

Total Pressure Cells



Vibrating Wire and Pneumatic Total Pressure Cells



Jackout Total Pressure Cell

Applications

The total pressure cell measures the combined pressure of effective stress and pore-water pressure. Typical applications include:

- Monitoring total pressure exerted on a structure to verify design assumptions.
- Determining the magnitude, distribution, and orientation of stresses.

Principle of Operation

Total pressure is the intergranular pressure in the soil (effective stress) combined with the pressure of water in the voids between soil grains (pore water pressure).

The pressure cell is formed from two circular plates of stainless steel whose edges are welded together to form a sealed cavity. The cavity is filled with a non-compressible fluid.

The cell is installed with its sensitive surface in direct contact with the soil. The total pressure applied to that surface is transmitted to the fluid inside the cell and measured with a pneumatic or vibrating wire pressure transducer.

Installation

Total pressure cells are typically embedded in fill or fixed to a structure. In fill, cells are often installed in arrays. Each cell is placed in a different orientation and covered with hand-compacted fill. When mounted on a structure, the cell is placed into a recess so that its sensitive side is flush with the surface of the structure.

The jackout total pressure cell is specially designed for installation in cast-in-place structures, such as diaphragm walls. Its name is derived from the use of a hydraulic jack that is activated to keep the cell in contact with the soil during concreting. See drawing on back.

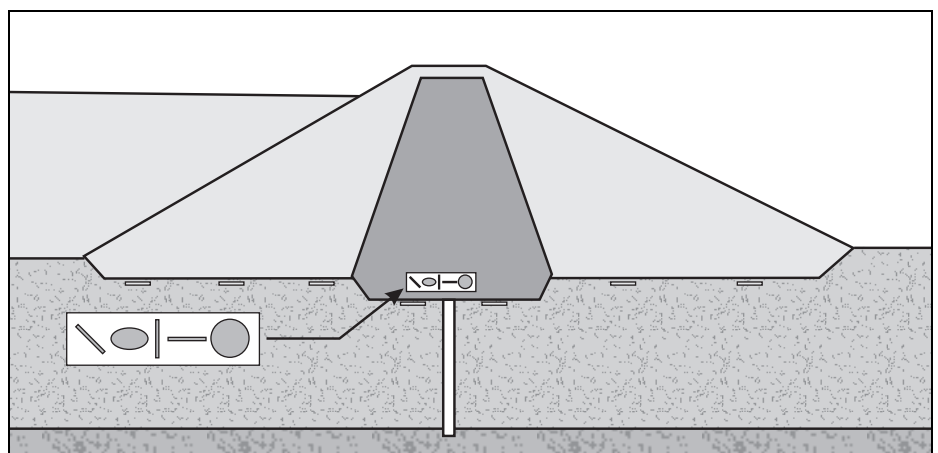
Advantages

Conformance: To minimize bridging effects, the total pressure cell has a low profile and a modulus similar to that of a typical soil. Fluid in the cell is de-aired to maximize sensitivity.

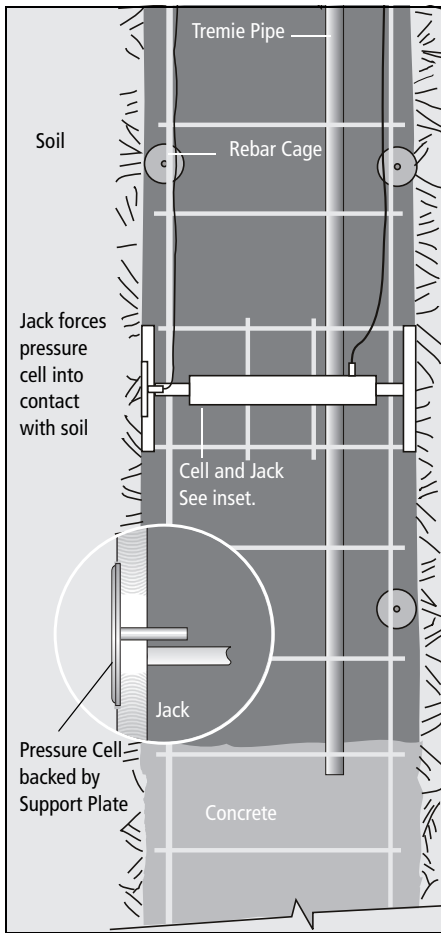
Accurate Calibration: The total pressure cell is calibrated under fluid pressure in a custom-designed test fixture.

Pneumatic or Vibrating Wire: The total pressure cell is available in a pneumatic or vibrating wire version.

Manual or Automatic Readout: The vibrating wire version can be read with a portable indicator or a data logger. The pneumatic version must be read with a portable readout.



Total pressure cells in an embankment dam. Detail shows multi-directional orientation of cells in an array.



Installation of the Jackout Cell

The jack-out cell is installed in the reinforcing cage, as shown in the drawing above. The signal cable and hydraulic hose are secured, and the cage is lowered into the slurry trench. When the cage is in position, the jack is activated and locked, forcing the cell into contact with the soil. The jack acts on the support plate, rather than directly on the cell, to prevent distortion of the cell. An equal force is applied to the reaction plate.

The trench is then concreted. In the illustration above, the jack has been activated, and the cell is in contact with the soil. Concrete is being delivered through a tremie pipe and will eventually displace the slurry.

VW PRESSURE CELLS

3.5 bar (50 psi) Pressure Cell 52608220
 7 bar (100 psi) Pressure Cell. . . . 52608230
 17 bar (250 psi) Pressure Cell. . . . 52608240
 35 bar (500 psi) Pressure Cell. . . . 52608250

7 bar (100 psi) Jack-Out Cell 52618230
 17 bar (250 psi) Jack-Out Cell 52618240
 35 bar (500 psi) Jack-Out Cell 52618250

The VW pressure cell includes the cell itself, a VW pressure transducer, and a thermistor or RTD for temperature measurement. Requires signal cable.

The VW jackout cell includes the cell, a VW pressure transducer, and a thermistor or RTD for temperature measurement. Requires signal cable. The rigid steel support plate, reaction plate, and double-acting hydraulic jack are supplied by the user.

Resolution: 0.025% FS.

Repeatability: $\pm 0.5\%$ FS.

Max. Pressure: 150% rated range.

Fluid: Ethylene glycol, de-aired to 2 ppm.

Dimensions: Cell is 230 mm diameter and 11 mm thick (9 x 0.43"). Transducer and connecting tube is 410 mm (16") long. Jackout version has transducer mounted to center of cell. Dimension from sensitive surface to connector end of transducer is 180 mm (7").

Weight: 3.2 kg (7 lb).

SIGNAL CABLE

Polyurethane Cable 50613524
 Shielded cable with four 22-gauge tinned-copper conductors and polyurethane jacket. Attached to pressure transducer at factory.

Universal Terminal Box. 57711600
 Not used if pressure cells are connected to data logger. Provides connections for 12 sensors and an indicator. Sensors selected by rotary switch. Weatherproof fiberglass box measures 290 x 345 x 135 mm (11.5 x 13.5 x 5.25").

VW READOUTS

Compatible readouts include the VW Data Recorder and other pluck-type VW readouts. See separate data sheets for details.

DATA LOGGERS

Compatible data loggers include the Campbell Scientific CR10X data logger with VW interface and AM16/32 multiplexer. Multiplexer can accommodate 16 transducers with temperature readings or 32 transducers without. See separate data sheet for features and specifications.

PNEUMATIC PRESSURE CELLS

21 bar (300 psi) Pressure Cell 51408200

21bar (300psi) Jackout Cell.51418200
 Pressure cell has pneumatic pressure transducer attached. Requires pneumatic tubing.

Range, Resolution and Repeatability:
 Determined by pressure gauge and indicator.

Fluid: Ethylene glycol, de-aired to 2 ppm.

Dimensions: 230 mm diameter x 11 mm (9 x 0.43"). Transducer adds 300 mm (11.75"). Jackout version has transducer is mounted to center of cell. From sensitive surface to connector end of transducer measures approximately 100 mm (4").

Weight: 3.2 kg (7 lb).

PNEUMATIC TUBING

Twin Tubing 51416900

Two 4.8 mm (3/16") polyethylene tubes bundled in polyethylene jacket. Rated for 35 bar (500 psi). Nylon tubing can be quoted on request.

Splice Kit. 51401723

Includes 3 brass unions, self-vulcanizing mastic pad, and sealing tape.

Quick Connect Plug. 51407302

Brass quick-connect fitting for input tube. Plug includes in-line filter and 90° elbow for insertion into panel.

PNEUMATIC READOUTS

Compatible readouts include 256 pneumatic indicator. See separate data sheet for features and specifications.