Dr. Vithalrao Vikhe Patil Foundation's

DR. VITHALRAO VIKHE PATIL COLLEGE OF ENGINEERING, AHMEDNAGAR.

Ref.No. CEA/CED/TESTING/18-19/35(2) Date: - 20/11/2018.

Name of Party & Address:- M/S MSNR- NR (JV), C/o- Shri M. Suryanarayana Reddy, No. 1025, 25th cross, MCECHS Layout Dr. Sivarama Karanthnagr., Banglore-560077.

Subject :- Design mix of concrete grade M – 35

Name of work: Construction of Major Bridges from Ch. 167500 to Ch. 223000 M in Beed Wadwani of Ahmednagar - Beed- Parli Vaijinath new Broad Gauge Line Project.

Testing Charges : Rs.50,000/-

Paid Vide Receipt No. : - 06933 Date: - 21/09/2018.

CONCRETE MIX DESIGN M35
(Ref. – IS – 10262 – 2009 Method)

A] Design Stipulations :

a) Characteristic compressive strength Required in the field at 28 days	= 35 N/mm^2
b) Maximum size of aggregate	= 20 mm
c) Workability of concrete	= Good
d) Compaction factor	= 0.89
e) Slump value	= 100 mm
f) Degree of Quality control	= Good
g) Type of Exposure	= Moderate
h) Chemical admixture type	= Supplied by party
i) Minimum Cement Content	= 400 kg/ m^3
j) Maximum Water cement ratio	= 0.45

B] Test Data for Materials:-

1] Cement

a) Type of cement	= Birla Shakti OPC- 53 Grade
b) 28 days compressive strength of cement	= 53.30 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	= 175 min
f) Final setting time	= 260 min
g) Soundness of cement	= 1 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	2.90	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:-

$= 35 + 5 \text{ X } 1.65 = 43.25 \text{ N/mm}^2$

5) Selection of Water Cement Ratio

From table 5 of IS 456-2000, Maximum water-cement ratio = 0.45

Based on experience adopt water-cement ratio as 0.41

6) Selection of Water Content

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

b) For increase in compaction factor = 3% of 186 Lit.

= 5.86 Lit.

Total = 191.58 lit

From trials with admixture the dose of 0.8 % of weight of cement is proposed. The minimum water reduction of 5% can be achieved. Hence net Water =191.58 X 0.95 = 182 L

7) Calculation of Cement Content

Water Cement ratio = 0.41

Cement content = $182/0.41 = 444 \text{ kg/m}^3$

From table 5 of IS 456-2000, minimum cement content for moderate exposure condition $= 300 \text{ kg/m}^3$

Hence $444 \text{ kg/m}^3 > 300 \text{ kg/m}^3$, hence OK.

8) Proportion of Volume of Coarse Aggregate and Fine Aggregate Content:

Volume of coarse aggregate corresponding to 20 mm size aggregate and fine aggregate (Zone I) for water cement ratio of 0.41 = 0.60

In the present case W/C ratio is 0.41

Therefore corrected proportion of coarse aggregate for W/C ratio of 0.41=0.60+1.0x0.01=0.61

For Volume of fine aggregate content = 1-0.61 =0.39

Adopt Volume of fine aggregate content = 0.40

Adopt proportion of coarse aggregate for W/C of 0.41 =0.60

9) Mix Calculations per Unit Volume of Concrete:

a) Volume of concrete = 1 m^3

b) Volume of cement= [Mass of cement]/ [Sc X 1000] = 0.141 m^3

c) Volume of water = [Mass of water]/ [Sw X 1000] = 0.182 m^3

d) Volume of chemical admixture= [Mass of chemical admixture]/ [Sad X 1000]= 0.005 m^3

e) Volume of all in aggregate = [(a-0.02)-(b+c+d)] = 0.672 m^3

f) Mass of coarse aggregate=exVolume of coarse aggregate X ScaX 1000 =1149.82 kg

g) Mass of fine aggregate= exVolume of fine agg X S fa X 1000 = 739.28

10] Actual Quantities Required For Cu.M. Of Concrete in Kg.

Cement	= 444 kg
Crushed Sand	= 591 kg
Natural Sand	= 147.8 kg
Coarse Aggregate	= 1149 kg (20mm = 690 + 10 mm=459)

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Water = 182 Lit
Admixture = 4.55 kg
W/C = 0.41

Water : Cement : Fine Aggregate : Coarse Aggregate
182 : 455.00 : 638.00 : 1149 (20mm = 690 + 10 mm=459)
0.40 : 1 : 1.40 : 2.60

Mix proportion by mass

Note :- After adjustment for absorption & surface moisture .

Mix No.	Quantities of materials per m^3 of concrete								Work ability (CF)	Concrete Comp Strength (N/mm^2)	
	Cement in kg	Crushed Sand in kg		Coarse Aggregate in kg		Water in kg	Admixture in kg	Corrected W/C		7 days	28 days
		Crushed Sand	Natural Sand								
		80%	20%	20 mm	10 mm						
I	444	591	147.8	690	459	182	5.3	0.41	0.89	28.10	45.60
II	455	510	128	711	355	185	4.55	0.40	0.90	23.60	41.30
III	480	736	184	691	460	186	3.60	0.49	0.90	26.10	42.10

Adopt Trial Mix No. – I :

Water : Cement : Fine Aggregate : Coarse Aggregate
182 : 444.00 : 690.00 : 1149 (20mm = 690 + 10 mm=459)
0.41 : 1 : 1.67 : 2.59

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

1) Cement = 50 kg
2) Crushed Sand = 66.4 kg
3) Natural Sand = 16.6 kg
4) Coarse Aggregate = 129 kg (20mm = 690 + 10 mm=459)
5) Water = 20 kg
6) Admixture = 600 gms
7) W/C = 0.41

This test results are based on samples received in the laboratory

Tested By

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