

5. How to DEVELOP THE SITE and construct a STRONG FOUNDATION?



Unsure how to choose the right site?
Concerned about overseeing site development?
Worried the foundation isn't properly laid?

This toolkit outlines key factors to consider when buying land or choosing where to build on your house.

Build a strong foundation today, to allow for house expansion tomorrow

Choose a site for your future home wisely, which will support a strong foundation and allow you to expand your house as needed for your family.

Poor site conditions, lack of site development, and poor foundation structure and materials can lead to very costly repairs, damage the house, and make it unsafe to live in.

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



Tips to select a GOOD SITE



1. **Choosing a safe site** helps you avoid costly repairs down the line
2. Make sure to **discuss multiple sites** with your contractor before you buy it
3. **Invest in site development** to give your building a strong and stable foundation
4. Design your **foundation based on the soil type and the structure** you're building.
5. Always make sure that your surrounding **environment is not harmed** during construction

What types of site should you avoid?

A. SITE SELECTION

SITES TO AVOID

Choosing a site that is not fit for construction requires costly modifications, & can lead to loss of life specially at times of natural calamities. Thus, avoid the following sites.



1.

Avoid building on filled earth. Always build on solid, natural ground.

If unavoidable, ensure that the foundations are deep enough that they reach natural solid ground.



2.

Avoid soils that absorb a lot of water, having high clay content., eg. Black Cotton soil.

If unavoidable, special foundations need to be designed.



3.

Never build in waterlogged areas, or flood-prone areas near water bodies

If unavoidable, houses can be raised from the ground by providing stilts in the designs.



4.

Avoid steep slope (more than 15%). Too much cut or fill lessens stability of the soil.

If unavoidable, expensive measures such as large retaining walls need to be designed with an engineer.



5.

Avoid sites with very high ground water table.

If unavoidable, dewatering must be done.

In case your site has the above issues, contact your contractor immediately.



How can you select a good and safe construction site?

B. IDEAL CHARACTERISTICS OF A SITE

- ✓ Choose a site that is well-drained and elevated, so as to avoid water-logging.
- ✓ Check availability of basic services on site such as potable water, electricity, sewage and waste management, storm-water management, and telecommunications.
- ✓ The orientation of building on site should be such that it receives natural light and ventilation in plenty.
- ✓ Build the house only on natural ground, and never on filled soil.
- ✓ Ensure the site is accessible throughout the months and seasons.
- ✓ Preserve natural features such as trees and vegetation on the site.

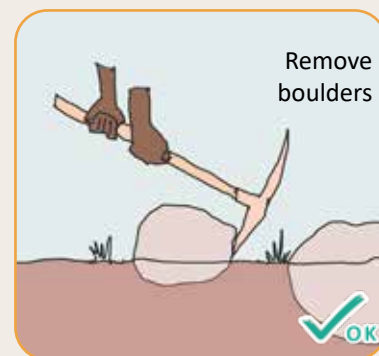
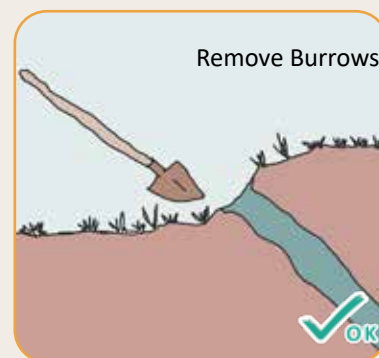
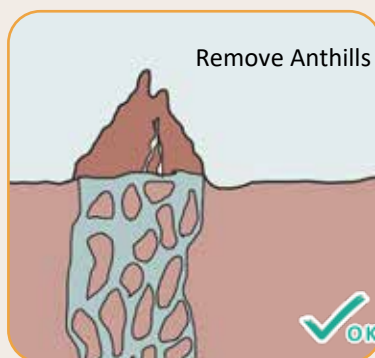
Do not underestimate the importance of selecting a good site. It is a life-time decision.



How should your site be prepared for construction?

C. CLEARING AND LEVELING THE SITE

1. Clear the site of existing structure, loose material and plant roots.
2. If you store the demolished rubble from site clearance, you can use it later for plinth filling and save cost.
3. Flatten portions of site where you will be building. Cut and fill, and ensure good compaction.
4. Provide a gentle slope to the site so that water is not allowed to collect.
5. This rainwater can be stored in an underground tank, or allowed to percolate and recharge ground water.
6. To protect the house from excessive winds, plant natural features such as trees or mounds on site edges as they act as natural wind breakers and reduce runoff and erosion



Points to note!

- ✓ Check where the underground services networks are present before finalizing the footing location and excavation area.
- ✓ While constructing, do not obstruct rivers and streams, storm sewers or wetlands, or other natural drainage features present on the site.
- ✓ Do not disturb the surrounding and vegetation that is not close to the construction site. Do not harm the trees on the site.



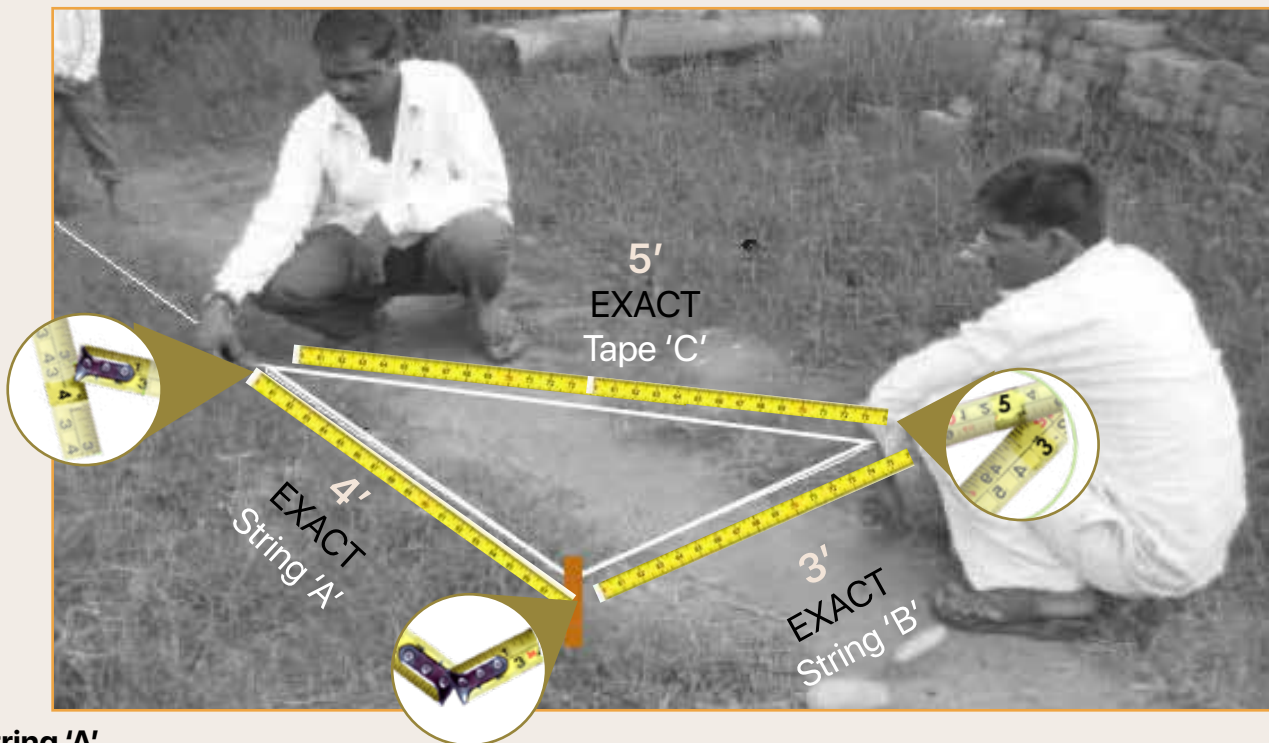
How can you supervise the correct method for site layout?

D.

MARKING OUT THE DESIGN

Mark out the finalized plan onto the site. Use the 3:4:5 string method to obtain the 90 degree angles for the house corners.

A. The "3-4-5" String Method



String 'A'

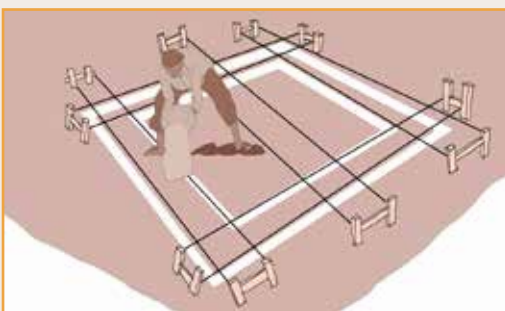
1. Establish a straight line. We will refer to this as 'String A'.
2. Measure 4ft on this straight line. Start in the corner and measure out. Once you've got three feet, make a mark.

String 'B'

Run another thread line that looks perpendicular to string A. This is String B. Measure and mark 3 ft. on String B, starting from the corner.

Tape 'C'

1. Stretch your tape measure from one mark to another.
2. It should equal five feet. If not, adjust the thread directions until it is correct.



Mark out the whole design of the house and check it with this method.



Make sure that the markings on the ground is exactly as per the finalized design plan!

How do you make sure that the foundation is laid correctly?

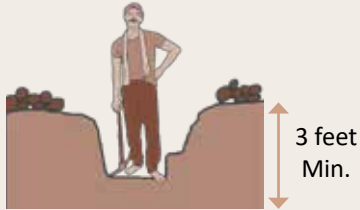
E.

MAKING A BASE FOR THE FOUNDATION

The depth of the foundation depends on the local soil conditions.

For Hard/ Rocky soil

Excavate between 1-3 ft. deep minimum for foundations.



1. Make sure the trench bottom is clean of roots and loose material.
2. Compact the bottom by watering & ramming with sand.

For Soft soil (eg. Black cotton soil)

Excavate 6 ft. deep or till you reach hard murrum, whichever is lesser.



1. Make a PCC base OR a brick bat layer in case of soft soils.
2. This is necessary for saving the foundation from sinking or water logging.

Points to Note!

1. Ensure good compaction of soil below, and good drainage around the foundation
2. Ensure steps to avoid foundation settlement or sinking.
3. Make sure that the footing location & alignment is perpendicular and as per designed plan.
4. Ensure there is proper water drainage system on the construction site.
5. Always construct the foundation in dry summer months
6. In the areas with severe white-ant problem, treat the foundation with Anti-termite treatment before laying the foundation.

How to decide which foundation to use while constructing your home?

F.

DIFFERENT TYPES OF FOUNDATION

The type of foundation should be chosen on the basis of the overall structural system:

1. Load-bearing foundations
2. RCC foundations
3. Foundations for Weak soils

1. LOAD BEARING FOUNDATION

Load-bearing Foundation is a continuous foundation, made of a cement base, brick stepped walls and single reinforcement bars.



Single steel bar reinforcement at junctions



Stepped brick foundation

Steps to Follow!

- ✓ Lay out the plan on the site excavate in a continuous manner all along the walls in the building.
- ✓ Minimum width of the foundation and the PCC base should be 900 mm (3 ft).
- ✓ Ensure that all reinforcement vertical steel bars used in the structures should be embedded in the PCC bed.
- ✓ Ensure stepping in the brick foundation till it reaches the ground.
- ✓ Do not backfill without curing the masonry.

Issues with foundation construction are very expensive, and often impossible to repair. Ensure that all the guidelines are followed by your mason/contractor.



How to decide which foundation to use while constructing your home?

G.

TYPES OF FOUNDATION

2. RCC FOUNDATION

RCC Foundation has isolated footings made of RCC, which connects to the columns of the building.



Steel cage positioned on PCC base using spacers



Concrete poured & shuttering

Steps to Follow

1. Excavate under column position, maintaining depth as per soil type & engineer's advice.
2. First lay a PCC bed, & then lay the RCC foundation over it.
3. Use minimum 10mm Steel bars for the reinforcement cage.
4. Backfilling should be done only after 10 days of curing for the RCC work.

Keep in mind

- ✓ Sizes and proportions of the foundation vary depending upon the design and size of house, soil condition of the site.
- ✓ The RCC Foundation should be designed by a structural engineer.
- ✓ All vertical reinforcement bars should be embedded to the PCC bed.

Take extra caution in laying foundation, as it affects the entire building.



If the soil on your site is weak, what foundation should to use to protect you home?

H.

SPECIAL FOUNDATIONS FOR WEAK SOIL

- Laying a PCC bed and a plinth band is a must.
- Foundation depth should be minimum 6ft or till you reach hard murrum, whichever is lesser
- Foundation types suitable for black cotton soil are Raft foundation or Pile foundation, which are very expensive and require a structural engineer.

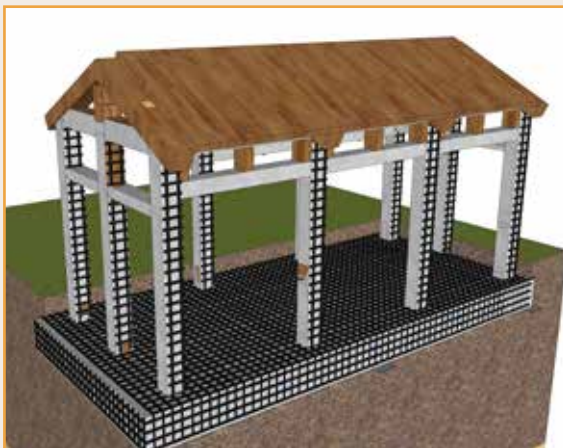


Black Cotton Soil

3. FOUNDATIONS FOR WEAK SOILS

Raft Foundations

1. These can be described as large continuous rectangular or circular concrete slab – like foundation that carries the entire load of the superstructure and spreads it over the whole area beneath the building.
2. Consult a structural engineer for further information and foundation design.



Raft Foundation

Pile Foundations

1. A pile foundation is defined as a series of columns constructed or inserted into the ground to transmit loads to a lower level of subsoil.
2. Consult a structural engineer for further information and foundation design..



Pile Foundation

Do not ignore the hazards of building on weak soils!

Consult an engineer or an experienced contractor for best local construction practices of foundation in black cotton soil to avoid the risk of settlement.



Once the foundation is laid, what are the next steps?

I.

FOLLOW AFTER LAYING THE FOUNDATION

1. BACKFILLING

1. Compact each layer of about 10 cm thickness before adding next layer, by watering & then ramming
2. If required, perform anti-termite treatment on the material before backfilling



2. CONSTRUCTING THE PLINTH

A. Plinth Walls

1. Start the masonry walls at least 6 inches (15 cm) below the ground level.
2. The plinth should be 6 inches above regular flood level, or 1 feet 6 inches (1'6") above road level, whichever is higher.
3. Leave holes in masonry during construction for pipe lines of water supply, sanitation etc., so that no breaking is required after it is built.



Provide plumbing outlets while laying the plinth

B. Plinth Beam

1. Provide a 6" deep plinth beam to reduce risk of settlement.
2. Width of the plinth beam must be equal to the width of the wall.
3. It must be continuous and run over all walls.
4. It should contain 4 bars of steel reinforcement.
5. DPC (Damp Proof Course) is provided above the plinth, to prevent water seepage from the ground.
6. Add waterproofing chemical to plinth beam while casting for better safety of structure.



Plinth beam acts as DPC when it is at flooring level

C. Plinth Filling

1. Plinth filling can be done using soil, aggregate, stones, or construction debris obtained from your site or neighboring sites.
2. Use of construction debris can save your cost.
3. Ensure compaction of the plinth filling before laying flooring.



Debris Materials can be used for plinth filling



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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?

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