

RECIPE FOR GRAVEL - BASE QUALITY

Ingredients

- Rock (strong and durable, not susceptible to weathering)
- 1 glacier

Crush rock with glacier for at least 10,000 years until mixture has right proportions of gravel, sand, and silt with little or no clay. Needs to be non-plastic, and densely graded.

From the kitchen of Mother Nature

Depending upon where it is used, gravel needs to have different characteristics. The difference in materials may be very slight, but is quite significant. A gravel pit, which has provided high quality gravel for many years, may suddenly be worked out because the gravel remaining is of marginal or poor quality

Good gravel has six characteristics. It should be:

- CLEAN
- STRONG
- DURABLE
- WELL-GRADED
- NON-PLASTIC
- ANGULAR

CLEAN

When building a road there are three important things to keep in mind, *drainage, drainage, drainage*. Fines (silt and clay) will hold on to any excess water and cause the gravel to be weak. Additionally, the fines will increase the problems of heaving during the winter. The more fines, the weaker the gravel, especially during the spring thaw. When using a gravel for a base, the maximum amount of fines is 8 percent. Five (5) percent is more desirable.

The recipe is different for a gravel-surfaced roadway. We need some fines to act like a binder and hold the particles of sand and gravel together under the force of traffic. In a gravel for a surface course the fines content should be between 8-15 percent. A gravel for a surface DOES NOT make a good gravel for a base. It would be too dirty.

CORNELL LOCAL ROADS PROGRAM

416 RILEY-ROBB HALL, ITHACA, NY 14853

PHONE: (607) 255-8033

FAX: (607) 255-4080

E-MAIL: clrp@cornell.edu

INTERNET: www.clrp.cornell.edu

Tech Tips are published by the Cornell Local Roads Program with support from the Federal Highway Administration, the New York State Department of Transportation, and Cornell University. The content is the responsibility of the Local Roads Program.

STRONG

We want a gravel which can support the weight of traffic. If the particles are not strong enough, they will break down under the force of traffic and degrade. They must be both strong enough to support traffic and to resist abrasion from the rubbing of the particle when traffic drives over them.

DURABLE

If we could stop winter, we might not need very durable materials. But winter comes every year and with it comes freezing and thawing. This action of water turning into ice and back again causes some stone materials, such as shales, to break apart, fail prematurely, and turn to silt.

The particles in the gravel must be able to survive freezing and thawing without loss of strength and without degrading into smaller size particles. If either happens, cleanliness and strength are lost.

WELL-GRADED

In the NYSDOT Specifications you can see the requirements for the amount of particles of various sizes in a gravel. The Specification says the gravel should be dense-graded with all particle sizes represented. Dense-graded materials are more stable, easier to construct and maintain, and will be free-draining if they are clean and durable.

NON-PLASTIC

There should be very few fines (silt-sized particles), and the fines that are present should be non-plastic. Plastic fines (clay) will cause excessive weakness during wet periods, reduce stability, and will lead to premature pavement failure.

If we have a dirty material that has a lot of non-plastic silty fines, the gravel will be prone to heaving and moving during the winter. It will drain poorly. Therefore, we need both a clean and a non-plastic quality to make a good gravel.

ANGULAR

The closer to the surface of the road, the more critical the angularity of the gravel. The angular nature of good gravel particles locks them into place and helps keep them from moving under traffic. Using crushed particles is the best way to ensure that the angularity of the base course and surface gravel is adequate. For a subbase this angularity is less critical. If we have all five of the above characteristics, crushing the stones just to get angularity may not be necessary.



This work by the Cornell Local Roads Program (CLRP) is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 3.0 Unported License](https://creativecommons.org/licenses/by-nc-sa/3.0/).