# Mix Design of M25 Grade Concrete as per IS 10262

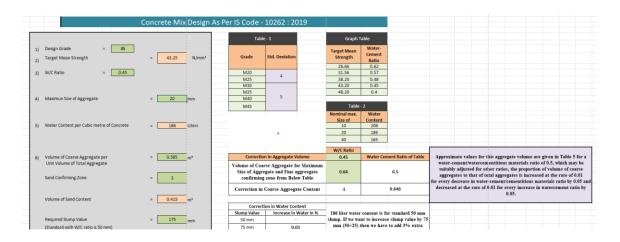
This document provides a detailed mix design procedure for M25 grade cement concrete as per the guidelines of IS 10262:2019. The mix design is based on standard assumptions and includes step-by-step calculations to proportion the different ingredients: cement, water, fine aggregate, and coarse aggregate.

#### 1. Given Data

- Grade of Concrete: M25
- Characteristic Compressive Strength: 25 MPa
- Maximum Size of Aggregate: 20 mm
- Exposure Condition: Moderate
- Workability: 100 mm slump
- Water-Cement Ratio: 0.45
- Type of Cement: OPC 43 Grade
- Specific Gravity of Cement: 3.15
- Specific Gravity of Coarse Aggregate: 2.74
- Specific Gravity of Fine Aggregate: 2.65
- Water Absorption of Coarse Aggregate: 0.5%
- Water Absorption of Fine Aggregate: 1.0%
- Free Surface Moisture of Coarse Aggregate: Nil
- Free Surface Moisture of Fine Aggregate: Nil
- Dry Rodded Bulk Density of Coarse Aggregate: 1600 kg/m<sup>3</sup>
- Grading Zone of Fine Aggregate: Zone II

## 2. Target Mean Strength Calculation

The target mean strength of the concrete mix is calculated using the formula:



$$f_{\text{arget}} = f_{\text{ck}} + 1.65 \times S$$

where,

 $f_{k} = Characteristic compressive strength (25 MPa),$ 

S = Standard deviation (Assumed as 4 MPa for M25 grade).

Thus, target mean strength =  $25 + 1.65 \times 4 = 31.6$  MPa.

Exposure Condition: Moderate exposure, as per IS 456:2000. Moderate exposure refers to concrete structures exposed to atmospheric conditions that are not extremely aggressive, such as weathering, corrosion, or carbonation.

Workability: The workability (measured by slump) is assumed to be 100 mm, suitable for general reinforced concrete work.

#### 3. Water-Cement Ratio

From the assumed data, the water-cement ratio is taken as 0.45 based on the exposure condition. As per IS 456, the maximum water-cement ratio for moderate exposure should not exceed 0.50. Therefore, 0.45 is safe for this mix design.

#### 4. Water Content

For a 20 mm maximum size of aggregate, the estimated water content for a slump of 100 mm is 186 liters (from IS 10262). Adjustments for workability and moisture content are not needed as the values are within acceptable ranges.

#### 5. Cement Content

The cement content can be calculated using the formula:

Cement Content = Water Content / Water-Cement Ratio = 186 / 0.45 = 413 kg/m³. As per IS 456, the minimum cement content for moderate exposure is 300 kg/m<sup>3</sup>. Thus, 413 kg/m<sup>3</sup> satisfies the criteria.

## **6. Proportioning of Coarse and Fine Aggregates**

Based on the mix design procedures, the ratio of fine aggregate to total aggregate by absolute volume is 35% for Zone II fine aggregate.

Hence, the proportions of coarse and fine aggregates are determined from the absolute volume method.

## 7. Mix Proportion Calculation

- Water = 186 liters
- Cement = 413 kg
- Fine Aggregate = 628 kg
- Coarse Aggregate = 1255 kg
- Water-Cement Ratio = 0.45

Final mix proportion by weight:

Cement: Fine Aggregate: Coarse Aggregate = 1: 1.52: 3.04.

				Mix Proportions By	Mass	
Sr. No:	Material Name	Quantity(Kg)	Water	Cement	F.A	C.A
			181.815	404	722	1083
1	Cement Content	404	0.45	1	1.79	2.68
2	Water	182				
3	Fine Aggregate	722				
	Coarse Aggregate	1083		Quantities For 1 Bag of		
4	1) Coarse Aggregate(20mm)	650	Water	Cement	F.A	C.A
	2) Coarse Aggregate(10mm)	433	23	50	89	134
5	Slump of Concrete 175					
5	Admixtures	4.8484				
				Quantity for 9 Cu	Quantity for 9 Cube	
			Water	Cement	F.A	C.A
			8	17	30	45
	CONCRETE MIX DESIGN AS PER IS: 10262		N 46 PER 16 40262 2040			
		CONCRETE MIX DESIGN AS PER				

### 8. Conclusion

The mix design provided above is for M25 grade concrete, and it is assumed based on standard values. All proportions are in line with the IS code 10262:2019 requirements. The mix ensures adequate strength, durability, and workability for moderate exposure conditions.