Ref.No. CEA/CED/TESTING/17-18/

Date: - 02/03/2018.

Name of Agency: M/S Shree SatyaSaibaba Constructions, Latur.

Subject: - Concrete Mix Design for M-20.

Sir,

With reference to your letter, we have made concrete mix design of M20 and compressive strength of concrete at the age of 28 days is as given below. The Mix design for 50% Crushed sand + 50% Natural sand and 100% Crushed Sand of M20 grade of concrete. We are suggesting you to adopt Trial Mix No. – II and III respectively.

Mix No.	Quantities of materials per m^3 of concrete							W/C	Work ability (CF)	Compressive Strength (N/mm^2)	
	Cement in kg	Water in kg	Crushed Sand kg	Natural Sand kg	Admixture in kg	Coarse Aggregate (kg)				7 days	28 days
						20mm (60%)	10mm (40%)				
	375	187.15	377.28 (50%)	377.29 (50%)	3.74	679.12	452.74	0.49	0.86	18.41	26.67
	379	186	920 (100%)	--	3.60	691	460	0.49	0.90	17.54	27.12

Detailed Concrete mix design report is attached for your reference.

Principal

Enclosed: Detailed Testing Report on Concrete Mix Design of M20.

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College of Engineering
Ahmednagar

DR. V.V.P. COLLEGE OF ENGINEERING
Ahmednagar

Ref.No. CEA/CED/TESTING/17-18/ Date: - 02/03/2018.

CONCRETE MIX DESIGN FOR M20 CONCRETE

(Ref. – IS – 10262 – 2009 Method)

Name of Party & Address:- M/S Shree SatyaSaibaba Constructions, Latur.
Subject :- Design mix of concrete grade M – 20
Name of work: Construction of Viaduct at KM 120 to 124 at Ahmednagar-Beed-Parali Section.
Testing Charges :Rs. 20,000/-
Paid Vide Receipt No. : - 00077 Date: - 24/01/2018.

CONCRETE MIX DESIGN M20

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	= 0.89
e) Slump value	= 97 mm
f) Degree of Quality control	= Good
g) Type of Exposure	= Moderate

B] TEST DATA FOR MATERIALS:-

1] Cement

a) Type of cement	= Birla Gold = OPC – 43 Grade
b)) i) 7 days compressive strength of cement	= 27.60 N/mm^2
ii) 28 days compressive strength of cement	= 43.00 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	= 87 min
f) Final setting time	= 185 min
g) Soundness of cement	= 1 mm

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2] Aggregate and Sand –

Test property	Coarse Aggregate		Fine Aggregate	
	20 mm	10 mm	Crushed Sand	Natural Sand
Specific gravity	2.49	2.97	2.78	2.73
Water absorption (%)	1.30	1.10	0.88	1.30
Aggregate Impact Value (%)	8.04	13.15	---	---
Aggregate Crushing Value (%)	17.00	16.20	---	---

3] Sieve analysis:-

a) Coarse Aggregate:-

IS Sieve Size	% Passing	
	20 mm	10 mm
80 mm	100	100
40 mm	100	100
20 mm	92.40	100
10 mm	1.50	38.70
4.75 mm	0.18	0.40
2.36 mm	--	0.09
Pan	--	---

b) Fine Aggregate:–

i) Crushed Sand: Sample= 2000 gms

IS Sieve size	Percentage Passing	
10 mm	100	Confirming to Grading Zone – I Of Table 4 of I.S : 383 : 1970
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	

Fineness Modulus = 3.31

ii) Natural Sand:-

IS Sieve size	Percentage Passing	
10 mm	100	

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4.75 mm	96.00	Confirming to Grading Zone – II Of Table 4 of I.S : 383 : 1970
2.36 mm	84.00	
1.18 mm	73.00	
0.600 mm	29.50	
0.300 mm	11.00	
0.150 mm	3.50	
Retained weight on following sieves:		
0.75 mm (weight) in gms	5.50	
Pan Weight in gms	9.0	

Fineness Modulus = 3.03

4] TARGET MEAN STRENGTH:-

$= 20 + 4.0 \times 1.65 = 26.6$ N/mm^2.

Water cement ratio = 0.45

1) Water content = 197 kg / m^3
2) Sand content = 40 %
3) Entrapped air in concrete = 2 %

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

1) Water content = 144 Lit
2) Sand content = 40 %
3) Cement content= 385 kg/m^3

[By IS 456: 2000 Table No. 05 = 300 Kg/m^3]

4) Entrapped air = 2 %

6] ACTUAL QUANTITIES REQUIRED FOR CU.M. OF CONCRETE IN KG .

Water	:	Cement	:	Fine Aggregate	:	Coarse Aggregate
197:		385.00	:	760.00	:	1140 (20mm = 684 +10 mm=456)
0.535:		1	:	1.96	:	2.96

Mix proportion by mass

Note :- After adjustment for absorption & surface moisture .

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Mix No.	Cement in kg	Sand in %	Quantities of materials per m^3 of concrete							Workability (CF)	Concrete Characteristics Compressive Strength(N/mm^2)	
			Crushed Sand in kg (50%)	Natural Sand in kg (50%)	Coarse Aggregate in kg		Water in kg	Admixture in kg	Corrected W/C		7 days	28 days
					20 mm	10 mm						
I	385	40	380	380	684	456	206	3.85	0.535	0.89	18.10	26.40
II	375	40	377.28	377.29	679.12	452.74	187.15	3.74	0.50	0.86	18.41	26.67
III	340	40	383.29	383.29	689.93	459.95	187.15	3.40	0.55	0.90	16.07	25.70

Adopt Trial Mix No. – II :

Water :Cement : Fine Aggregates :Coarse Aggregate: Admixture : W/C ratio

187.15 :375.00 : 754.56(Natural Sand-380 + Crushed Sand - 380)+10mm- 452.74) :1132(20mm –679.12 : 3.74 : 0.499

1 : 2.01 : 3.01 : 0.499

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

1) Cement = 50 kg
2) Sand = 100.50 kg (Natural Sand: 50.25 + Crushed Sand: 50.25)
3) Coarse Aggregate = 150.5 kg(20 mm Fraction = 90.3 kg
   10 mm fraction = 60.2 kg)
4) Water = 24.95 kg
5) Admixture = 495gms
6) W/C = 0.499

Tested By

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Laboratory In-charge
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