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BUILDING MATERIALS

8.1 INTRODUCTION

During construction of the building generally cement, sand, stone chips, steel, tiles etc are used as materials of construction. Apart from this electric wires for wiring, pipes for water line, tanks for storage of water, bathroom, kitchen, sewers for sewer lines are also used as materials during construction of the building.

8.2 OBJECTIVES

After going through this lesson you will be able to:

- describe the materials used in construction of building;
- explain the property of materials and their utility;
- describe the procedure for storage of cement.

8.3 CEMENT

8.3.1 Cement

Cement is a very important material. Therefore it is necessary to know about it in some details. In general cement has been classified by different groups depending upon its strength e.g. grade 43, grade 44 etc. Depending upon the requirement of strength in the structure the Engineer I/C decides as to which cement is to be used where.

8.3.2 Storage

Storage of the cement is done in a very specialized manner. First of all the place of storage should be selected in such a way that there is less circulation of air, because the air contains moisture and cement sets due to it very soon.

Cement should not be kept in open too. The floor and roof should be damp proof. The cement bags should be stalked in such a way that it facilitates inspection from all the four sides. In one stalk not more than 10 bags should be loaded in vertical space. In general wooden sleepers should be used in the bottom, which should be at least 20 cm for the floor and it should also be at least 30 cm away from the wall of the stalk room.

At the time of using cement, it should be ensured that the cement bags which had arrived first are put to use first. If the cement is more than 6 months old, it should be used only after performing the strength test of cement.

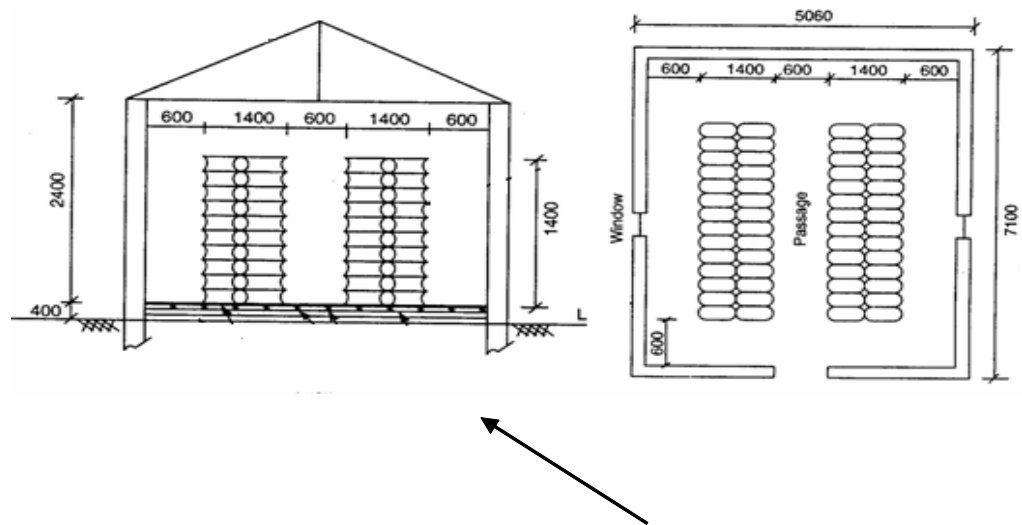


Fig. 8.1: A sketch of cement godown for stalking 500 bags of cement.

Table 8.1: Strength depletion of cement with time with respect to the strength of fresh cement

Time elapsed in months	% Reduction in strength	Remaining strength
3 months	20%	80%
6 months	30%	70%
12 months	40%	60%
24 months	50%	50%

Table 8.2: Specification for staking of Cement

a)	Distance of wall from the edge of the stalk	30 cm
b)	Ht. of planks form the floor	15-23 cm
c)	Ht. of stalk	10-20 bags
d)	Rows of cement bags	15
e)	Air & light	No outside air is allowed only light is allowed

8.4 FINE SAND

In general sand is mined from rivers and canals. The coarser the particles of sand, the better it is. For this purpose I.S. Sieves are available. Sieving through them gives the required size of sand particles. It should be ensured that there is no soil particles mixed with sand. Sand is used in plastering, brick work and in concrete work.

8.4.1 Bulking of sand

When water is added into sand, initially the volume of sand increases. This phenomenon is known as bulking of sand. But when water is added in large amount

into the sand its volume again reduces to that of the original one of dry state. The bulking by volume may vary between 15% to 30%.

To check the presence of clay in sand, silt content test is conducted. A glass of water (preferably half full) is taken and it is filled with the sand. It is then stirred with a stirrer so that the clay (silt) gets dissolved in it. Then keep the glass on the table. One layer of silt (clay) will settle at the top. Take the measurement of this layer of silt with a measuring tape. The ratio of the height of this layer of soil to that of the height of water in the glass gives the percentage of clay present as an idea.

The sand which contains greater than 18% of clay in the sand is to be rejected.

- The sand should be chemically un-reactive.
- The crystalline sand should be clean, hard, and it should be free of domestic waste, carbonic matters, and vegetable ingredients.
- When the sand is kept in water for 24 hrs., not more than 10% of water should be absorbed into it.

8.5 COARSE SAND

The fineness modulus of coarse sand should be less than 2.5. It should be tested as per I.S.I. (B.I.S.) manual.



Fig. 8.2: Different types of sieves in a set

8.6 STONE BALLAST (STONE CHIPS)

In general stones having sizes 25 to 50 mm and greater than 50 mm are called stone ballast. It is used in road construction. The length of the stone ballast is called gauge of the ballast. On sieving the ballast 90-100% of Ballast of particular size/gauge should pass the specified sieves for that gauge e.g. for 50 mm gauge, 90-100% stone Ballast should pass through the 50 mm size sieve.

The stone Ballast are stalked in 60 cm heights of specified area at a time.

8.6.1 Fine stone chips

The stone chips of size 25 mm to 50 mm is used in concrete work and they are categorized as fine stone chips. Generally soft foundations are cast using chips of this size.

8.6.2 Coarse Stone Chips

The stone chips of size 40 to 60 mm are generally used in road construction in the base and sub-base. It should neither be too soft nor too hard. It should be slightly porous also, so that a compact base can be prepared with the addition of Murrum etc.

8.7 BRICKS

The quality of brick is evaluated on the basis of its shape, water absorbing capacity, and load carrying capacity. The edges of the bricks should be straight. The brick should be properly burnt, water absorption should be minimum (usually less than 1/5th of its weight). It should not break if dropped by hand. The bricks which are under burnt will break if dropped by hand and its color will also be not Cherry red. Over burnt bricks are usually black in color and its edges are curved (not straight). Bad quality brick should not be used for brick work.

The soil used for making brick should neither be excessively cohesive (clay) nor it should be excessively cohesion less (sandy). A well burnt brick should have cherry red color.

The general dimensions of the standard brick are as follows:

Length — 9 inches (22.9 cm)

Breadth — 4.5 inches (11.2 cm)

Height — 3.0 inches (7.0 cm)

The size includes the $\frac{1}{4}$ inch (6.0mm) the thickness of cement mortar in the joints. In case of IS Bricks the corresponding sizes are 20 cm x 10 cm x 10 cm. This also includes the thickness of the mortar.

Frog: The depression in the middle of the flat side of the brick is called frog. During brick work this depression is filled by the cement mortar at the time of brick work.

8.7.1 Types of Bricks

Well Burnt (Properly Burnt) Bricks: These types of bricks have cherry red color. When kept in water for 24 hrs, it should not absorb more the 20% water by weight.

Jhama Bricks (Over Burnt Bricks): Over burnt bricks, become black and its edges also become curved. This type of brick is not used in brick work of building.

Yellow Bricks (Under burnt Bricks): These types of bricks are under burnt. Their load carrying capacity is also very low. They break easily. Therefore they are not suitable for use in construction work.

8.8 WHAT HAVE YOU LEARNT

- Proper method of cement staking
- Sand and their varieties.
- Stones and their types.
- Bricks and its properties.

8.9 TERMINAL QUESTIONS

1. What is the proper method of staking of cement?
 2. How many types of sand can be used in building construction?
 3. What types of stone chips are suitable for building construction?
 4. What are the general shape and size of standard brick and what are the suitable properties of brick for use in building works?
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