

# RAPIDroads User Guide

## Emergency Management Operations

RAPIDroads increases soil density: helps reduce voids between soil particles by altering electro-chemical attraction in soil particles and releasing bound water. The result is a tighter, dryer, more dense road foundation

RAPIDroads lowers water permeability: Tighter soil configurations discourage the migration of water that normally occurs in the voids between particles. Greater resistance to water penetration deterioration.

**RAPIDroads fully cures in just 72 hours. This means that you can have active secondary access roads virtually anywhere and in full use within 72 hours which means:**

**EXPIDITED EMERGENCY SERVICES AND ASSISTANCE!**

Environmentally safe: RAPIDroads is a natural, safe (organic) material. RAPIDroads is non-toxic, non-caustic and will cause no harm or danger to humans, animals, fish or vegetation.

Cost effective: All weather, low maintenance soil roads can be achieved for small fraction of bituminous paving or other resurfacing costs.

Simple to use: RAPIDroads is simply added to water, applied with a sprayer truck and mixed into the material. RAPIDroads is a liquid product. This eases handling and preparation procedures and adds to the cost effectiveness. None of the elements in the natural organic materials are combustible.

## **How to Build Emergency Roads using RAPIDroads**

RAPIDroads is easy to apply and requires no special equipment or application procedures. It can be used with reclaiming machines or applied with regular road building machines. RAPIDroads should be used with soils that contain approximately 20% cohesive fines. It is mixed with water used for compaction during normal building techniques. A typical application to stabilize a 6-inch existing or new road base is presented as follows:

### **Guidelines before starting:**

Construction of new and existing roads should consider several design elements, some of which are: long term use and maintenance, weather conditions such as snow, rain, extreme heat and cold, traffic loads and frequency of use, vehicle weight and speed, and soil condition.

Road construction should not be done when rain is expected or nighttime temperatures are below 0c (32 deg) and daytime temperatures are below 10c (50 deg).

Sample the soil that will be used on the project. Contact TerraFusion to make sure soil is within a usable gradation range.

Proper moisture must be maintained for compaction.

### **Items needed to complete a successful demonstration:**

1. Blade (grader).
2. 20 ton compactor (preferred) or larger.
3. Water truck or movable tank.
4. Approximately 4000 gallons of water, depending on soil moisture content).
5. Aggregate – RAPIDroads needs materials with 10% to 20% cohesive fines passing the 200 mesh size. Use materials that are structurally sound and will result in good load bearing values.
6. Basic measuring equipment
7. People to operate the equipment and labor required.

### **Preparations prior to construction:**

Blade the area in which the road will be used. If the road being built will have a lot of heavy traffic, or heavy equipment, greater base thickness will be required. Consult with a civil engineer qualified in road construction for base thickness to achieve proper load bearing capacities.

Blade the material into a windrow on the side of road. If imported aggregate is needed mix your materials to the gradation desired. Road base materials using RAPIDroads should have a gradation mix (size distribution) that will result in good load bearing values and contain approx. 18% to 30% non-granular fines (-200 mesh size and be cohesive in nature). Keep in windrow on side of road.

We will add RAPIDroads to the water and spray on the windrow and road sub-base prepared the day before. Add one gallon of RAPIDroads concentrate to the required amount of water (will vary from soil to soil – see tables below) to bring 165 cubic yards of material up to optimum moisture. The amount of water needed will depend on how wet or dry your material is. A general starting rule for dry material is 1 gallon of RAPIDroads to 1,000 gallons water. 15 gallons of RAPIDroads will treat one mile 24 feet wide and 6 inches deep. With top loading water tanks, always fill the tank with water first, then add the RAPIDroads. Failure to do so will result in a tank full of foam.

Blade the windrow treated with RAPIDroads side to side to mix everything together and promote total moisture absorption. Proper moisture must be maintained during compaction. RAPIDroads works best between 2% - 3% below optimum moisture. Do not compact above optimum moisture. After applying RAPIDroads to the road “material” additional water can be applied to bring the moisture content closer to the amount needed for proper compaction.

Grade the aggregate mix back onto the road sub-base in 6” inch lifts. Each 6” inch lift will require about 6 rolls with the compactor (or until proper compaction is achieved), the last lift will require 5 to 8 passes with the compactor, or until you have achieved maximum compaction. In between lifts, we spray RAPIDroads water mix on the compacted surface, before the next 6” inch lift. If only one 6 inch lift is being done 5 to 8 passes with the compactor is required. Always turn off vibrator for the last two passes.

Let cure for 3 days. After 3 days, you can add chip seal, asphalt, concrete or leave bare.

### **Determining the proper amount of RAPIDroads and water:**



Good compaction required more experience than other types of excavation work. It is difficult because there are so many type of soil, each needing different compaction techniques. For example, a sandy soil needs much more water than heavy clay before it reaches maximum density. You need to know what the different types need for proper compaction.

After a few years of experience of compacting different types of soil, you will be able to look at a particular soil and know whether it has enough water to compact well. **One quick test is to grab a handful of soil and squeeze it. Soil that crumbles when you open your hand it is too dry. If it holds solid, it should be good. If you can squeeze moisture out of the soil or it feels sticky, it is too wet.**

Water acts as a lubricant and helps the particles of soil slide into place. If too much water is added, the particles of soil tend to float, lowering the soil density. On the other hand, if the soil is too dry, the particles will not slide into the small voids and the density will be lowered. If soil does not contain the correct amount of water, it won't pass compaction testing no matter how much you roll it. If soil fails the test because it is too wet, it can be rolled again after it dries some. It'll probably pass then. IF the soil didn't pass because it was too dry, you'll have to re-ripe it up again, add more water, and re-roll it.

The above calculations assume a weight of 2,700 lbs per cubic yard of material. This is a good approximation for a cubic yard of clay and silt.

## Total RAPIDroads Needed

### Example: Metric

A) Width	7 m
B) Length	46 m
C) Depth	.152 m
D) Volume m <sup>3</sup> 7m x 46m x .152m =	48.95 m <sup>3</sup>
E) RAPIDroads 33 / 48.95	33/48.95
G) Total RAPIDroads needed liters	About 1.5 liters

*The simple steps in the RAPIDroads process:*



Grader blading material into a windrow



Water truck adding RAPIDroads to windrow materials and sub base



Grader mixing RAPIDroads by windrowing the material side to side



Grader spreading material and shaping the road



Compactor, compacting the road



Final shaping of the road