

AIM:

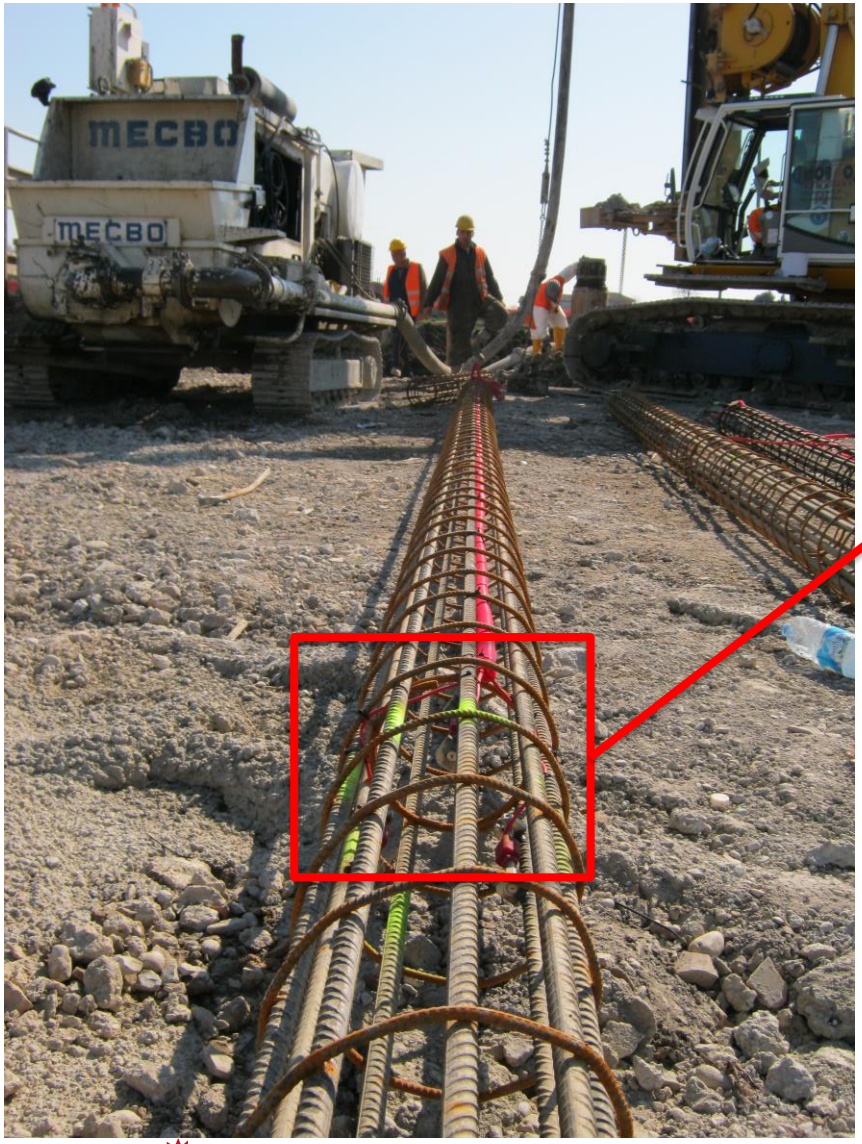
monitor stress
into foudation piles

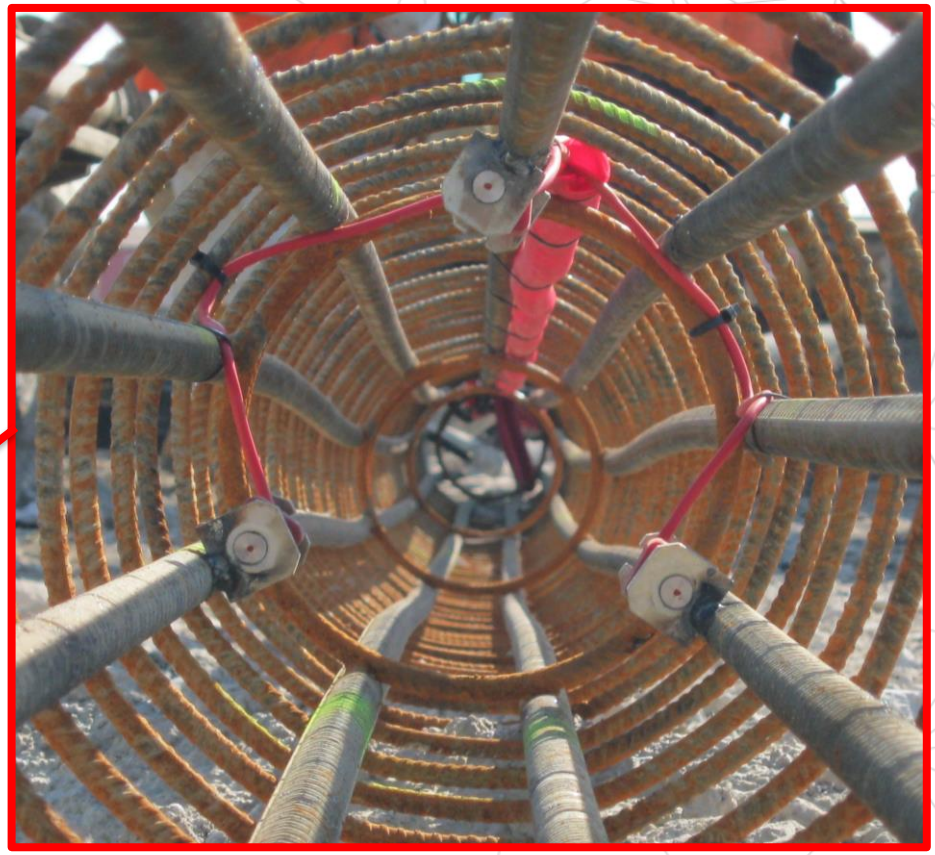
INSTALLATION:

- Construction



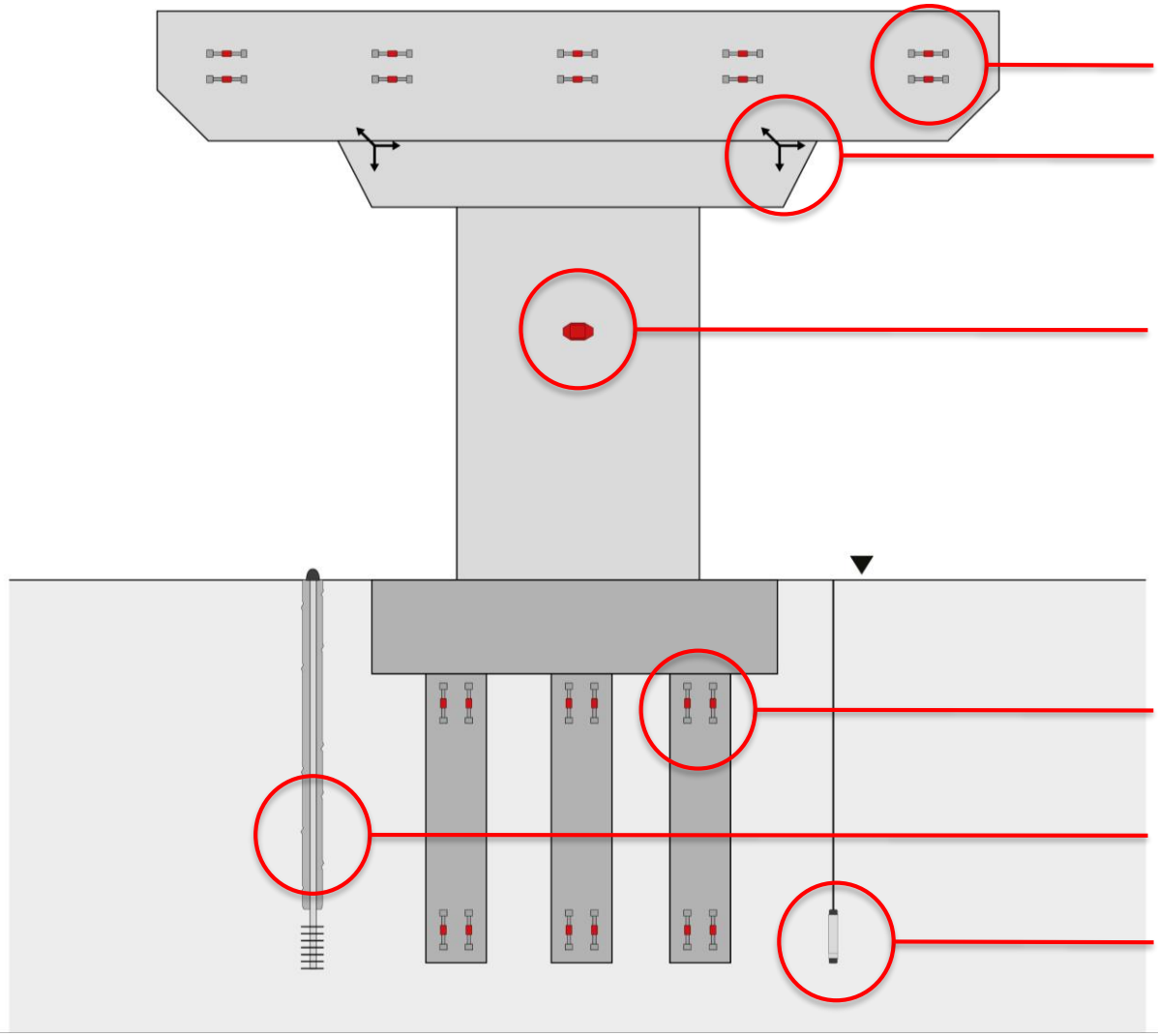
VIBRATING WIRE STRAIN GAUGES IN PILES



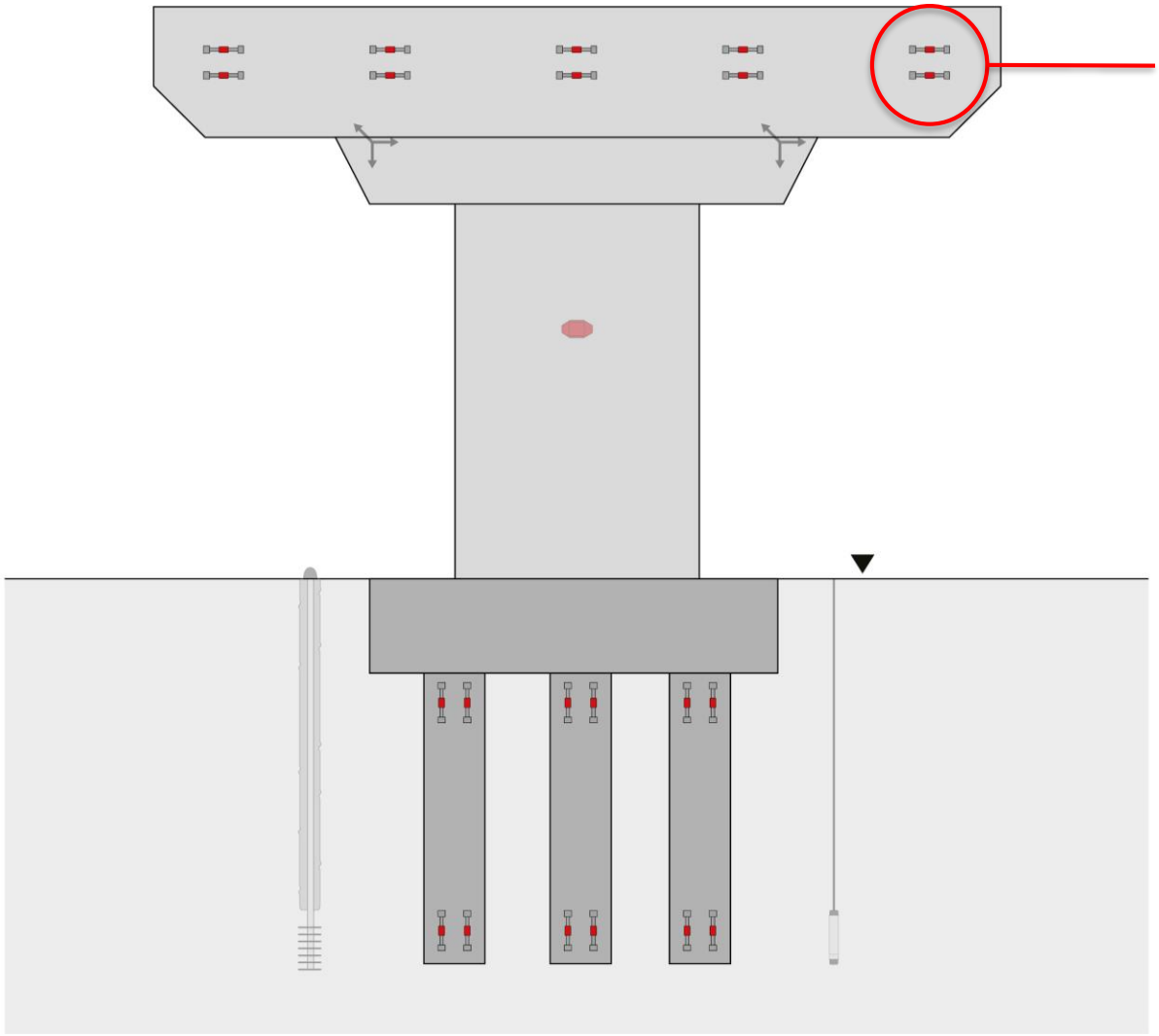


VIADUCTS

TYPICAL VIADUCT MONITORED SECTION



VIBRATING WIRE STRAIN GAUGES



Vibrating wire strain gauges embedded in the deck

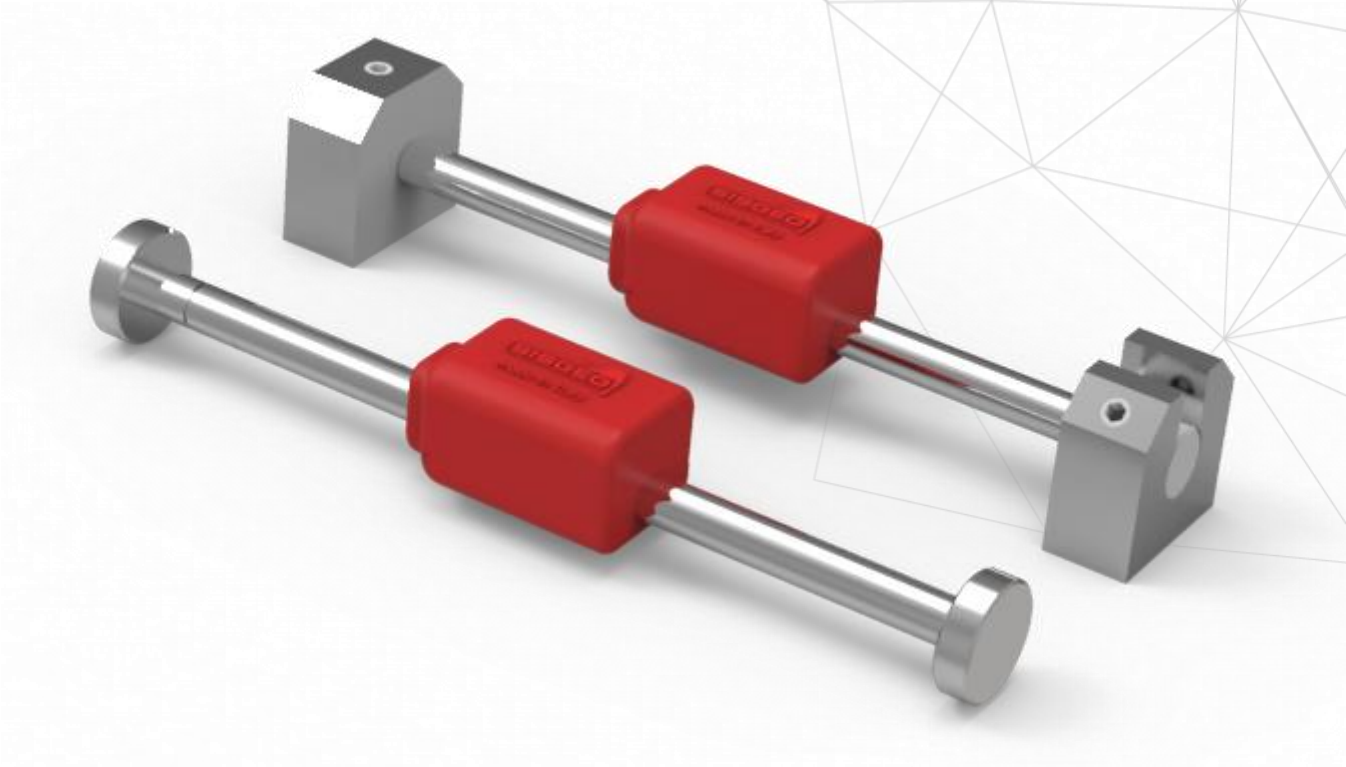
VIBRATING WIRE STRAIN GAUGES

AIM:

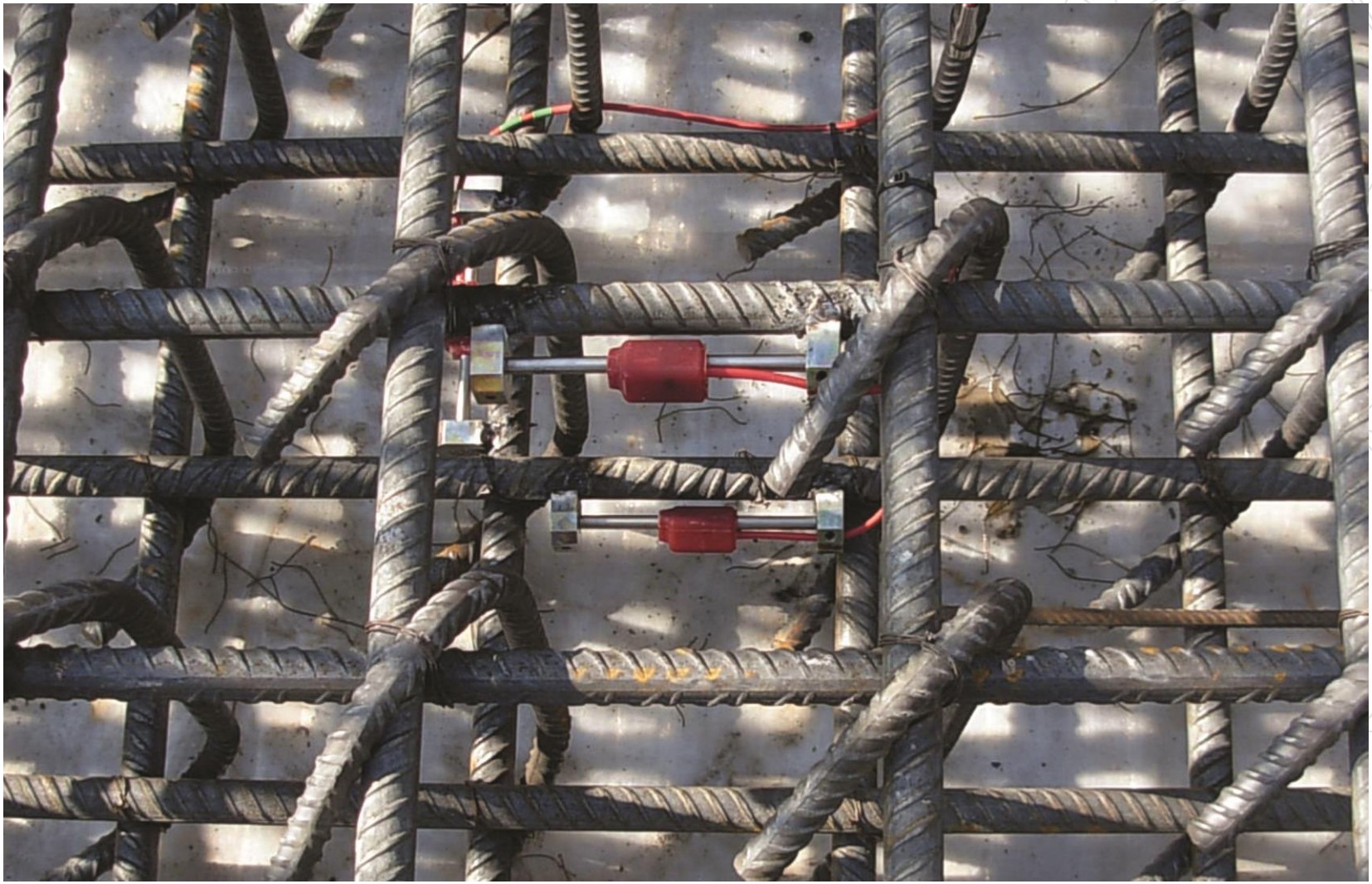
monitor stress
into deck reinforced concrete

INSTALLATION:

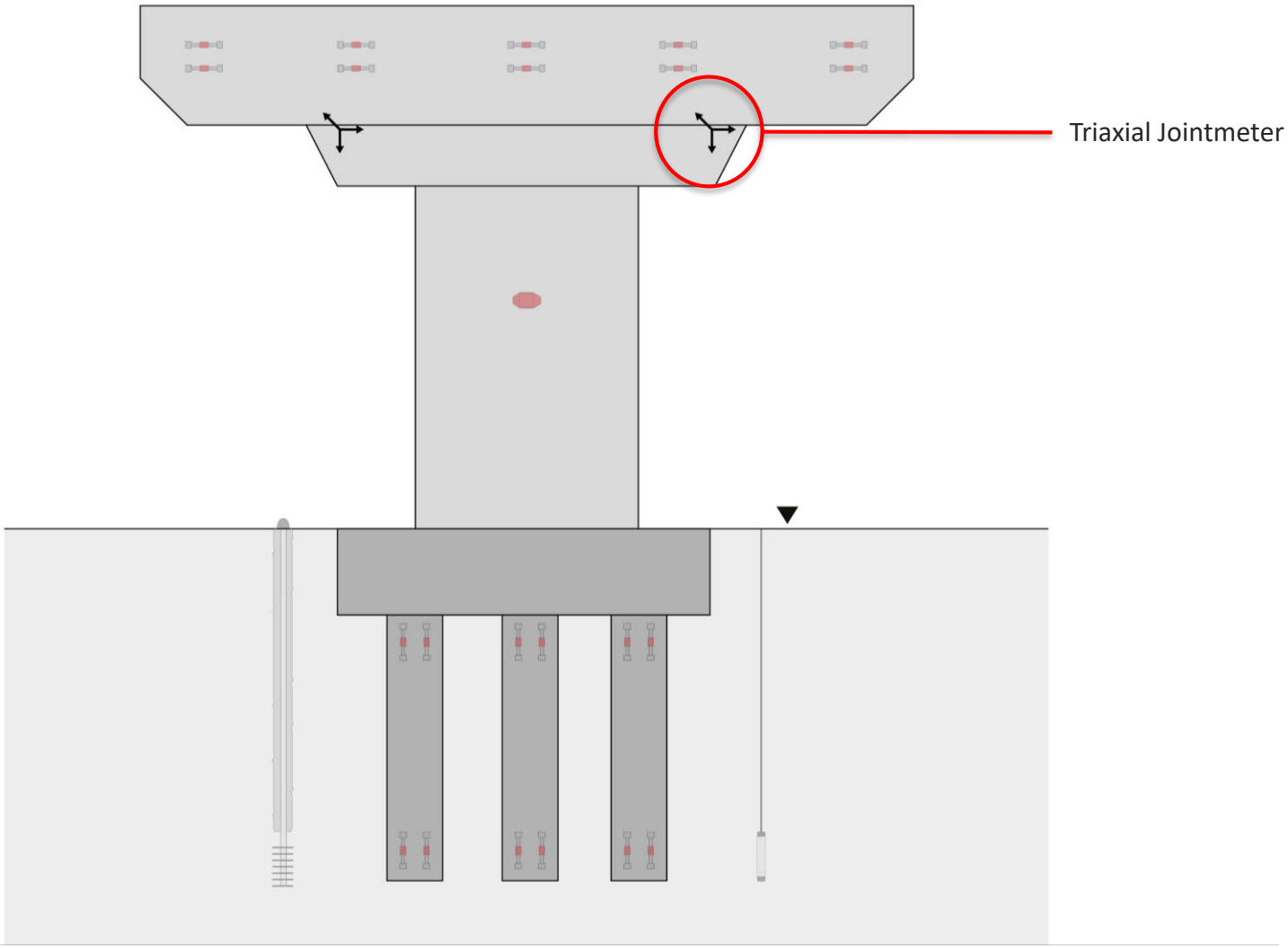
- Construction



VIBRATING WIRE STRAIN GAUGES READY FOR GROUTING IN THE DECK



3-AXIAL JOINT METERS



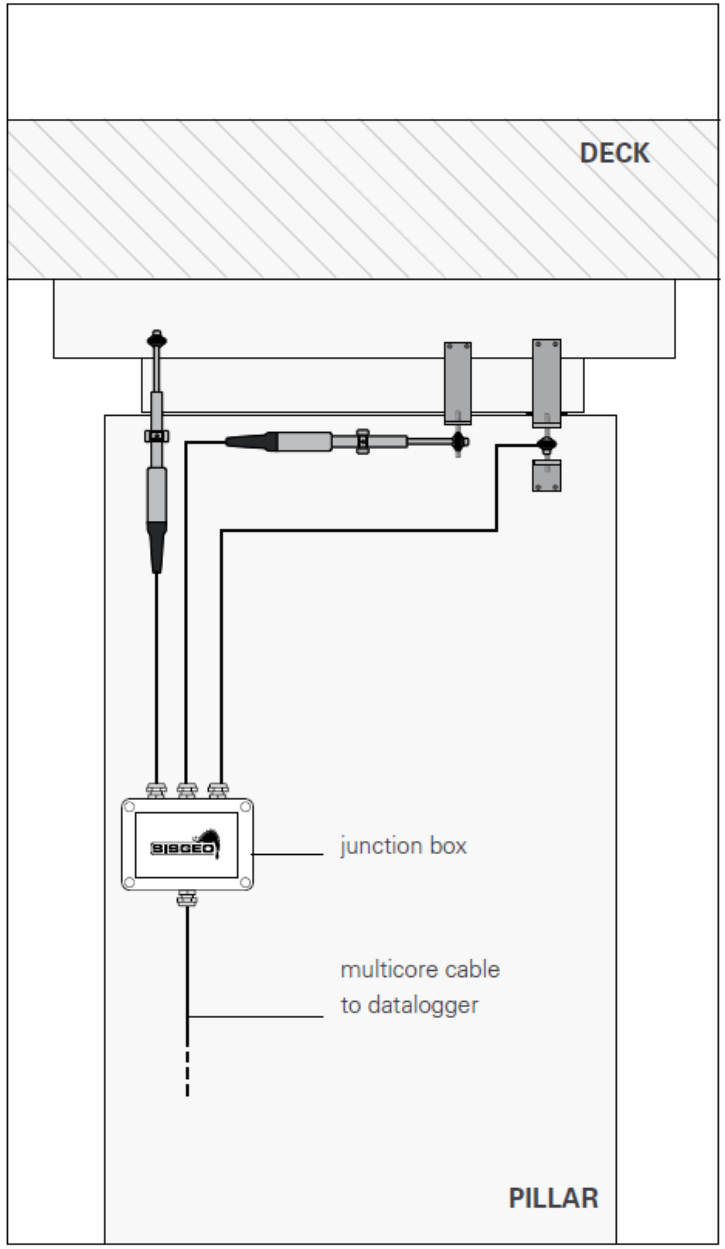
3-AXIAL JOINT METERS

AIM:

monitor the relative movement/displacement between pile and deck

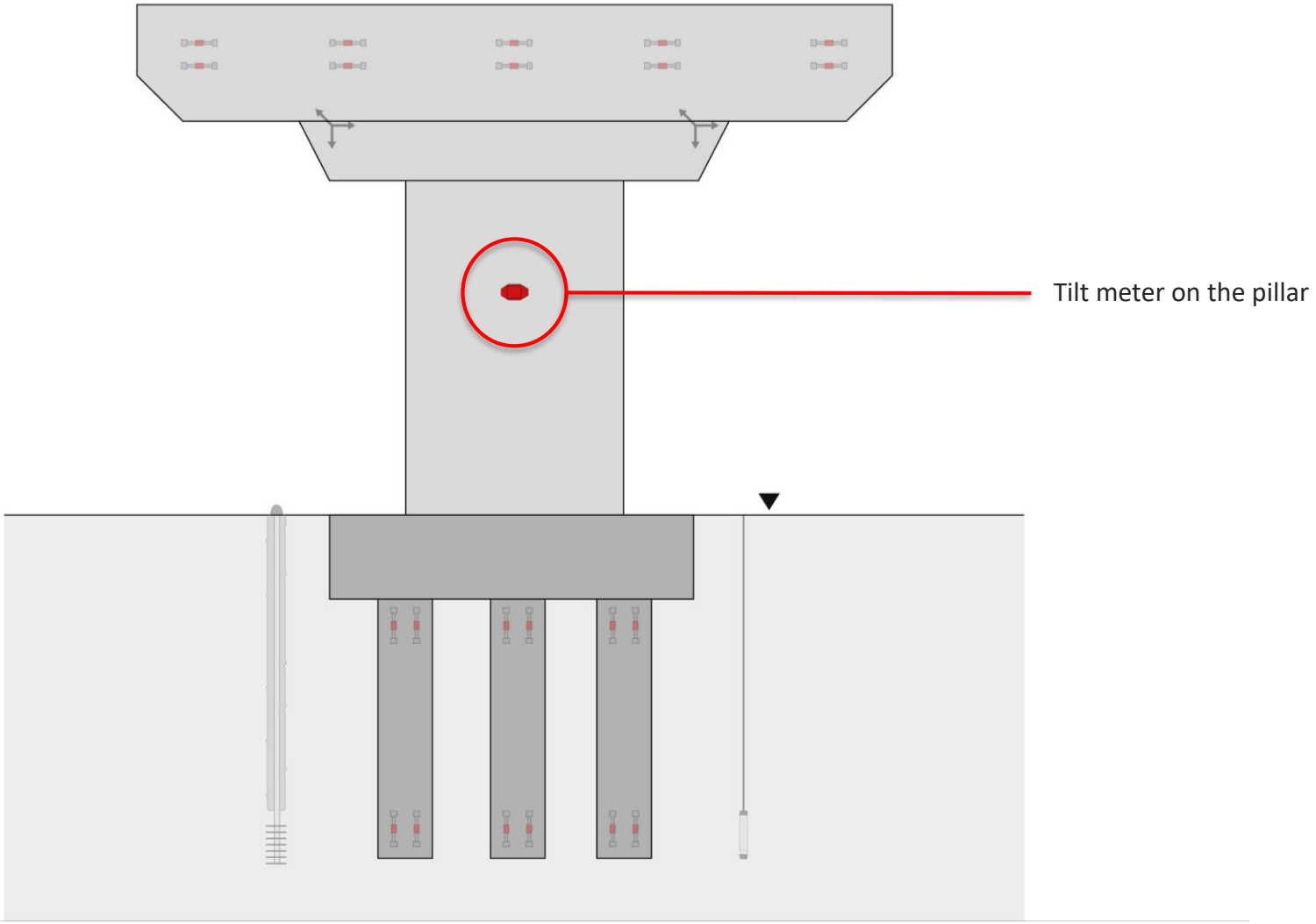
INSTALLATION:

- **Construction**
- **Rehabilitation**



3-AXIAL JOINT METERS BETWEEN PILLAR AND DECK

BIAXIAL TILT METERS



BIAXIAL TILTMETER

AIM:

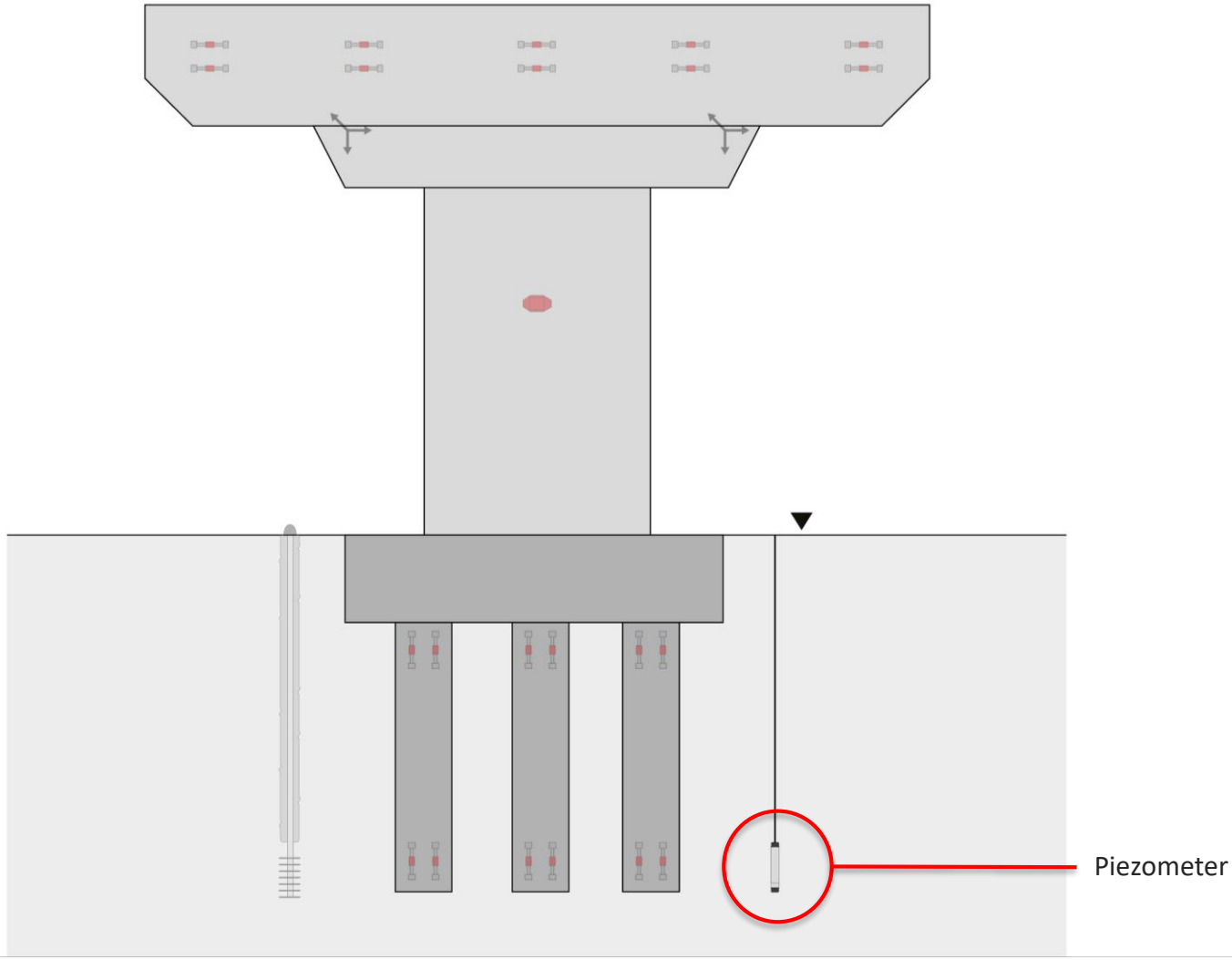
monitor inclination in X and Y directions of viaduct pillar.

INSTALLATION:

- **Construction**
- **Rehabilitation**

BIAXIAL TILT METER WITH ADJUSTABLE PLATE

PIEZOMETERS



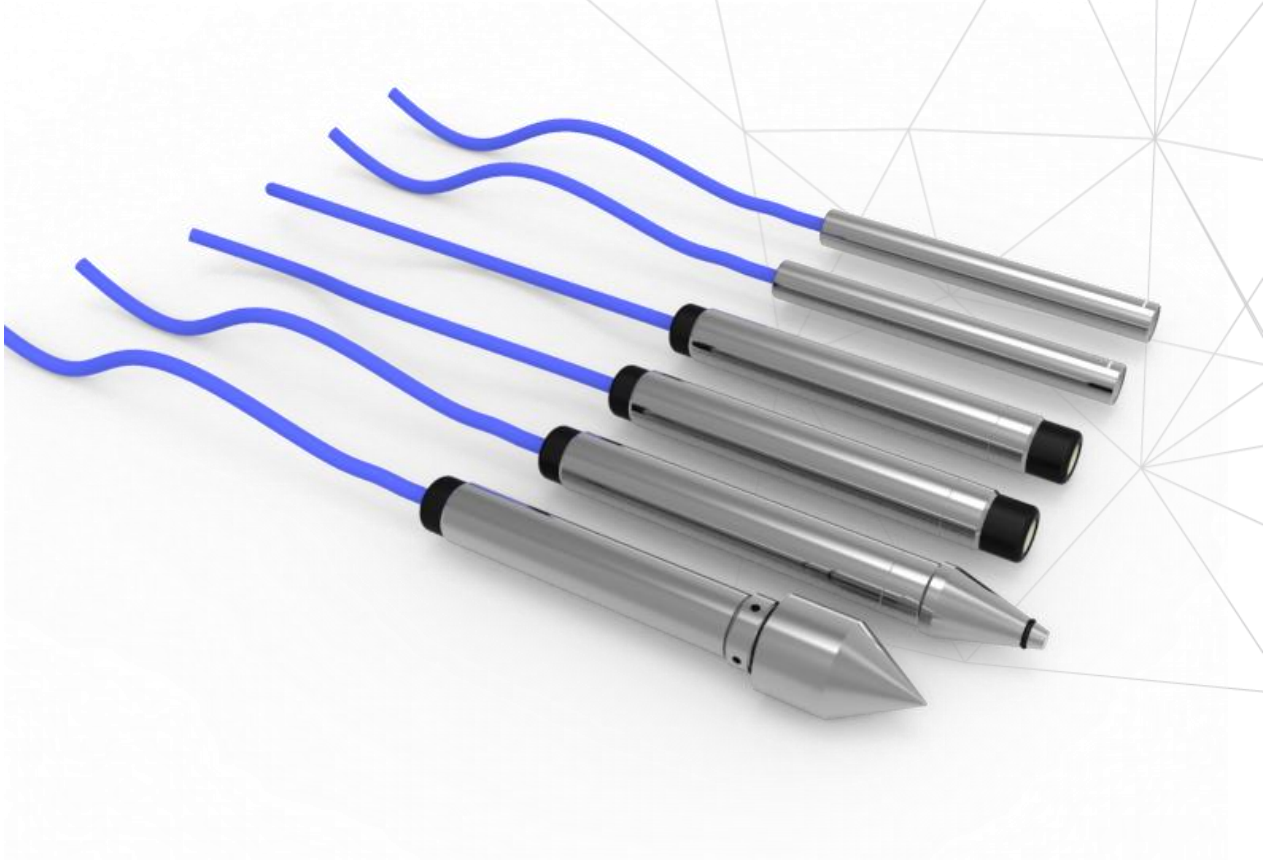
PIEZOMETERS FOR PORE PRESSURE

AIM:

Pore pressure or water table level monitoring

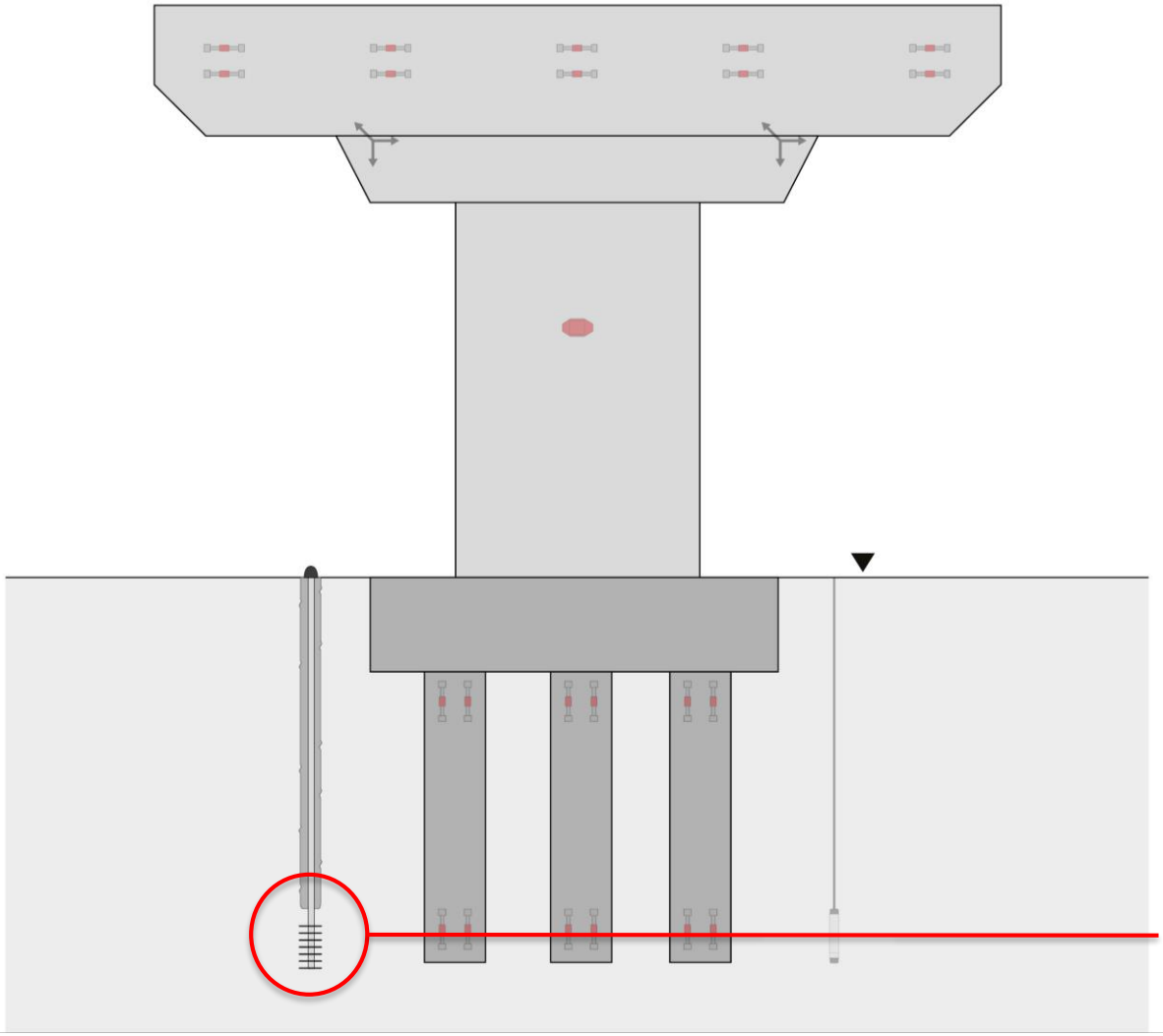
INSTALLATION:

- **Construction**
- **Rehabilitation**



PIEZOMETERS FOR PORE PRESSURE

TELL-TALE EXTENSOMETER



Tell tale extensometer
for absolute settlement

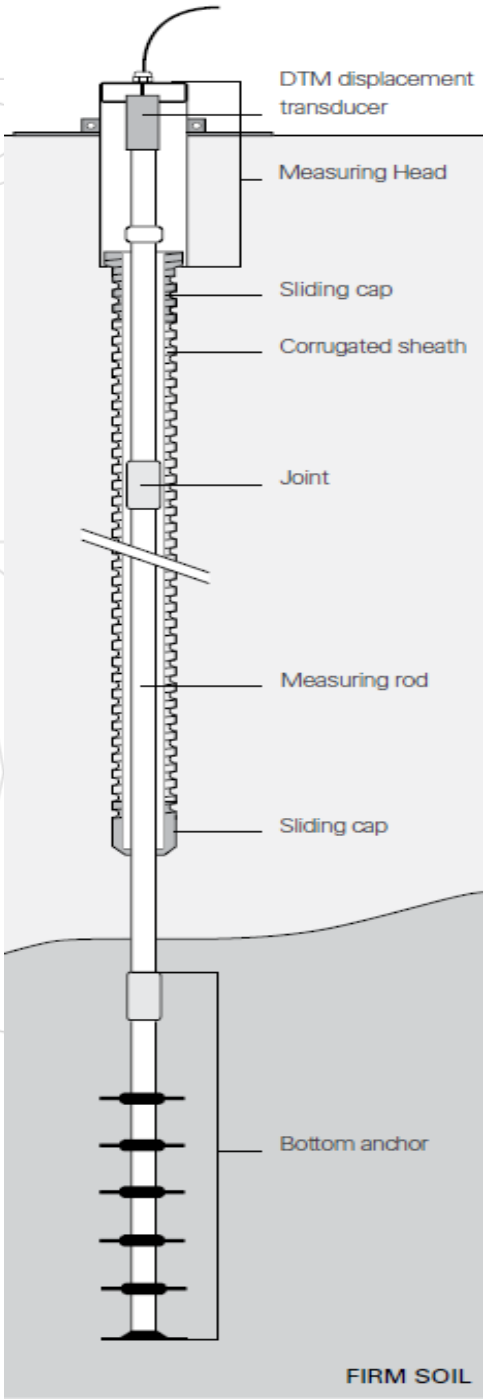
TELL-TALE EXTENSOMETER

AIM:

monitor absolute ground settlement caused by viaduct construction and during viaduct life

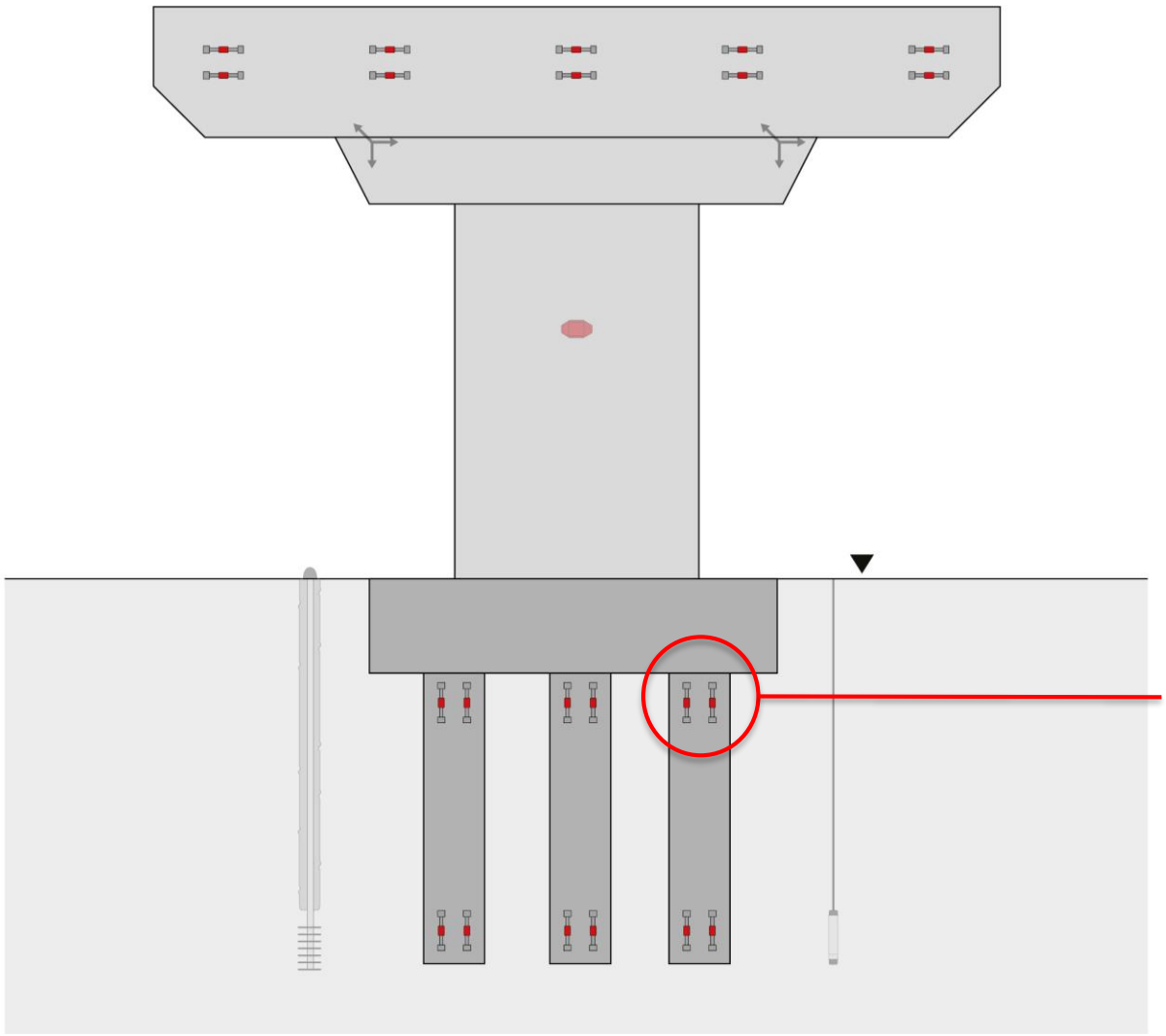
INSTALLATION:

- **Construction**
- **Rehabilitation**



TELL-TALE EXTENSOMETER

VIBRATING WIRE STRAIN GAUGES



Vibrating wire strain gauges
in foundation pile

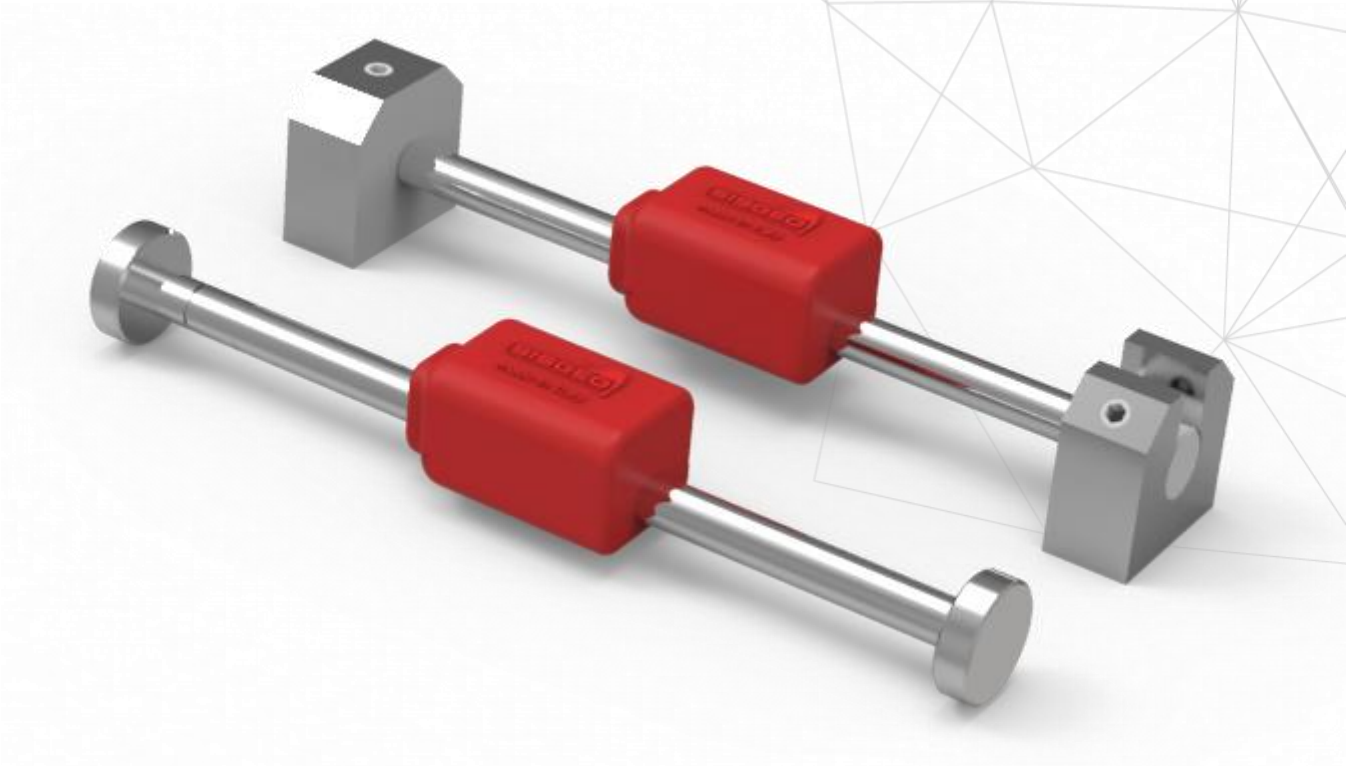
VIBRATING WIRE STRAIN GAUGES

AIM:

monitor stress
into foundation piles

INSTALLATION:

- Construction



VIBRATING WIRE STRAIN GAUGES IN PILE STEEL CAGE

SISGEO

DATA ACQUISITION SYSTEM

OMNIAlog is the right solution for bridges automatic monitoring, data transmission and alerting:

1. ***OMNIAlog, through 3G/4G router or other communication interface, sends the data packages at a preset intervals to a dedicated server***
2. ***Data are subjected to a first automatic validation in order to delete peaks and abnormal readings***
3. ***OMNIAlog can be set to send alarms (i.e. through SMS/email) or activation of sirens / flashings at the pre-set thresholds overcoming.***

DATA MANAGEMENT AND INTERPRETATION

WMS Web Monitoring System is a SW platform for data management for geotechnical and structural monitoring systems, with the possibility to import data from both automatic data acquisition systems or manual readings. With WMS platform, data are sorted, converted into engineering units, validated, corrected by temperature variations, processed and plotted on special navigable and interactive charts.

THANK YOU!

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