

6. How to build **STRONG** WALLS and design **WINDOWS**?



How to build strong durable walls using local materials?
How can I oversee construction of walls to minimize future damage?
How to design and place windows for good light and ventilation?

This toolkit outlines key factors to consider while constructing the walls, doors, and windows.

Constructing walls with the correct techniques and quality materials is essential!

Selecting the correct materials and ensuring that walls are laid correctly can ensure durability and longevity to your house.

Poor masonry practices and lack of supervision can lead to unsafe walls, resulting in damages and costly repairs.

Follow the steps in the manual, and consult with your local contractor in every decision.



Tips to constructing a STRONG WALL



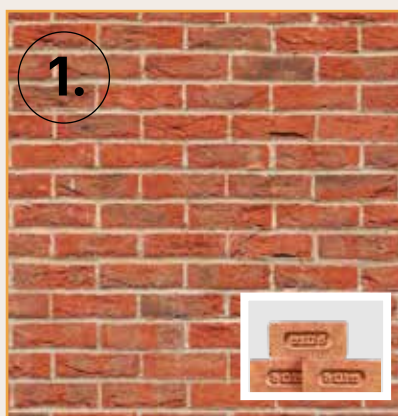
1. Make sure all batches of materials are of good quality.
2. Use materials that are locally available to save transportation costs.
3. Check the laying of the wall every 7-10 courses, and if there are any problems, correct immediately.
4. Make sure all bricks are cured well before use.
5. Correct placement of windows can lead to healthier living spaces.

What types of materials should you choose?

A. TYPES OF MATERIALS

Material selection for wall construction should be done considering cost and availability, climate of the region, local skill and suitability to house design.

Masonry with burnt red brick and mortar



Masonry with concrete block and mortar



AAC block/ autoclaved aerated cement block & mortar



Walls with CSEB or 'Compressed Stabilized Earth Blocks' & mortar



Masonry with local dressed stone & mortar



Random Rubble Masonry with local stones & mortar



- **Good quality materials ensure good quality construction, and a long-lasting house.**
- **Buy your materials from reliable sources and brands**
- **Choose the material as per your budget, availability, local skills, and the climate of the region.**



What are some good masonry practices you should ensure during construction?

B. GOOD MASONRY PRACTICES

1. SOAKING BRICKS BEFORE USE



Soak bricks in water until the bubbles stop coming out. That may take up to 10 minutes.



If while doing masonry the mortar starts cracking, it indicates that the masonry unit is dry. In such a case, you have to break the wall and rebuild

2. MINIMUM THICKNESS OF WALLS



1. For RCC structures - all thickness should be 9 inches minimum for outer walls.
2. For Load-bearing structures - all thickness should be minimum 9 inches, recommended 12 inches



Do not use 2 different materials in one wall

Maintain the same brick bond type and thickness throughout the wall.



What are some good masonry practices you should ensure during construction?

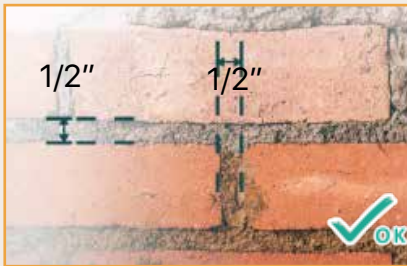
B.

GOOD MASONRY PRACTICES

3. LAYING BRICKS

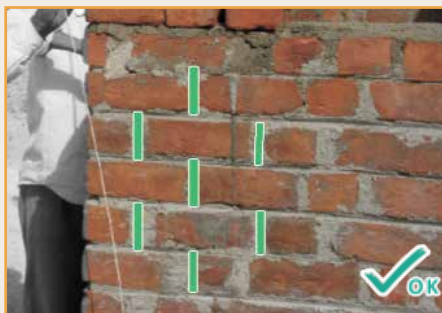


1. Identify the 'brick frog' or the side of the brick having a depression. Place the brick with this facing upwards. Fill the frog fully with mortar.
2. Ensure that no more than 8 courses are laid in a day.
3. Avoid bricks without frog



4. Mortar thickness should be close to 10mm (about half an inch), not less or more.
5. Ensure that joints are fully filled with mortar to ensure proper bonding.

4. STAGGERING VERTICAL JOINTS



Stagger bricks to improve stability of the wall



Stagger joints in stone masonry as well.

Ensure that all vertical joints are staggered.



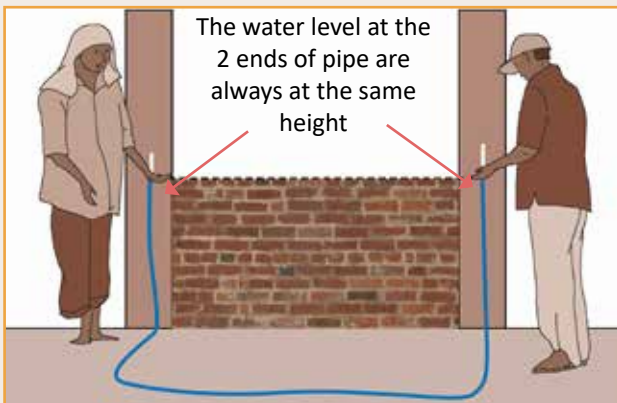
What are some good masonry practices you should ensure during construction?

B.

GOOD MASONRY PRACTICES

5. CHECKING ALIGNMENT OF THE BRICK WALL

The mason should verify that all wall corners remain vertical and check that the level of each course is correct. This can be done by two different methods as described below:



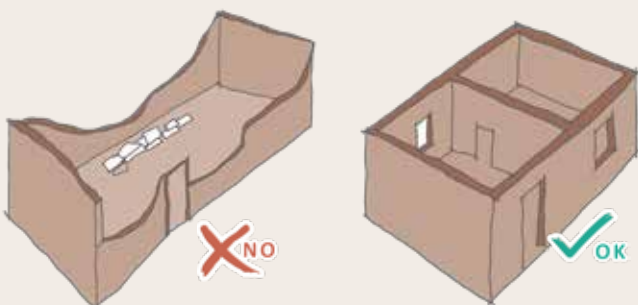
1. Fill a plastic tube with water, and hold the two ends as shown. The water level will be the same.
2. Make sure that the mason checks the horizontal level of the bricks after each course using a tube level.
3. Make sure that the mason checks the vertical alignment of the wall using plumb-bob.

6. DOOR AND WINDOW INSTALLATION



- Install all door and window frames before laying the walls.
- Check their alignment using these methods as well.

7. PLACEMENT OF BRICK WALLS



- Walls longer than 25 feet should have a joining wall in the middle.

What are some good masonry practices you should ensure during construction?

B. GOOD MASONRY PRACTICES

8. JOINING WALLS



- Build the interior and exterior walls at the same time.
- If this is not possible, leave the ends of the wall serrated at an angle. This makes it easy to join the walls later.

9. CURING BRICK WALLS



10 Day

- Keep the walls wet for at least 7-10 days after laying the bricks.
- Cover walls with wet gunny bags during hot weathers to prevent the mortar from cracking.

10. PLASTERING



- Plaster and paint provide extra protection to the walls.
- If the wall is not plastered, cover the exposed wall with plastic sheet during monsoons to avoid seepage.
- Types of plasters are discussed in Chapter 9

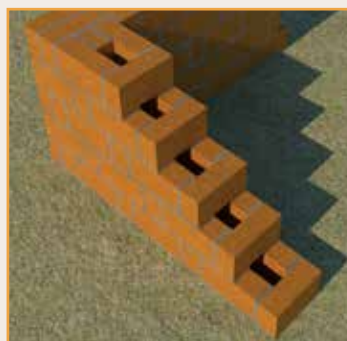
11. RAT-TRAP BOND



First Course



Second Course



Uses lesser bricks



Keeps the indoors cooler than normal walls

How can you supervise the placement of the reinforcement bars?

C.

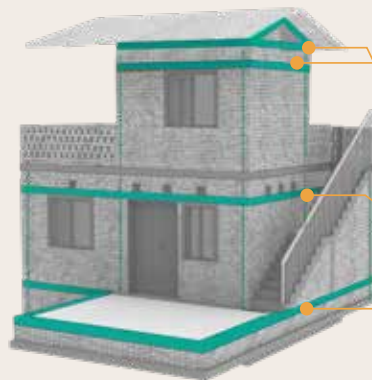
STEEL REINFORCEMENT IN MASONRY

1. HORIZONTAL REINFORCEMENT

Provide continuous horizontal RCC bands on various levels as shown in the image below:



All bands should be 3" thick with 2 bars at mid height with cross links.



RCC band around Gable Wall

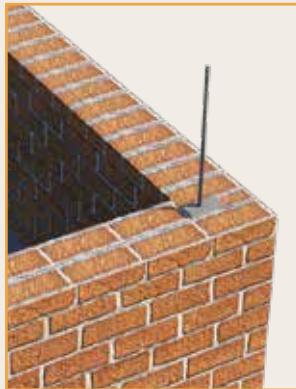
RCC band at Roof Level

RCC band at Lintel Level

RCC band at Plinth Level

2. VERTICAL REINFORCEMENT

A single bar of vertical reinforcement helps in strengthening wall edges.



- All vertical steel members should arise from the PCC base under the foundation.
- Provide single bar vertical reinforcement on the corners of all walls.
- Tie all vertical reinforcement with horizontal bands and the slab.

- Soak bricks before use & cure brick wall after finishing
- Stagger vertical joints
- Avoid thick mortar joints
- Horizontal & Vertical bands are necessary for strength & safety of the wall.

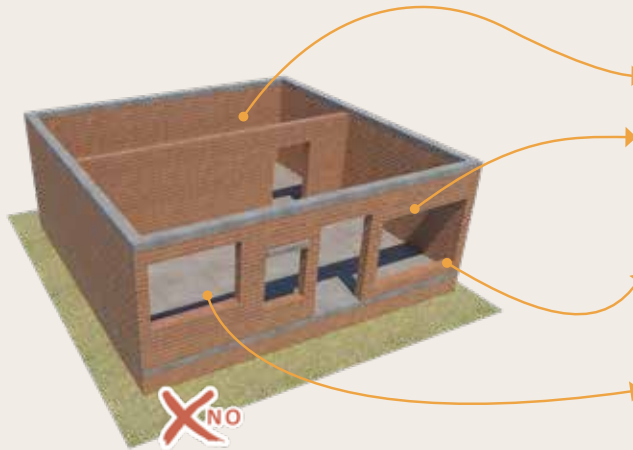
These are required mainly in load-bearing walls to increase seismic resistance and strength of the walls.



How to decide where to place windows in a room?

D.

BEST POSITION FOR WINDOWS

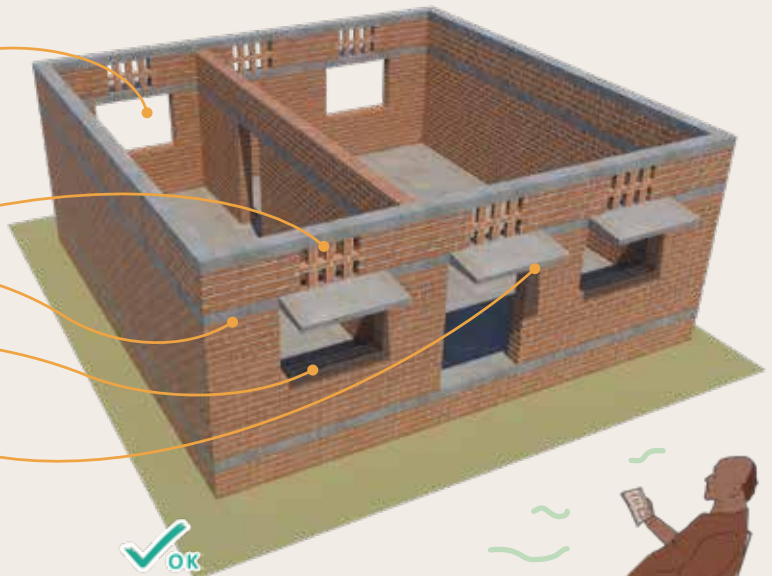


Don't !

- Do not design rooms without any windows.
- Don't have a window without a lintel.
- Don't have lintels at various levels.
- Don't place a window immediately next to a wall.
- Don't put too many windows on a single wall.
- Don't have windows with span larger than 1.5m.

Do !

- Good ventilation
- Provide windows on opposite sides of the wall to facilitate cross ventilation.
- Jaalis above lintel can be used to improve air circulation.
- Lintel level of all windows must be same and continuous.
- Provide adequate spacing between 2 windows.
- Provide structurally strong & adequately sized Chajjas.



Remember!

Good natural lighting & ventilation will have a good effect on your health everyday, and reduce the cost of electricity for fans and lights.

What are the type of windows you can choose from?

E. TYPES OF WINDOWS

Louvers in frame



Good for ventilation in hot climates

Casement window



Cheapest and easy to maintain

- Windows can either be made on site or factory-made. Window design should be selected based on the requirements of the room.
- Make sure door and window frames are not damaged by masons during wall construction.

Improved light and ventilation



- Provide a courtyard or skylight for better indoor light and ventilation
- They are encouraged in the houses where openings on outer walls are not possible.

The correct placement of windows is crucial to ensure light and ventilation in your house.



How can you make your door and window openings more strong?

F. TYPES OF LINTELS

Lintel band should be placed above doors and windows to support the load.

RCC Lintels For RCC Structure



- In an RCC house, lintels can be separate.

Lintels For Load-bearing Walls



- Lintel band must be continuous over the walls for load-bearing walls. It is helpful to align all openings to this lintel band.

Brick Arches



Brick Arch



Brick Flat Arch

- Brick arches are cost-effective as no steel and concrete is required.
- Skilled masons are required.
- Fast construction requires practice & experience.

Never make brick wall openings without a lintel.



How can you ensure good cover and protection for your window openings?

G. TYPES OF CHAJJAS

- Chajjas shade the opening, stop rain from entering the room and reduce glare while looking out of the room.
- The material, length & shape of Chajjas is based on local climatic and site conditions.

Various Materials for Chajjas



- Standard RCC Chajja



- Modular 'FRP' Chajja
- Light weight, Cost Effective



- RCC 'Box' Chajja
- Protection from all sides



- Metal Sheet with Brackets
- Light weight, Cost-effective



- Polycarbonate Sheet with Metal Frame
- Light weight, good for large openings

It is important to install chajjas over all door and window openings, to protect the interiors from rain and sunlight.



How can you ensure good cover and protection for your window openings?

G. TYPES OF CHAJJAS

CORRECT DIMENSIONS OF CHAJJAS

Width of Chajjas

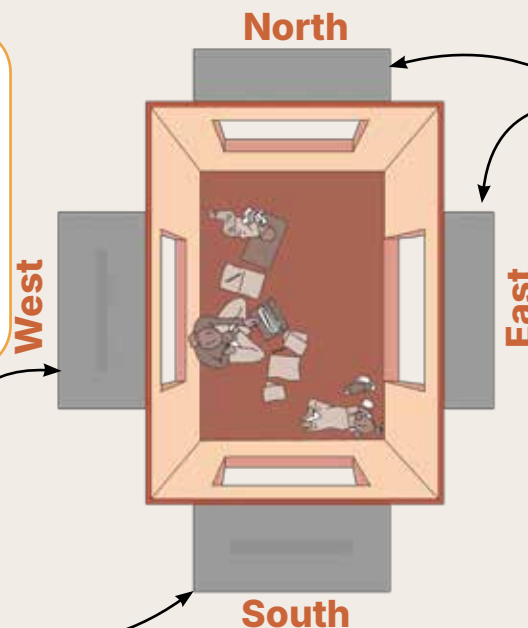
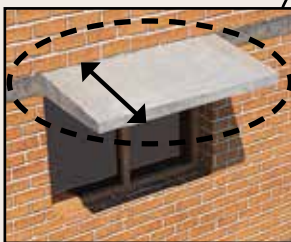


- Width of chajja should be slightly greater than the width of window. 6 inches bearing is recommended on both sides.

Depth of Chajjas

Apart from size of openings, size of chajja depends on intensity of sun falling on that particular facade.

- South and West Facing Facades have high sun exposure throughout the year.
- Thus, for effective shading, these require deep chajjas.



- North Facing facades tend to have least amount of sun exposure at any given time of the year.
- Thus, standard depth of chajjas (i.e. 2 feet) is sufficient for protection in summers and rains.

Jaali: A Cost-Effective Alternative

Jaalis can be decorative, and improve indoor ventilation in hot climates.



They allow air circulation thus making the indoor temperature comfortable.



Jaalis are cheap and easy to build.









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6. How to build strong walls and design windows?
7. How to build a strong roof?
8. How to choose the structural system for your home?
9. How to build a well-serviced home?
10. What are the tips for good RCC construction?
11. How do I maintain my home after construction?
12. How do I design my home?

Disclaimer:

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