

Highlights

1. It is advisable to use Blended Cement in all constructions like concrete, plaster, brickworks, etc.
2. During storage, ensure that cement is protected from moisture in any form.
3. Make sure that the sand is free from clay or salt.
4. Stone aggregates must be clean, dense, hard, durable and should bond well with cement.
5. Minimise water usage for mixing of concrete and mortar, and maximise for curing.

Home Guide Series

1. Pre-Planning Home Construction
2. Planning Construction Costs
3. Construction Materials And Their Characteristics
4. Good Construction Practices
5. Protecting And Beautifying Your Home
6. Essential Utilities For Your Home
7. Heat Insulation And Rainwater Harvesting
8. Ensuring That Your New Home Lasts For Generations

Authorised stamp

For more information log on to www.acchelp.in

Disclaimer: ACC makes no representations or warranties about the information provided in this information booklet / pamphlet and reserves the right to make changes and corrections at any time, without notice in this information booklets / pamphlets. Any decision based on such information is the sole responsibility of the Customer. By using the information in this information booklet / pamphlet or any information collected through the ACC authorized information centers, you agree that ACC will not be liable for any inaccuracies or omissions or any direct, special, indirect or consequential damages or losses, or any other damages or losses of whatsoever kind resulting from whatever cause through the use of any information obtained either directly or indirectly from ACC published information booklet / pamphlet or through ACC authorized information centers and any decisions based on such information are the sole responsibility of the Customer.

ACC

Build with confidence

Home Guide 3

Construction Materials And Their Characteristics



“The Quality And Durability Of Your Home Is Only As Good As The Materials You Use.”

Cement

Cement is the basic binding material in concrete mixes which consists of cement, sand, stone aggregates and water. Cement mortar consists of cement, sand and water. When mixed with water, cement sets and hardens by means of chemical reactions.

Concrete		Mortar
Plain Cement Concrete (PCC)	Reinforced Cement Concrete (RCC)	
Cement, sand, stone aggregates, and water	Steel rods, cement, sand, stone aggregates and water	Cement, sand and water (For masonry works constructed with stones / rubble / concrete blocks. Also for plaster)

Types Of Cement

1. Ordinary Portland Cement
2. Blast Furnace Slag Cement
3. Flyash-based Portland Pozzolana Cement
4. Air Entraining Cement
5. Low Alkali Cement
6. Hydrophobic Cement
7. Sulphate Resisting Cement
8. Quick Setting Cement
9. Low Heat Cement
10. Rapid Hardening Cement
11. Coloured Cement
12. Expansive Cement and many more

However, the following two categories of cement are generally used for normal house construction:

Ordinary Portland Cement (OPC)	Blended or Composite Cement
33 grade	Flyash-based Portland Pozzolana Cement
43 grade	Portland Blast Furnace Slag Cement
53 grade	

1) OPC contains lime, silica, alumina, iron oxide, etc., and is divided into three grades 33, 43 and 53 depending on the minimum compressive strength of cement sand mortar cubes at 28 days.

For example, the minimum compressive strength of 33 grade OPC would be 33 N/mm² or 330 Kg/cm² at 28 days.

Please remember that long-term strengths of all the grades remain the same. Often, low-grade cement is preferred due to its performance parameters like low heat of hydration, protection from cracks and durability.

2) Blended Cement is similar to Ordinary Portland Cement. Except, it has mineral additives (flyash, slag, etc.) which improve the properties of both fresh and hardened concrete. This is



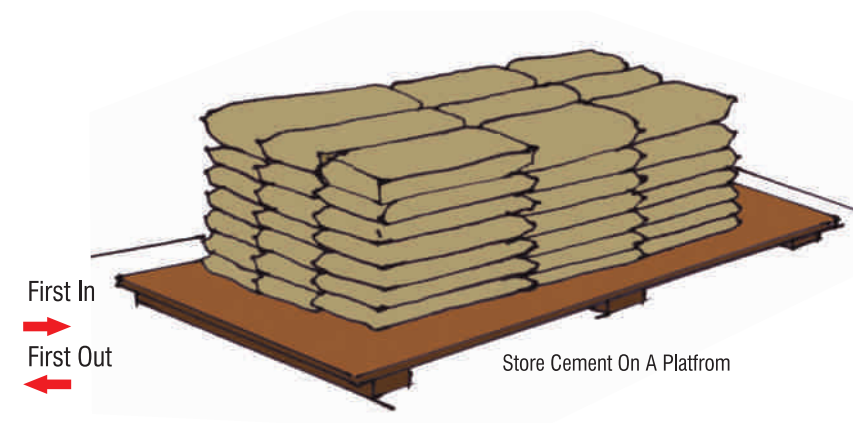
because Blended Cement allows for extended hydration period, reduced water demand, low heat of hydration and improved cohesion of the paste. It also enhances the durability owing to its lower permeability and improved micro structure. Furthermore, ingredients used in Blended Cement make it a value-added, eco-friendly product

Tips To Remember

- It is advisable to use Blended Cement in all constructions like concrete, plaster, brickworks, etc.
- Always buy cement from reputed companies and reliable retailers.
- Select cement with moderate setting properties, because strength development also depends on other factors like quantity of water in the mix, workmanship, etc.

Safe Storage Of Cement

Water is the No.1 Enemy of cement during storage. That is why, you need to ensure that cement is kept free from moisture in any form. The storage shed should have a concrete floor raised at least 150 mm above ground level, and should have airtight doors and windows. At site, cement should be kept on a raised platform and covered with a tarpaulin.



Cement stored for a long time tends to deteriorate. So it is a good practice to move cement in and out of the godowns in the 'first-in-first-out' method. You should also use the cement within 2-3 months of the date of manufacture.

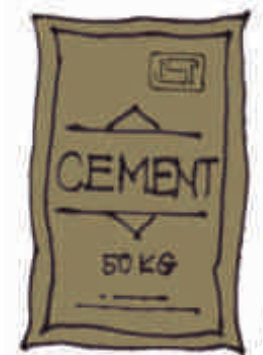
Some Common Misconceptions About Cement

- Use of highly strength cement results in Reduced cement content in concrete

Reducing cement content in the concrete mix results in a higher water to cement ratio, which in turn leads to higher permeability of the concrete and eventually, to poor durability of the concrete structure.

Therefore, you should never use a higher grade to save on the quantity of cement.

ISI Mark denotes Good Quality Cement



- **Darker / Lighter coloured cement is superior**

The colour of cement has nothing to do with its quality. Variation in colour is a result of the colour or even the composition of raw materials.

Sometimes, people use dark coloured cement to reduce the cement content in the concrete / mortar mix. In fact, this could bring the quality down.

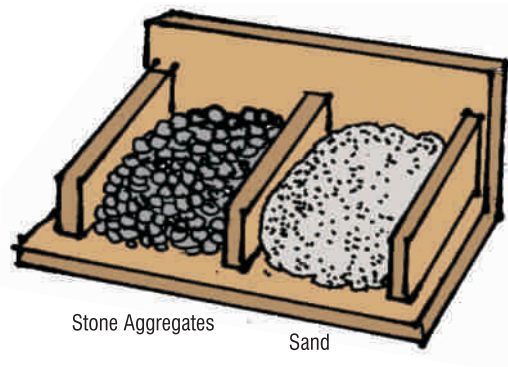
Therefore, the colour of cement does not determine quality.

Sand, Stone & Water

Sand & Stone

Sand and stone are called aggregates. They constitute 70 to 75% of the total volume and give body to the concrete. River sand or stone dust is used as fine aggregate and stone pieces (crushed rock) as coarse aggregate. In certain parts of the country, 10 mm stone pieces are called grit and 20 mm pieces, coarse aggregates.

In some areas, 10 mm and 20 mm stone aggregates are mixed and supplied together. However,



if the 10 mm stone content is lowered, the sand requirement goes up and will require more water. In turn, water quantity per bag of cement will increase, leading to late setting, poor strength in the short and long terms, permeable concrete, etc. Generally, 20 mm and 10 mm aggregate ratio in the range of 60:40 to 70:30 offers best results.

Please contact the aggregate suppliers in your city for prices and delivery details. Suppliers will quote the price of aggregates per cubic foot or cubic metre or per truck. At the time of delivery, do ensure that the quantity is measured. It is also critical that you check the source of supply. For example, there may be two sources of sand in your city and one may be better than the other.



What To Look Out For When Buying Aggregates

Stone Aggregates:

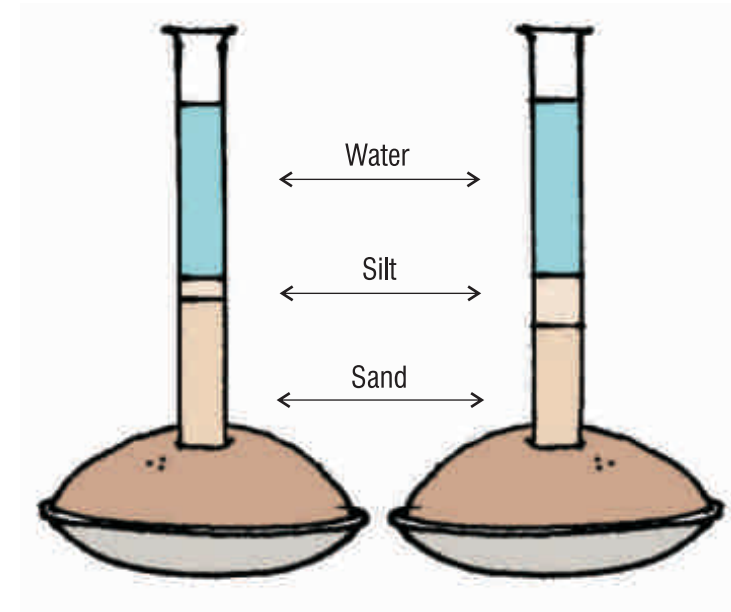
- Must be clean, dense, hard, durable, structurally sound (neither flaky nor elongated) and capable of bonding well with cement.
- Should be cubical in shape.
- Should be stored properly and different fractions must not be mixed together.

Sand:

- Should be clean - without silt, salt and other materials.
- Should neither be very fine nor very coarse.

How To Check The Presence Of Silt And Clay In Sand

- (1) Rub a sample of sand between damp hands. Clean sand will leave your hands only slightly stained. If your hands stay dirty, it means that there is too much of silt and clay in the sand.
- (2) Fill a glass container with sand up to half its capacity and pour clean water three quarters full. Shake it vigorously and let it settle for half an hour.



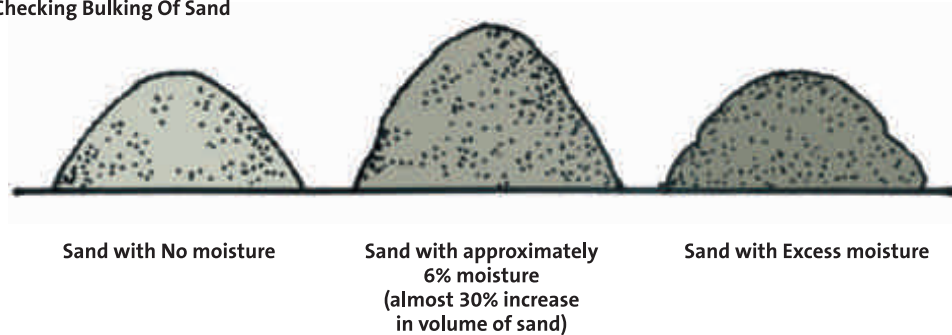
Clean sand will settle at bottom immediately. The presence of clay or silt will make the water muddy and will settle slowly on top of the sand. You could add one teaspoonful of salt to quicken the process.

The thickness of the silt / clay layer should not be more than 4% of the sand layer. If it is higher, the sand must be washed before use.

Bulking Of Sand

As against dry sand, sand that contains moisture before mixing causes the particles to increase in volume. This is called bulking. For example, sand with 6% moisture content shows around 30% bulking. This means that you need to add approximately 30% extra sand. Needless to mention, you will need to correct the volume of water in the mix accordingly. However, at an even higher moisture content of say, 20%, no bulking occurs and hence correction for sand is not required.

Checking Bulking Of Sand



Water

Water is as important as cement. It distributes the cement evenly, so that every particle of the aggregate is coated with it. The chemical reaction of water with cement is called hydration, wherein it sets and hardens the cement. Water also lubricates the mix and gives it the workability required for proper compaction. So, you need to be equally careful about the selection of good quality water as you are with cement. Simply apply this golden rule: “use minimum required water for mixing of concrete and mortar, and maximum water for the entire curing period.”

Points To Remember

- Use potable water that is free from impurities and harmful ingredients.
- Do not use sea water.
- Water that is suitable for mixing could be used for curing too.
- Use minimum quantity of mixing water to enable easy placement and compaction of concrete.
- Ensure that water is measured before mixing.
- Remember, an optimum water-to-cement ratio is essential for good performance of the structure in the long run.