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$^3$
Dry Rodded Bulk Density of coarse aggregate = 1638 Kg/m$^3$

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 0.68 m$^3$
Weight of C.A = 0.68*1638 = 1108.13 Kg/m$^3$

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)
\[
V = \left\{1-\left(\frac{\text{Dry Rodded unit wt}}{\text{specific gravity of FA} \times 1000}\right)\right\} \times 100
\]
\[
= \left[1-\left(\frac{1726}{2.6 \times 1000}\right)\right] \times 100
\]
\[
= 34.62\%
\]
Adjustment in mixing water = (V-35)\times 4.55
\[
= (34.62 - 35) \times 4.55
\]
\[
= -1.725 \text{ ml}
\]
Total water required = 148 + (-1.725) = 146.28 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 kg/m³

**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 = 0.7376m³
Volume of Fine Aggregate= 1-0.7376
Weight of Fine Aggregate= 0.2624*2.6*1000 = 683.24 kg/m³

**Step-5**
Super plasticizer:
For 0.8% = (0.8 / 100)*583.53 = 4.668 ml

**Step-6**
Correction for water:
Weight of water (For 0.8%) =146.28 – 4.668 =141.61 kg/m³

**Requirement of materials per Cubic meter**
Cement = 504.21 Kg/m³
Fine Aggregate = 683.24 Kg/m³
Coarse Aggregate = 1108.13 Kg/m³
Water = 141.61 Kg/ m³
Super plasticizers = 4.6681 / m³
So the final ratio becomes
Cement : Fine agg (kg/m³) : Coarse agg (kg/m³) : Water (l/m³): Superplasticizer (l/m³)  
**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](http://www.engineeringcivil.com/concrete-mix-design-m-60.html)