



ENCARDIO RITE



SHOTCRETE RADIAL PRESSURE CELL

MODEL ESC-37V-4

INTRODUCTION

The 'New Austrian Tunneling Method', or N.A.T.M., calls for the support of a tunnel by the rapid application of shotcrete to the freshly exposed ground. The theory behind this method of support, particularly useful in weaker grounds, is that if the inherent strength of the ground can be preserved, it will be almost self-supporting and will require much less artificial support in the form of concrete or steel.

Proper evaluation of total stress may help in:

- ✦ The adequacy of the shotcrete lining, indicating the need for perhaps more or less shotcrete to maintain stability.
- ✦ Verifying design assumptions that will promote safer and more economical design and construction.

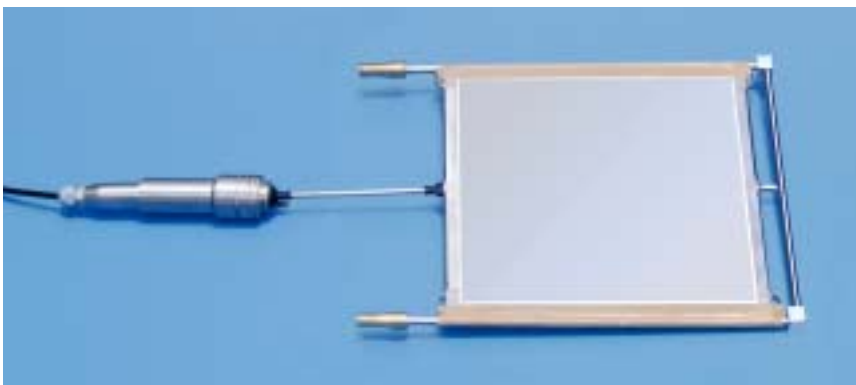
SHOTCRETE RADIAL PRESSURE CELL

Shotcrete radial pressure cells are designed for the measurement of radial stresses in shotcrete tunnel linings. They are often used in conjunction with the EDS-80 tape extensometer and EDS-64 bore hole extensometer to measure:

- ✦ The performance of the lining and
- ✦ To determine whether the lining is thick enough to maintain stability.

DESCRIPTION OF EQUIPMENT

The Encardio-rite N.A.T.M. style shotcrete radial pressure cells basically consists of a 300 mm x 300 mm flat square capsule and a pressure transducer connected to each other by a 6 mm dia. 165 mm long stainless steel tube. The rigidity of the cell exceeds 50,000 Mpa and ensures it will respond immediately and accurately to the onset of increasing concrete stresses.



FEATURES

- ✦ Rugged, waterproof all stainless steel construction for high reliability.
- ✦ Fluid filled for high rigidity, accurate and fast response.
- ✦ Vibrating wire sensor assures long term stability quick and easy readout.
- ✦ Grouting attachment for re-grouting the gaps between the cell and shotcrete.
- ✦ Readily adaptable to data loggers.
- ✦ Thermistor available for temperature correction .

APPLICATIONS

- ✦ Radial stresses in shotcrete tunnel linings.
- ✦ Assessing the adequacy of shotcrete lining.
- ✦ Mine backfill monitoring.
- ✦ Pressure on and within lining of underground excavations.
- ✦ Evaluating foundation bearing pressures.
- ✦ Stress in the rockwalls of unlined caverns.

Fluid filled pressure cells

The Encardio-rite shotcrete radial pressure cells comprises of two square plates welded round the edge. The narrow gap between plates is filled with fluid using a special process which ensures that all the air is excluded.

Vibrating wire transducer

The stainless steel pressure transducer is 42 mm dia. x 190 mm long. It incorporates the vibrating wire, the coil magnet assembly and the cable joint housing.

Lugs

Lugs are provided at the corners of the square plates to facilitate holding the cell in plane while the shotcrete is applied.

Grouting arrangement

The purpose of the grouting arrangement is to fill in the gaps between the cell and shotcrete, which might form due to shrinkage of the latter. These gaps, if allowed to remain, would prevent the transmission of pressures to the cell and will lead to zero or erroneous readings. For grouting arrangement, 8 mm dia. steel tubes having holes at every 25 mm are attached on both sides of the square pressure pad. These tubes are connected by a similar un-holed steel tube at the top. Grout is pumped into the gaps through the grouting arrangement integral to the cell using a manual grout pump, after the shotcrete around it has fully cured and has cooled off to the ambient temperature.

OPERATING PRINCIPLE

Increase in stress in the concrete causes a corresponding rise in the fluid pressure as the steel plates are squeezed together. The change in fluid pressure is sensed by the specially built Encardio-rite vibrating wire transducer and is converted to an electrical (frequency) signal which is transmitted to the vibrating wire readout unit. The transducer basically consists of a magnetic, high tensile strength

stretched wire, one end of which is anchored and the other end fixed to a diaphragm which deflects in some proportion to the applied pressure. Any deflection of the diaphragm changes the tension in the wire, thus affecting the resonant frequency of the vibrating wire.

The resonant frequency with which the wire vibrates can be accurately measured by the vibrating wire readout unit.

SPECIFICATIONS

Model:	ESC-37V-4
Range:	50 kg/cm ²
Transducer type:	Vibrating wire
Accuracy:	± 1 % fsd with our EDI-51V version 4.0 vibrating wire indicator (non linearity + hysteresis + repeatability)
Temperature limit	
Operational:	-20 to 70°C
Over range limit:	150 % of range
Read out:	Portable vibrating wire indicator
Enclosure:	Stainless steel
Thermistor:	YSI 44005 or equivalent (3 kOhms at 25 °C)

ENCARDIO-RITE ELECTRONICS PVT. LTD.

A-7 Industrial Estate, Talkatora Road, Lucknow, UP 226011, India
Tel +91 (522) 2661044 Fax +91 (522) 2661043 E-mail sales@encardio.com

Visit us at: www.encardio.com

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