

## **EXPERIMENT 4**

### **SPECIFIC GRAVITY DETERMINATION**

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**Purpose:**

This lab is performed to determine the specific gravity of soil by using a pycnometer. Specific gravity is the ratio of the mass of unit volume of soil at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature.

**Standard Reference:**

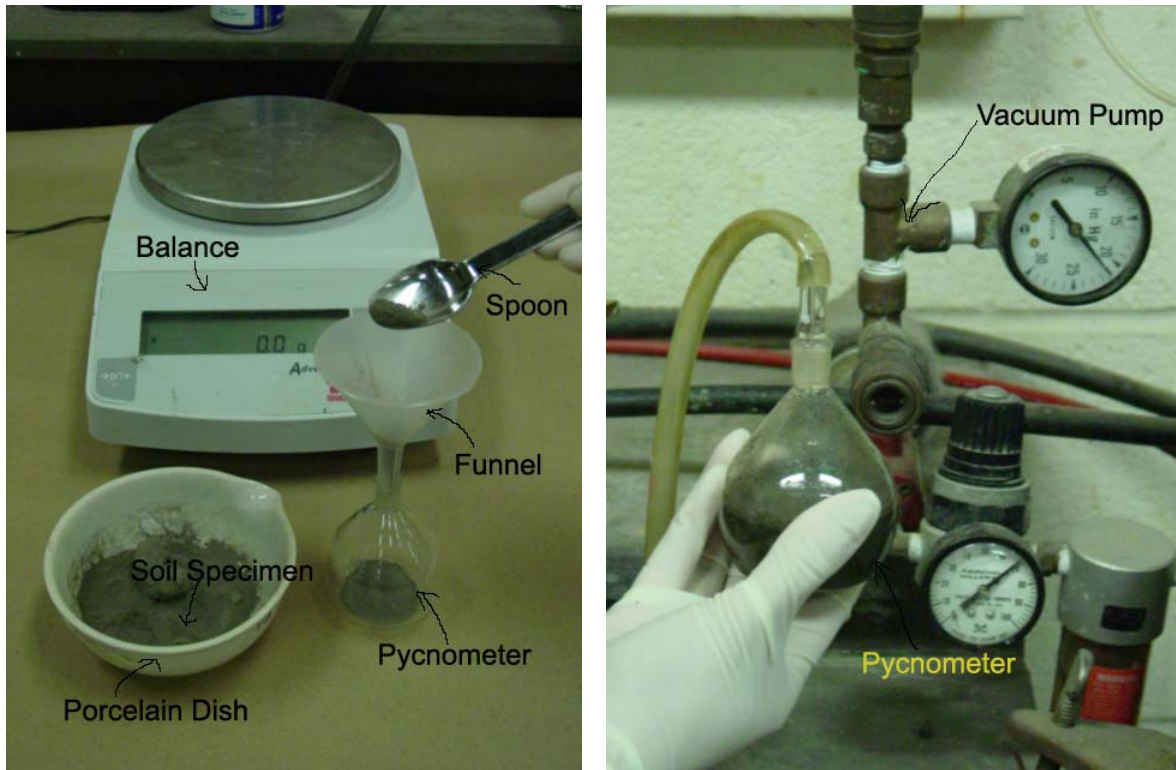
ASTM D 854-00 – Standard Test for Specific Gravity of Soil Solids by Water Pycnometer.

**Significance:**

The specific gravity of a soil is used in the phase relationship of air, water, and solids in a given volume of the soil.

**Equipment:**

Pycnometer, Balance, Vacuum pump, Funnel, Spoon.



### Test Procedure:

- (1) Determine and record the weight of the empty clean and dry pycnometer,  $W_p$ .
- (2) Place 10g of a dry soil sample (passed through the sieve No. 10) in the pycnometer. Determine and record the weight of the pycnometer containing the dry soil,  $W_{PS}$ .
- (3) Add distilled water to fill about half to three-fourth of the pycnometer. Soak the sample for 10 minutes.
- (4) Apply a partial vacuum to the contents for 10 minutes, to remove the entrapped air.

- (5) Stop the vacuum and carefully remove the vacuum line from pycnometer.
- (6) Fill the pycnometer with distilled (water to the mark), clean the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and contents,  $W_B$ .
- (7) Empty the pycnometer and clean it. Then fill it with distilled water only (to the mark). Clean the exterior surface of the pycnometer with a clean, dry cloth. Determine the weight of the pycnometer and distilled water,  $W_A$ .
- (8) Empty the pycnometer and clean it.

### **Data Analysis:**

Calculate the specific gravity of the soil solids using the following formula:

$$\text{Specific Gravity, } G_s = \frac{W_0}{W_0 + (W_A - W_B)}$$

Where:

$W_0$  = weight of sample of oven-dry soil,  $g = W_{PS} - W_P$

$W_A$  = weight of pycnometer filled with water

$W_B$  = weight of pycnometer filled with water and soil

**EXAMPLE DATA**

## SPECIFIC GRAVITY DETERMINATION DATA SHEET

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Date Tested: *September 10, 2002*

Tested By: *CEMM315 Class, Group A*

Project Name: *CEMM315 Lab*

Sample Number: *B-1, SS-1, 2'-3.5'*

Sample Description: *gray silty clay*

Specimen number	1	2
Pycnometer bottle number	<i>96</i>	<i>37</i>
$W_P$ = Mass of empty, clean pycnometer (grams)	<i>37.40</i>	<i>54.51</i>
$W_{PS}$ = Mass of empty pycnometer + dry soil (grams)	<i>63.49</i>	<i>74.07</i>
$W_B$ = Mass of pycnometer + dry soil + water (grams)	<i>153.61</i>	<i>165.76</i>
$W_A$ = Mass of pycnometer + water (grams)	<i>137.37</i>	<i>153.70</i>
Specific gravity ( $G_s$ )	<i>2.65</i>	<i>2.61</i>

Example Calculation:  $W_P = 37.40$  g,  $W_{PS} = 63.49$  g,  $W_B = 153.61$  g,

$$W_A = 137.37 \text{ g}$$

$$W_o = 63.49 - 37.40 = 26.09 \text{ g}$$

$$G_s = \frac{26.09}{26.09 + (137.37 - 153.61)} = 2.65$$

## **BLANK DATA SHEETS**

**SPECIFIC GRAVITY DETERMINATION  
DATA SHEET**

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Date Tested:

Tested By:

Project Name:

Sample Number:

Sample Description:

Specimen number	1	2
Pycnometer bottle number		
$W_P$ = Mass of empty, clean pycnometer (grams)		
$W_{PS}$ = Mass of empty pycnometer + dry soil (grams)		
$W_B$ = Mass of pycnometer + dry soil + water (grams)		
$W_A$ = Mass of pycnometer + water (grams)		
Specific Gravity ( $G_s$ )		

Calculations: