

**TEST REPORT ON HOMOGENEITY OF FRESH
CONCRETE MIXED IN AJAX SELF LOADING MIXER
(ARGO 4000 MACHINE)**

**TEST ORDER NO. BL/193/8/2019/1
Dated : 02.08.2019**

OCTOBER 2019

REPORT FOR

***M/s. Ajax Engineering Pvt. Ltd.
#253/1, 11th Main, Phase III, Peenya Industrial Area,
Bengaluru - 560 058, Karnataka, India.***



BUREAU VERITAS (INDIA) PRIVATE LIMITED

Construction Services Laboratory

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To : M/s Ajax Engineering (I) Pvt. Ltd., Bengaluru.

A. INTRODUCTION:

On reference from M/s. Ajax Engineering Pvt. Ltd., #253/1, 11th Main, Phase III, Peenya Industrial Area, Bengaluru - 560 058, Karnataka, India, vide their Letter Dated 03.07.2019, analysis of fresh Concrete mix for homogeneity of mix in Self Loading Concrete Mixer “ARGO 4000” was taken up at our laboratory vide our Test Order No. BL/193/8/2019/1 Dated: 02.08.2019.

For analysis of fresh concrete mix in self-loading concrete mixer for homogeneity of the mix, trials were conducted by adopting a theoretically proportioned concrete mix based on IS-10262-2019 and IS-456-2000 recommendations.

B. MATERIALS:

Cement	:	Dalmia. SRPC
Fine Aggregate	:	Crushed Stone Sand (Manufactured sand)
Coarse Aggregate	:	Angular crushed coarse aggregate of size 20 mm and 12.5 mm down size
Water	:	Potable

Above materials adopted during trials are conforming to relevant Indian Standards.



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C. DETAILS OF AJAX SELF LOADING CONCRETE MIXER: - "ARGO 4000"

Specification: (As furnished by the customer)

Engine

- 4 Cylinder turbo charged intercooled – 80.9 kW @ 2500 rpm.
- Bharat III Emission Certified

Chassis

- High tensile steel welded "Box" type construction

Hydrostatic Drum Drive

- Hydrostatic Drum Drive with high rotation for homogenous mix and drum lift for fast and complete discharge even on inclines.
- Drum Volume : 5.3 m³
- Concrete Output : 4m³
- Maximum Drum Rotation : 0 – 22 rpm
- Infinitely variable for mixing & discharge.

Wheels

- Tyre : 16.0/70-20 -14 PR

Transmission

- 4 wheel drive, 4 Speed Automotive hydrostatic transmission.
- Electro-hydraulic control for "slow" & "fast" speeds.
- Vehicle speed - 0 to 30 kmph (forward and reverse)

Brake

- Power braking with oil cooled disc type brakes.
- Dual brake circuit for front & rear axles.
- Hand operated parking brake acting on transmission shaft.

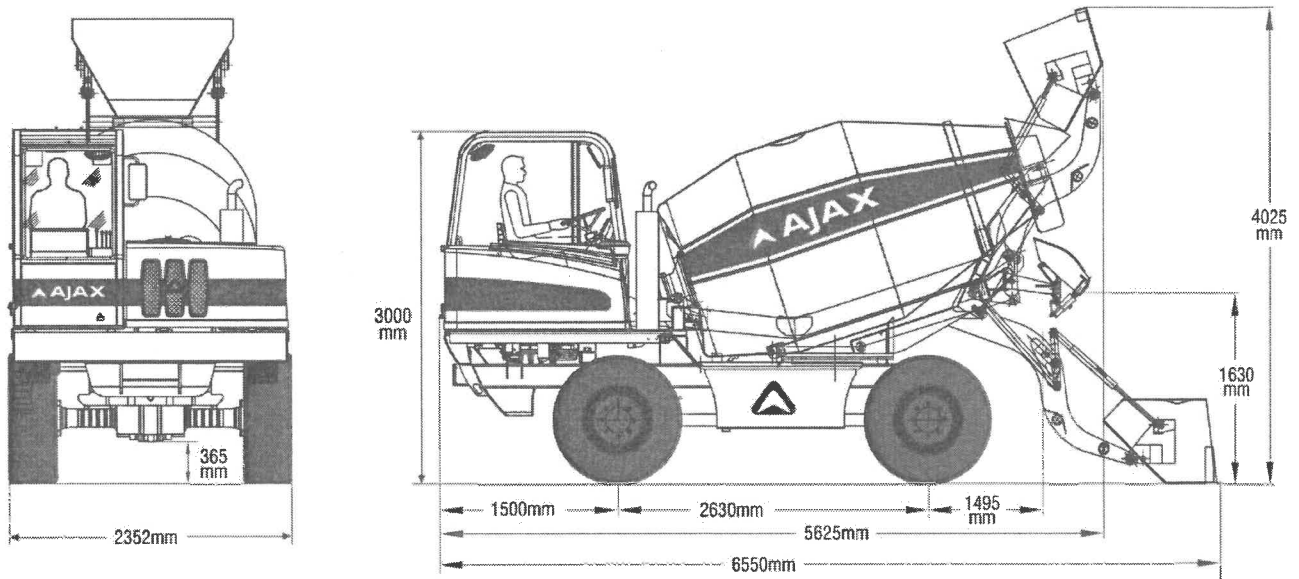
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Electrical System

- Battery: 12V, 135 Amp-hr.
- Complete lighting & signaling system as per CMVR standards.

Weight

- Net vehicle weight : 7610 kgs
- Gross vehicle weight : 17210 kgs



D. PROCEDURE FOR BATCHING OF MATERIALS IN ARGO 4000:

Operator of the self-loader is trained to batch the materials as per mix design recipe to be adopted for a particular job. Concrete Batch Controller (CBC) device fitted inside the operator cabin, aids the operator to know the weight of the mentioned batched. Loading is continued until the required quantity is batched as per the mix design recipe.



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Aggregate is scooped by the loading bucket and loaded into the mixer. Similarly required quantity of cement is batched using loading bucket. Water is added to the mixer from the water tank fitted with a water meter. After batching all the constituents of concrete, the mixer is kept rotating.

Print out of the batched materials can be obtained using a batch printer fitted in the cabin.

E. MIX PROPORTION:

Properties of the materials brought from site were determined. Concrete Mix of grade M25 was proportioned as per Mix Design.

Trials were conducted for M25 grade of concrete in the self-loading Ajax mixer- "ARGO-4000" machine.

MIX PROPORTION ADOPTED (Quantities for 1 cum of Concrete)

Cement	:	350 kg
Free W/C	:	0.49
Free water	:	171.5 kg
Manufactured Sand	:	780.5 kg
20 mm	:	638.5 kg
12.5 mm	:	425.6 kg

Note: Aggregate in saturated surface dry condition.

F. TEST SAMPLES:

Twelve samples of fresh concrete each weighing about 4 kg from the above mix were taken for analysis of concrete at different locations of mixer viz., 4 Nos. at initial pour, 4 Nos. at middle pour, 4 Nos. at the end pour to find the proportion of ingredients used in the mix. The purpose of this analysis of fresh concrete is to verify the homogeneity of the mix in the self-loader. Samples were brought to the laboratory in air-tight containers within one hour from the time of addition of water.



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G. PROCEDURE FOR ANALYSIS OF FRESH CONCRTE:

Sampled fresh concrete was analysed as per the procedure given in IS: 1199 – 1959 for checking the homogeneity of concrete.

H. CONCLUSION:

From the results of analysis of fresh concrete it can be concluded that ingredients of fresh concrete determined as per IS: 1199 – 1959 are within the tolerance given in IS: 4634 – 1991 in comparison with actually batched materials which establishes the homogeneity of the concrete mix in self loader.




22/10/2019
SANJEEV PATGAR
MANAGER-LAB



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TABLE 1

TEST REPORT ON PHYSICAL PROPERTIES OF CEMENT

Test Method : IS 4031 (Part 3 to 6) 1988 (Reaffirmed 2019) and
IS 4031 (Part 2) -1999 (Reaffirmed 2013)

Sl. No.	Test Conducted	Results	Requirements as per IS : 12330 – 1988 (Reaffirmed 2009)
1.	CONSISTENCY	24.0 %	Not specified
2.	INITIAL SETTING TIME	165 Minutes	Shall not be less than 30 minutes
3.	FINAL SETTING TIME	315 Minutes	Shall not be more than 600 minutes
4.	COMPRESSIVE STRENGTH; a) 72 ± 1h (average of three results) b) 168 ± 2h (average of three results) c) 672 ± 4h (average of three results)	36.0 MPa 46.0 MPa 58.5 MPa	Shall not be less than 10.0 MPa Shall not be less than 16.0 MPa Shall not be less than 33.0 MPa
5	FINENESS (by Blaine's air permeability method)	332 m ² /kg	Min. 225 m ² /kg
6	SOUNDNESS (by Le-Chatelier's method)	0.5 mm	Max. 10mm
7	SOUNDNESS (by Autoclave expansion method)	0.023 %	Max. 0.8%



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TABLE 2

TEST REPORT ON COARSE AGGREGATE SAMPLE

Test Method : IS:2386 (Part I & III)-1963 (Reaffirmed – 2016)

Sieve Analysis - 20mm and Down :

IS Sieve Designation	Cumulative Percent		Requirements as per IS:383-2016 in respect of 20mm nominal size aggregate (% passing)	
	Retained	Passing	Graded	Single Size
40.00 mm	0	100	100	100
20.00 mm	7.3	92.7	90-100	85-100
12.50 mm	90.5	9.5	-	-
10.00 mm	98.9	1.1	25-55	0-20
04.75 mm	100	0	0-10	0-5
Remarks : The above tested sample conforms to the requirement of single size aggregate as per IS:383-2016.				

Sieve Analysis – 12.5mm and Down :

IS Sieve Designation	Cumulative Percent		Requirements as per IS:383-2016 in respect of 12.5mm nominal size aggregate (% passing)	
	Retained	Passing	Graded	Single Size
20.00 mm	0	100	100	-
16.00 mm	0	100	-	100
12.50 mm	3.0	97.0	90-100	85-100
10.00 mm	36.5	63.5	40-85	0-45
04.75 mm	100	0	0-10	0-10
Remarks : The above tested sample conforms to the requirement of graded aggregate as per IS:383-2016.				

Test Conducted	Results		Requirements as per IS:383-2016
	20mm	12.5mm	
Water absorption (%)	0.5	0.5	Not Specified
Specific gravity	2.62	2.62	Not Specified



TABLE 3

TEST REPORT ON FINE AGGREGATE SAMPLE

Test Method : IS:2386 (Part I & III)-1963 (Reaffirmed – 2016)

SIEVE ANALYSIS:

IS Sieve Designation	Cumulative Percent		Specification as per IS:383-2016 for Fine Aggregate (Percentage Passing)			
	Retained	Passing	Zone-I	Zone II	Zone-III	Zone IV
10.00 mm	0	100	100	100	100	100
04.75 mm	2.5	97.5	90-100	90-100	90-100	95-100
02.36 mm	23.4	76.6	60-95	75-100	85-100	95-100
01.18 mm	44.7	55.3	30-70	55-90	75-100	90-100
600 microns	56.1	43.9	15-34	35-59	60-79	80-100
300 microns	69.1	30.9	5-20	8-30	12-40	15-50
150 microns	79.5	20.5	0-10	0-10	0-10	0-15
REMARKS: The sample supplied satisfies the requirements of grading Zone II as per IS:383- 2016. According to IS:383-2016 for Crushed Stone Sands, the permissible limit on 150 micron IS Sieve is increased to 20%. This does not affect the 5% allowance permitted in Cl. 6.3						

Test Conducted	Results	Requirements as per IS:383-2016
Specific gravity	2.65	Not Specified
Water absorption (%)	3.0	Not Specified



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RESULTS OF ANALYSIS OF FRESH CONCRETE

TABLE 4A

Sample taken from the starting of the pour (4 Nos.)

Sl. No.	Ingredients	Theoretical Content of Ingredients (kg)	Quantity of ingredients in 20 kg concrete (kg)	Arrived Content of Ingredients	Error (%)	Tolerance on Error as per IS: 4634 - 1991
1	CEMENT	350.00	2.96	2.82	-4.73	+/- 8.0 %
2	COARSE AGGREGATE	1064.10	8.95	9.00	+0.58	+/- 8.0%
3	FINE AGGREGATE	780.50	6.53	6.75	+3.36	+/- 6.0 %
4	WATER	171.50	1.56	1.43	-8.33	Not Specified
5	Total	2366.00	20.00	20.00	--	--

TABLE 4B

Sample taken from the middle of the pour (4 Nos.)

Sl. No.	Ingredients	Theoretical Content of Ingredients (kg)	Quantity of ingredients in 20 kg concrete (kg)	Arrived Content of Ingredients	Error (%)	Tolerance on Error as per IS: 4634 - 1991
1	CEMENT	350.00	2.96	2.80	-5.4	+/- 8.0 %
2	COARSE AGGREGATE	1064.10	8.95	8.90	-0.55	+/- 8.0%
3	FINE AGGREGATE	780.50	6.53	6.85	+4.90	+/- 6.0 %
4	WATER	171.50	1.56	1.45	-7.05	Not Specified
5	Total	2366.00	20.00	20.00	--	--



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TABLE 4C

Sample taken from the end of the pour (4 Nos.)

Sl. No.	Ingredients	Theoretical Content of Ingredients (kg) per cum.	Quantity of ingredients in 20 kg concrete (kg)	Arrived Content of Ingredients	Error (%)	Tolerance on Error as per IS: 4634 - 1991
1	CEMENT	350.00	2.96	2.76	-6.75	+/- 8.0 %
2	COARSE AGGREGATE	1064.10	8.95	8.94	+0.10	+/- 8.0%
3	FINE AGGREGATE	780.50	6.53	6.89	+5.51	+/- 6.0 %
4	WATER	171.50	1.56	1.41	-9.60	Not Specified
5	Total	2366.00	20.00	20.00	--	--

TABLE 4D

Summary of total concrete samples (12 Nos.)

Sl. No.	Ingredients	Theoretical Content of Ingredients (kg)	Quantity of ingredients in 60 kg concrete (kg)	Arrived Content of Ingredients	Error (%)	Tolerance on Error as per IS: 4634 - 1991
1	CEMENT	350.00	8.88	8.38	-5.6	+/- 8.0 %
2	COARSE AGGREGATE	1064.10	26.85	26.84	-0.04	+/- 8.0%
3	FINE AGGREGATE	780.50	19.59	20.49	+4.59	+/- 6.0 %
4	WATER	171.50	4.68	4.29	8.33	Not Specified
5	Total	2366.00	60.00	60.00	--	--



To : M/s Ajax Engineering (I) Pvt. Ltd., Bengaluru.

REFERENCES:		
1.	IS:10262-2009	Concrete Mix Proportioning - Guidelines (First Revision)
2.	IS:1199-1959 (Reaffirmed 2013)	Indian Standard specifications for methods of sampling and analysis of concrete.
3.	IS: 4634 – 1991	Methods for testing performance of batch-type concrete mixers
4.	IS:456-2000 (Reaffirmed 2011)	Code of Practice for plain & reinforced concrete. (Fourth Revision)
5.	IS:516-1959 (Reaffirmed 2013)	Method of test for strength of concrete.
6.	IS:383-2016	Indian Standard specifications for coarse and fine aggregates for concrete. (Third Revision)
7.	SP:23(S&T)-1982	Handbook on concrete mixes.
8.	IS:4926-2003 (Reaffirmed 2012)	Ready-Mixed Concrete - Code of Practice
9.	IS: 12330 – 1988 (Reaffirmed 2009)	Sulphate Resisting Portland Cement
10.	Neville, A. M.	“Properties of Concrete” 4 th Edition, – 1995- Publicity Pearson Education (Singapore) Pte. Ltd., Indian Branch, 482, FIE, Prathapganj Delhi 110092
