

Atterberg Limits Checklist
DOTD TR428

I. Scope

Procedure to determine the Liquid Limit, Plastic Limit, and Plasticity Index of soils.

II. Sample

- A. Weigh out 25 g of material passing the No. 40 sieve that has been obtained by DOTD TR 411 and oven dried at 140 °F.
 1. Place dried sample in evaporation dish and add enough water and mix to make the soil sufficiently form into a ball (be sure that sample is wetter than its Plastic Limit).
 2. Set sample aside uncovered to be ran after the liquid limit is set up.
- B. Weigh out 50 g of the material passing the No. 40 as performed in section II.A.
 1. Place sample in evaporation dish and mix with distilled water (be sure that sample is drier than its Liquid Limit).
 2. Set aside, covered (Do not add any dry soil to the sample after water is added).

III. Procedure:

- A. Plastic Limit
 1. Place material from section II.A on a glass plate or a piece of paper.
 2. Using 80-90 Strokes per minute roll the material into a thread 1/8th inch thick.
 3. Break thread into 6-8 pieces, re-combine the pieces, and roll them into a ball.
 4. Repeat steps 1-3 until the pieces crumble under pressure, and can't be rolled into a 1/8th inch thread anymore.
 5. Place pieces into a tared sample container, and cover with a lid to keep moisture content from changing.
 6. Weigh and record sample weight.
- B. Liquid Limit
 1. Calibrate the liquid limit device (Should be done before using the device).
 - a. Tape the straight edge of a strip of masking tape to the middle of the circle mark on the back of the brass cup (It should be a circle if it is an older device).
 - b. Flip the brass cup back down and slide your calibration block the brass cup until it meets the straight edge of the tape.
 - c. Turn on the device or turn the crank (if manual) and watch the brass cup as it taps the calibration block. The movement should be slight (up/down) and a light tapping sound should be heard when the cup hits the calibration block.
 - d. Adjust the settings of the device until this is done. Once calibrated, take the masking tape off the cup.
 2. Return to the Liquid Limit material.
 - a. Mix small portions of water into the sample making sure to mix it into a uniform mixture and place the material in the brass cup of the liquid limit device.
 - b. Spread the material evenly over half of the cup to a 1 cm thickness and press firmly on the sample to remove air bubbles. Place excess material in a dish.

- c. Swipe the material in the cup across the top face of the soil with a fluid motion and split the material down the middle with the grooving tool.
- d. Turn on the device or turn the crank. Liquid Limit device should crank at 2 rpms. The groove in the material should close between 20-30 blows. If it closes outside of this range, moisture in the material will need to be added or removed. Be sure not to hold the base of the liquid limit device while testing.
- e. Take the portion of the material with a spatula above and below the point of closure and place into a tared container, weigh, and record the weight.
- f. Place material in oven at 230 ± 9 °F and dry to a constant mass.

IV. Calculations

- A. Calculate the Plastic limit with this equation.

$$1. \% \text{ moisture} = \left(\frac{\text{weight of water}}{\text{dry weight of soil}} \right) \times 100$$

- B. Liquid limit is determined by the % moisture to the nearest 0.1%.

- 1. It is then plotted on the mean slope nomograph at Number of Blows to Moisture Content to Liquid Limit.

- 2. Report to the nearest whole number.

- C. Plasticity Index is the Liquid Limit - Plastic Limit ($PI = LL - PL$).

- 1. When the Plastic Limit is greater than or equal to the Liquid Limit, it is said to be Non Plastic. $PL \geq LL = NP$.