

Australian Standard[®]

AS 1289.3.2.1—2009

Methods of testing soils for engineering purposes

Method 3.2.1: Soil classification tests— Determination of the plastic limit of a soil— Standard method

1 SCOPE

This Standard sets out a method for determining the plastic limit of a soil (the moisture content at which a soil passes from the semi-solid to the plastic state).

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1289 Methods of testing soils for engineering purposes

1289.1.1 Method 1.1: Sampling and preparation of soils—Preparation of disturbed soil samples for testing

1289.2.1.1 Method 2.1.1: Soil moisture content tests—Determination of the moisture content of a soil—Oven drying method (standard method)

3 APPARATUS

The following apparatus shall be used:

- (a) A thick, flat, rigid mixing plate of suitable size, made of non-absorbent material.
- (b) A mixing bowl of convenient size with a suitable close-fitting lid.
- (c) Palette knives of convenient size.
- (d) Frosted glass plate of suitable size on which to roll the threads.
- (e) A rod 3 mm in diameter and about 100 mm long.
- (f) Small containers with close-fitting lids.
- (g) A wash bottle or beaker containing potable water.

NOTE: Some types of clay may be affected by poor or marginally potable water. In such cases, and when testing for reference purposes, distilled, demineralized or deionized water should be used.

4 PROCEDURE

The procedure shall be as follows:

- (a) Obtain a sample of about 40 g of soil from the material passing the 425 μm sieve which has been prepared in accordance with the procedure prescribed in AS 1289.1.1.

Alternatively, when practically all soil passes a 425 μm sieve the material may be used in the natural state without further preparation.

If the plasticity index is to be calculated using the results from this test, the same method of preparation shall be used for both liquid limit and plastic limit tests.

NOTE: If stones are present, only the material passing the 425 μm sieve should be used for the test. This can be achieved by rubbing the wet soil through the sieve until a sufficient quantity is obtained. The sieve used for this process should not be one of a set used for a particle size analysis, as the rubbing of wet soil through a sieve results in rapid wear of the sieve. This wear, however, will not have any appreciable effect on the plastic limit obtained for the sample under test.

Then proceed as follows:

- (i) Record the method of preparation.
- (ii) Thoroughly mix the soil with the water on the glass mixing plate or in the bowl, and knead until it becomes homogeneous and plastic enough to be shaped into a ball.
- (iii) Cover the soil and allow to cure for at least 12 h at room temperature.

NOTE: Prior to testing, some clayey soils may require to stand for 24 h to allow thorough permeation of the water through the soil.

- (b) Take a ball of soil of about 8 g and mould it between the fingers. Then roll the ball between the palms of the hands until slight cracks appear on its surface. (This is to ensure that the soil has dried sufficiently.) Roll the ball between the hands and the glass plate, or between two glass plates, using sufficient pressure to form the soil into a thread of about 3 mm diameter.
- (c) If the soil thread crumbles before the diameter reaches 3 mm, add more potable water to the whole soil mass, re-mix on the glass plate, and knead thoroughly.
- (d) If the soil thread rolls down to 3 mm diameter without crumbling, gather up the soil, knead it together again, and re-roll a thread.

The rod shall be used for comparison as a guide to the correct thread diameter.

- (e) Repeat Step (d) until the thread crumbles when it becomes 3 mm in diameter. Gather the portions of the crumbled thread into the container and cover the container. When threads of at least 3 mm in diameter cannot be rolled owing to the lack of cohesion of the soil (a true crumbling point), the plastic limit cannot be determined and shall be reported as such.

NOTE: Determination of crumbling point is as follows: With some soils the threads become extremely tough and it is difficult to determine the end point, since it is not possible to fully knead together the portions of the previously rolled thread, and the thread tends to split back into the unkneaded portions. Whether a true thread crumbling has taken place can be tested by trying to roll the crumbs. If they immediately break up, the plastic limit has been reached; but if they continue to roll down, then a true crumbling point has not been reached.

- (f) Roll further threads until between 5 g and 20 g of crumbled threads are produced and place them into the container.

NOTE: The quantity of 5 g to 20 g, which is taken as the moisture content sample, is less than that recommended in AS 1289.2.1.1; however, because of the homogeneity of the soil which constitutes the sample, it is considered to be a satisfactory quantity.

- (g) Determine the moisture content of the soil in the container in accordance with AS 1289.2.1.1.
- (h) Make two completely separate determinations as described in Steps (b) to (f) above. If the results from the two determinations differ by more than 2% moisture content, repeat the test.