CALCULATIONS & REVIEW

American Concrete Pipe Association

Calculations and Review

ACPA QCAST CALCULATION FORMULA SHEET

Aggregate Moisture Calculations

$$\%\ Total\ Moisture = \frac{(W_{wet} - W_{dry})}{W_{dry}} * 100$$

$$Free\ Moisture = Total\ Moisture - Absorption$$

Mix Design Calculations

$$Volume = \frac{Weight}{SG * 62.4}$$

$$Weight = Volume * SG * 62.4$$

Cement SG = 3.15

1 Gal = 8.33 lb

1 yd^3 = 27 ft^3

Density of Water = 62.4 lb/ft^3

Steel Area Calculations

$$A_{wire} = \pi r^2, \quad OR \quad A_{wire} = \frac{\pi * d^2}{4}$$

$$d_{wire} = \sqrt{\frac{A_{wire} * 4}{\pi}}$$

$$A_{steel} = \frac{A_{wire} * 12}{S}$$

S = Wire Spacing

D-Load Calculations

$$DLoad\ (D) = \frac{Load\ (lb)}{\frac{Length\ (ft)}{Diameter\ (ft)}}$$

$$Load = DLoad * Length * Diameter$$

ASTM C76 D-Load Requirements

CLASS	0.01"	ULTIMATE
I	800	1200
II	1000	1500
III	1350	2000
IV	2000	3000
V	3000	3750

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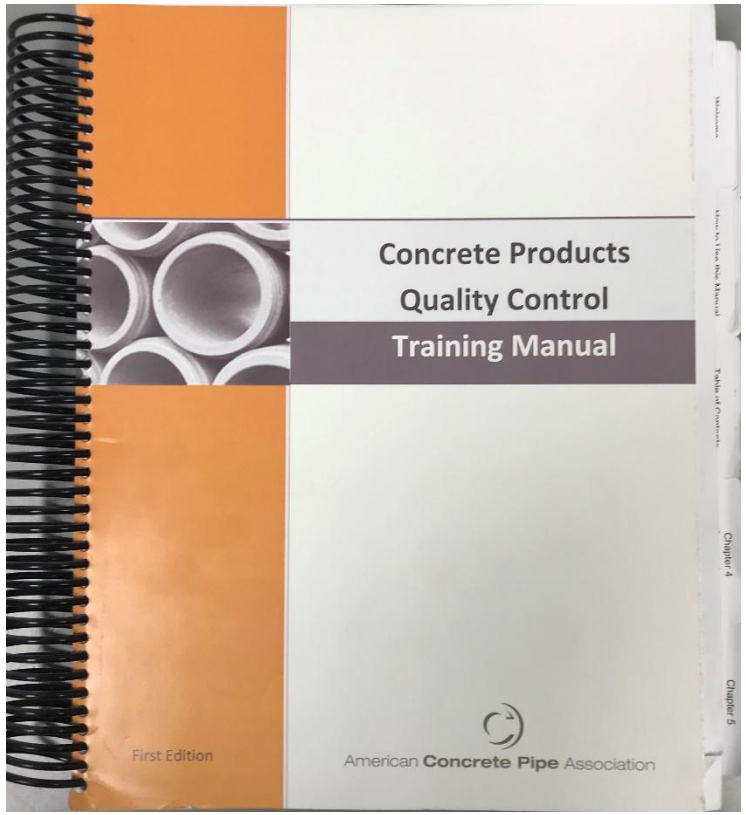




Calculations and Review

ACPA Q-SCHOOL CALCULATIONS

1a. Calculate the total moisture content in the coarse aggregate based on the following information: Weight of wet rock = 1725g, Weight of dry rock = 1674g, Absorption = 1.2%

1b. What is the free moisture content of the coarse aggregate?

2. Given 400 lbs of Cement, 100 lbs of Fly Ash and 23.4 Gallons of Water per cubic yard of concrete, calculate the w/c ratio of the mix.

3a. Given the following: 400 lbs of Cement (SG = 3.15), 100 lbs of Fly Ash (SG = 2.7), 23.4 Gal of Water, 3% Air. Calculate the volume of aggregate needed for the mix to equal one cubic yard.

3b. Sand and rock are split 60/40 by volume (60% sand, 40% rock), calculate the weight of sand and rock in lbs. (sand SG = 2.62, rock SG = 2.67)

3c. The total moisture content of sand = 6.4%, rock = 2.2%, Calculate the adjusted batch quantities for sand, rock and batch water (absorption of sand = 1.3%, rock = 1.1%)

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4a. Given the wire diameter of 0.226 inches, calculate the area of the wire.

4b. What is the wire size designation for this smooth wire?

5a. Given the following mesh: 2x8 W5.0xW2.5 94" x 600' 1/2x1/2. Calculate the wire diameter of the circumferential wire in inches.

5b. What is the circumferential steel area per foot of length?

6a. 8 ft long, 36" CL4 B-Wall RCP was observed to develop a 0.01" D-load crack at 46,200 lbs. Does this meet the CL4 0.01" D-load requirement?

6b. What is the required load to produce the 0.01" D-load crack for the RCP?

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Calculations and Review

1a. Calculate the total moisture content in the coarse aggregate based on the following information: Weight of wet rock = 1725g, Weight of dry rock = 1674g, Absorption = 1.2%

$$\frac{\text{Wet Wt.} - \text{Dry Wt.}}{\text{Dry Wt.}} \times 100 = \text{Total Moisture}$$

Calculations and Review

1b. What is the free moisture content of the coarse aggregate?

Total Moisture – Absorption = Free Moisture

Calculations and Review

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Calculations and Review

1b. What is the free moisture content of the coarse aggregate?

Total Moisture – Absorption = Free Moisture

Calculations and Review

2. Given 400 lbs of Cement, 100 lbs of Fly Ash and 23.4 Gallons of Water per cubic yard of concrete, calculate the w/c ratio of the mix.

W/C = W/Cm Water/Cementitious

Calculations and Review

3a. Given the following: 400 lbs of Cement (SG = 3.15), 100 lbs of Fly Ash (SG = 2.7), 23.4 Gal of Water, 3% Air. Calculate the volume of aggregate needed for the mix to equal one cubic yard.

$$\frac{\text{Mass}}{\text{S.G} \times 62.4} = \text{Volume} \qquad \frac{\text{Air \%}}{100} \times 27\ \text{ft}^3 = \text{Volume}$$

Calculations and Review

3b. Sand and rock are split 60/40 by volume (60% sand, 40% rock), calculate the weight of sand and rock in lbs. (sand SG = 2.62, rock SG = 2.67)

$\frac{\text{Percentage}}{100}$ = Decimal Equiv. Volume x S.G. x 62.4 = Weight

Calculations and Review

3c. The total moisture content of sand = 6.4%, rock = 2.2%, Calculate the adjusted batch quantities for sand, rock and batch water (absorption of sand = 1.3%, rock = 1.1%)

Total Moisture – Absorption = Free Moisture

Calculations and Review

4a. Given the wire diameter of 0.226 inches, calculate the area of the wire.

$\pi = 22/7 = 3.14$ Area = πr^2 or Area = $\frac{\pi \times D^2}{4}$

Calculations and Review

4b. What is the wire size designation for this smooth wire?

Area x 100 = Size Designation

W = Smooth Wire
D = Deformed Wire

Calculations and Review

5a. Given the following mesh: 2x8 W5.0xW2.5 94” x 600’ 1/2x1/2. Calculate the wire diameter of the circumferential wire in inches.

Wire Size ÷ 100 = Area Diameter = √(Area x 4 ÷ π)

Calculations and Review

5b. What is the circumferential steel area per foot of length?

πr^2 x number of wires in one foot

Calculations and Review

6a. 8 ft long, 36” CL4 B-Wall RCP was observed to develop a 0.01” D-load crack at 46,200 lbs. Does this meet the CL4 0.01” D-load requirement?

Calculations and Review

6b. What is the required load to produce the 0.01” D-load crack for the RCP?

Load = D-Load x length of pipe (ft) x diameter of pipe (ft)

Calculations and Review

6a. 8 ft long, 36” CL4 B-Wall RCP was observed to develop a 0.01” D-load crack at 46,200 lbs. Does this meet the CL4 0.01” D-load requirement?