

# Concrete Mix Design M-60

## CONCRETE MIX DESIGN (GRADE M60)

### (a) DESIGN STIPULATION:-

Target strength = 60Mpa

Max size of aggregate used = 12.5 mm

Specific gravity of cement = 3.15

Specific gravity of fine aggregate (F.A) = 2.6

Specific gravity of Coarse aggregate (C.A) = 2.64

Dry Rodded Bulk Density of fine aggregate = 1726 Kg/m<sup>3</sup>

Dry Rodded Bulk Density of coarse aggregate = 1638 Kg/m<sup>3</sup>

### Step-1

Calculation for weight of Coarse Aggregate:

From ACI 211.4R Table 4.3.3 Fractional volume of oven dry Rodded C.A for 12.5mm size aggregate is 0.68m<sup>3</sup>

Weight of C.A = 0.68\*1638 = 1108.13 Kg/m<sup>3</sup>

### Step-2

Calculation for Quantity of Water:

From ACI 211.4R Table 4.3.4

Assuming Slump as 50 to 75mm and for C.A size 12.5 mm the Mixing water = 148 ml

Void content of FA for this mixing water = 35%

Void content of FA (V)

$$V = \{1 - (\text{Dry Rodded unit wt} / \text{specific gravity of FA} * 1000)\} * 100$$

$$= [1 - (1726 / 2.6 * 1000)] * 100$$

$$= 34.62\%$$

$$\text{Adjustment in mixing water} = (V - 35) * 4.55$$

$$= (34.62 - 35) * 4.55$$

$$= -1.725 \text{ ml}$$

$$\text{Total water required} = 148 + (-1.725) = 146.28 \text{ ml}$$

### Step-3

Calculation for weight of cement

From ACI 211.4R Table 4.3.5(b)

Take W / C ratio = 0.29

Weight of cement =  $146.28 / 0.29 = 504.21 \text{ kg/m}^3$

#### **Step-4**

Calculation for weight of Fine Aggregate:

Cement =  $504.21 / 3.15 * 1000 = 0.1616$

Water =  $146.28 / 1 * 1000 = 0.1462$

CA =  $1108.13 / 3 * 1000 = 0.3690$

Entrapped Air =  $2 / 100 = 0.020$

Total =  $0.7376 \text{m}^3$

Volume of Fine Aggregate =  $1 - 0.7376$

Weight of Fine Aggregate =  $0.2624 * 2.6 * 1000 = 683.24 \text{ kg/m}^3$

#### **Step-5**

Super plasticizer:

For 0.8% =  $(0.8 / 100) * 583.53 = 4.668 \text{ ml}$

#### **Step-6**

Correction for water:

Weight of water (For 0.8%) =  $146.28 - 4.668 = 141.61 \text{ kg/m}^3$

#### **Requirement of materials per Cubic meter**

Cement =  $504.21 \text{ Kg/m}^3$

Fine Aggregate =  $683.24 \text{ Kg/m}^3$

Coarse Aggregate =  $1108.13 \text{ Kg/m}^3$

Water =  $141.61 \text{ Kg/ m}^3$

Super plasticizers =  $4.6681 / \text{m}^3$

So the final ratio becomes

Cement : Fine agg ( $\text{kg/m}^3$ ) : Coarse agg ( $\text{kg/m}^3$ ) : Water ( $\text{l/m}^3$ ): Superplasticizer ( $\text{l/m}^3$ )

**1: 1.35 :2.19 :0.29 :0.8**

This concrete mix design has been submitted to us by Natarajan. We are thankful to him for this valuable contribution.

**Source:** <http://www.engineeringcivil.com/concrete-mix-design-m-60.html>