William Rossell

CE 417

Homework 19

Due Date: 03-05-2018

Question:

A soil borrow material in its natural state in the ground has a unit weight of 123 pcf. When a sample of this soil is dried in the laboratory, its dry unit weight is 103 pcf. What is the water content of this borrow material?

Solution:

Where, γ is the unit weight of soil

γd is the dry unit weight of soil

ω is the water content

**Final Solution:** Water content of soil borrow material is around 19.4%.

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Homework 19

Due Date: 03-05-2018

Question:

A soil borrow material in its natural state in the ground has a unit weight of 124 pcf. Its natural water content is 8.2%. What is the dry unit weight of this material?

Solution:

Where, γ is the unit weight of soil

γd is the dry unit weight of soil

ω is the water content

**Final Solution:** The dry unit weight of soil borrow material is 114.6 pcf.William Rossell

CE 417

Homework 19

Due Date: 03-05-2018

Question:

The borrow material to construct an embankment has a dry unit weight of 85.0 pcf and a water content of 6%. The specific gravity of the solids is 2.64. The contract specifications require that the soil be placed in the fill at a γd of 113 pcf and a water content of 6%. How many cubic yards of borrow are required to construct an embankment have a 60,000-cy net volume? (79,765 bcy)

Solution:

Due to required water content and present water content being the same, simply equate desired fill material to borrow material:

**Final Solution:** 79,765 cubic yard of the specified borrow material will be required to construct the embankment within contract specifications.

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Homework 19

Due Date: 03-05-2018

Question:

The soil borrow material to be used to construct a highway embankment has a mass unit weight of 98.0 pcf, a water content of 6%, and the specific gravity of the soil solids is 2.65. The specifications require that the soil be compacted to a dry unit weight of 112 lb per cf and the water content be held to 13%. (279,355 bcy, 21.0 gal/bcy borrow, 18%, 132.1 lb/cf)

1. How many cubic yards of borrow are required to construct an embankment having a 230,600-cy net section volume?
2. How many gallons of water must be added to the borrow material, on a per cubic yard basis, assuming no loss by evaporation?
3. If the compacted fill becomes saturated at constant volume, what will be the water content and mass unit weight of the soil?

Solution:

a.

b.

c.

**Final Solutions:**

**a.** The required volume of borrow material is 279,355 bcy.

**b.** The required amount of additional water to increase the moisture content of soil is roughly 21 gallons per cubic yard of borrow material.

**c.** Should the compacted fill become saturated at a constant volume, the moisture content of saturated soil will be roughly 18% and the new mass unit weight of the soil will be approximately 132.16 pounds per cubic foot.