MAZBOOTI GUARANTEED

JK LAKSHMI CEMENT

JK LAKSHMI CEMENT

COMBINED PRODUCTION

JK LAKSHMI CEMENT PLANT - SIROHI (RAJ.)

25

CRORE BAGS PER YEAR.

JK LAKSHMI CEMENT PLANT - DURG CHHATTISGARH

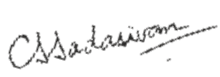
Preface

The quality of any construction depends on a number of factors. Most importantly quality of inputs, be it Cement, Steel or Plaster of Paris. The quality of labour and methodology is equally important. We have tried to highlight the methodology and techniques in this User's Guide.

The purpose of this User's Guide is to provide an insight into proven construction practices which, when properly executed, will produce quality concrete construction. It can also be used as a training manual for contractors.

This book emphasizes the fundamental principles and their practical applications, providing detailed coverage of all types of buildings. This latest edition now incorporates the IS:456:2000 guidelines.

We hope that this guide will help you to build your Dream Home.



C.S. Sadasivan

S. Chouksey

Accredited Certifications

ISO 14001 : 2004

Environment Management System

OHSAS 18001

Occupation Health & Safety Management System

ISO/IEC17025:1999

General Requirements for the Competence of Testing & Calibration Laboratories

ISO 9001:2000

Quality Management System

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Concrete Historical Time Line

300 BC-476AD
Applian Way, Roman baths, the Coloseum and Pantheon used Pozzalana Cement. Animal fat, milk and blood were used as admixtures.

1824
Josph Aspdin of England invented Portland Cement by burning ground chalk with finely divided clay in a lime kiln until carbon dioxide is driven off.

1836
The first systematic test of tensile and compressive strength took place in Germany.

1886
First rotary kiln was introduced in England, which allowed for continuous production of Cement.

1889
First concrete reinforced bridge was built.

What is CEMENT ? What is the raw material used for manufacturing of cement ?

Cement can be defined as an inorganic chemical powder which possess very good adhesive or bonding & cohesive properties which makes it possible to bond with other materials in presence of water.

Main constituents of cement are Calcium, Silicon, Alumina & Iron oxide. Two types of raw materials are used while manufacturing cement (1) Calcareous : In this the percentage of calcium (lime) is more e.g. Limestone, Chalk, Shale & Marl available in sea. (2) Agrillaceous : In this the percentage of Silica, Alumina, Iron is more e.g. certain type of clay, china clay etc.

How is cement manufactured ?

Above described raw materials, are mixed in predetermined proportion & are ground to fine powder. This fine blended material is burnt in a kiln at 1400°C to 1500°C temperature. The material that emerges from kiln is in nodule form & is called clinker. This clinker is cooled & ground further alongwith 2 to 5% of gypsum to a very fine powder. This fine powder is called Portland cement.

Types Of Cement

Ordinary Portland Cement (OPC) : OPC is obtained by grinding the clinker with Gypsum. OPC is manufactured in 3 grades i.e. 33, 43, & 53 grade. This Cement is mostly used in general construction of masonary flooring, RCC work and prestress concrete work.

Rapid Hardening Cement : It is similar to OPC but develops strength earlier than OPC due to more percentage of C_3S. By use of this cement formwork can be removed earlier and structure can be used very soon.

Low Heat Cement : Due to low C_3A and more C_2S, heat liberated due to hydration is reduced making cement particularly suitable for use in structures like dam, bridge, abutments etc. Its rate of development of strength is however slower, hence requires longer curing period.

Portland Blast Furnace Slag (PBFS) : The cement is made from inter grinding Portland clinker and blast furnace slag (25 to 65%). PBFS can be used for all construction where OPC is used, specially in marine structure, municipality works, mass concrete such as dam, bridges etc.

Portland Pozzolana Cement (PPC) : PPC is manufactured either by intergrinding Portland Clinker and Pozzolana or by intimately and uniformly blending Portland cement and Pozzolana together.

Pozzolana may vary from 15 to 35% by wt. of cement.This cement has higher resistance to chemical agents and to attack by sea water. Due to low heat of hydration of PPC, possibility of cracks formation is negligible. It can be used where OPC is used, specially in mass concrete work.

Super Sulphate Cement : It is made from well granulated blast furnace slag (80 to 85%) Calcium Sulphate (10 to 15%) & Portland Cement (1 to 2%) and is ground finer than portland cement. Concrete made from SSC may expand if cured in water and may shrink if cured in air. Another big advantage of SSC is its comparatively higher resistance to chemical attack.

White Cement : The greyish colour of Portland cement is due to presence of iron oxide. In White Cement iron oxide is limited to 1%, Oil fuel is used in place of pulverised coal. White cement is used in decorative work like flooring, tiles etc.

High Alumina Cement (HAC): It is manufactured by chalk and bauxite, which is special clay of high alumina content. HAC is characterised by its dark colour, high early strength, high heat of hydration and resistance to chemical attack.

There are other type of cement such as oil well cement, expansive cement, acid resisting cement, hydrophobic cement, sulphate resisting cement, masonry cement having different properties and uses.

Grades of cement to be used for different types of construction :

CEMENT GRADE	TYPE OF CONSTRUCTION	
JK Lakshmi Cement	All types of RCC Work, Under-Ground Structures, General Building Works, Bridges, Hydro-Power Stations, Dams, Roller Compacted Concrete	
53 GRADE	Pre-stressed Works, Silos, Bridges, Dams, Atomic Power Stations, Railway Sleepers, Precast Element, RCC Pipe etc.	
43 GRADE	Commercial Building, Industrial Construc-tion,Multi-storeyed complexes, Cement Concrete Roads, Heavy Duty Floors etc.	

Requirement for concrete exposed to Sulphate Attack

Class	Concentration of Sulphate, Expressed as SO_3 In Soil			Type of Cement	Dense Fully compacted Concrete. Made with 20 mm Nominal Maximum s size Aggregates Complying with IS:383	
	Total SO_3 Percent	SO_3 2:1 Water Soil Extract g/l	In Ground Water g/l		Min. Cement Content Kg./m^3	Max. Face Water Cement Ratio
1	Traces (< 0.2)	Less than 1.0	ess than 0.3	O.P.C./P.S.C./P.P.C.	280	0.55
2 330	0.2 to 0.5 0.50		1.0 to 1.9	0.3 to 1.2 O.P.C. / P.S.C. / P.P.C. S.S.C./S.R.C.	310	0.50
3 330	0.5 to 1.0 0.50		1.9 to 3.1	1.2 to 2.5 S. S. C. / P.P.C./P.S.C.	350	S. R. C. 0.45
4 370	1.0 to 2.0 0.45		3.1 to 5.0	2.5 to 5.0 S. S. C. /		S. R. C.
5	>2.0	>5.0	>5.0	S.R.C./S.S.C.	400	0.40

Notes :- Cement content given in this table is irrespective of grades of cement.

- O.P.C. - Ordinary Portland Cement.
- P.S.C. - Portland Slag Cement
- P.P.C. - Portland Pozzolana Cement.
- S.S.C. - Super sulphated Cement.

Minimum Grade Of Concrete For Different Exposures

Exposure	Minimum Cement Content kg/m^3	Maximum Free Water Cement Ratio	Minimum Grade of Concrete
PLAIN CONCRETE			
Mild	220[3]	0.60	–
Moderate	240	0.60	M15
Severe	250	0.50	M20
Very Severe	260	0.45	M20
Extreme	280	0.40	M25
REINFORCED CONCRETE			
Mild	300	0.55	M20
Moderate	300	0.50	M25
Severe	320	0.45	M30
Very Severe	340	0.45	M35
Extreme	360	0.40	M40

for details refer IS 456:2000

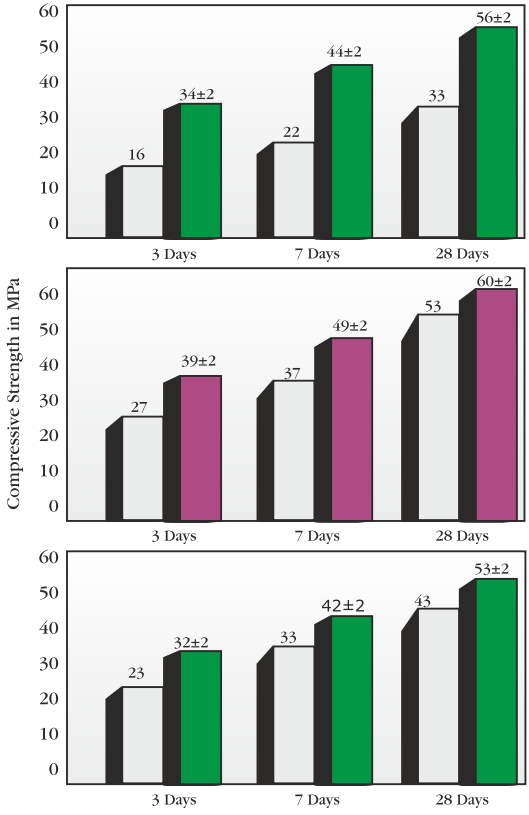
Environmental Exposure Condition

Environment	Exposure Conditions
Mild	Concrete surfaces protected against weather or aggressive conditions, except those situated in coastal areas.
Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet. Concrete exposed to condensation and rain. Concrete continuously under water Concrete in contact or under non aggressive soil/ground water. Concrete surfaces sheltered from saturated salt air in coastal area.
Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation. Concrete completely immersed in sea water. Concrete exposed to coastal environment.
Very Severe	Concrete surfaces exposed to sea water spray, corrosive fumes or severe freezing conditions whilst wet. Concrete in contact with or buried under aggressive sub-soil/groundwater.
Extreme	Surface of members in tidal zone Members in direct contact with liquid/solid aggressive chemicals.

Physical Characteristics Of Various Types Of Cement

Type of cement	IS Number	Fineness m/kg^2 (Min)	Setting time Inital Min.	Setting time Final Max.	Comp. Strength MPa Days 3	7	28
OPC 33 Grade	269:1989	225	30	600	16	22	33
OPC 43 Grade	8112:1989	225	30	600	23	33	43
OPC 53 Grade	12269:1987	225	30	600	27	37	53
PPC (Fly ash based)	1489 (Part 1) 1991	300	30	600	16	22	33
PSC (Slag Cement)	455 :1989	225	30	600	16	22	33
SRC (Sulphate Resisting Cement)	12330:1988	225	30	600	10	16	33
White Cement	8042:1989	225	30	600	14.4	19.8	29.7

Superior Quality of JK Lakshmi Cement



AT A GLANCE

PARAMETER	IS:1489	IS:12269 O.P.C.	JK LAKSHMI CEMENT
1 Setting time			
a) Initial	30 min. (min.)	30 min. (min.)	120 ±15
b) Final	600 min. (max.)	600 min. (max.)	180 ±15
2. Comp. Strength			
a) 3 days	16 MPa (min.)	27 MPa (min.)	35 ±2
b) 7 days	22MPa (min.)	37 MPa (min.)	44 ±2
c) 28 days	33MPa (min.)	53 MPa (min.)	55 ±2
d) after 28 days	Higher than O.P.C.	Normal	Higher than .O.P.C.
3.Tensile Strength *	Lower as compared to O.P.C. Picks up beyond 90 days & overtakes O.P.C. in the later stages.	Higher in initial Stages upto 28 days	Lower as compared to O.P.C. Picks up beyond 90 days & overtakes O.P.C. in the later stages.
4. Water demand *	Less than O.P.C. hence better workability & reduced segregation & bleeding	High	Less than O.P.C. hence better workability & reduced segregation & bleeding
5. Deshuttering period	As per IS:456	As per IS:456	As per IS:456
6. Curing period	Min. 10 days	Min. 7 days	Min. 10 days
7. Chloride resistance*	Better than O.P.C.	-do-	Better than O.P.C.
8. Sulphate resistance*	Better than O.P.C.	-do-	Better than O.P.C.
9. Heat of Hydration	Very Low	High	Very Low
10.Durability *	Considered better as compared to O.P.C.	Generally good	Considered better as compared to O.P.C.

* Based on research studies

- ☑ Super Strength
- ☑ Better Workability
- ☑ Low Heat of Hydration
- ☑ Sulphate Resistant
- ☑ Corrosion Resistant
- ☑ Low Permeability
- ☑ Higher Fineness

Material Used In Concrete

The Main Constituents of Concrete are :

Cement, Coarse Aggregates, Fine Aggregates & Water

a) Cement : We have already discussed where to use which grade of cement. Ref. (Page 4 to 9). When cement is mixed with water, a chemical reaction takes place as a result of which, the cement paste first loose its plasticity and then becomes stiff and later acquires hardness and strength.

Storage of Cement :

- Cement should be stored in weather proof building.
- Follow "First in - First out" for usage.
- In cement godown, keep the cement bags on a raised wooden platform at ground level, except incase of dry concrete floor.
- Cement should be kept in stacks preferably up to 10 bags in height and 30 cm away from the wall.

- Store the bags on a raised platform (1Ft. above ground) and cover with tarpaulin or polythene sheets while storing cement bags at work site.

Strength Of Stored Cement

As time passes, stored cement looses its strength, resulting in reduction in the strength of cement.
Following values are tentative.

Period of storage of cement	Expected Reduction in strength at 28 days
Fresh	0%
3 months	20%
6 months	30%
1 year	40%
2 year	50%

As per BIS, cement give best performance if consumed within 90 days from the dates of its packaging. Beyond this period, it should be retested before use.

b) Aggregate :Aggregates are inert or chemically inactive material which when bonded together by cement, form concrete. Aggregates are naturally occurring such as crushed rock, gravel and sand or processed aggregate such as broken bricks and crushed blast furnace slag.

Quality of Aggregate : Aggregate should be chemically inert, strong, hard, durable, have least porosity, free from adherent coating, clay lumps, coal and coal residue, and should contain no organic and other admixture that may cause corrosion of the reinforcement or impair the strength or durability of concrete. The aggregates are classified as :

i) Coarse aggregate ii) Fine aggregate

The material retained on 4.75 mm I.S. sieve are termed as coarse aggregate and material smaller than 4.75mm size are termed as fine aggregate. If aggregate is a mixture of all sizes, it is termed as blended aggregate. Crushed stone and natural gravel are common coarse aggregate and natural sand is generally used as fine aggregate.

The average size of a particle can be judged by its Fineness Modulus.

If the aggregate supply is having more dust or clay, it should be cleaned and screened to get required proportion of grading.

Storage of aggregate : It should be kept on firm dust free & oil free ground. It should be stocked preferably in trapezoidal section, and different sizes should not be mixed up.

Properties Of Concrete Influenced By Aggregate Properties

CONCRETE PROPERTIES	RELEVANT AGGREGATE PROPERTIES
Strength and workability indices	Strength Surface, Texture, Particle shape, flakiness and elongation Maximum size, grading, deleterious constituents
Shrinkage & creep	Modulus of elasticity, Particle shape, Grading Cleanliness, Maximum size, Presence of Clay
Durability	
Resistance to wetting & drying	Pore structure Modulus of elasticity
Resistance to heating & cooling	Coefficient of thermal expansion
Abrasion resistance	Hardness
Alkali- aggregate	Presence of particular siliceous reaction constituents
Slipperiness	Tendency to polish
Economy	Particle shape, Grading , Maximum Size, Amount of processing required, Availability

Water : Water acts as a lubricant for the fine and coarse aggregates and act chemically with cement to form the binding paste for the aggregates and reinforcement. Water is also used for curing the concrete after it has been cast into the form.

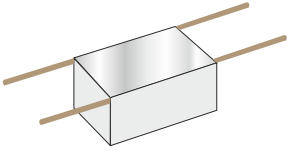
Water used for mixing & curing should be clean and free from injurious amount of oil, acids, alkalies, salts, sugar, organic materials or any other substances that may be deleterious to concrete or steel. Portable water is generally considered satisfactory for mixing & curing of concrete.

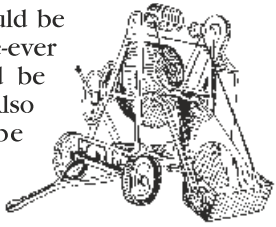
How To Make Good Concrete

To make good concrete, following points are important pertaining to material & workmanship.

1) Cement : Cement should be fresh. We recommend to usage of JK Lakshmi cement.
ii) Aggregates : Aggregates should be of good quality refer pg. No: 14 & 15.
iii) Nominal Mix and design mix concrete.

Batching : Batching of material by weight is preferable. If batching is done on volumetric basis, use measuring boxes in such a way that 50 kg cement bag may be mixed directly. The cements bag should always be batched in whole bag. *Correction for bulking of sand is to be done.*





Mixing : Mixing of material should be done by mixer machine. Where-ever hand mixing is done, it should be done on impervious platform. Also cement and sand should be mixed first then aggregate to be mixed and then water is to be added. Use the minimum quantity of water, considering the workability required to enable easy placing and compaction of concrete.

Transportation : Concrete should be transported in such a way that it should not be dried or set on the way and segregation should not occur.

Placing : Place concrete in final position before setting starts. To avoid segregation it should not be dumped from height more than 1M. If height is more than 1M, cone flask should be used. Also form work should not be disturbed during placing of Concrete, it should be laid in layers without any break .

Compaction : Concrete should be compacted preferably by vibrator. Over vibration should be avoided to avoid bleeding, lesser vibration causes honey combing in concrete.

Finishing : After completion of concrete work, surface should be finished by stiffening & levelled to required degree.

Curing : Curing is one of the most essential operation in which concrete is kept continuously damp for some days to enable the concrete to gain more strength. Curing replenishes the loss of moisture from the concrete due to evaporation, absorption and heat of reaction.

The period of curing depends upon atmospheric conditions such as temperature, humidity & wind velocity. The normal period is between 7 to 10 days. There are several methods of curing the concrete, the more common being :

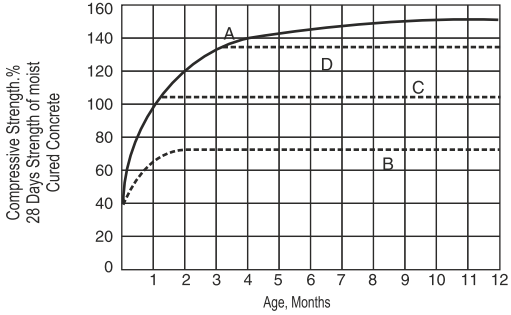
a) Covering the exposed surface with a layer of sacking, canvas, or similar absorbent material and keeping them continuously wet.

b) Thoroughly wetting the surface of concrete & then keeping it covered with a layer of suitable water proof material.

c) Impounding water in earthen or sandy bunds in square over the flooring/roofing.

d) Curing with the help of steam of hot water, resulting in rapid development of strength.

Curing and Strength Relationship for Portland Cement Concrete



A) Continuously moist cured B) Continuously air cured
C) Moist cured 1 month then air curedD) Moist cured 3 month then air cured

Reinforcement : Reinforcement should be clean and free from loose mill scales, loose rust and coats of paints, oil or other coating which may destroy or reduce bond. Generally twisted bars are used for RCC work.

Formwork : Formwork should be rigid & should have sufficient strength to withstand the load of concrete and manpower during placing of concrete. Formwork should be closely fitted to avoid any leakage of concrete/cement slurry during compaction of concrete.

Hot-Weather Concrete Checklist

Like the human body, concrete requires some special precautions to deal with hot weather conditions.

- Think ahead. Have the proper equipment, manpower and protective measures in place well ahead of time.
- Concrete sets faster is hot weather. Setting can be delayed by using concrete containing a set-retarding admixture. Reduce the time between placing concrete and applying the curing material.
- Immediately prior to concrete placement, spray the form, reinforcing steel and sub grade with water to prevent water absorption from the concrete and reduce the temperature of all the surfaces the concrete will come in contact with.
- To offset the effects of dry warm wind, low humidity, or hot temperatures, erect sun shades and wind barriers to protect the fresh concrete from stiffening or crushing and to help minimize cracking, crazing, plastic shrinkage and rubber sets.
- Prolonged mixing in hot weather increases the temperature of the concrete, which makes it set faster and shortens the placing and finishing time.
- Vibrate or screed without delay. Protect the surface from rapid drying by covering it with vapor -proof sheeting. Don't over-vibrate or over-finish the surface.
- Moist curing should commence as soon as surface is finished.

☑ DO

JK SMARTBLOX

- Stack on dry and even surface to avoid damage and contact with moisture (If available on pallets).
- Keep material covered (in rainy season if possible).
- Before starting masonry work, block should be make moist by gently dipping surface, (which will have contact with mortar) of the block in water.
- Use mortar mix 1 : 6 (Cement : Sand).
- Use thin mortar thickness as far as possible buy it should not be more than 10 mm.
- Lintel should rest on full block.
- Curing by water sprinkling should be done for masonry joints.
- Use cutting tool like handsaw / rotary cutter for working with JK Smart Blox.
- Chasing work for electrical conduit should be done Before plastering.

☒ DON'T

- Avoid multiple handling.
- Avoid haphazard stacking.
- Rich mortar mix 1:4 (Cement : Sand) will shrink so it leaves bond with blocks. It causes cracks in wall.

JK LAKSHMI CEMENT INTRODUCES JK SMARTBLOX

JK Lakshmi Cement Limited is a leading company manufacturing a range of building materials. JK Lakshmi Cement, with its promise of "Mazbooti Guaranteed", is among the top cement brands in the country today.

Continuing its endeavour to bring the best in building materials, JK Lakshmi Cement Limited now introduces "JK SMARTBLOX", which are produced in a state of the art plant using the machinery and technology from Germany.

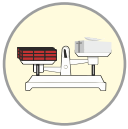
The highly automated manufacturing process which incorporates the technological innovations such as 'Green Separation' and 'Horizontal Autoclaving' is capable of delivering unmatched consistency in product quality. The unique features of 'Hand Grips' and 'Tongue & Groove' profile puts JK SMARTBLOX generation ahead of others.

The use of "JK SMARTBLOX" in walls replacing conventional clay bricks & CLC/Hollow Blocks delivers not only unmatched speed, quality, and economy in construction but also provides life-long benefits such as energy saving, low maintenance cost, long life, safety, health, and hygiene to the users.

Comparison between Alternative Walling Materials

Parameter	JK SMARTBLOX	Clay Bricks	Advantages of Using JK SMARTBLOX
Common Size (LxHxW) in mm	600 x 200 x 75 –375	210 x 70 x 90 –100	Faster construction, more floor space & savings on labour and jointing mortar
Dry Density (Kg/ m^3)	550 –650	1900 –2300	Up to 15% savings in cost of structure
Precision (Tolerance) in mm	+/-1.0 to 1.5	+/-5 to 10	Even wall surface, savings on plaster and labour
Thermal Insulation in W/ m-k	0.10 –0.14	0.81	25 – 30% less electricity consumption on HVAC
Noise Transmission/ Sound Insulation in db	40 – 45 db for 200 mm wall	More than 50 db for 230 mm wall	Quieter interiors
Tongue – Groove Profile	Yes	No	Faster construction, saving on labour and jointing mortar due to elimination of vertical joints
Hand Grips	Yes	No	Faster construction due to ease in lifting & placement
Green Building Points	Yes	No	Carbon credits & higher occupancy in commercial buildings
Water Absorption Coefficient in Kg/ m^2 x $h^{0.5}$	4 – 6 (no micro-pores and capillaries)	22 – 30 (suction through capillary action)	Long life of paint and healthy interiors
Fire Resistance in Hours	2 to 6	2	Increased safety for occupants
Earthquake Resistance	Conformance to requirement of seismic zone IV & V	Conditional Conformance	Increased safety for occupants
Termites & Pest Resistance	High	Low	Long lasting & healthy interiors
Workability	Easy	Difficult	Can be used to create arches, curves etc.
Manufacturing Process & Quality Consistency	Fully automatic & high consistency	Fully manual and high variability	Reliable product performance
Wastage due to breakage	Negligible	10 –12%	Economic construction
Water Usage in construction	Low, needs only surface wetting before use	High, needs curing before use	Faster & economic construction
Availability	Any time during the year	Seasonal	Less storage space, peace of mind, and in time completion of construction

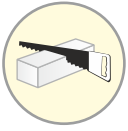
Smart Benefits



Light Weight

Energy Saving

Eco Friendly



Workability

Earthquake Safe

Fire Resistant

Termite Resistant

Noise Reduction

JK LAKSHMIPLAST
ONE COAT PLASTER

GypGold
(PERLITE BASE)

Available in 25 kg. Moisture proof Laminated P.P. Bag

ONE COAT GYPSUM PLASTER

JK GypGold is a light weight gypsum-based plaster. JK GypGold consists essentially of gypsum hemi-hydrate formulated with special additives to control working and setting characteristics. It includes perlite a lightweight aggregate to improve the plaster's handling, workability & application.

JK GypGold can be used in one coat thicknesses suitable for all normal purposes, on any background such as brick, solid or hollow blocks, AAC blocks, concrete surface, plasterboard and expanded metal lath. It is suitable for hand or machine application to internal surfaces. After drying, it gives brilliant white, smooth & matt finish. It has good impact strength. It can be used for new surfaces as well as old repaired patches. JK GypGold should be protected from continuous exposure to moisture. Please note that prolonged or repeated exposure to moisture may cause a loss of strength and/or adhesion

- Store the bags on elevated dry platform made of bricks/timber/concrete.
- Shelf life is minimum 3 month when properly stored but could be in excess of 6 months subject to temperature and humidity.

JK Lakshmi Power Mix Concrete

IS : 4926 : 2003 defines Ready Mix Concrete (RMC) as "Concrete mixed in a stationery mixer in a central batching and mixing plant or in a truck-mixer and supplied in fresh condition to the purchaser either at the site or into the purchaser's vehicles".

Advantages

- Customers assured of a standard quality of concrete.
- Reduced wastage and pilferage.
- Enables customers to plan just-in-time construction.
- Leads to convenience and comfort.
- Allows construction engineers to concentrate on planning, engineering and the construction activity itself.
- Construction work is thrice as fast as compared to conventional on-site mixing used to making concrete.

POWER MIX STATION

• AHMEDABAD • GREATER NOIDA • JAIPUR • JODHPUR
• KHUSKHERA • KOTA • MOHALI • SAHIBABAD
• SURAT • VADODARA

www.jklakshmicement.com

Assumed Standard Deviation As Per IS 456 : 2000

Grade of Concrete	Assumed Standard Deviation N/mm^2
M 10 / M 15	3.5
M 20 / M 25	4.0
M 30 To M 50.	5.0

The above value correspond to the site control having proper storage of cement, weight batching of all material; controlled addition of water, regular checking of all material, aggregate gradings and moisture content; and periodical checking of workability and strength. Where these is deviation from the above, the value given in the above table shall be increased by 1N/mm^2.

? DO YOU KNOW ?

Retarder : An admixture which extends the setting time of cement paste, and therefore of mixtures such as concrete, mortar, or grout.

Plasticizer : A material that increases the workability or consistency of a concrete mixture, mortar or cement paste.

Strength Of Concrete With Time

The strength of concrete increases with time.The basis of design is taken as 28 days strength. The approx. percentage of strength of concrete at different time period in comparison to 28 days strength are :-

Age	Strength in %
1 day	16
3 day	40
7 day	67
28 day	100
3 months	122
6 months	146
12 months	155

? DO YOU KNOW. ?

Concrete Power Tools

1. For the best penetration rates in concrete, apply steady pressure while operating the tool, but do not use excessive force.
2. Higher speeds and impact force works best for faster penetration when drilling or chiseling in hard concrete. Slower speeds work best to reduce breakout when bits exit the material being drilled.

Effect Of Weather Conditions On Concrete Properties

S.No.	PROPERTY	HOT	COOL	DRY/ WINDY
1.	Slump	Decreased	-	Increased
2.	Strength			
	-short term	Increased	Decreased	-
	-long term	Decreased	Increased	-
3.	Incidence of plastic Shrinkage cracking	Increased	Reduced	Increased
4.	Incidence of drying shrinkage cracking	Increased	-	Increased
5.	Incidence of cold joints .	Increased	Decreased	Increased
6.	Period required prior to remove formwork		Reduced	Increased -

Properties of Concrete Affected by Addition of water

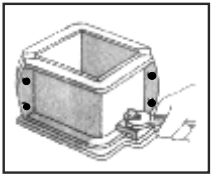
S.No.	PROPERTY/PERFORMANCE	EFFECT
1.	Slump	Increased
2.	Workability	Increased
3.	Volume of compaction	Decreased
4.	Comp.Strength	Decreased
5.	Durability	Decreased
6.	Premeability	Increased
7.	Incidence of shrinkage cracks	Increased
8.	Chance of dusting surface	Increased
9.	Chance of segregation	Increased
10.	Volume of bleed water	Increased

? DO YOU KNOW ?

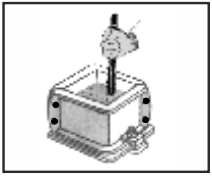
Bleeding, Bleed water : A form of segregation in which some of the water in a mix tends to rise to the surface of freshly placed concrete.

Procedure For Casting Concrete Cube Mould as per IS : 516

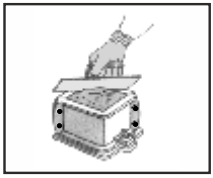
- Concrete cube mould should be as per IS:10086.
- Tamping rod should be of 16mm diameter having length of 2 Ft.(60 cm)
- Clean the cube mould properly & free from dust.
- Apply mould release agents or light oil. Any excess oil should be removed prior to use.
- The correct application of oil can be checked by wiping a dry finger across the mould surface. If the mould oil is ridged either side of the finger, it indicates presence of excess of oil . If the finger is still oil free then insufficient oil is on the surface.
- Ensure to tight all nuts and bolts. The joint between the mould sections and the bottom plate should be watertight.

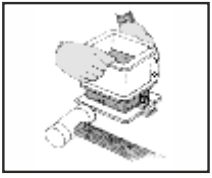


- Prepare an area to manufacture and store the cubes. The area should be dry and the cubes should be made on a flat, solid base free from vibration and the effects of weather. The area should be shaded and if possible inside an enclosed room.
- Mix the concrete properly and thoroughly. Fill the concrete in the mould 50 to 60 mm and compact it by applying blows of tamping rod 35 times. Ensure no air pocket remain in the mould.

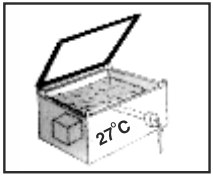


- In similar fashion, repeat the procedure second and third time also.
- Remove excess concrete on the surface of cube mould and make the surface plain by hand troweling & cover it with top plate Clearly mark the moulds with the identification assigned to that batch of cubes.

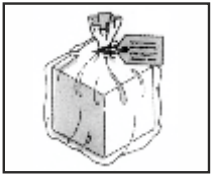




- After 24 hours carefully strip the cubes from the moulds and place in clean water.



- Place the cube mould in the room where temperature is maintained at 27±2° C & relative humidity is above 90%
- Ensure that concrete cube should not be dry at any point of time of curing period.
- Change the water of curing tank after every 7 days.



Blended Cement Concrete Compared to O.P.C. Concrete

Cost :-	
1 Material cost	Lower
2. Labour	Similar
Durability :-	
1. Resistance to sulphate attack	Very High
2. Resistance to alkali-silica expansion	Very High
3. Resistance to reinforcement corrosion	High
Properties :-	
1. Workability	Easier
2. Pumpability	Easier
3. Finishing	Quicker
4. Setting time	Slower upto 1.5 hr
5. Early strength (up to7-D)	Slightly Lower
6. Ultimate strength (90-D+)	Higher
7. Crack resistance to thermal shrinkage	Lower

USEFUL DATA

1. Standard Consistency of our cement
   - Ordinary Portland Cement 43 Grade 27 ± 0.5%
   - Ordinary Portland Cement 53 Grade 28 ± 0.5%
   - JK Lakshmi Cement 28 ± 0.5%
2. Specific Gravity of Cement 3.15± 0.01
3. Unit weight of O.P.C. 1300 ± 50kg/Cu.M
4. Nominal weight of plain cement concrete 2400 kg/Cu.M
5. Nominal coefficient of linear expansion of concrete $10x10^{-6}$ per C^{o}
6. Density of water 1000 kg/Cu.M^2
7. Weight of round bar in kg per RM (Æ dia. of bar in mm) 0.006165 x (∅)

BASIC CONVERSION FACTOR

1 in	=	25.4 mm	1 yd^2	=	0.8361 m^2
1 ft	=	0.3048 m	1 arce	=	0.4047 hectares
1 yd	=	0.9144 m	1 pound	=	0.45359 gm
1 mile	=	1.609 km	1 ounce	=	28.3495 gm
1Mpa	=	10.2 kg/cm^2	1 Liter	=	0.22 imperial gallon

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Acknowledging the need for a branded and superior quality Plaster of Paris in the Indian market, JK Lakshmi introduces another quality product, JK Lakshmiplast - A Branded Premium POP. Be it decorative cornices, ceiling roses or fire resistant cladding for structural steel work, JK Lakshmiplast offers one ideal solution for all.

Salient Features	Benefits
Highest Adhesive Ability	Adheres well to gypsum, wood, metal, lath, masonry etc.
Snow White	Low paint consumption.
Exceptional Purity	Dissolves well and gives crack free designs.
Ideal Setting Time	Economical production and better coverage area.
Superfine Plus	Smooth and Better finish. Consistency in Quality & Weight Reliability.
Unique, Laminated Packaging	Moisture proof bags to increase shelf life.
JK Hologram on the Bags	Easy Identification.

Ceilling Rose

Column

Moulding

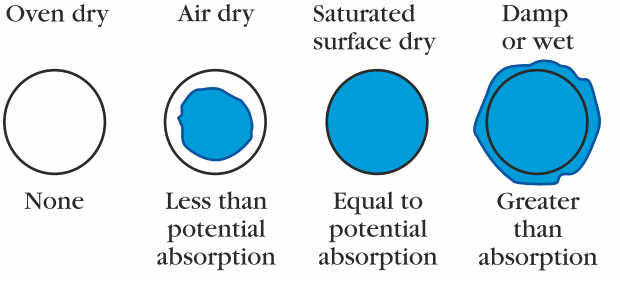
Cornices

Appendix-1

Bulking Of Sand For Various Moisture Contents

Moisture %	Percentage bulking in		
	Fine Sand	Medium Sand	Coarse Sand
1	16	8	6
2	26	16	12
3	32	22	15
4	36	27	17
5	38	29	18

State of Aggregates & Moisture



Appendix-2

Bulk Density, Specific Gravity & Voids Of Aggregates

1.	Bulk density Kg/L	
	River sand, Fine	1.44
	Medium	1.52
	Coarse	1.60
	Beach or River Shingle	1.60
	Broken Stone	1.60
	Stone Screening	1.44
	Broken Granite	1.68
2.	Specific Gravity	
	Trap	2.90
	Granite	2.80
	Gravel	2.66
	Sand	2.65
3.	Voids :	
	River Sand Fine	43
	Coarse	35
	Broken Stone graded 25	46
	graded 50	45
	graded 63	41
	Stone Screening	48

Appendix-3

Effect Of Varying Quantity Of Water On Strength Of Concrete (For M-15)

Specimen	1	2	3	4	5
1. Water, liter per bag of cement	23	25	27	28	30
2. Slump mm^2	6	55	160	175	210
3. 28 day Strength kg/cm^3	350*	420	350	280	210
4. Cement content in bag per m of concrete	6.5	6.5	6.5	6.5	

** Strength is less as mixture is too stiff to compact property*

? DO YOU KNOW ?

Segregation :The tendency for coarse particles to separate from the finer particles in handling. In concrete, the coarse aggregate and drier material remains behind and the mortar and wetter material flows ahead.This also occurs in a vertical direction when concrete is over vibrated or dropped vertically into the forms, the mortar and wetter material rising to the top. In aggregate, the coarse particles roll-to the outside edges of the stockpile.

Appendix-4

Estimated Quality Of Material Required For One Cubic Meter Mortar/Concrete

Nominal Mix	Cement (in bags)	Sand (in liters)	Aggregates (in liters)	Water liters per 50 kg bag of cement
MORTAR				
1:1	20.1	697	-	12.50
1:2	13.6	944	-	15.00
1:3	10.1	1052	-	20.00
1:4	7.9	1097	-	26.50
1:5	5.6	1167	-	35.00
1:6	4.4	1222	-	45.0.0
CONCRETE				
1:1:2	11.0	382	764	15.00
1:2:2	8.5	590	590	21.00
1:1½:3	7.9	411	822	21.00
1:2:3	7.1	493	740	25.00
1:2:4	6.1	424	848	27.50
1:3:4	5.3	552	736	32.50
1:3:5	4.8	500	833	34.50
1:3:6	4.3	448	896	37.50
1:4:8	3.3	458	916	47.50

Appendix-5

Weight Of Construction Materials

Material	Weight, kg/m^3
Plain concrete	2,240 to 2,400
Reinforced concrete	
With 1% steel	2,310 to 2,470
With 2% steel	2,370 to 2,530
With 5% steel	2,560 to 2,720
Solid Basalt	2,850 to 2,960
Solid Granite	2,640 to 2,800
Solid Limestone	2,400 to 2,400
Solid Sandstone	2,240 to 2,460
Timber (hard wood)	640 to 960
Dry Earth	1,410 to 1,840
Brick Masonry	1,920
Bitumen	1,040

Material	Weight, for 10 mm thickness, kg/m^2
Cement Plaster	23
Asphalt Flooring	22
Rubber Flooring	15 to 20

Material mm	Weight, for 10 thickness, kg/m^2
Timber Boarding	7
Glass	24 to 27.2
Lead Sheet	110
Slate	28
Terrazzo tiles	24
Breeze Partitions	15

	Weight, kg/m^2
Slates on battens, roofing	35 to 50
Felt roofing, 10-mm thick	0.8
Steel purlins	10 to 20
Timber rafters and purlins	34
GI Sheet	15
Asbestos-cement corrugated sheeting	12 to 15.6
Hollow concrete block wall, 100-mm thick	140
Hollow concrete block wall, 200-mm thick	240
Hollow concrete block wall, 300-mm thick	340
Timber studded partitions Complete	100

Appendix-6

Weight, Perimeter Of Steel Bars

Bar Diameter mm	Weight kg/m	Number of Bars Area in cm^2 1	2	3	4
6	0.222	0.28	0.56	0.85	1.13
8	0.395	0.50	1.00	1.51	2.01
10	0.617	0.79	1.57	2.36	3.14
12	0.888	1.13	2.26	3.39	4.52
16	1.58	2.01	4.02	6.03	8.04
20	2.47	3.14	6.28	9.42	12.57
25	3.85	4.91	9.82	14.73	19.63
28	4.83	6.16	12.31	18.47	24.63
32	6.31	8.04	16.08	24.13	32.17
36	7.99	10.18	20.36	30.54	40.72
40	9.86	12.57	25.13	37.70	50.26
45	12.50	15.90	31.81	47.71	63.62
50	15.40	19.63	39.27	58.91	78.54

Appendix-7

Rolled Steel Angles

Size A-B mm	Thickness mm	Sectional Area cm^2	Weight kg/m
25x25	4.0	1.84	1.4
	5.0	2.25	1.8
35x35	4.0	2.66	2.1
	5.0	3.27	2.6
	6.0	3.86	3.0
45x45	4.0	3.47	2.7
	5.0	4.28	3.4
	6.0	5.07	4.0
50x50	4.0	3.88	3.0
	5.0	4.79	3.8
	6.0	5.68	4.5
65x65	6.0	7.44	5.8
	8.0	9.76	7.7
	10.0	12.00	9.4
75x75	6.0	8.66	6.8
	8.0	11.38	8.9
	10.0	14.02	11.0
100x100	8	15.39	12.1
	10	19.03	14.9
	12	22.59	17.7

Rolled Steel Channels

Width	Sectional Area cm^2	Weight kg/meter
ISMC 75	8.67	6.8
ISMC 100	11.70	9.2
ISMC 125	16.19	12.7
ISMC 150	20.88	16.4
ISMC 200	18.21	22.1
ISMC 250	30.4	30.4

Rolled Steel Beams

ISMB 100	14.60	11.5
ISMB 125	16.60	13.0
ISMB 150	19.00	14.9
ISMB 200	32.3	25.4
ISMB 250	47.35	37.3
ISMB 300	56.26	44.2

Square Bar

6.0	0.36	0.28
8.0	0.64	0.50
10	1.00	0.78
12	1.44	1.13
18	4.00	3.14
25	6.25	4.91

Appendix-8

Consumption Of Building Material

BRIEF NOTE :

1. Terrazo flooring, in-stiu material required for $10m^2$

White Portland Cement	58 kg
White Marble Chip	80 kg
Grey colour Cement	20 kg
Oxide for colour chosen	6.70 kg
For border black oxide or chocklate	4 kg

2. Colouring for floor : Mixed dry with Cement

   Red & Blue : 15 parts of Red Oxide or Azure blue with 85 parts cement

   Black : 10 parts of oxide of manganese or any carbon black, 90 parts cement

   Buffer : 5 parts of yellow ochre with 59 parts cement.

3. Broken marble/mosaic tile pavement IT Covers $10m^2$ approx.

   Cement for 10 m^2 = 21 bags

   Red Oxide colour = 25 kg

4. Broken with glazed tiles pieces pavements

   It Cover 70 m^2

   Cement required for 10 m^2 =2.10 bags

5. WALL FINISHES

a) For $10m^2$ Neeru Finish of 1.50 mm thk. lime required 40 kg.; sand $0.10m^3$; Jute & soap stone powder-Re-1.0

b) Required of good white washing work on new plaster surface for 3 coats -$10m^2$

Slaked stone lime	2.50 kg
Shell lime	1kg
Gum	1 kg
Blue (Cooper sulphate)	60 gm
Common salt	250 gm

c) For colour washing to add 1 kg of yellow ochre on last two coats.

d) Distempering : $10m^2$, requires 1.5kg of distemper for 2 coats

e) Oil Painting : $10m^2$ requires 1 litre ready paint

weight	1.40 kg
Priming coal -Chalk	0.90 kg
White Paint	1.0 kg
Linseed Oil	0.5 kg
Further 2 coats, Paint	1.7 g/litre
Linseed Oil	1.0 kg
Turpentine	0.40 kg

f) For painting structural steel - 1 ton of structural steel of common uses has average surface area of 40-50 m^2 Primer required 3 liter; finishing two coats- 4 litre linseed oil -1 liter for every 5 litre.

g) For two coats of cement paint over 10m^2 area, 3.50 kg of snowcem or equivalent required.

h) Plastic emulsion paint for 2 coats - 1.70 litre

Masonry :

a) Full Brick work :-

Brick (Size 21 x 11x 7 cm)=480 to 500 Nos/m^3

b) Half Brick work

Brick -65 to 70 Nos/m^2 of 11 cm thick wall.

40-45 Nos/m^2 of 7cm thick wall.

Feedback

For further information/guidance on our products, please contact

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Technical Service Cell

The Technical Service Cell of JK Lakshmi Cement consists of well equipped hi-tech laboratory and highly qualified civil engineers with vast experience in cement and concrete technology. The Technical Service Cell offers various kinds of services to consumers.We strongly believe in sharing our technical know-how and new techniques, developments in cement and concrete techno-logy with consumers so that they can get the best out of the best JK Lakshmi Cement.

Mobile Lab of
Jk Lakshmi Cement

As an important part of routine, the Technical Service Cell encourages consumers to use our well equipped hi-tech testing laboratory to conduct all kinds of test for cement and concrete.

JK Lakshmi Cement's full fledged Technical Service Cell is always available for guidance and detailed mix designs, to meet the needs of valued customers. If you are using Mazbooti guaranteed JK Lakshmi Cement, be assured, not only of the quality of cement but also about the prompt pre and post sales service, that is, consistency not only in its quality but consistency in prompt services also.

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Autoclaved Aerated Concrete

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