1 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 1: Choose the Mix Ratio of Concrete

Let take the mix proportion in M20 grade concrete as M20 (1:1.5:3).
It means that every 1 part of cement needs 1.5 parts of sand and 3 parts of aggregate.

2 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 2: Calculate the Total Dry Volume of Concrete

Assume you need to mix 1 m^3 of concrete. Increase the concrete volume to take the approx. 52 % of voids and wastage.

Total Volume = 1 + 0.52 =1.52 m^3

Note: Additional volume includes the volume of voids between the aggregate and the loss of volume during mixing

3 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 3: Cement Calculation

Cement quantity = 1/5.5 × 1.52 = 0.276 m^3
Bags of cement = 0.276 × 1440 ÷ 50 = 7.94 bags

Since 1 m^3 of cement = 1440 kg and
1 bag of cement = 50 kg, to change to bags, multiply by 1440 and divide by 50.
Bags of cement = 0.276 × 1440 ÷ 50 = 7.94 bags

4 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 4: Calculate Sand Quantity

Quantity of Sand = (1.5 / 5.5) × 1.52 = 0.414 m^3

Convert this volume to weight, because 1 m^3 of sand = 1600 kg.
Sand in kg = 0.414 × 1600 = 662.4 kg
Note: Always convert the volume to weight for ease during mixing.

5 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 5: Calculate the Aggregate Quantity

Aggregate quantity = (3/5.5) × 1.52 = 0.828 m³

Now, convert this volume to weight since 1 m³ of aggregate = 1450 kg.
Aggregate in kg = 0.828 × 1450 = 1201 kg

6 Calculate Cement, Sand, and Aggregate for M20 Grade of Concrete?

Step 6: Water-Cement Ratio

The water-cement ratio for M20 grade concrete is generally 0.5. That is to say, per 1 kg of cement, it requires 0.5 kg of water.

Water required = 0.5 × weight of cement in kg
Water in liters = 0.5 × 7.94 × 50 = 198.5 liters

Note: Water content may vary slightly depending on site conditions and workability requirements.