

# Gravel: Testing

If we want a good gravel to use in building our roads, we need to ensure we have a good quality material. If tests are not performed on the gravel, we only know what we are getting if it fails prematurely. It is too late to change anything at that point. We should verify compliance with the specifications beforehand.

Every year we should have the material in a gravel pit tested at a laboratory for cleanliness, soundness, and plasticity. This is going to cost approximately \$400. How much did you spend last year for gravel?

Over the course of the year, as we use the gravel, we should see if any changes occur either by using simple hand tests, visual means, or a Sand Equivalent test. If we suspect something has changed, we should perform another set of laboratory tests to see if the material still meets our specifications.

Many boards will balk at paying to have gravel tested. Ask the board members if they want their children to go to school on a bus that has not had its brakes tested. Or if they want to drive over a bridge where the contractor accepted the word of the concrete and steel suppliers that the materials were strong enough.

**Remember: One test is worth a thousand expert opinions.**

Test	Characteristic tested	Typical cost	When to Test		
			Each spring	Periodically (as needed)	When things change
Sieve (gradation)	Cleanness, gradation	\$60-75	X		X
Soundness	Durability	\$120-175	X		X
Plastic Index	Plasticity	\$70-80	X		X
Sand Equivalent	Plasticity	\$90-100	X	X	X
Hand test			X	X	X

## TESTS FOR GRAVEL

### Sieve Analysis

Many highway and all soils laboratories are equipped with a set of sieves and a sieve shaker. If you have access to such a laboratory, the gradation can be determined quite

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readily. The dry material is weighed, washed to remove the fines, dried, weighed again, placed in a set of sieves and then agitated until the smaller-sized particles move down through the nest of sieves. The material retained on each of the sieves is weighed and expressed as a percentage of the weight of the total sample. The washed portion is also included in the calculations.

If you do this test yourself or have it done by laboratory personnel, get the total sample weight and then make sure that the total sample is washed through the No. 200 sieve before sieving. If the material is merely sieved dry, the percent silt and clay will be too low since much of the finer material will adhere to the larger sand and gravel particles.

### Soundness

The soundness test simulates the effects of freezing and thawing. The gravel is placed in a bath of Epsom salts (Magnesium Sulfate) and water. The stones are then heated in an oven. The crystals that form during the drying will break apart weak materials in a similar fashion to water when it freezes. Unsound gravel will degrade very quickly.

### Plastic Index

Two tests -the liquid limit and the plastic limit -are run on that part of the sample which passes a No. 40 sieve (40 opening to the inch).

The plastic limit is the moisture content at which a snake of soil 1/8" in diameter begins to break apart. It is a measure of how plastic the fine particles are.

The liquid limit is the moisture content where the fine material begins to behave more like a semi-liquid than a plastic or solid.

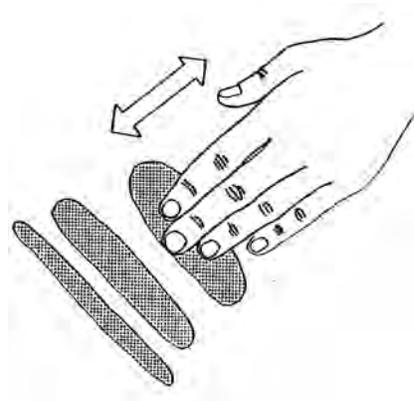
The difference between the liquid limit and the plastic limit is the plastic index. The greater this difference the more problems will occur in a roadbed when there is excess moisture.

### Sand Equivalent Test (see *Tech Tip Gravel: Sand Equivalent Test*)

This simple test is performed in a lab or in the field in approximately 40 minutes. The Sand Equivalent Test measures the proportion of clay-like particles in the sand size and smaller particles of a gravel. It is similar to the Mason Jar test many people know.

### Hand Tests (see *Tech Tip Gravel: Hand Test*)

There are several hand tests that can be performed to help detect when the quality of a gravel changes.



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