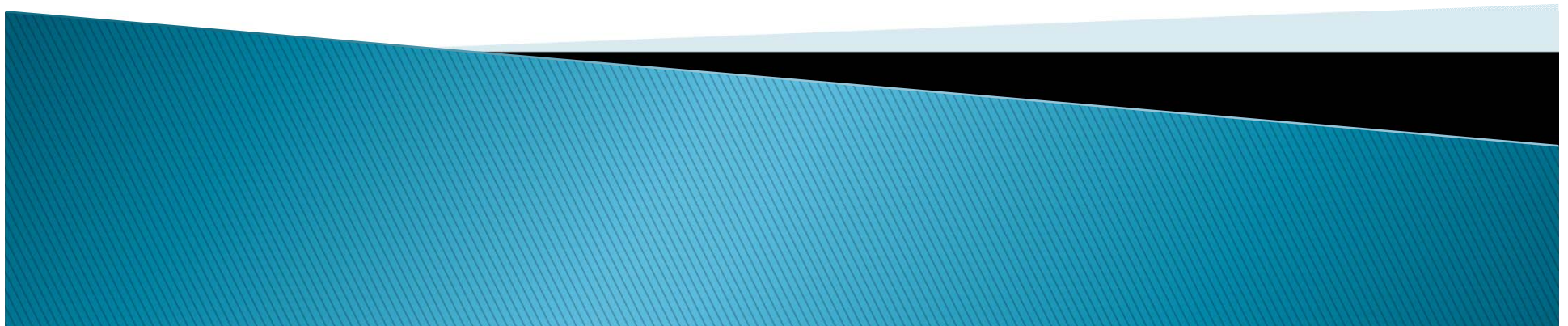


Kuliah Materi-4

Dynamic Cone Penetrometer (DCP)

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DCP – Introduction



Measuring the strength of in situ soil and the thickness and location of underlying soil layers can be accomplished using a simple, hand-held device called the Dynamic Cone Penetrometer (DCP). Used worldwide, the DCP is an inexpensive and easily transportable tool. The DCP was first introduced to the Minnesota Department of Transportation (Mn/DOT) at the Minnesota Road Research Project (Mn/ROAD). Since 1993, the DCP has been used by Mn/DOT as an acceptance tool for the compaction of pavement edge drain trenches.

Description of Device

The Dynamic Cone Penetrometer (shown at right) consists of two 16-mm (5/8-inch) diameter shafts coupled near midpoint. The lower shaft contains an anvil and a pointed tip which is driven into the soil by dropping a sliding hammer contained on the upper shaft onto the anvil. The underlying soil strength is determined by measuring

the penetration of the lower shaft into the soil after each hammer drop. This value is recorded in millimeters (inches) per blow and is known as the DCP penetration index (DPI). The penetration index can be plotted versus depth to identify thicknesses and strengths of different pavement layers or can be correlated to other soil strength parameters such as the California Bearing Ratio (CBR).



Handle: The handle is located at the top of the device. It is used to hold the DCP shafts plumb and to limit the upward movement of the hammer.

Hammer: The 8-kg (17.6-pound) hammer is manually raised to the bottom of the handle and then dropped (allowed to free fall) to transfer energy through the lower shaft to the cone tip. It is guided by the upper shaft.

Upper Shaft: The upper shaft is a 16-mm (5/8-inch) diameter steel shaft on which the hammer moves. The length of the upper shaft allows the hammer to drop a distance of 575 mm (22.6 inches).

Anvil: The anvil serves as the lower stopping mechanism for the hammer. It also serves as a connector between the upper and lower shaft. This allows for disassembly which reduces the size of the instrument for transport.

Lower Shaft: The lower shaft is a 16-mm (5/8-inch) diameter steel shaft, 900-1200 mm (35-47 inches) long, marked in 5-mm (0.2-inch) increments for recording the penetration after each hammer drop.

Cone: The cone measures 20 mm (0.787 inch) in diameter. Dimensions of the cone are shown in **Figure 4**. The 60° cone is becoming the standard for DCPs, although a 30° cone can be used when measuring the penetration index in stiffer soils.

Mn/DOT DCP Design (Scale 1 mm = 10 mm)

