Atterberg Limits: Plasticity, Liquidity and Consistency Indices

Plasticity index, liquidity index, consistency index and activity of a fine soil from its liquid limit, plastic limit, natural water content and clay fraction.

Method: Atterberg limit indices; Casagrande A-line I_P = 0.73(w_L − 20) (ASTM D2487)

Input parameters

Unit system: SI

Parameter	Value	Unit
Liquid limit	48.000	%
Plastic limit	22.000	%
Natural water content	30.000	%
Clay fraction (finer than 2 µm)	35.000	%

Calculated results

Parameter	Value	Unit
Plasticity index w_L − w_P	26.000	%
Liquidity index (w − w_P)/I_P	0.30769	
Consistency index (w_L − w)/I_P	0.69231	
Activity I_P/clay fraction (both in %)	0.74286	
A-line value 0.73(w_L − 20 %)	20.440	%

Notes for this case

- Above the A-line on the plasticity chart: clay.

Formula and method

$$I_P = w_L - w_P, \quad I_L = \frac{w - w_P}{I_P}, \quad I_C = \frac{w_L - w}{I_P}, \quad A = \frac{I_P}{c}$$

Variables

w_L	Liquid limit	-
w_P	Plastic limit	-
w	Natural water content	-
c	Clay fraction (finer than 2 µm)	-
I_P	Plasticity index w_L − w_P	-
I_L	Liquidity index (w − w_P)/I_P	-
I_C	Consistency index (w_L − w)/I_P	-
A	Activity I_P/clay fraction (both in %)	-
$I_{P,A}$	A-line value 0.73(w_L − 20 %)	-

Method and standards

Definitions.

Assumptions and limits

- Fine soils. The note is a simple A-line check; ASTM D2487 also has the CL-ML band (PI 4–7) and needs PI of at least 7 above the A-line for CL, so low-PI soils are flagged rather than called clay.

References

- Atterberg limit indices; Casagrande A-line I_P = 0.73(w_L − 20) (ASTM D2487)

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/geotechnical/atterberg-indices

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Reopens the calculator with the inputs of this report.