

REGIONAL LABORATORY

R.W.D, MUZAFFARPUR

PHYSICAL & GRADATION TEST OF WBM Gr. III

Name of Work: Construction of Road from Raipur Ghat to Koyari Tola under MMGSY under Nanpur Block
 Name of Division: R.W.D Works Division Pupri Date of Collection/ Receipt: 07.09.20
 Name of Agency: Gaurav Kumar Date of Test: 09.09.2020
 Agreement No: 14/SBD/2020-21 Package No: MMGSY
 Ref:- (PIU) A.E, R.W.D, Works Sub Div Nanpur LT No: 302/Enc./DT 12.08.20

PHYSICAL TEST

SL.NO	A.I.V		WATER ABSORPTION		REMARKS
	TEST VALUE %	REQUIRED LIMIT %	TEST VALUE %	REQUIRED LIMIT %	
1.	21.38%	40%	0.777%	3%	Permissible.

GRADATION TEST

SL.NO	Sieve No. mm	Weight Retained (KG)	% Wt. of Retained	Cumulative % Retained	% of passing (KG)	Required limit %	Remarks
		<u>CH. 150 M.</u>					
		<u>Wt. of Sample - 31.790 Kg.</u>					
		<u>Wt. of Screening - 6.517 "</u>					
		<u>Wt. of Stone Metal - 25.273 Kg.</u>					
	63	NIL	NIL	NIL	100	100	
	53	1.332	5.27	5.27	94.73	95-100	
	45	6.225	24.63	29.90	70.10	65-90	
	22.4	15.184	60.08	89.98	10.02	0-10	
	11.2	2.402	9.50	99.48	0.52	0-5	Permissible.

Memo No: 1025 Date 09/09/20Copy to: E.E, R.W.D, Works Div Pupri

21h 6m12
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E.E
 कार्यपालक अभियन्ता
 ग्रामिण कार्य विभाग
 क्षेत्रीय प्रयोगशाला, मुजफ्फरपुर

REGIONAL LABORATORY

R.W.D , MUZZAFFARPUR

TEST RESULT OF CONCRETE CUBE

Name of Work :- Cube Test for CCP-M30.

Name of Road :- Raipur Goat to Koyari Tola under MMGSY under Nannpur Block.

Name of Division :- R.W.D Works Division Pupri. Date of Collection/Receipt 07.09.2020

Name of Agency :- Gaurav Kumar. Date of Test :- 09.09.2020

Agreement No :- 14/SBD/2020-21 Package No :- MMGSY.

Ref:- (PIU) A.E R.W.D Works Sub Div. Nannpur LT No:- 302/Enc./DT 12.08.2020

SL. No	Test after 7 days			Test after 28 days CH-30M.		
Dt. of Concreting				12.08.20	12.08.20	12.08.20
Dt. Of Test				09.09.20	09.09.20	09.09.20
ID Mark				G ₁	G ₂	G ₃
Area C.M ²				225	225	225
Maximum Load KN				700.00	670.00	690.00
Crushing Strength Kg/CM ²				317.46	303.85	312.92
Remarks				— M30 —		

Remarks :- M30.

Memo No 1625 Date 09/09/20

Copy To :- E.E R.W.D Works Divisions Pupri.

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E.E
R.W.D

Regional Laboratory
Muzaffarpur

कार्यपालक अभियन्ता
व्यापिन कार्य बिभाग
क्षेत्रीय प्रयोगशाला, मुजफ्फरपुर



REPORT

ON



MIX DESIGN of M-30
(With Super Plasticizer)

*Construction of Road from " Raypur Goat to
Koyari Tola " Under MMGSY RWD Works
Division, Pupri in Block Nanpur District
Sitamarhi.*

(Aug- 2020)

Submitted to

Assistant Engineer
R.W.D Works Sub Division Nanpur

Name of Agency :- Gaurav Kumar

Test Conducted By
Shambhavi Techno Solutions Pvt. Ltd.
ISO 9001:2015 Certified Company
E/82, Rajesh Kumar Path
S.K. Puri Patna

Mix Design of M - 30 (With Super Plasticizer)

To,

Assistant Engineer

R.W.D Works Sub Division Nanpur

Name of Test :- Mix Design for M-30 mix grade

Name of Work :- Construction of Road from " Raypur Goat to Koyari Tola " Under MMGSY RWD Works Division, Purni in Block Nanpur District Sitamarhi.

Aggrement No :- 14/SBD/2020-20, Dated :- 27.05.2020

Ref No. :- Your Letter No. - 300, Dated :- 10.07.2020

1 Design Stipulation

- | | | |
|-----|--|-----------------------|
| (a) | Characteristic compressive strength at 28 days | 30 N mm ² |
| (b) | Maximum size of aggregate | 20 mm |
| (c) | Degree of workability | 0.9 compacting factor |
| (d) | Degree of quality control | Good |
| (e) | Type of exposure | Moderate |

2 Test data of materials

- | | | |
|-------|--|--------|
| (i) | Cement used OPC (43 Grade) | |
| (a) | Specific gravity of cement | 3.14 |
| (ii) | Specific gravity of coarse aggregate | 2.76 |
| (iii) | Specific gravity of sand | 2.65 |
| (iv) | Water absorption of coarse aggregate | 0.58 % |
| (v) | Water absorption of sand | 1.16 % |
| (vi) | Sieve analysis of coarse aggregate Mirzachauki | |

Table 1 (Single-Sized Aggregate of Nominal size 20 mm)

Wt. - 10.00 kg

Total

10000 gm

Sieve (mm)	Wt. Retained (gm)	Cumulative wt. Retained (gm)	Retained %	% passing	As per IS-383 (% passing)
40	0	0	0	100	100
20	482	482	4.82	95.18	85-100
10	7866	8348	83.48	16.52	0-20
4.75	1314	9662	96.62	3.38	0-5
Pan	338	10000	100	-	-

Table 2 (Single-Sized Aggregate of Nominal size 10 mm)

10 mm wt. - 10.00 kg

Total

10000 gm

Sieve (mm)	Wt. Retained (gm)	Cumulative wt. Retained (gm)	Retained %	% passing	As per IS-383 (% passing)
20	0	0	0	100	100
12.5	0	0	0	100	100
10	584	584	5.84	94.16	85-100
4.75	7864	8548	85.48	14.52	0-20
2.36	1296	9844	98.44	1.56	0-5
Pan	156	10000	100	-	-



Table 3 (Graded Aggregate of Nominal size 20 mm)

(After mixing 20 mm single- Sized (60%) and 10 mm single- sized (40%) Aggregate

Sieve (mm)	Wt Retained (gm)	Cumulative wt. Retained (gm)	Retained %	Total 10000 gm	
				% passing	As per IS-383 (% passing)
40	0	0	0	100	100
20	289	289	2.89	97.11	95-100
10	4953	5242	52.42	47.58	25-55
4.75	3974	9216	92.16	7.84	0-10
Pan	784	10000	100.00	-	-

Conforms Is 383 for 20 mm graded chips.

(vi)

Sieve analysis of sand Kailwar

Table 4 SAND TAKEN 2000 gm

Sieve (mm)	Wt Retained (gm)	Cumulative wt. Retained (gm)	Retained %	% passing	As per IS-383 % passing for			
					Gr. Zone I	Gr. Zone II	Gr. Zone III	Gr. Zone IV
10	0	0	0	100	100	100	100	100
4.75	84	84	4.20	95.80	90 - 100	60 - 100	90-100	95 - 100
2.36	162	266	13.30	86.70	60 - 95	75 - 100	85-100	95 - 100
1.18	200	466	23.30	76.7	30 - 70	55 - 90	75-100	90 - 100
0.6	304	770	38.50	61.5	15 - 34	35 - 59	60-79	80 - 100
0.3	674	1444	72.20	27.80	5 - 20	8 - 30	12-40	15 - 50
0.15	532	1976	98.80	1.20	0 - 10	0 - 10	0-10	0 - 15
Pan	24	2000	100.00	0	-	-	-	-

Fineness Modulus of Sand = 2.50

Hence conforms to zone III of IS - 383

3 Target mean strength concrete :

For Good quality control and M - 30 concrete

Standard Deviation as per table - 1 of IS-10262 - 2009 = 5

So for M -30

$$\begin{aligned} \text{Target mean strength } f_{ck} &= f_{ck} + 1.65 \times S \\ &= 30 + 1.65 \times 5 \quad 38.25 \text{ N / mm}^2 \\ &\text{Say } 38 \text{ N / mm}^2 \end{aligned}$$

4 Selection of Water Cement Ratio

From fig. 1 of IS 10262

For target mean strength of 38 N/mm²

IS 456 Maximum Water Cement Ratio 0.45

Water cement ratio = 0.415

5 Selection of water and sand content

From table - 4, of IS 10262, for 20 mm nominal size chips water is
sand percentage for Zone II sand =

186 kg/m³ and 35 %

For change in values in water cement ratio compacting factor and sand Zone III, the following adjustment as required.

Change in Condition	Water content		
(a) For decrease in w.c. ratio by (0.6 - 0.415) that is 0.185	0		3.7
(b) For sand zone conforming to sand Zone III of Table - 4 of IS 383	0		1.5
(c) For increase in compacting factor by (0.9-0.8) that is 0.1	3		0
	3 %		5.2
Therefore required sand content = 35-5.2 = 29.8			
water content 186 kg +3 % 191.58 kg			

6 Determination of Cement Content

W/C ratio	=	0.415
Water	=	191.58 kg
Cement	=	461.64 kg

Superplasticizer used here is **CONPLAST SP430BH** of Fosroc Chemicals (India) Pvt. Ltd., H.O. Vishnu Chittam, No. 10, 2nd Floor, Sirur Park B Street, Seshadripuram, Bangalore 560020 (website: www.fosroc.com). Water content is to be reduced up to 25% as per the brochure of **CONPLAST SP430BH** of Fosroc Chemicals (India) Pvt. Ltd.

As per IS: 9103 - 1999 for the reduction of water content up to 18.25 % after application of the superplasticizer/admixtrue by 0.6% by weight of cement one gets:
Reduced water content = 156.6166 litre/m³ of fresh concrete.

Determination of cement content

w/c = 0.415
w = 156.62 litre/m³
Cement = 377.39 kg per cum of fresh concrete.
② Minimum cement content for moderate exposure (as per Table-5 of IS: 456-2000) = 300kg
③ Minimum cement content for all type of exposure in case of PCC (as per Table-1700 - 2(A) of clause 1703.2 of MOSRTH) = 390kg
④ Minimum cement content for normal exposure in case of RCC (as per Table-1700 - 3(A) of clause 1703.2 of MOSRTH) = 310kg and for as Table 1700 - 2 (A) of MOSRTH for moderate exposure, > or = 310 kg per cum of fresh concrete.
Required cement content = 377.39 kg (greater than above three) per Cum of fresh concrete.

7 Determination of coarse and fine aggregate

$$V = \left[W + \frac{C}{S_c} + \frac{1}{p} \cdot \frac{f_c}{S_p} \right] \times \frac{1}{1000} \quad , \text{ and}$$

$$V = \left[W + \frac{C}{S_c} + \frac{1}{1-p} \cdot \frac{c_s}{S_{s,a}} \right] \times \frac{1}{1000}$$



where

V = absolute volume of fresh concrete, which is equal to gross volume (m^3) minus the volume of entrapped air,

W = mass of water (kg) per m^3 of concrete,

C = mass of cement (kg) per m^3 of concrete,

S_c = specific gravity of cement,

p = ratio of fine aggregate to total aggregate by absolute volume,

f_a, c_a = total masses of fine aggregate and coarse aggregate (kg) per m^3 of concrete respectively, and

S_{ca}, S_{cs} = specific gravities of saturated surface dry fine aggregate and coarse aggregate respectively.

i. Coarse aggregate

Here, $V = 0.98$ $C = 377.39$ $S_c = 3.14$ $p = 0.298$
 $S_{ca} = 2.76$ $S_{cs} = 2.65$

$0.98 = [156.61665 + 377.39/3.14 + (1/0.702) \times (c_a/2.76)] \times 1/1000$

$c_a = 1362.46 \text{ kg/m}^3$

ii. Fine aggregate

$0.98 = [156.61665 + 377.39/3.14 + (1/0.298) \times (f_a/2.65)] \times 1/1000$

$f_a = 555.31 \text{ kg/m}^3$

Quantities per m^3

Water (kg)	Cement (kg)	Coarse aggregate (kg)	Fine aggregate (kg)
156.62	377.39	1362.46	555.31
0.415	1.0	3.61	1.47

FOR ONE BAG OF CEMENT

Water -	20.7	kg
Coarse aggregate -	180.5	kg
20 mm size (60%) =	108.3	kg
10 mm size (40%) =	72.2	kg
sand [fine aggregate] =	73.6	kg (dry)

Adjustment in water for water absorption

Total Wt. of water = $20.75 + 180.51 \times 0.58\% + 73.57 \times 1.16\%$
 22.7 kg

Considering 2% free water in sand

So net water = $22.65 - 73.57 \times 2\%$
 21.2 kg
 Or 21.2 litre

So for one bag of cement

Coarse aggregate - 180.5 kg

Sand = 73.6 kg (dry)

Water = 21.2 litre



Shambhavi Techno Solutions Pvt Ltd



Shambhavi Techno Solutions Pvt. Ltd.,

ISO 9001:2015 Certified Company

Corporate Reg. No.: U74999BR2011PTC016938
PAN No.: AAPCS8429M
GSTIN : 10AAPCS8429M1ZU
Contact No.: 7766031138

No.

Date 11.08.2020

Mix Design of M - 30 (With Super Plasticizer)

To,
Assistant Engineer
R.W.D Works Sub Division Nanpur
Name of Test :- Mix Design for M-30 mix grade

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Aggrement No :- 14/SBD/2020-20, Dated :- 27.05.2020

Ref No :- Your Letter No.- 300, Dated :- 10.07.2020

Quantities per m ³			
Water (kg)	Cement (kg)	Coarse aggregate (kg)	Fine aggregate (kg)
156.62	377.39	1362.46	555.31
0.415	1.0	3.61	1.47

Six no. of Cubes were Casted on 14.07.2020 (7 days & 28 Days) Compressive Strength are tabulated below:

Sample no.	7 days Comp.Strength (N/mm ²)	7 days Av. Comp.Strength (N/mm ²)	Sample no.	28 days Comp.Strength (N/mm ²)	28 days Av. Comp.Strength (N/mm ²)
1	27.5	27.5	4	39.4	39.7
2	27.2		5	39.7	
3	27.6		6	40.0	

Conclusion : 7 days compressive strength is higher than 70% of target mean strength , 28 Days compressive strength is higher than target mean strength hence the above mix design may be adopted.



Shambhavi Techno Solutions Pvt. Ltd.

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