Annex 16
Working Draft

Dry Mix Mortar — Specifications

Foreword

Formal clauses will be added later

Ready Mix Mortar is ready to use cement based product for plastering (Internal and external) at construction site after mixing potable water and thoroughly mixing manually or in a mechanical mixer. Ready mix mortar is produced in a manufacturing unit where different ingredients are suitably selected, weighed precisely and homogenised thoroughly in a high efficiency mixer.

Ready mix mortar is widely used in various countries for some time. It is consistent in quality and environment friendly as compared to site mixed plaster. In view of non-availability of the river sand in many parts of the country, the use of appropriate mineral and chemical additives has become necessary to achieve workable and cohesive plaster. Plaster plays very important role in protecting internal and external surfaces of concrete and masonry from various climatic elements like variations in temperature, humidity, rainfall, freezing and thawing etc.

The use of ready mix mortar is continuously increasing in the country and a need has been felt for long to bring out a standard on this product. While framing the standard for Dry Mix Mortar, assistance has been derived from following international standards.

a) DIN 18555 (part 2 to 6) – Testing of mortars containing mineral binders, determination of consistency flow, compressive strength, setting time, elastic modules and bond strength.
b) ASTM C 941- Standard Test Method for water retentivity of Ground Mixtures.
c) ASTM D 4541 – Standard Test Method for Pull-off strength of Coatings.
d) ASTM C 157 – Standard Test Method for Length Change of Hardened Hydraulic – cement mortar and concrete
e) ASTM C-1403 – Standard Test Method for Rate of water Absorption of Masonry Mortars.
f) BS EN 1015-1999 (part 1,8,11,12 &18) – Method of Test for Mortar for masonry.
g) BSEN 998-1-2016 – Specification for mortar for masonry, rendering and plastering
mortar.

In addition to International Standards assistance of other Indian Standard has also been taken. The references of all such standard is given at the appropriate place in this standard.

For the purpose of deciding whether a particular requirement of this standard is

complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2:1960 ‘Rules for rounding off numerical values (revised)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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WORKING DRAFT

Draft Indian Standard for
Dry Mix Mortar –RMM Specification

1 SCOPE

This standard covers the physical, chemical and performance requirements of Ready Mix Mortar. Ready Mix Mortar is used for external and internal application of plastering on masonry and concrete surfaces in general construction of civil engineering works.

This standard does not cover the physical, chemical and performance requirements of dry mix mortar, which is used for jointing of masonry units.

2 NECESSITY OF THE CODE

Ready mix mortar offers number of advantages to the construction work due to availability of ready to use quality material. This avoids manual mixing at site and thereby possible mixing mistakes/dosing errors, etc. In developed countries like Germany and USA most of the products supplied to construction industry are in the form of ready to use and similar trend is emerging in India like RMC use in recent years.

Number of plants in, organized and unorganized sectors in India have already been setup during last few years for Ready Mix Mortar. The use of Ready Mix Mortar is increasing in all sectors of construction. The retail customers are unable to make right choice while buying and assurance of quality product in absence of an Indian Standard on Ready Mix Mortar. Bureau of Indian Standards has considered it necessary to frame a standard on Dry Mix Mortar aligning with International Standards in order to protect the consumer's rights.

3 REFERENCES

The following standards contain provisions which through references in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and practise to agreements based on this standard and encouraged to investigate the possibility of applying the most recent editions of the standards indicated below;

IS No	*Title*
269 : 2015	Ordinary Portland Cement – Specification (*Sixth Revision*)
383 : 2016	Specification of Coarse and Fine Aggregate (*Third Revision*)
1542 : 1992	Sand for Plaster—Specification (*Second Revision*)
2386	Methods of Test for Aggregates for Concrete
Part 1 : 1963	Particle size and shape

Part 2 : 1963	Estimation of deleterious materials and organic impurities
Part 3 : 1963	Specific gravity, density, voids, absorption and bulking
3812 (part 1) : 2013 as	Pulverized Fuel Ash –Specification Part 1 : For Use Pozzolana in Cement, Cement Mortar and Concrete (*Third Revision*)
4032:1985 (*First Revision*)	Methods of Chemical Analysis of Hydraulic Cements
40 1996	Recommendations on Stacking and Storage of Construction Materials and Components at site (*second revision*)
IS 16714 - 2018	Ground Granulated Blast Furnace Slag for Use in Cement, Mortar And Concrete - Specifications

3 Terminology

3.1 Plaster/Render: Cement/cementitious materials based mortars used externally are referred to as render and materials used internally as plasters on structural elements.

3.2 Ready Mix Mortar: The cement/cementitious based mortar constituents (dry) are wholly batched and mixed in a factory, supplied to the building site and mixed only required amount of potable water according to the manufacturers specification and condition.

3.2 Site Mix Mortar: The cement/cementitious based mortar constituent along with required amount of portable water are mixed at building site according to the specifications of the quality assurance documents or Engineer In-charge of the site.

4 RAW MATERIALS:

4.1 Cement – Ordinary Portland cement for manufacture of Ready Mix Mortar shall conform to IS 269 (OPC 53/43 grade).

4.2 Sand – Sand to be used for Ready Mix Mortar shall conform to IS 1542 ‘Sand for Plaster – Specification’

4.2.1 *Quality of Sand*

4.2.1.1 *General*
The sand shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these. The sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain clay, silt and dust more than specified under **4.2.1.3** (a).

4.2.1.2 *Deterious Materials*

The sand shall not contain any harmful impurities, such as, iron pyrites, alkalies, salts, coal, mica, shale or similar laminated materials, soft fragments, sea shells and organic impurities in such quantities as to affect adversely the hardening, the strength, the durability and the appearance of the plaster or applied decoration, or to cause corrosion of metal lathing or other metal in contact with the plaster.

4.2.1.3 *Limits of Deleterious Materials*

Unless found satisfactory as a result of further tests as may be specified by the engineer or architects, or unless evidence of such performance is offered which is satisfactory to him, the maximum quantities of clay., fine silt, fine dust and organic impurities in the sand shall not exceed the following limits:

a) Clay, silt and dust [determined in accordance with IS 2386 (Part 2)] – Not more than 5 percent by weight.

b) Organic impurities [determined in accordance with IS 2386 (part 2)] – Colour of liquid below that indicated by comparison with the standard solution specified in **6.2.2** of IS 2386 (part 2).

NOTE – In particular cases crushed stone sand with even higher proportions of fine dust than specified above, may be satisfactory and the limits so permitted may be subject to the agreement between the supplier and the purchaser.

The average compressive strength, determined by the standard procedure detailed in Annex A of IS 2250, of mortar cubes composed of one part of cement and six parts of sand conforming to gradation in Table 1 shall be not less than 3 N/mm^2 at 28 days.

The amount of water for gauging shall be that required to give a flow between 110 to 115 with 25 drops in 15 seconds, as determined in **9.5.3** of IS 1727.

4.2.1.4 *Grading of Sand*

The particle size grading of sand for plaster work for internal as well as external walls and ceiling as analysed by the method described in IS 2386 (part 1) shall be as specified in Table 1. Where the grading falls outside the limits of grading zones of sieve by a total 150, 300 and 600 micron IS sieve by a total amount not exceeding 5 percent, it shall be regarded as falling within the grading.

Table 1 Grading of Sand for Internal Wall or External Wall or Ceiling Plaster

(*Clause* 4.2.1.4)

Sl No (1)	IS Sieve Designation (2)	Percentage Passing (3)
a)	10 mm	100
b)	4.75 mm	95-100
c)	2.36 mm	95-100
d)	1.18 mm	90-100

e)	600 micron	80-100
f)	300 micron	20-65
g)	150 micron	0-15

NOTE – For crushed stone sands and crushed gravel sands, the permissible limits on 150 micron IS Sieve is increased to 20 percent. This does not affect the 5 percent allowance permitted.

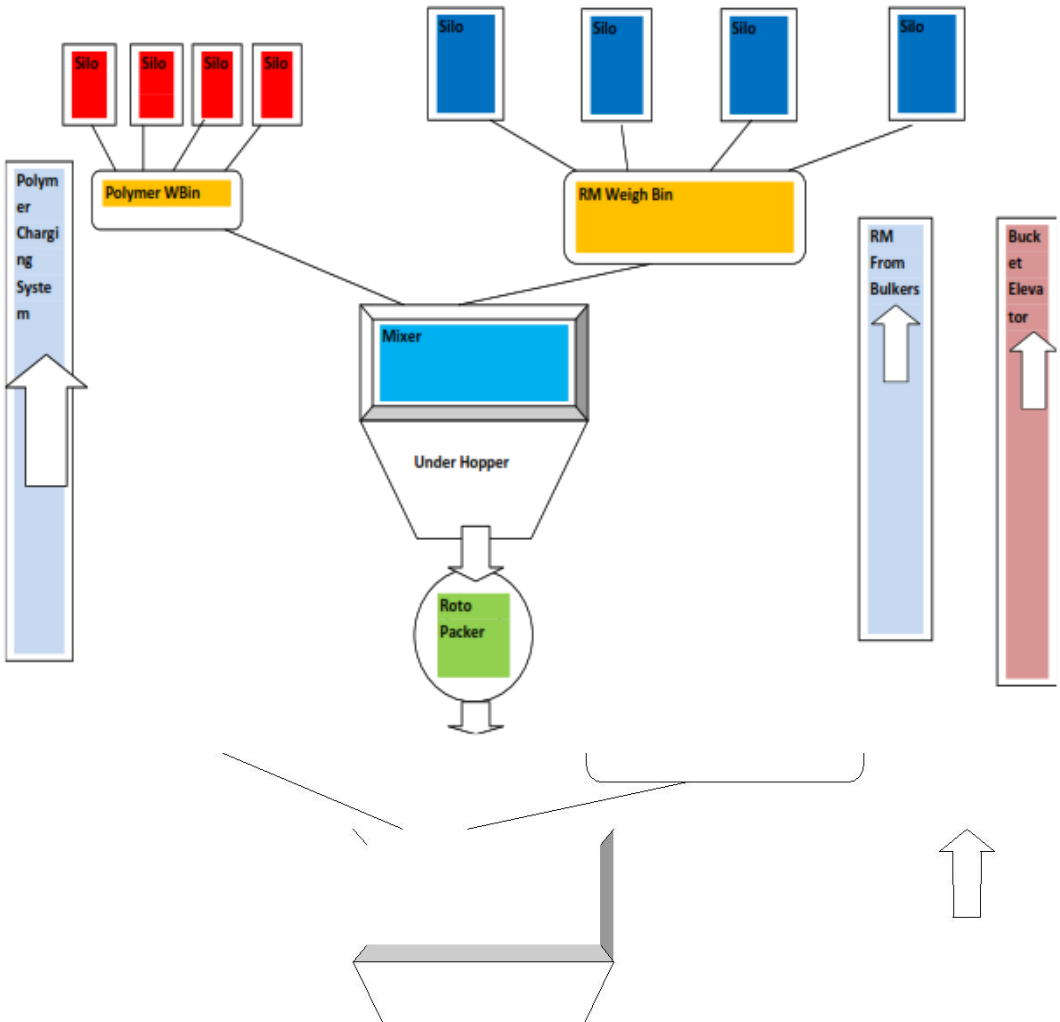
The fineness modulus of sand shall be not less than 1.4 in case of crushed stone sands and crushed gravel sands and not less than 1.5 in case of naturally occurring sands.

The various sizes of particles of which the sand is composed shall be uniformly distributed throughout the mass.

The required grading may often be obtained by screening and / or by blending together either natural sands or crushed stone screenings, which are by themselves of unsuitable grading.

4.3 Mineral Additives – Mineral additives like fly ash and ggbs, conforming to IS 3812 (part 1) and IS 16714 respectively can be added as part replacement of either cement or sand to the extent that physical and chemical characteristics of Ready Mix Mortar as specified in this standard are fully complied with.

4.4 Chemical Additives – Chemical additives such as polymer, dispersion agents, plasticizers, etc shall be added to conform to the specification of this standard for physical, chemical properties and performance requirements



6 PHYSICAL AND CHEMICAL REQUIREMENTS

The physical and chemical requirements of Ready Mix Plaster in fresh and hardened state, when mixed in cement sand ratio of 1:4 as per IS 2250 are given in Table- 2

Table-2 Physical and chemical Requirements
(*Clause* 6)

Sl. No	Physical and Chemical Requirements	Requirement	Procedure of testing
	Mix Ratio Cement : Sand	1 : 4 (by weight)	IS 2250
a)	Compressive Strength at	7.5 MPa	IS 4031 (part 6)
	28days,in MPa/N/mm2 *Min*		~~DIN 18555 (Part 3)~~
b)	Bulk Density, kg/cm^3	1800-2000	IS 1727/2250
			~~DIN 18555 (Part 2)~~
c)	Initial Setting Time, in min,	60	IS 4031 (Part 5)
	Min		
d)	Final Setting Time, in min,	600	IS 4031 (Part 5)
	Max		
e)	Tensile Adhesion Strength /	0.3	~~Din 18555 (Part 6)~~
	Bond Strength to substrate		~~ASTM D4541~~
	(10mm thickness) @ 14		Annexure -1 – Attached
	days, in MPa, *Min*		
f)	Flexural strength at 28 days,	2.5	~~DIN 18555 (Part 3)~~
	in MPa, *Min*		Annexture – 2 Attached
g)	Chloride Content, in percent,	0.15	IS 4032 – 1985
	Max		
h)	*SO3 Content, in percent, Max*	3.00	IS 4032 – 1985
~~i)~~	~~Water retention (%) (Min.)~~	~~95%~~	~~IS 1727/2250~~ ~~DIN 18555 (Part – 7)~~ ~~ASTM C941~~ -NO Need already in Additional Performance

			Parameters
j)	Workable life or pot life	Shall not be less than the declared value	As Specified by manufacturer

Notes

1 The above requirements are mandatory for product to comply to this standard.

2 There are other characteristics of the product which improves its performance. These characteristics have been identified after the review of international standards and discussions with manufactures and users of Dry Mix Plaster. These characteristics are given in Table-3

3 The characteristics gives in Table -3 are not mandatory for the product but given for the guidance of the manufacturers and users.

Table-3 Additional Performance Requirements

(*Table 2*)

Sl. No	**Performance Requirements**	**Requirement**	**Procedure of Testing**
1	Air Content of fresh mortar at 0 min, in percent, *Max – No need*	20	~~DIN 18555 (Part 2)~~
2	pH Value at 0min, *min – NO need*	12	
3	Shelf-life	Max 6 month and to test before usage if bags are lying in vendor's go-down for more than 3 months to find suitability as per parameters Specified	similar provision for cement is made in IS:269, which can be referred only for rejection/ acceptance Criteria
4	Water retention , in percent, *Min*	95	IS 1727/2250
			~~DIN 18555 (Part- 7)~~
			~~ASTM C941~~
5	Drying Shrinkage, in percent, *Max*	0.015%	IS 1727 ~~ASTM C157~~
6	Soundness of Mortar by Le Chatelier Test, in mm, *Max*	10	IS 4031 (Part 3)
7	Specific Gravity, in g/cm^3	2.5-2.8	IS 1727
8	Elastic Modulus, in MPa – NO need	15000 – 30000 MPa	~~DIN 18555 (Part 4)~~

9	Water absorption at 28days, in	1	~~ASTM C1403~~
	percent, *Max – No need*		
10	Sag Resistance/Slip	Nil	IS 15477:2019
11	Thermal Conductivity – NO need	≤ 0.2 W/m.K	~~EN 1745 (2012)~~

The proportion of cement and sand for all plaster work either on concrete or brick masonry is recommended in 1:4 proportion as per the requirements given in Table-2. However, proportions other than 1:4 may be adopted depending upon the mutual agreement between the supplier and the user. For such situations, the physical and performance requirements are given in Table-4 (For guidance only).

Table-4 Physical and Performance Requirements with cement: Sand proportions other than 1:4

Property	Cement: Sand (1:3)	Cement: Sand (1:5)	Cement: Sand (1:6)
Bulk Density g/cm^3	1.9 to 2.1	1.8 to 2.0	1.75 to 1.95
Tensile adhesion strength/bond strength to substrate (10mm thickness) @ 28 days, Min	0.40	0.25	0.20
Initial Setting Time, Min.	60	60	60
Final Setting Time, Max.	600	600	600
Water Retentively, in percent, Min	95	95	95
Compressive Strength, in MPa, Min	8.5	6.5	5.0
Flexural Strength, in MPa, Min	3.0	2.25	2.0
Water Absorption @28 days, in percent, Max.	1	1	1

7. PACKING

7.1 The Ready Mix Mortar shall be packed in any of the following bags;

a) Multi-wall paper sacks conforming to IS 11761
b) HDPE /PP woven sacks conforming to IS 11652
c) Jute synthetic union bags conforming to IS 12174 or
d) Any other approved composite bag

The net quantity of Ready Mix Mortar per bag shall be 40 kg. The net quantity of Ready Mix Mortar may also be 25kg, 20kg, 10kg, 5kg, 2kg, and 1kg as agreed to between the purchaser and the supplier.

Supplies of Ready Mix Mortar in bulk may be made by arrangement between the purchaser and the supplier / manufacturer or stockist.

8 STORAGE AND INSPECTION

The Ready Mix Mortar shall be stored in such a manner so as to permit easy access for proper inspection and identification of each consignment.

Adequate facilities shall be provided to the purchaser for careful sampling and inspection, either at the source or at the site of work, as may be specified by the purchaser. For guidance on storage of Ready Mix Mortar at site, IS 4082 may be referred to. In general the material shall be stored similar to cement / fly ash / silica fume / metakaolin, etc. storage depending upon the storage requirements in bag / bulk form.

9 DELIVERY

The supply of Ready Mix Mortar shall be made in suitable quantities mutually agreed upon between the purchaser and the supplier. Where so required by the purchaser, the material shall be supplied in bags jute laminated, multiply paper or polyethylene lining.

10 MANUFACTURER CERTIFICATE

The supplier / manufacturer shall satisfy himself that the Ready Mix Mortar conforms to the requirements of this standard and, if requested by the purchaser, shall furnish a certificate to this effect, indicating the results of the tests carried out on the samples3of Ready Mix Mortar. The specimen of Test Certificate is given in Table -5

Table-5 Material Test Certificate (Standard Format) which has to be released to customers along with each supply

No	Unit	Results	Test Method
1	Mix Ratio Cement to Sand	1 :	IS 2250
2	Bulk Density	Kg/cum	IS 1727 /2250 ~~DIN 18555 (part 2)~~
3	Initial Setting Time	Minute	IS 4031 (Part 5)
4	Final Setting Time	Minute	IS 4031 (part 5)
5	Tensile Adhesion Strength/ Bond Strength @ 28 days	MPa	Annexture 1
6	Compressive Strength @ 28 days	MPa	IS 4031 (part 6) ~~DIN 18555 (part 3)~~
7	Flexural Strength at 28 days	MPa	~~DIN 18555 (part 3)~~

			Annexture 2
8	Chloride Content (%)	0.15 (Max)	IS 4032 - 1985
9	SO3 Content (%)	3.00 (Max)	IS 4032 - 1985
10	Water retention (%) (Min.)	95%	IS 1727/2250 ~~DIN 18555 (Part-7) ASTM C941~~
11	Workable life or pot life	Shall not be less than the declared value	As Specified by manufacturers

11 MARKING

Each bag / consignment of Ready Mix Mortar shall be clearly and permanently marked with the following information

a) Identification of the source of Ready Mix Plaster
b) Net mass of Ready Mix Mortar
c) Batch / Control unit number
d) Week , month and year of packing
e) Any other identification mask as required by the purchaser
f) Maximum Retail Price inclusive of all Taxes.

12 BIS CERTIFICATION MARKING

12.1 The Ready Mix Mortar may also be marked with the Standard Mark.

12.2 The use of Standard Mark is governed by the provision of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The details of conditions under which a licence for the use of the standard mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standard.

13 APPLICATION PROCEDURE

13.1 Preparation Mixing & Application – Ready-Mix Mortar can be used for exterior and as well as interior wall and ceiling. The ratio of cement: sand shall be decided based on the structural element (wall, ceiling) of usage. The substrate shall be clean and free from dust, grease and loose adhering particles, etc else it will affect the bonding of the plaster to the surface. The porous and absorbent substrates shall be pre-wetted prior to application of Ready-Mix Plaster to prevent premature loss of water from the plaster. This will ensure that thin layer can be applied without cracking problems and proper cement hydration and adherence of the mortar to the substrate is attained. Use 7-8 liters of clean water per every 40kg of Ready Mix Mortar, however, the exact quantity shall be added as per manufacturer's instructions. Pour the Ready Mix Mortar while mixing for 5-10 minutes with hand or otherwise mechanical mixer is recommended for better result and to achieve a good consistency. Do not over mix (depending on the speed of mixing

equipment). Allow mixtures to stand for 5 minutes for additives to dissolve completely. Re-mix again for about 2 minutes just before use (do not over mix). Hard and set plaster shall not be mixed again. The correct ratio of water and Ready –Mix Mortar is essential for proper plastering. Apply plaster to the substrate, using some pressure while finishing with a steel trowel or wooden float to ensure optimum bonding of the plaster to the substrate surface. For better sticking of the plaster, the prepared surface shall be rough. Once the mixture is prepared, it should be applied within one hour. Ready-Mix Mortar can be used for exterior and as well as interior wall and ceiling. Plastering on brick wall must need prewetting of substartes before plastering. Incase of plastering on mivon surface, ceiling or AAC blocks before plaster must apply polymer modified bond coat & then plaster anchoring coat . Alternatively can apply dash coat of same RMM up to 2-3 mm to cover complete surface. Such dash coat must be water cured for 3-4 times – 3 days before applying base coat up to 10-12 mm.

13.1 The application procedure is given for general guidance, it may change due to nature of substrate, application methods and environment conditions.

14 WATER CURING

Ready Mix Mortar doesn't need watering for 24 hours in normal weather. Once the plaster has dried and set completely watering should be done once or twice for 8-10 days under normal weather and 12-14 days under abnormal weather condition, such as hot and dry conditions.

15 COVERAGE

Ready Mix Mortar approx. coverage per 40kg bag (for guidance only)

10-12 mm plaster on light weight blocks -17-18 sq.ft.

10-12 mm on brick wall – 14-15sq.ft. 18 mm on light weight blocks11sq.ft. 25 mm on brick wall – 7-8 sq.ft.

10 mm on RCC work- 20-22 sq.ft.

Coverage depends on quality and nature of substrate. If the plaster thickness is more than 12 mm, it shall be done in 2 coats.