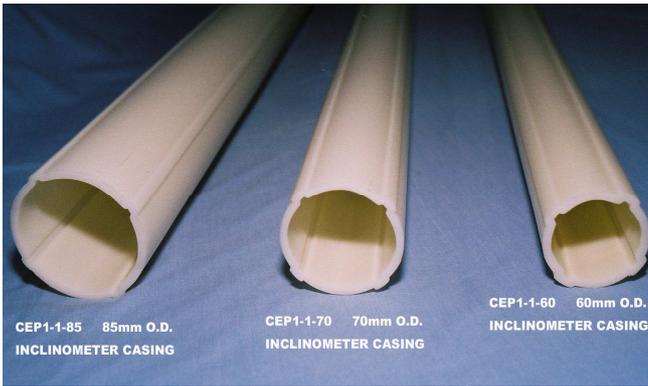


# CEP INCLINOMETER CASING



## INCLINOMETER CASING

CEP's inclinometer casings are typically installed in boreholes for use in slope stability surveys. It may also be embedded in fills, surcharge, cast into concrete in bored piles or diaphragm walls.

CEP's inclinometer casings are made from high-impact ABS plastic and are suitable for long term contact with all types of soils, grouts and ground water. The inclinometer casing has 4 external self alignment spines.

## CASING DIAMETER SELECTION

The diameter of the inclinometer casing affects the useful life of an inclinometer installation. Larger diameter casing offers longer life and is recommended for most applications where large vertical and lateral soil movements are expected.

**CEP1-1-85 mm Casing** is recommended for long term monitoring or where large lateral soil movements are expected.

**CEP1-1-70 mm Casing** is suitable for most construction projects where a moderate degree of lateral movement is expected.

**CEP1-1-60 mm Casing** is for installation in small diameter bore holes in competent soils or rock where anticipated deflections are small.

## INCLINOMETER COUPLING JOINTS SELECTION

The type of coupling joints to be used for an inclinometer bore hole installation depends on the strength of the sub-soils in which the casings are to be installed. The weakest link in the inclinometer

casing installation is the coupling joint. Correct selection of the type of coupling joints is very important to avoid:-

- ◆ Crushing and buckling of the joints and inclinometer casing caused by large vertical force due to

soil settlement.

- ◆ Dislocation and misalignment of the joints due to lateral squeezing and migration of the soft sub-soil during construction.

Correct coupling selection helps to prevent the inclinometer sensor from jumping grooves at the joints during bore hole survey caused by failure of the joints.

## STANDARD, SLIP-ON OR FIXED COUPLINGS

Standard, slip-on or fixed couplings are available in 160mm and 200mm length. Fixed connections are used in competent soil or where the SPT of the soil is greater than 10 blows per 300mm, or where the total vertical or lateral movements of the inclinometer installations are less than 50mm.

## TELESCOPIC AND FIXED COUPLING

For projects e.g. basement, tunnels, slope stability etc where the soil strength increases with depth, the inclinometer bore holes are subject to some vertical settlement instead of purely lateral movements. To get a better lateral profile from the inclinometers, it is good engineering practice to use telescopic couplings where the SPT N values of the soil are relatively low.

In order to take into account vertical movements of less than 60mm (from ground level to a depth of 12m B.G.L.), telescopic couplings each with a telescopic range of +/- 30mm should be used in the top 12 meter of an inclinometer BH.

## TELESCOPIC COUPLINGS.

Telescopic couplings which permit vertical and lateral movements of the inclinometer bore hole must be used in:-

- ◆ Soft sub-soils where SPT of the soil is less than 10 blows per 300mm.
- ◆ Reclamation projects.
- ◆ Sub-soil Improvement projects.
- ◆ Basement projects where total vertical or lateral movements are expected to exceed 50mm.

## SPIRAL OF CASING

In Singapore, a large scale land reclamation and soil improvement project was carried out in Changi and the specifications state that a spiral sensor should be used to measure the spiral of all the installed inclinometers. CEP inclinometer casings with telescopic couplings of +/- 75mm range were used for the project. (Deepest bore holes exceed 70m). The spiral sensor used was supplied by SLOPE Indicator Co., USA. All the spiral readings of the installed inclinometers were within the contract specification.

## INCLINOMETER CASINGS – PROJECT REFERENCE

- Singapore Projects by:-**
  - ◆ Public Works Department
  - ◆ Land Transport Authority
  - ◆ Port of Singapore Authority
  - ◆ Housing and Development Board
  - ◆ Jurong Town Corporation
  - ◆ Public Utilities Board
  - ◆ Ministry of the Environment
  - ◆ Private Developers
- Brunei Projects by:-**
  - ◆ JKR (Public Works Department)
  - ◆ Muara Port
- Malaysia Projects by:-**
  - ◆ JKR (Public Works Department)
  - ◆ PLUS (North-South Highway Project)
  - ◆ Private Sector Developers.
- Other Countries:**
  - ◆ Indonesia, Thailand, Brunei, Vietnam, Hong Kong, Taiwan, Japan, Korea, Sri Lanka, India, Australia, New Zealand, United Kingdom and EU Countries.

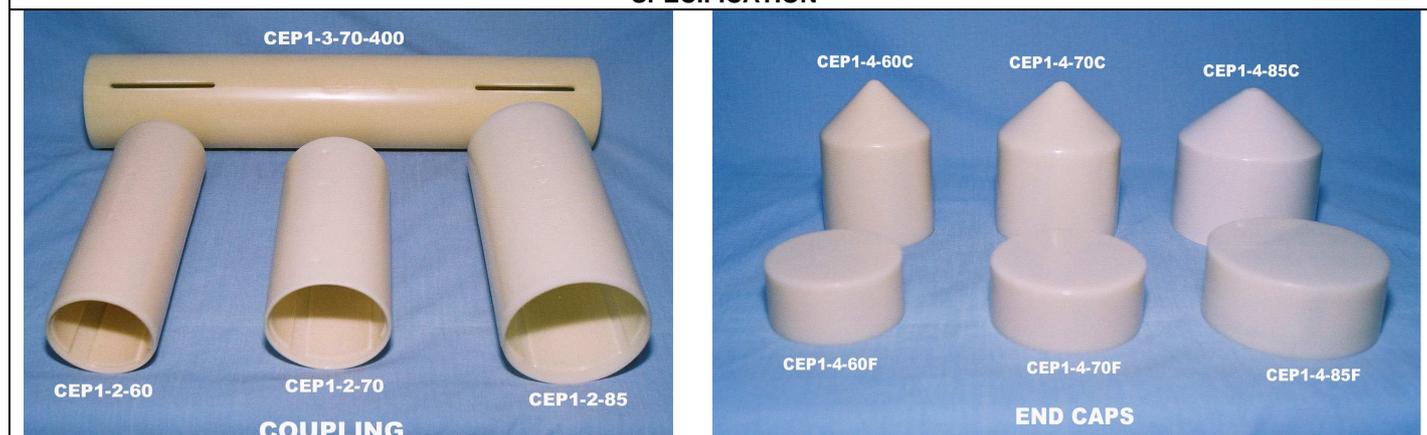
## CEP SERVICES PTE LTD

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# CEP INCLINOMETER CASING

## SPECIFICATION



Size	Model No.	Type	O.D., mm	I.D., mm	Length, mm	Telescopic Range, mm	Weight, Kg
60 mm	CEP1-1-60	Casing	60	52	3000		2.34
	CEP1-2-60	Coupling	67	60	200		0.18
	CEP1-3-60-200	Telescopic Coupling	67	60	200	±30	0.18
	CEP1-4-60C or CEP1-4-60F	Cap	66	60			0.04
70 mm	CEP1-1-70	Casing	70	62	3000		2.66
	CEP1-2-70	Coupling	77	70	160		0.14
	CEP1-3-70-200	Telescopic Coupling	77	70	200	±30	0.20
	CEP1-3-70-400	Telescopic Coupling	77	70	400	±75	0.40
	CEP1-4-70C or CEP 1-4-70F	Cap	77	70			0.07
85 mm	CEP1-1-85	Casing	85	77	3000		3.18
	CEP1-2-85	Coupling	91	85	200		0.30
	CEP1-3-85-380	Telescopic Coupling	91	85	380	±75	0.38
	CEP1-4-85C or CEP 1-4-85F	Cap	90	85			0.09

**Note: Specifications may be changed without prior notification.**

### Results of Test conducted on CEP Incliner Casing

CEP Incliner Casing and a 200 mm standard coupling assembled with rivets and sealed with special designed O-rings			
	O.D. 60mm	O.D. 70 mm	O.D.85mm
<b>Pull Test</b>	760kg	705kg	700kg
<b>Torque Test</b>	638Nm	520Nm	481 Nm
<b>Bending Test</b>	2.8KN	3.07KN	2.65KN
<b>Pressure Test</b>	>1.96MPa. Exceeds test chamber range of 20kgf/sq.cm	>1.96MPa Exceeds test chamber range of 20kgf/sq.cm	1.77MPa
<b>Spiral Test</b>	<0.3 degree per 3m.	<0.3 degree per 3m	<0.3 degree per 3m.
<b>Temperature Range</b>	-30°C to +88 °C	-30°C to +88 °C	-30°C to +88 °C

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