MIX DESIGN, M-25

Sample submitted by	:	AGE B/R Ludhiana
Vide letter No	:	800/CEJZ/FZR-14/15-16/68/BR dated 31 Mar 2016
CA No	:	CEJZ/FZR-14/2015-16
Material tested	:	Mix -25
Method Adopted	:	IS : 456, & IS-10262
S. No & Date	:	13 dated 07 Apr 2016

A. STIPULATIONS FOR PROPORTIONING

(a)	Grade designation	M-25
(b)	Type of cement	PPC conforming to IS:1489 Part-I
(c)	Maximum nominal size o	20mm
(d)	Degree of Quality Contro	Good
(e)	Degree of Workability	As per IS-456
(g)	(slump)	50-75 mm
(h)	Cement Content	As per IS 456-2000 Table 5
(j)	Maximum water-cement	As per IS 456-2000 Table 5 (0.5)
(k)	Type of aggregate	Crushed
(l)	Exposure condition	Moderate
(m)	Chemical admixture type	NA

B. TEST DATA FOR MATERIALS

(a)	Cement used	(PPC Shree Cement conforming to IS:1489 pt-I)
(b)	Specific gravity	
	Cement	3.15
	Coarse aggregate	2.66
	Fine aggregate	2.75
	Admixture	0.00
(c)	Water absorption	
	(1) Coarse aggregate	0.70%
	(2) Fine aggregate	0.65%

(d) Free (surface) moisture

(1) Coarse aggregate 0.00%

(2) Fine aggregate 0.15%

Sieve analysis

(I) Coarse aggregate

IS Sieve sizes mm	Analysis of Coarse Aggregate Fraction, % Passing		Percentage Passing of Different Fractions			Percentage passing for graded aggregate as per Table II of IS 383-1970
	I	II	I	II	Combined	
	20mm	12.5mm	60%	40%	100%	
40	100.00	100.00	60.00	40.00	100.00	100
20	96.76	85.90	58.06	34.36	92.42	95-100
10	4.08	63.47	2.45	25.39	27.83	25-55
4.75	0.66	7.47	0.40	2.99	3.38	0-10

(II) Fine aggregate Conforming to grading Zone -II of Table 2

C. DESIGN COMPRESSIVE STRENGTH FOR MIX PROPORTIONING

$f'ck = f_{ck} + 1.65 \times S$

Target average compressive strength in N/mm^2 = 31.60

Flexural strength using IS: 456 relationship 3.93

D. SELECTION OF WATER-CEMENT RATIO

From Table -5 of IS-456

TRIAL I	TRIAL II	TRIAL III
0.45	0.495	0.405

0.495< 0.50, Hence OK.

E. SELECTION OF WATER CONTENT

From Table 2, water content for 20	**186.00**	kg/m^3
Adustment :- Add @ 3 % for every 25mm slump. Then actual water content	5.58	kg/m^3
	191.58	kg/m^3
Total		
Net water required	**191.58**	kg/m^3

F. CALCULATION OF CEMENT CONTENT

	TRIAL I	TRIAL II	TRIAL III		
Water-cement ratio	0.45	0.495	0.405		
Cement content	425.73	387.03	473.04	>360 and <450 Except trial III	kg/m^3 OK

G. PROPORTION OF VOLUME OF COARSE AGGREGATE AND FINE AGGREGATE

From Table 3, volume of coarse aggregate corresponding to 20 mm size aggregate and fine aggregate grading Zone-II = 0.62 perunit volume of total aggregate. This is valid for water-cement ratio of 0.45 In the present case water-cement ratio is 0.495.
Therefore,volumn of coarse aggregate =

Volume of fine aggregate content = 1- volume of CA

TRIAL I	TRIAL II	TRIAL III
0.630	0.621	0.639
0.370	0.379	0.361

From Table 3

Nominal Maximum Size of Aggregate (mm)	Volume of Coarse Aggregate Per Unit Volume of Total Aggregate for			
	Zone IV	Zone III	Zone II	Zone I
10	0.50	0.48	0.46	0.44
20	0.66	0.64	0.62	0.60
40	0.75	0.73	0.71	0.69

H. MIX CALCULATIONS

			TRIAL I	TRIAL II	TRIAL III	
			1	1	1	m^3
(a)	Volume of concrete					
(b)	Volume of cement	(Mass of cement / Specific gravity of cement) X (1/1000)	0.1352	0.1229	0.1502	m^3
(c)	Volume of water	(Mass of water / Specific gravity of water) X (1/1000)	0.19158	0.19158	0.19158	m^3
(d)	Volume of chemical Mass of Super-Plasticizer is		0.00000	0.00000	0.00000	
(e)	Volume of all in aggregate	{a -(b+c+d)}	0.67327	0.68555	0.65825	m^3
(f)	Mass of coarse aggregate	(e) X 0.621 XSpecific gravity of coarse aggregate X 1000	1128.26	1132.44	1118.85	kg/m^3
(g)	Mass of fine aggregate	(e) X 0.379 X Specific gravity of fine aggregate X 1000	685.0487	714.5179	653.4772	kg/m^3

J. MIX PROPORTIONS FOR TRIAL NUMBER 1 BASED ON AGGREGATE IN SSD CONDITION

W/C Ratio	Cement	Water	Coarse agg	Fine aggregate	Water absorption		Free moisture	
					Coarse agg	Fine agg	Coarse agg	Fine agg
0.45	425.73	191.58	1128.26	685.05	7.90	4.45	0.00	1.03
0.495	387.03	191.58	1132.44	714.52	7.93	4.64	0.00	1.07

K. MIX PROPORTIONS BASED ON AGGREGATE IN DRY CONDITION

W/C Ratio	Cement	Water	Coarse agg		Fine aggregate	Admixture	28th day's comp strength
			20mm	12.5mm			
0.45	425.73	202.90	672.22	448.14	681.62	0.00000	30.28
0.495	387.03	203.08	674.71	449.80	710.95	0.00000	27.84

Result - 28th day's compressive strength of mix is below the mean target strenth. Few reasons are as under-

(a) Cement has low compressive strength (separate test sheet enclosed)

(b) Sample of 20 mm aggregate failed in individul sieve analysis under graded aggregate. (Sieve analysis enclosed)

Station : Chandigarh

Date May 2016

(M K Walia)
AE (Civ)
AGE, CTL
for GE CTL, WC

Notes -

1. The test results listed pertain to the sample tested and applicable parameters.
2. Any discrepancy found in the test report may be communicated within 15 days from the date of issue of test report.
3. Remanants of sample tested may be collected within 90 days from the date of issue of test report, after which they shall be disposed off
4. The test report or any part thereof should not be produced as an evidence for any legal purposes without prior permission of GE CTL, WC