

Dr. Vithalrao Vikhe Patil Foundation's
DR. VITHALRAO VIKHE PATIL COLLEGE OF ENGINEERING, AHMEDNAGAR.

Ref.No. CEA/CED/TESTING/18-19/40

Date: - 13/11/2018.

Name of Party & Address:- M/S Krishi Infratech, Bangalore-560085.

Subject :- Design mix of concrete grade M – 20

Name of work: Construction of Major Bridges from Ch. 223000 to Ch. 260000M in Connection with Ahmednagar - Beed- Parli Vaijinath new Broad Gauge Line Project.

Testing Charges : Rs.30,000/-

Paid Vide Receipt No. : - 06934

Date: - 21/09/2018.

CONCRETE MIX DESIGN M20
(Ref. – IS – 10262 – 2009 Method)

A| Design Stipulations :


- | | |
|--|------------------------|
| a) Characteristic compressive strength | |
| Required in the field at 28 days | = 20 N/mm ² |
| b) Maximum size of aggregate | = 20 mm |
| c) Workability of concrete | = Good |
| d) Compaction factor | = 0.92 |
| e) Slump value | = 100 mm |
| f) Degree of Quality control | = Good |
| g) Type of Exposure | = Moderate |
| h) Chemical admixture type | = Supplied by party |

B| Test Data for Materials:-

1| Cement

- | | |
|---|------------------------------|
| a) Type of cement | = Birla Shakti OPC- 53 Grade |
| b) i) 7 days compressive strength of cement | = 37.60 N/mm ² |
| ii) 28 days compressive strength of cement | = 55.53 N/mm ² |
| c) Specific gravity of cement | = 3.15 |
| d) Fineness of cement | |
| (by dry sieve analysis) as per IS 269-1969 | = 1 % |
| e) Initial setting time | = 118 min |
| f) Final setting time | = 179 min |
| g) Soundness of cement | = 0.5 mm |




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2) Aggregate and Sand –

Test property	Coarse Aggregate		Fine Aggregate
	20 mm	12.5 mm	Crushed Sand
Specific gravity	2.85	2.93	2.75
Water absorption (%)	0.76	0.75	0.51
Aggregate Impact Value (%)	9.3	12.00	---
Aggregate Crushing Value (%)	14.33	15.00	---

3) Sieve analysis:-

a) Coarse Aggregate:-

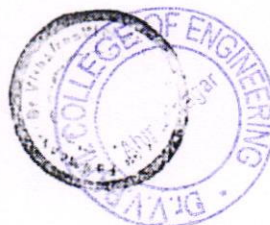
IS Sieve Size	% Passing	
	20 mm	12.5 mm
80 mm	100	100
40 mm	100	100
20 mm	61	100
10 mm	37.5	97.2
4.75 mm	1	2.6
2.36 mm	0.4	0.02
Pan	--	---

b) Fine Aggregate (Sand):-

IS Sieve size	Percentage Passing
10 mm	100
4.75 mm	96.25
2.36 mm	30.25
1.18 mm	17.25
0.600 mm	12.75
0.300 mm	11.25
0.150 mm	7.75

c) Fine Aggregate (Crushed Sand):-

IS Sieve size	Percentage Passing
10 mm	100
4.75 mm	98.13
2.36 mm	70.68
1.18 mm	37.93
0.600 mm	28.95
0.300 mm	18.98
0.150 mm	14.33
Retained weight on following sieves:	
0.75 mm (weight)	29.5 gms
Pan Weight	254 gms



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4) Target Mean Strength:-

$$= 20 + 4.0 \times 1.65 = 26.6 \text{ N/mm}^2$$

5) Selection of Water Cement Ratio

From table 5 of IS 456-2000, Maximum water-cement ratio = 0.50

Based on experience adopt water-cement ratio as 0.49

6) Selection of Water Content

a) Maximum water content for 20mm aggregate = 186 litre

b) Water cement ratio = 0.49

c) Sand content = 40 %

d) Entrapped air in concrete = 2 %

5) Requirement per Cu. M. of concrete :-

1) Water content = 186 Lit

2) Sand content = 40 %

3) Cement content = 380 kg/m³

[By IS 456: 2000 Table No. 05 = 300 Kg/m³]

4) Entrapped air = 2 %

6) Actual Quantities Required For Cu.M. of Concrete In Kg.

Water : Cement : Fine Aggregate : Coarse Aggregate
186 : 380.00 : 920.00 : 1152 (20mm = 691 + 10 mm=460)
0.49 : 1 : 2.43 : 3.04

Mix proportion by mass

Note :- After adjustment for absorption & surface moisture .

Mix No.	Cement in kg	Quantities of materials per m ³ of concrete						Workability (CF)	Concrete Characteristics	
		Crushed Sand in kg (100%)	Coarse Aggregate in kg		Water in kg	Admixture in kg	Corrected W/C		Compressive Strength(N/m ²)	
			20 mm	10 mm					7 days	28 days
I	400	890.15	662.13	441.41	160	4.00	0.45	0.88	16.20	25.45
II	360	880.10	656.53	437.69	180	3.60	0.53	0.90	15.10	21.50
III	380	920	691	460	186	3.60	0.49	0.90	17.54	27.12

Adopt Trial Mix No. – III :

Water : Cement : Fine Aggregate : Coarse Aggregate
186 : 380.00 : 920.00 : 1152 (20mm = 691 + 10 mm=460)
0.49 : 1 : 2.42 : 3.03



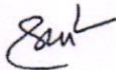
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7] Actual quantities required per batch of cement in kg after adjustment for water absorption and surface moisture.

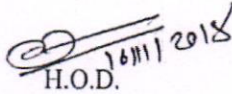
- | | |
|---------------------|---|
| 1) Cement | = 50 kg |
| 2) Crushed Sand | = 121.50 kg |
| 3) Coarse Aggregate | = 152 kg (20 mm Fraction = 91.2 kg
10 mm fraction = 60.8 kg) |
| 4) Water | = 24.5 kg |
| 5) Admixture | = 450 gms |
| 6) W/C | = 0.49 |

This test results are based on samples received in the laboratory

Tested By

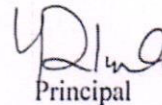


Dr. S. L. Hake
Laboratory In-charge



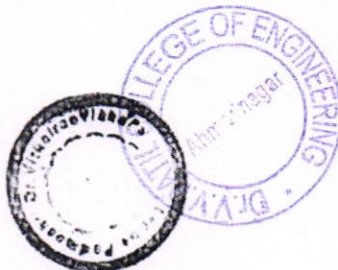
H.O.D.

Dept. of Civil Engg.



Principal

Dr. V. V. P. C. O. E. Ahmednagar



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