Brick Works (cont.)

Building in bricks:

Building in brick by using mortar of cement and sand or gypsum paste. When a mortar cement and sand used, bricks must be soaked with water before use to achieve:

1. To insure that the brick not adsorption the water in mortar which is necessary for it.
2. To lift the dust stuck to the face of bricks to increase cohesion between the brick and mortar.
3. To decrease the soluble salts inside the bricks.

When bricks used in construction it should be noted, that:

1. The horizontal surface of the brick level
2. The face of the brick straight and straightening the outer face of the building
3. Faceted and staff placed vertically for the built and will be set by means of plumb line
4. Fill the joints (horizontal and vertical) between the bricks by mortar material.

Factors affecting the stability of brick building:

1. Vertical loads
2. Binding is not good enough, which makes the wall subjected to failures when downloading any weight
3. The side pushing.

Properties of bricks:

Hardness: This is somewhat vague term very commonly used to description of bricks. By general agreement it is recognized that the brick which is to have a moderately good compressive strength, reasonable resistance to saturation by rain water and sufficient resistance to the disruptive action of frost should be hard burned. A method of testing for hardness is to hold the brick in one hand and give it a light tap with a hammer. The sound cause by the blow should be a dull ringing tone thud.

Compressive strength: This is only property of bricks which can be determined accurately.

Absorption: A wall built of very hard bricks which absorb little water may well be more readily penetrated by rain water than one built of bricks which absorb a lot of water. This is because rain will more easily penetrate a small crack in the mortar between bricks if the bricks are dense than if the bricks around the mortar are absorptive.

Frost resistance: A very few failures of brickwork due to the disruptive action of frost have been reported during the last years. The few failures reported were in exposed parapet, walls chimney stacks, where bricks suffer most rain saturation and there is a
likelihood of damage by frost. Parapet walls, chimney stacks and garden walls should be built of sound, hard burned bricks protected with coping, capping and damp proof courses.

Efflorescence: Clay bricks contain soluble salts that migrate, in solution in water, to the surface of brickwork as water evaporates to the outside air. These salts will be collect on the face of brickwork as efflorescence of white crystals that appear in irregular, usually patches.

**Brick walls classification:**

Brick walls may be classified according to:

1. **Construction design:**
   a. Bearing walls: which are built to transfer loads to the soil as in the light building like houses, schools and others. These walls constructed for buildings with one or two floors and rarely three floors. Its thickness variables between 24-36 cm.
   b. Non bearing walls: built to bear its weight only. It is divided the internal space in light buildings as well as heavy buildings. They should be of thickness 24cm for external one and 12 cm for internal one and in some cases the thickness 7cm.
   c. Retaining walls: design to resist lateral forces of the output of the dust materials as water in dams and other hydraulic structures. Short wall is one type of retaining walls which has a little height less than 1m to support the fill soil, which is used in walkways around the buildings and gardens.

2. **Density design:**
   a. Solid walls: This constructed without any voids between bricks.
   b. Hollow or cavity walls: This constructed with hollow according to the desire to improve one of the followings:
      i. Thermal isolation by leave the hollow or fill it with isolated material
      ii. Bearing capacity by fill the hollow with reinforcement concrete

Or to allow the engineer to use the hollow as service duct

**Bond of bricks:**

It is a building block in the organization so that they not be joints in the successive layers one above other and be more what can be the joint space. For good bond taking into account the following rules:

1. Brick placed on a regular basis in the construction and with joints of equal width.
2. Use less of what can break the bricks
3. The vertical joints in the frequent layers on the straight line and is perpendicular to the surface of the wall
4. Use brick of equal dimensions in order to achieve uniformity in construction
   Bonding the bricks in the building in several types, including:
   a. English bond: bricks are placed in this type so that the face of the building including the brick on the length and on its head in the following layer and as shown in the following in Fig. 5-5.

   ![Fig. 5-5 English bond](image)

   b. German double bond (Flemish double bond): to be developed so that the bricks in the layer one brick on the length and the other on the head thus, as in Fig. 5-6.
That this type of bond is the weakest bond comparing with the first type, and so should be used to break bricks in addition to the used of bricks to put on its length more than the first type. But this kind has the appearance of better than the English bond, also is economist because of the possibility of using broken bricks resulting from the transportation.

c. German single bond (Flemish single bond): In this type the bricks putted so that the external face is of German bond and internal bond of English bond type where the wall of this type have strongly English bind and German beauty linkage as in Fig. 5-7.
d. Bond on the length (Stretcher bond): This type is used in the non bearing walls with thickness 12cm with every laid on the bed with every brick showing a stretcher or long face as shown in Fig. 5-8.

![Fig. 5-8 Bond on the length](image)

e. Bond on the head (Stretcher bond): This type is used in the non bearing walls with thickness 24cm with every laid on the bed with every brick showing a stretcher or head face as shown in Fig. 5-9.

![Fig. 5-9 Bond on the head](image)

f. Raking bond: walls which are very thick have fewer stretchers in them and hence their longitudinal stiffness gets decreased. This defect is overcome by the use of raking courses at certain intervals along the height of the wall say, after sixth or eighth course (Fig. 5-10).

![Fig. 5-10 Raking bond](image)
Joints in the face of the building bricks (jointing):

The finishing in the face of construction joints of the brick walls that cover rising any other work in some ways set out below in order to obtain the strength in construction, landscape and good resistance to atmospheric changes:

a. Flush or flush joint: This is the simplest type of joint and when ribbed give a good finish. It used with English bond. This is filling the intervals between the bricks with mortar of cement and sand, then raise the excess mortar and wiping the face with a rough cloth.

b. Struck or weathered: This joint permits water to drop off from the face of brickwork. The works of this type done by filling the horizontal joints and clicking on the mortar along upper edge of the joint to an angle of about 60°. The appearance of this joint is not satisfactory if ordinary bricks are used because unevenness in the edges of the bricks is visible.

c. Recessed joint: This joint is made with jointing tool; the thickness of the rubber attached in front of the tool is being to the joint. Rubber attachment is used as it adjusts itself to the irregularity of the brick edge. This tool is used after any projecting mortar has been removed. The brick should be carefully selected and should have uniform thickness. This joint is at least 1cm in thickness. This is satisfactory in face-work for good textured bricks and good quality of mortar.

d. Keyed or curved recessed (Concave joint): This type similar to the first type, but it works a hole of a semi-circle along the separation in the center of it by rule with the end of the form of hemisphere.

e. V-joints: It is similar to flush but during construction, hole made as triangle. This is used to give an appearance of narrow joints. The finishing should be done before the mortar sets.

f. Projecting joints: Mortar is left projecting from the joints. This type of joint affords a rough surface which can be helpful in keying the plaster which is applied later on.
Fig. 5-11 Various types of jointing

Reference:
1. BARRY, The construction of building, vol. 1&4
2. S.K.SHARMA, Building construction