

TEX-104-E

Determining Liquid Limits of Soils



Why

To define the water content of soil at the arbitrarily determined boundary between the liquid and plastic states.



When

For Type A embankment, untreated base, treated new base, when required on the plans, or plasticity index is required.

- Specification 132
- Specification 247



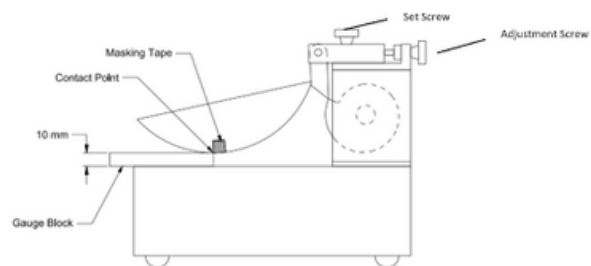
How

Equipment

- Porcelain Mixing Dish
- Scale
- Oven; maintain $230 \pm 9^\circ\text{F}$.
- Grooving Tool
- Liquid Limit Device
- Height Gauge Block

Procedure

- Inspect and verify the Liquid Limit Device to ensure it is in good working condition by checking:
 - Pin connection, screws, the point of contact, and the groove are not exceptionally worn on the cup and base.
- Use the height-of-drop gauge block and the adjustment plate to adjust the height of the cup.
- Place a piece of tape on the bottom of the cup halfway through the point of contact.
- Place gauge block on its back under the front of the cup up against the tape.
- Turn on/crank the handle and adjust the cup to where you hear a ringing, but the cup is not moving.



QUICK FACTS: SB 101 DRAFT

Part I: Multi-Point Method

- Mix 100 g of material and distilled or deionized water.
- Mix the water into the sample in small increments.
 - Do NOT mix material and water in the liquid limit cup.
- Spread material to a depth of 10 mm in the bottom of the cup.
- Make a groove in the material, ensure the groove closes with 25 - 35 blows.
- Allow the material to sit for 12 hours in a sealed bag.
- Spread and level material to a depth of 10 mm in the bottom of the cup, in as few strokes as possible.
- Use no more than six strokes to groove the material to avoid ripping the material.
- Turn on/crank the handle to drop the cup two times a second until the two sections of material come in contact for 0.5 inch at the bottom of the cup.
- Record the number of blows it took to get the closure. Observe two closures before one is accepted.
 - Do NOT hold the base of the liquid limit device while cranking machine.
 - If the material continues to slide on the cup with 20 blows or fewer this test is not applicable and should perform Tex-107-E on material.
- Remove at least a 10 g sample the width of the cup.
- Record the weight of the empty container/tare as C.
- Record the weight of the tare and wet sample to the nearest 0.01 g. record as A.
- Multi-point is the liquid limit at different moisture contents, ensure closures at:
 - 15-25 blows
 - 20-30 blows
 - 25-35 blows
- The three trials should be a minimum of ten blows apart.
- Dry samples in a $230 \pm 9^\circ\text{F}$ oven to constant mass
- Weigh and record dry weight of sample and tare. Record as B.

Part II: One-Point Method

- Follow Part 1 except for:
- Use 50 g of material.
- Obtain closure at 20-30 blows equal to Part 1 standard, observe two closures.
- Take one sample for trial.

Action

- Determine water content.
 - Plastic Index using the linear shrinkage percent.
 - $PI = LS \times (1.6)$
- Data Reduction
 - Plot Data
 - Use a Graph to correspond the number of blows to the water content for each point.
 - Draw a best-fit line straight through the three plotted points.
 - Liquid limit is the water content at the intersection of the line at 25 blows.
- Report liquid limit to the nearest whole percent.

$$W = \frac{(A - B)}{(B - C)}(100)$$

Where:
W = percent water content
A = mass of wet sample + tare, g
B = mass of dry sample + tare, g
C = mass of tare, g.