



REGENESIS

Oxygen Release Compound (ORC[®])

Installation Instructions

(Excavation Applications)

SAFETY:

Pure ORC is shipped to you as a fine powder, which is rated at -325 mesh (passes through a 44 micron screen). It is considered to be a mild oxidizer and as such should be handled with care while in the field. Field personnel should take precautions while applying the pure ORC. Typically, the operator should work up wind of the product as well as use appropriate safety equipment. These would include eye, respiratory protection and gloves as deemed appropriate by exposure duration and field conditions.

Although two options are discussed, application of ORC should never be applied by personnel within the tank excavation, unless proper shoring or sidewall cutback is in place.

GENERAL GUIDELINES:

ORC can be applied in a dry powder form or as a slurry. Field conditions dictate which form of ORC can be used most effectively.

Installation of ORC should be within the tank excavation floor and/or in an adequate backfill section thickness to account for the anticipated groundwater "smear zone".

Maximum treatment effect is obtained when ORC is mixed as thoroughly as possible within the backfill material. The more dispersed the ORC slurry/powder within the excavation backfill, the more effective the treatment.

The quantity of ORC to be used is generally calculated prior to moving into the field for installation. Generally it is applied at a rate of between 0.1% and 1.0% by weight of the soil matrix. The following illustrates a dilute application rate calculation:

Use a weight/weight percent of ORC/backfill material to ensure distribution of the ORC into the desired aquifer section. For example: a 0.15% weight of ORC to weight of backfill for the standard ORC weight (30 pounds) per container calculates as follows: $30 \text{ lb. ORC} / 0.15\% = 20,000 \text{ lbs. of soil matrix}$. Thus, to achieve a 0.15% mixture of ORC in the backfill material, 30 lb. of pure ORC should be mixed into 10 tons (20,000 lbs. ÷ 2,000 lbs./ton) of backfill, or approximately 7 - 10 cubic yards of soil depending on field conditions. Professional judgment should be used to select the appropriate soil mass per cubic yard for designing each site treatment.

CHOOSING THE FORM OF INSTALLATION:

Pure ORC is shipped to you in a powder form. Weather conditions (especially wind) may have a direct effect on the application of ORC as a tank backfill amendment.

Application of the dry powder may be difficult in windy conditions. To counter the effects of wind (and the subsequent potential loss of ORC), Regenesi recommends that a water source or a spray tank be on-site to wet down the ORC and the backfill material as ORC is applied.

Application of ORC in a slurry format is a very effective method and eliminates the wind issue.

Four somewhat different installation conditions can be encountered in the field:

- ORC in a pea gravel back-fill. ("Type 1")
- ORC in a soil back-fill. ("Type 2")
- ORC mixed in native soil in the bottom of a tank pit. ("Type 3")
- ORC installed in soil under standing water in the bottom of a tank pit. ("Type 4")

A single tank pit excavation can include more than one of these conditions, depending on the site and extent of treatment. Instructions for each condition are discussed separately in the following sections. After the installation instructions are detailed instructions for mixing the slurry, if that is the option chosen.

INSTALLATION INSTRUCTIONS:

"Type 1," ORC in a Pea Gravel Back-fill

The easiest method for installing ORC in pea gravel back-fill is to mix the ORC in the material in a backhoe or skiploader bucket before placing it in the excavation.

- **Dry Powder method**

Into each scoop of back-fill material add the appropriate portion of ORC being installed. Generally, it is advisable to moisten the material in the bucket to reduce wind blown ORC loss. Excessive winds make this method not feasible.

After mixing the dry powder in the bucket, it is dumped into the bottom of the excavation. The backhoe bucket can be used for further mixing in the excavation.

- **Slurry method**

Mix a 63% solids slurry of ORC and water (see "Steps to make ORC slurry"). This relatively thick slurry is used to help keep the ORC dispersed through the pea gravel, even when it contacts water in the bottom of the excavation during installation. It is generally desirable to avoid having the ORC run down through the pea gravel and collect in the bottom of the excavation. The thick slurry addresses this issue.

In each scoop of back-fill material, add the appropriate amount of ORC slurry. Pre-mix the materials in the backhoe bucket. After mixing, dump the slurry and back-fill into the bottom of the excavation. The backhoe bucket can be used for further mixing in the

excavation.

If the slurry method is being used, observe the physical behavior of the ORC in the fill material. If the ORC collects at the bottom of the back-fill material, increase the percent solids content by reducing the amount of water being used to make the slurry.

“Type 2,” ORC in a Soil Back-fill

Follow the instructions for the pea gravel back-fill method, except:

If the slurry method is being used, the solids content should be reduced. Typically a 50% solids is appropriate, although soil conditions sometimes dictate lower solids contents (see “Steps to make ORC slurry”).

“ Type 3,” ORC Mixed in Native Soil in the Bottom of the Tank Pit

When ORC is added to the bottom of a tank pit it may be done by backhoe or injection.

CAUTION: Personnel should never work within the tank excavation, unless proper shoring or sidewall cutback is in place.

- **Backhoe method**

A skilled backhoe operator can distribute the ORC around the bottom of the tank excavation and, using the bucket, mix it thoroughly. If there are no winds, it may be possible to:

1. Put the dry ORC powder in the backhoe bucket,
2. Lower it to the bottom of the pit,
3. Gently deposit the ORC evenly on the remaining soil,
4. Use the bucket to mix the powder into the soil,
5. To mitigate dusting, if necessary, spray water into the excavation during the process.

An alternative backhoe method is to use a 50% (or less) solids ORC slurry (see “Steps to make ORC slurry) in place of the dry powder. This eliminates the dusting problem, and in some cases enhances the even distribution of ORC into the soil. Observe the slurry mixing behavior in the bottom of the excavation, and adjust the water content of the slurry to optimize mixing, if necessary.

- **Injection method**

If available, a pump and root feeder may be used to inject an ORC slurry into the excavation floor. This may require a more dilute slurry mix, and care should be taken to assure that the solids do not settle out of the slurry prior to injection.

“ Type 4.” ORC installed in standing water in the bottom of a tank pit

Application of ORC into tank excavations with standing water requires the operator apply ORC in a slurry form. ORC powder application in this scenario is not advised because a portion of the ORC particle fraction is not likely to pass through the surface tension of the standing water. Caution: Personnel should never work within the tank excavation, unless proper shoring or sidewall cutback is in place.

- **Backhoe method**

A skilled backhoe operator can distribute the ORC slurry within the excavation, and mix it into the soil underlying the standing water with the bucket. Steps for installation:

1. Mix a high solids content ORC slurry (63% solids). See (“Steps to make ORC slurry”).
2. Pour slurry into the backhoe bucket.
3. Lower the bucket to the standing water level in the excavation, and deposit the slurry as evenly as possible across the excavation floor. The dense slurry (63% solids is 1.6 grams per ml) will tend to make the majority of the slurry sink quickly to the bottom of the water layer.
4. Use the bucket to mix the slurry into the soil.
5. Water in the vicinity of the ORC slurry will often turn white and milky, since some of the ORC is dispersed within the standing water. This provides additional dispersion within the standing water and back-fill material as it is added to the excavation.

- **Injection method**

If available, a pump and root feeder may be used to inject an ORC slurry into the soil in an excavation. This may require a more dilute slurry mix, and care should be taken to assure that the solids do not settle out of the slurry prior to injection.

MIXING ORC SLURRY:

ORC powder is shipped to you in pre-measured batches. Each batch is contained in a plastic bag which is shipped in a 5-gallon bucket.

Remove the pre-measured ORC bag from the 5-gallon bucket and open
 Measure and pour the appropriate amount of water from the following table into the 5 gallon bucket

Slurry Solids Content (%)	Pounds of ORC	Gallons of Water
63%	30 lbs.	2.1 gal. (2 gal. + 2 cups)
50%	30 lbs.	3.6 gal. (3 gal + 2 1/2 qts.)

Add the entire ORC pre-measured bag to the water (30 pounds). If the slurry solids contents of less than 50% are desired, the quantity of ORC per batch mixed in the bucket must be reduced. For example, a bucket containing four gallons of water would require 22.4 pounds of ORC to make a 40% solids slurry, and 16.6 pounds of ORC to make a 33% slurry.

Use an appropriate mixing device to thoroughly mix ORC and water. Regenesis

recommends use of a 0.5 Horsepower (minimum) hand held drill with a “jiffy mixer” or stucco mixer. A common paint paddle can be used to scrape the bottom and sides of the container to ensure thorough mixing. Standard environmental slurry mixers may also be used.

After mixing, small amounts of water can be added to adjust the consistency of the slurry.

When slurries are used, the early batches should be observed in the process of mixing with the soil. Each site can vary, due to soil type and moisture content. Based on professional judgment, additional water can be added to subsequent slurry batches.

ORC slurry should be used ASAP; if the ORC slurry has been standing more than 15 minutes, it should be remixed immediately before using. Do not let stand more than 30 minutes without stirring. Otherwise, the slurry will begin to harden into a weak cement.

For direct assistance or answers to any questions you may have regarding these instructions, contact Regenesi s Technical Services at 949-366-8000.

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