



JECRC Foundation



JAIPUR ENGINEERING COLLEGE
AND RESEARCH CENTRE

JAIPUR ENGINEERING COLLEGE AND RESEARCH CENTRE DEPARTMENT OF CIVIL ENGINEERING

Class – III Semester /II Year

Subject –Building Materials And Construction

Chapter – 4(Mortar, Plaster & Pointing)

Presented by – Teekam Singh (Assistant Professor)

VISION AND MISSION OF INSTITUTE

VISION

To become a renowned center of outcome based learning, and work towards academic, professional, cultural and social enrichment of the lives of individuals and communities.

MISSION

Focus on evaluation of learning outcomes and motivate students to inculcate research Aptitude by project based learning. Identify, based on informed perception of Indian, Regional and global needs, areas of focus and provide platform to gain knowledge and solutions. Offer opportunities for interaction between academia and industry. Develop human potential to its fullest extent so that intellectually capable and imaginatively gifted leaders can emerge in a range of professions.

VISION AND MISION OF DEPARTMENT

VISION

To become a role model in the field of Civil engineering for the sustainable development of the society.

MISSION

To provide outcome base education

To create a learning environment conducive for achieving academic excellence

To prepare civil engineers for the society with high ethical values.

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INTRODUCTION

Mortar is the term which is used to describe the paste obtained by the addition of water in the mixture of binding material like cement or lime and aggregate like sand in definite proportion.

The binding material used may also be referred as matrix and the aggregate used may also be referred as adulterant. Hence, mortar is a mixture of matrix & adulterant.

PROPERTIES OF GOOD MORTAR

- 1.It should be capable of developing good adhesion with the building units such as bricks, stones etc.
- 2.It should be capable of developing the designed stresses.
- 3.It should be capable of resisting penetration of rain water.
- 4.It should be cheap.
- 5.It should be durable.
- 6.It should be easily workable.
- 7.It should not affect the durability of materials with which it comes into

USES

- 1.To bind the building units such as bricks, stones etc.
2. To carry out painting and plaster works on exposed surfaces of masonry.
- 3.To form an even bedding layer for building units
- 4.To form joints of pipes
- 5.To improve the appearance of structure.

TYPES OF MORTAR

The mortar are classified on the bases of the following

1. Bulk density
2. Kinds of binding material
3. Nature of application
4. Special mortars

Bulk density:

According to bulk density of mortar in dry state, the mortars are two types

a. Heavy mortars -bulk density is more than 1500kg/m^3 and prepared from heavy quartz

b. Lightweight mortars – bulk density is less than 1500kg/m^3 and prepared from light porous sands.

Kinds of binding Material

According to the kinds of binding material, several factors such as expected working conditions, hardening temperature, moisture conditions, etc should be considered. The mortars are classified into five categories.

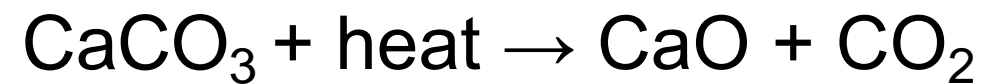
a. Mud mortar

- ✓ The paste is prepared by mixing suitable clay, soil with water.
- ✓ The soil which is used for preparing mud mortar should be free from grass, pebbles etc.
- ✓ These are the cheapest mortars but weakest in strength.
- ✓ These mortars are used for brickwork of ordinary buildings and for plastering walls in rural areas.

b. Lime Mortar -it is a type of mortar composed of lime and an aggregate such as sand, mixed with water. In this mortar, lime is used as binding material.

✓ Lime may be fat lime or Hydraulic lime. Fat lime mortar 1:2 to 1:3 and hydraulic lime mortar may be 1:2 by VOLUME.

✓ A **lime kiln** is used to produce quicklime through the calcination of limestone (calcium carbonate).



1. The paste is prepared by mixing lime and sand or surkhi in suitable proportions in addition to water.

2. If surkhi is to be added in lime mortar the equal proportions of sand and surkhi should be mixed with lime.

3. These mortars are inferior to cement mortars in strength as well as water tightness.

4. These mortars should not be used for underground works as they set in the presence of carbon dioxide and break up in damp conditions.

5. This type is used for construction work above ground level i.e. exposed positions.

Cement mortar-In this mortar, cement is used as binding material. Depending upon the strength required and importance of work, the proportion of cement to sand varies from 1:2 to 1:6 or more.

- The paste is prepared by mixing cement and sand in suitable proportions in addition to water.
- The general proportion is 1 part of cement to 2-6 parts (or more) clean sand.
- These mortars must be used within half an hour, i.e.; before initial setting time of the cement.
- This type is used for all engineering works where high strength is desired such as load bearing walls, deep foundations, flooring etc.

d. Gauged Mortar or composite mortar:

The process of adding cement to lime mortar to improve the quality of lime mortar is known as gauging. It makes lime mortar economical, strong and dense. The usual proportion of cement to lime by volume is about 1:6 to 1:8.

e. Gypsum mortar:

These mortars are prepared from gypsum binding material such as building gypsum and anhydrite binding materials.

Nature of Application:

According to the nature of application, the mortars are classified into two categories.

A. Brick laying mortars: Mortars for brick laying are intended to be used for brick works and walls. Depending up on the working conditions and type of construction, the composition of masonry mortars with respect to the kind of binding materials is decided.

B. Finishing Mortars: These mortars include common plastering work and mortars for developing architectural or ornamental effects. Generally cement or lime is used as binding material.

Special Mortars:

A.Fire resistant mortar- This mortar is prepared by adding 1:2 ratio of aluminous cement with crushed powder of fire bricks used for fire brick lining furnaces, fire places, ovens etc.

B.Light weight mortar –This mortar is prepared by adding sawdust, wood powder to lime or cement mortar for sound proof and heat proof construction

C.Packing Mortar –To pack of oil wells, special mortars possessing the properties of high homogeneity, water resistance, predetermined setting time, ability to form solid water proof plugs in cracks and voids of rocks, resistance to subsoil water pressure etc. have to be formed with cement sand, cement loam and cement sand loam mortars.

D. Sound absorbing mortars: To reduce the noise level, sound absorbing mortars with Portland cement, lime, gypsum, slag Portland cement etc as the binding materials employed in its composition. The aggregates reselected from lightweight porous material such as pumice, cinders etc.

E. X-ray shielding mortar: This type of mortar is used for providing the plastering coat to walls and ceiling of x-ray cabinets.

This is heavy mortar with bulk density over 2200 kg/m^3 is used. The aggregates are obtained from heavy rock and suitable admixture are added to enhance protective property of such a mortar.

PREPARATION OF CEMENT MORTAR

Cement mortar may be prepared by manual mixing or by mechanical mixing. Mechanical mixing is preferred when mortar is required in large quantities to be used in continuous order.

a.Mixing in mechanical mixer: In this case, cement and sand in desired proportion are fed in the mixer and mixed dry. Water is then added gradually and the wet mixing a continued for at least one minute to obtain the mortar of desired consistency. It is necessary to

ensure that only the quantity of mortar which can be used within half an hour of its mixing should be prepared at a time. This is essential as after 30 minutes the mortar begins to set.

MIXING IN MECHANICAL MIXER



PREPARATION OF CEMENT MORTAR

Manual mixing: In this case, specified quantity of sand is spread and leveled on clean dry masonry platform. Required quantity of cement bags are emptied over the sand layer. The ingredients are then mixed thoroughly by turning them over the sand layer. The ingredients are then mixed thoroughly by turning them over and over. Backward and forward several times with the help of spade. Dry mixing is continued till the mix has attained a uniform colour. A batch of dry mix is then put in the shallow masonry tank and just sufficient quantity of water is added to bring the mortar to the consistency of a paste. The quantity of dry mix taken in each batch should be such that the mortar formed each time is consumed within half an hour.

MANUAL MIXING



PRECAUTIONS IN USING MORTAR

1. Consumption of mortar – the consumption of mortar should be as early as possible

Lime mortar – within 36 hours after its preparation Cement mortar – within 30 minutes

Gauged mortar – within 2 hours.

2. Frost action - Setting action of mortar is affected by the presence of frost and not advisable in frosty weather.

3. Soaking of building units: Building units should not be soaked before application of mortar. If this precaution is not taken, water of mortar will be absorbed by the building units and mortar will become weak.

PRECAUTIONS IN USING MORTAR

4.Sprinkling of water: The construction work carried out by mortar should be kept damp or wet by sprinkling water for about 7 to 10 days to avoid rapid drying of mortar.

5.Workability: Mortar should not contain excess water and it should be stiff as can be conveniently used. Joints should be well formed and excess mortar from joints should be neatly taken off by a trowel. Surface formed by mortar for building units to rest should be even.

PLASTERING

Plastering is the process of covering rough surfaces and uneven surfaces with a plastic material, called plaster or mortar to obtain an even , smooth , regular , clean & durable surface.



OBJECTIVE OF PLASTERING

- 1) Plastering is done to achieve the following objects.
- 2) To protect the external surfaces against penetration of rain water and other atmospheric agencies
- 3) To give smooth surface in which dust and dirt cannot lodge.
- 4) To give decorative effect.
- 5) To protect surfaces against vermin.
- 6) To conceal inferior materials or defective workmanship

REQUIREMENTS OF GOOD PLASTER

1. It should adhere to the background and should remain adhered during all variations of the climatic changes.
2. It should be cheap and economical
3. It should be hard and durable.
4. It should be possible to apply it during all weather conditions
5. It should be effectively check the entry or penetration of moisture from the surface.
6. It should possess good workability

MORTAR FOR PLASTER

- 1) Cement mortar
- 2) Lime mortar
- 3) Gypsum mortar
- 4) Gauged mortar
- 5) Surkhi mortar
- 6) Aerated cement mortar

1.Cement Mortar: In this type, cement is used as binding material and sand is used as adulterant (fine aggregate). The proportion of cement and sand is decided based on the specified durability and working conditions. Cement mortar will give high strength and resistivity against water. The proportion of cement to sand may varies from 1:2 to 1:6.

2.Lime Mortar:In case of lime mortar, lime is used as binding material. There are two types of limes namely fat lime and hydraulic lime. Fat lime in lime mortar requires 2 to 3 times of sand and it is use d for dry work. Hydraulic lime and sand in 1:2 ratios will give good results in damp conditions and also suit able for water logged areas. The lime mortar has a high plasticity so; it can be placed easily.

3.Gypsum Mortar:Gypsum mortar consists of plaster and soft sand as binding material and fine aggregate. In the Egyptian ancient structures called as pyramids, gypsum mortar is used. Gypsum mortar will have low durability in damp conditions.

4. Gauged Mortar: Gauged mortar consists lime, cement and sand. We knew that lime mortar has high plasticity and cement has high strength than lime so, whenever we mixed these both in some proportions then the resultant will give two properties in economical way. So, this is also called as composite mortar or lime-cement mortar. Usually 1:6 to 1:8 ratio of cement to lime is used to prepare gauged mortar.

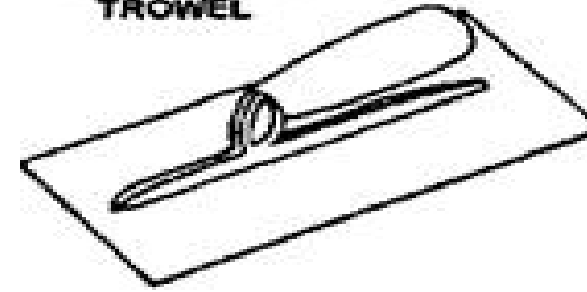
5. Surkhi Mortar: Surkhi mortar consists lime, surkhi and water. Surkhi is used as adulterant or fine aggregate. Sometimes half amount of sand and half amount of surkhi also used. Surkhi is finely powdered burnt clay which is free from any admixtures, impurities. It will give more strength than sand and cheaply available in the market.

6. Aerated cement mortar: General cement mortar does not contain good plasticity and workability. To make it more plastic and workable, air entraining agents are added to cement mortar. The resulted mortar is called as aerated cement mortar.

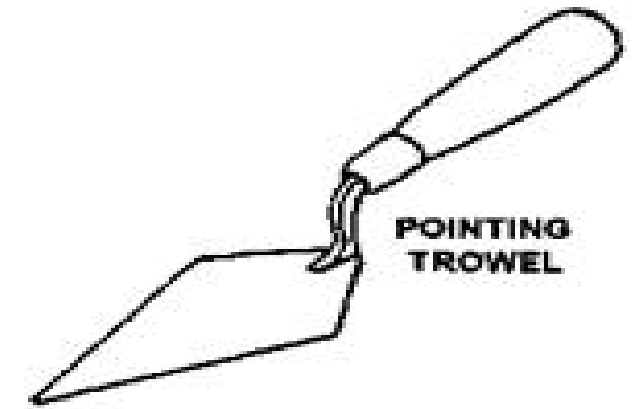
PLASTERING TOOLS AND ACCESSORIES

<p>"H" ALUMINIUM LEVELS. 1.5MM THICKNESS OF ALUMINIUM SIZE - 1.5 METER SIZE - 2 METER</p>	
<p>WEDGE PROFILE ALUMINIUM LEVEL SCREED SIZE - 1.5 METER SIZE - 2 METER</p>	
<p>FAÇADE SCRAPER WITH PROFESSIONAL TPR HANDLE, MIRROR POLISHER STAINLESS STEEL SIZE - 24 INCH SIZE - 18 INCH</p>	
<p>STAINLESS STEEL TROWELS, WITH TPR HANDLE SIZE - 280X130 MM</p>	
<p>SS BRICK LATING TROWERLS FOR INNER CORNER SIZE - 60 CM SIZE - 120 CM</p>	
<p>SS BRICK LATING TROWERLS FOR OUTER CORNER SIZE - 60 CM SIZE - 120 CM</p>	
<p>SQUARE PROFILE ALUMINIUM LEVEL SCREED WITH GRIP HOLE SIZE - 2 METER</p>	

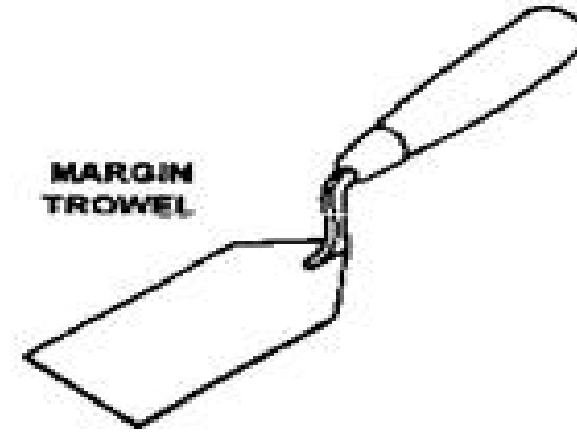
RECTANGULAR TROWEL



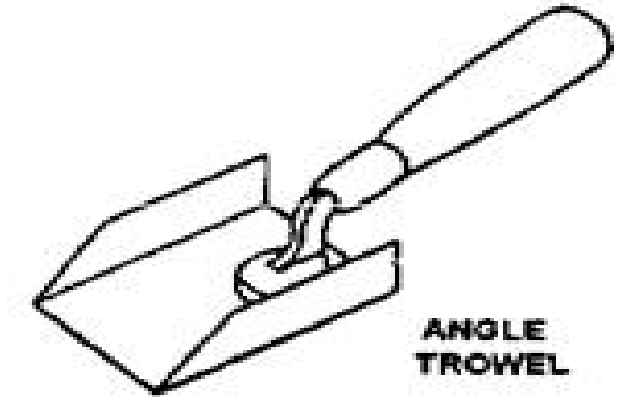
POINTING TROWEL



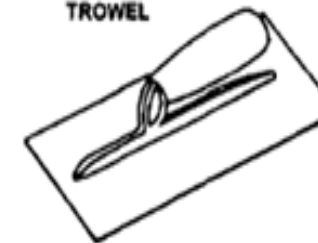
MARGIN TROWEL



ANGLE TROWEL



RECTANGULAR TROWEL

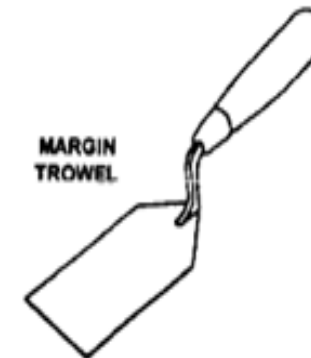


WOOD FLOAT



ANGLE FLOAT

MARGIN TROWEL



SPONGE FLOAT

METHODS FOR PLASTERING

	Name of coat	Thickness	Cement mortar	Lime mortar
First coat	Render coat	9-10 mm	*3-4 days to harden *Surface is kept rough.	This is left for a period of 2 days to set and not allowed to dry.
Second coat	Floating coat	6-9 mm	For even surface	This coat is applied with trowels and rubbed with straight edge. The water is sprinkled on the surface and the surface is well rubbed with floats to make it an even surface.
Third coat	Setting coat or finishing coat	3 mm	Similar to second coat	*applied after 5 days *after giving a rest of 24 hrs to the plastered surface, the work should be well watered for a for night or so.

TYPES OF EXTERNAL PLASTER

Sand faced finish

- The first coat of sand faced cement plaster is done with cement mortar in 1:4 with coarse sand after curing the plaster for seven days the second coat of cement plaster 1:3 ratio will be done on the first coat
- Sponge is used in the second coat and it is applied when the second coat is wet, it is thus worked that the density of sand grain appear on surface is equal and uniform.
- The surface is kept well watered at least for 15 days.

Rough cast finish or spatter dash finish

- This plaster is a mixture of sand and gravel in specified proportion dashed over a freshly plastered surface.
- The plaster base consists of two coats, under layer 12 mm thick and top layer 10 mm thick having the cement mortar ratio 1:3.
- In order to make the base more plastic, about 10% of hydrated lime by volume of cement shall be added while prepare mortar.

TYPES OF EXTERNAL PLASTER

Depeter finish

- This is just another form of rough cast finish.
- The rendering coat of 12 mm thick is prepared as in case of pebble dash finish.
- While this coat is wet, pieces of gravel are pressed with hand on the surface.
- Thus it is possible to have beautiful patterns and ornamental designs on the surface by selecting materials of different colors.

Pebble dash or dry dash finish

- It is similar to rough cast finish except clean pebble of size from 6 mm to 12.5 mm are dashed against the surface so that there are laid in position by mortar applied only

Smooth cast finish

- This finish is just similar to sand faced finish except fine grained sand is used instead of coarse sand.
- No sponging is done to expose the sand grain .
- It is normally done on internal walls.

DEFECTS IN PLASTER

➤ **Blistering of plaster surface**

This is the formation of small patches of plaster swelling out beyond the plastered surface, arising out of late slaking of lime particles in the plaster.

➤ **Cracking**

- ✓ Imperfect preparation of background
- ✓ Structural defects in building
- ✓ Discontinuity of surface
- ✓ Movements in the background due to its thermal
- ✓ rapid drying
- ✓ Movements in the plaster surface itself, either due
- ✓ shrinkage.

DEFECTS IN PLASTER

➤ **Efflorescence**

- ✓ It is the whitish crystalline substance which appears on the surface due to presence of salts in plaster making materials as well as building materials like bricks, sand, cement etc and even water.
- ✓ This gives a very bad appearance. It affects the adhesion of paint with wall surface.
- ✓ Efflorescence can be removed to some extent by dry brushing and washing the surface repeatedly.

➤ **Flaking**

It is the formation of very loose mass of plastered surface, due to poor bond between successive coats.

➤ **Peeling**

It is the complete dislocation of some portion of plastered surface, resulting in the formation of a patch. This also results from imperfect bond.

DEFECTS IN PLASTER

➤ **Popping**

It is the formation of conical hole in the plastered surface due to presence of some particles which expand on setting.

➤ **Rust stains** :These are sometimes formed when plaster is applied on metal laths

➤ **Uneven surface: This** is obtained purely due to poor workman ship.

POINTING

The term pointing is used to denote the finishing of mortar joint of either stone masonry or brick masonry. The joints are raked out a depth of about 20 mm and then , these spaces are filled up by suitable mortar in desired shape.

It is desirable to avoid the pointing as far as possible. This is due to the fact that pointing involves raking out of joints which are constructed with good mortar and filling the joints with mortar which, in many cases is not sufficiently watered. For this reason, the pointing work of new structure should follow the masonry work in progress. The joints are thus raked out when the mortar has not set.

Scope of pointing

- Maintaining the joints of the structures.
- Pointing being cheap can be adopted in places of low rainfall.
- Where the natural beauty of materials, viz., stone blocks, bricks etc, is desired to be exhibited.
- Gives resisting power to the bricks and stones used in construction towards weather conditions.

METHOD OF POINTING

1. The mortar of the masonry joints to be covered by pointing is raked out least to a depth of 20 mm.
2. The dust from the masonry joints is removed by the brushes.
3. The surface is then washed with clean water and it is kept wet for a few hours.
4. The mortar is then carefully placed in desired shape in these prepared joints. The mortar is placed by a small trowel and it is slightly pressed to bring it into close contact with the old interior mortar of the joint.
5. The finished surface is well watered for a period of at least 3 days, if lime mortar is used and 10 days, if cement mortar is used.

POINTING



TYPES OF POINTING

Beaded pointing

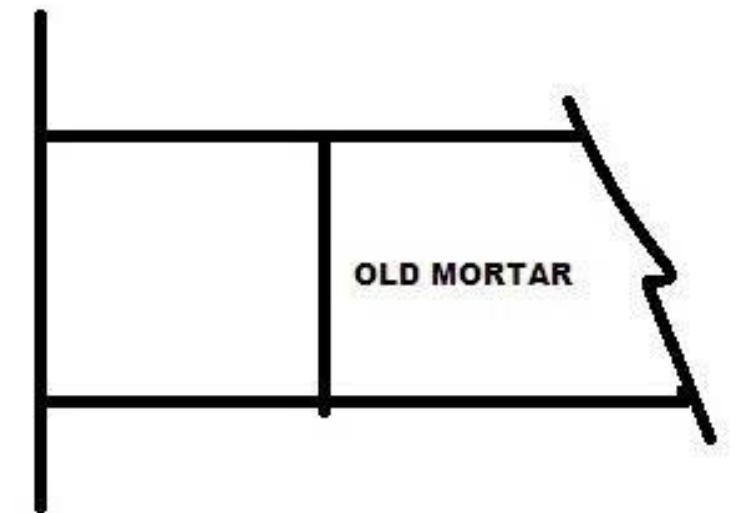
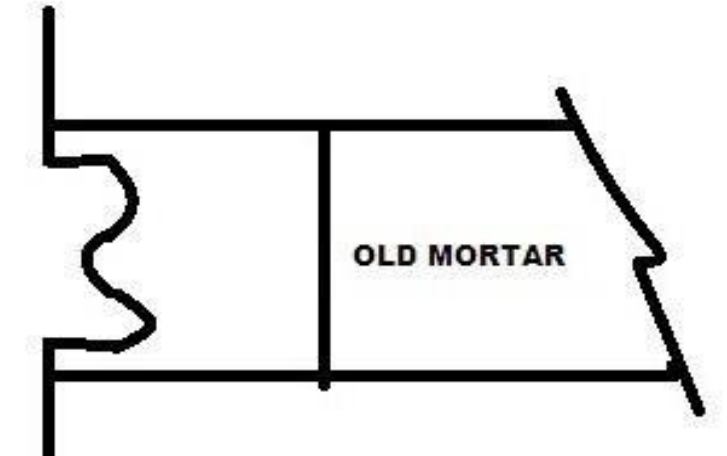
Formed by steel or iron rod with a concave edge.

Gives food appearance but liable to damage easily.

Flush pointing

➤ The pointing may be level as in flush pointing, which is made by wiping over the finished pointing with the trowel or piece of rough cloth.

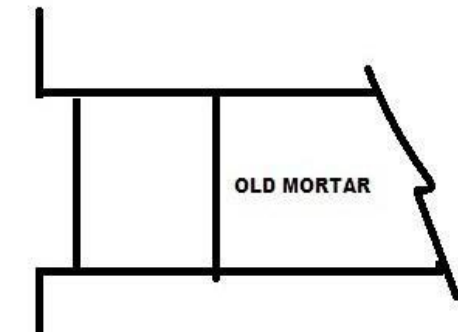
➤ Does not give good appearance. But it is durable as it does not provide any space for accumulation of dust, water etc.



TYPES OF POINTING

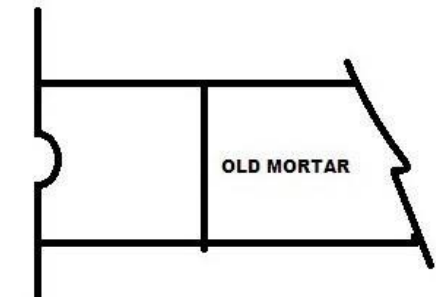
Recessed pointing

- Recessed joints are not suitable for buildings in exposed situations because they do not readily shed water.
- This is done by pressing mortar back from edges by 5 mm or more.
- Face of pointing is kept vertical.
- Only bricks with good frost resistance should be used with recessed joints.
- Gives good appearance.



Rubbed or key or grooved pointing

- In this type mortar is first up flush with the face of wall.
- A semi circular notch is formed by a tool known as pointer
- This type of pointing gives an attractive appearance to the surface.
- This type is mostly used for superior type work,
- particularly for vertical joints of walls.



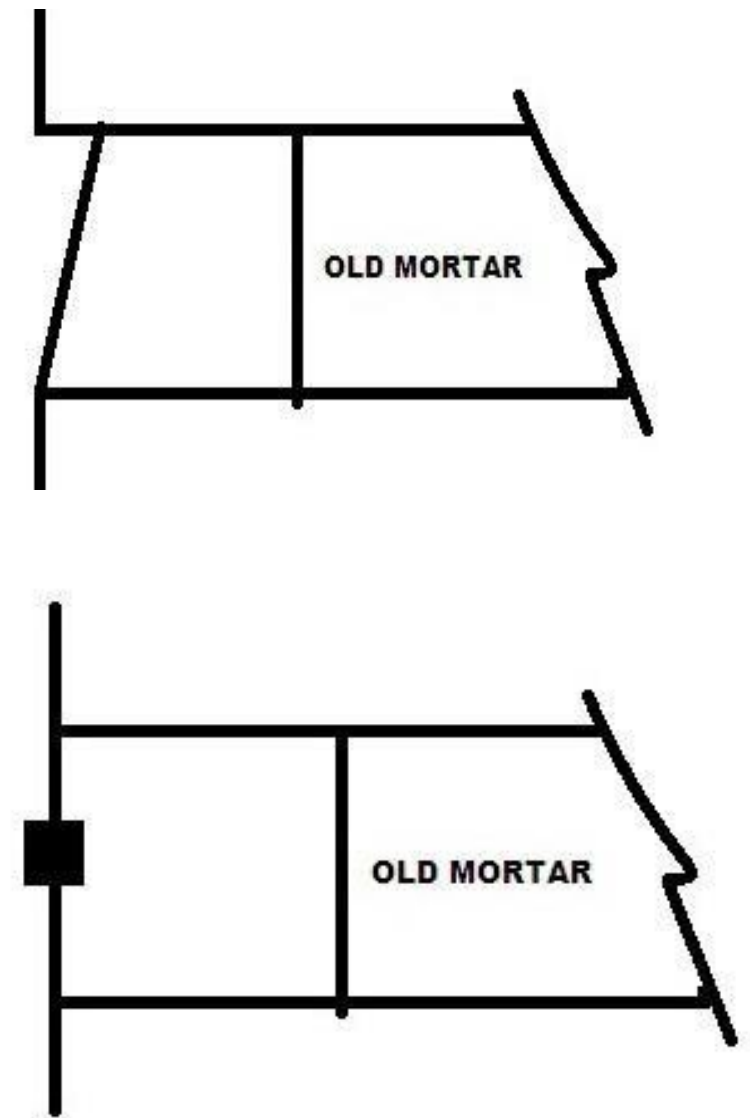
TYPES OF POINTING

Struck pointing

- The upper edge of joint is about 10 mm inside the face of masonry.
- This joint disposes water easily.
- If lower edge of joint is kept inside the face of masonry, known as overhand struck pointing, but not satisfactory because it collects water.

Tuck pointing

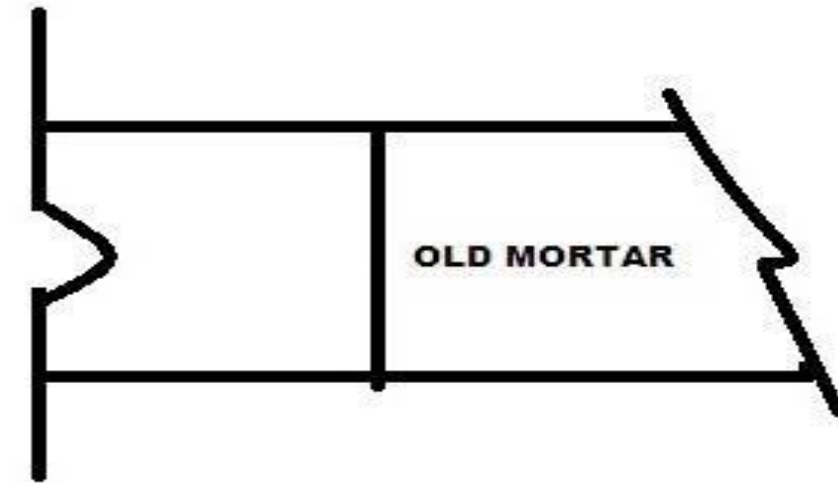
- The width and depth of groove are respectively 5 mm and 3 mm.
- It is tucked by white cement putty with projection of 3 mm.
- If projection is done in mortar, known as half tuck pointing



TYPES OF POINTING

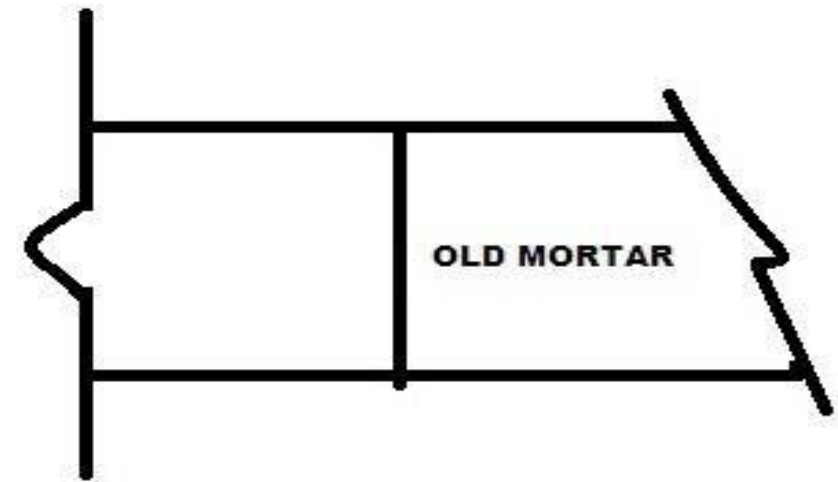
Vee pointing

- Vee shaped groove is formed in the mortar joint



Weathered pointing

- Vee shape projection is formed in the mortar joint.



Types of Pointing



**Weathered
Pointing**



**Struck
Pointing**



**Flush
Pointing**



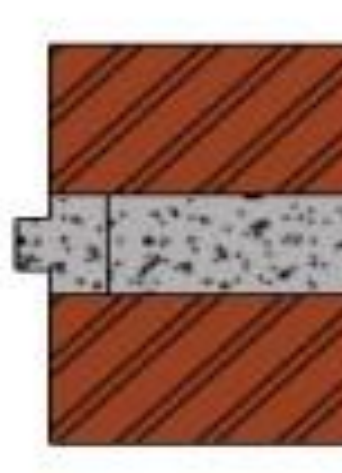
**V-grooved
Pointing**



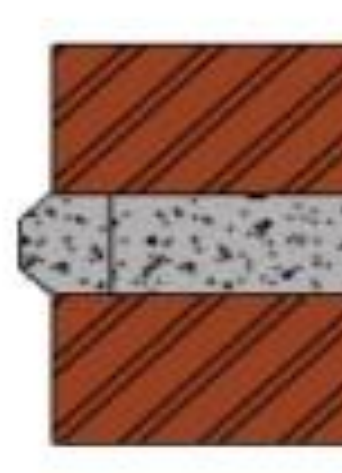
**Keyed
Pointing**



**Recessed
Pointing**



**Tuck
Pointing**



**Beaded
Pointing**

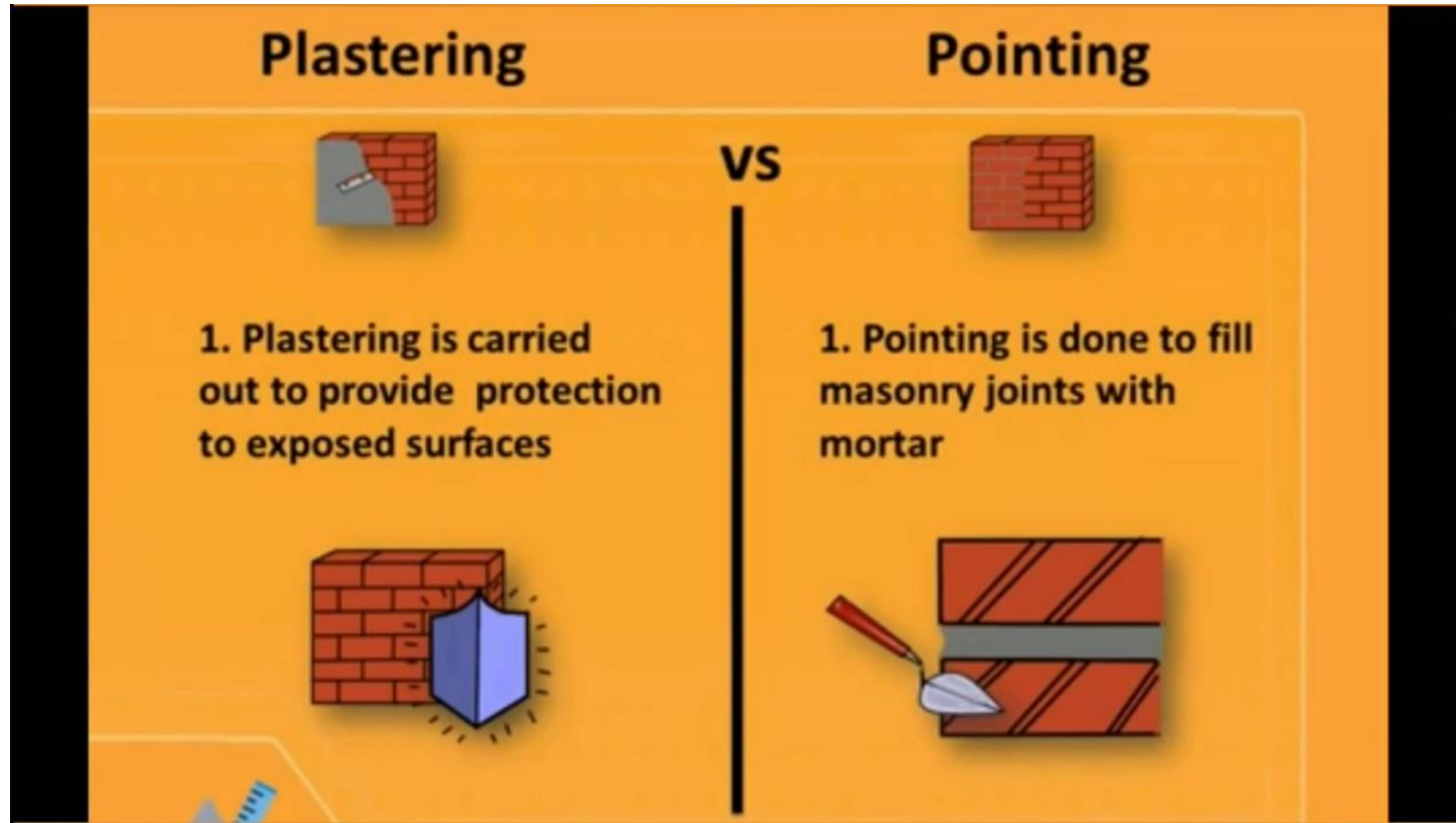
What is the difference between pointing and plastering

- Plastering is used to protect the exposed surface of masonry. However, in pointing only joints are properly filled with mortar.
- Cement, sand and lime are used in plastering. In pointing, we use just cement mortar. The plastering is done at both sides of surface (both inside and outside). However, pointing is done only at the outer side of the wall.
- In plastering work, we use the large amount of materials. However in pointing, we use less amount of mortar.
- After the plastering, the defects of the masonry are not visible. However, after the pointing, the surface does not become smooth and plain.

When we plaster the wall, after the plastering work, the surface becomes smooth and plain.

However, after pointing, the defects of masonry can be seen.

What is the difference between pointing and plastering





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*Thank
you!*

STAY HOME, STAY SAFE