

Safer Earth Building for Floods and Rains

Builder Training Curriculum



Building Back Better



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Guiding Principles

Time: 30 Mins

Venue: Training Room

Resources: Blackboard / Flipchart and Pens

Learning Objectives:

- That all participants understand that the purpose of the program is to provide **Affordable, Environmentally Sustainable** housing that makes use of existing **Knowledge, Skills** and locally available **Materials**

Activities:

1. Ask participants of their experiences during the floods and about the damage caused.
2. Program Introduction: That it is to assist low income families affected by floods and rain to reconstruct their homes so that they will better able to withstand future events. This is to be achieved by:
 - Providing technical information and training to the communities and local authorities
 - To provide a model house that is accessible by each community to demonstrate good building practice
 - To assist the most vulnerable families with materials and technical assistance
 - Write the guiding principles on the board - Affordable, Sustainable (doing no harm), using existing Knowledge, Skills and Materials
3. Ask participants based on the Guiding Principles
 - What construction is affordable? - Make a list of materials and which of these can be found locally
 - What are the risks of using local timber? How can this be avoided (re-planting, coppicing)
 - List the skills needed for construction in a matrix and showing those that required skilled labour

Evaluation:

1. Ask the group for the definition of each of the Guiding Principles.



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Hazard and Risk Awareness

Time: 60 Mins

Venue: Training Room

Resources: Blackboard / Flipchart and Pens

Learning Objectives:

- That all participants will have knowledge of the different hazards that can impact on houses ; how this causes damage; and which risks are most likely and of greatest importance

Activities:

1. Introduction: What causes house to be damaged and even destroyed
2. In groups make a list of all these and report back to the group . Should include
 - Floods, Rain
 - Wind
 - Earthquake
 - Fire
 - Landslide
 - Subsidence
 - Animals, termites
3. Write the list in a matrix on the board
 - Ask for a score 1-3 (where 3 is the worst damaged) what is the potential damage
 - Ask then how often or likely this might happen. This can be described by how many years between possible events. Score 1-3 (Where 3 is the most likely or frequent)
 - Add the two scores together and highlight the greatest risk
4. Conclusion
 - Floods are not the only risk and we should design for all risks
 - That some risks are more important based in the level of damage and frequency

Hazards	Level damage	How often	Total
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Evaluation:

- Participants will be asked in later session to repeat the lists of hazards and risks



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Site Selection

Time: 45 Mins

Venue: Training Room

Resources: Blackboard

Learning Objectives:

- That all participants have knowledge of the basic principles of site selection to avoid: **Flood, Rain, Wind, Landslide, Fire, and Location of Latrines**

Activities:

1. Use the Hazard List previously produced and highlight Flood, Rain, Wind, Landslide, and Fire. In groups ask for recommendations for the choosing a site and positioning the house on the site . Report back and list the findings.
2. Talk about other buildings that form the home – Kitchen and Latrine. Talk about where they should be positioned to avoid smells and flies. Look at Where to build your kitchen and latrine.
3. Show the Safer guide page on this and agree the recommendations

Evaluation:

- Risk assessment at sites to cover the principle hazards. Participants to go through the hazards, assess the risks, and make recommendations based on the guidelines provided.



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Building Design

Time: 30 Mins

Venue: Training Room

Resources: Blackboard / Flipchart and Pens

Learning Objectives:

- That all participants understand the basic principles of good design: Raised Plinth, correct positioning of Doors and Windows, Veranda, Hipped Roof.

Activities:

1. Describe how and why buildings collapsed in flood and driving rain:
 - That walls soaked in water turn back to mud and collapse
 - That the driving rain on exposed gables causes erosion and the weight of the wall can cause it to bend and collapse when wet. That when the gable walls collapse the roof support is lost and will cause further damage.
2. Use the Hazard List previously produced and highlight Flood, Rain and Wind risks. Use the Safer Earth Building guide to demonstrate:
 - Raised Plinth – Reduces risk of flooding into the house and protects the house foundations
 - Door and Window size and position
 - Veranda – Protects the walls from driving
 - Hipped Roof – Protects the walls and removes the need of the gables

Evaluation:

- Participants can point out good design and failings during site visit



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Materials

Time: 30 Mins

Venue: Training Room

Resources: Blackboard / Flipchart and Pens

Learning Objectives:

- That the participants have knowledge of how to select and produce earth for mud block construction; That they know which timber to use in the construction and how this can be treated.

Activities:

1. Ask participants to describe the best soils for making earth bricks and how they test it. Feedback to the group
2. Use the Safer guide to demonstrate how :
 - To use soil without organic matter
 - Use soil that has the right ratio of sand and clay
 - That the water content is correct
 - That the blocks are cast on flat ground
 - That the blocks are covered to stop them drying too quickly
3. Ask how which timber is suitable for each part of the building and how to protect against termites

Evaluation:

- Participants can test and comment on the quality of soil during site visit



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Setting Out

Time: 60 Mins

Venue: Training Room (outside)

Resources: Blackboard / Setting Out Guide

Learning Objectives:

- That all participants know how to set out using the 3,4,5 triangle

Activities:

- Explain that 3,4,5 triangles are always right angles . That we can use this for setting out foundations
- Use setting out guidelines in the appendix

Evaluation:

- Check setting out on site



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Foundations

Time: 20 Mins

Venue: Training Room

Resources: Blackboard

Learning Objectives:

- That participants know the principles and standards for foundations

Activities:

- Ask the group what are the rules, standards, traditions about foundation depths.
- Describe that foundations need to be at minimum depth of 50cm:
 - To reach stable undisturbed ground
 - That at this depth the soil does not shrink and expand so much
 - Allows for the ground level to be worn away over time but the foundations will not get exposed
- That the foundations should be dug deeper if needed to get to undisturbed ground and deeper than any roots
- Test the firmness of the foundations with the heel of a boot or by trying to push a stick into the soil. It should not go in more than 20cm
- Check that the foundations are level, and never backfill to make up ground if it has been dug too deep
- If the foundation needs to be levelled use compacted sand up to a maximum depth of 5cm
- Build foundation walls making sure that all the joints are filled.
- Backfill with clean subsoil, no roots of vegetable matter. Compact in layers of no more than 15cm (6"). This is important not only to prevent later subsidence but also to stop the foundations collecting water.

Evaluation:

- Check foundation on site



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Wall Construction

Time: 20 Mins

Venue: Training Room

Resources: Blackboard

Learning Objectives:

- That participants understand the basics principle and standards for brick building

Activities:

- Ask the group what are the rules , standards, traditions for earth brick construction
- What are the common faults and problems?
- The following to be explained and discussed
 - All foundation walls should be level when starting the walls
 - Use a gauge rod to build each corner so that the walls go up at the same level
 - Corners should be stepped and not toothed
 - The mortar should be the same material as the blocks, do not use soil from the surface as it has too much silt and vegetation
 - Care should be taken to make sure that all the joints are filled and compacted
 - Internal wall s must be built up at then same time to make sure the y have a good connection
 - Window and door openings over 60cm need to have a lintel fitted.
 - Lintels should be heat treated and 7.5cm for openings up to 90cm and 10cm for openings up to 120cm
- Ask what material and process should be used for render
 - Render should have a higher clay content than the brick . This helps with waterproofing
 - Rake out joints to 2cm so that render can key to the wall
 - Render should be 1.5 – 2 cm thick
 - Smooth render finish is best as this will allow what to run off easier

Evaluation:

- Check wall construction on site



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Roof Construction

Time: 20 Mins

Venue: Training Room (outside)

Resources: Blackboard

Learning Objectives:

- That participants understand the basics principle and standards for roof construction

Activities:

- Ask what materials are used for roof construction and why. Need to establish size of timbers , type of timber, and treatment (if any)
- Go through the following details:
 - Depth of support posts (need to 50cm below ground level), blue gum , and heat treated
 - That build should have a wall plate and this is joined at the corners. If part of the wall collapses then roof will be supported
 - That the roof should extend beyond the plinth wall to prevent this getting eroded.
 - Plastic paper should be fitted especially when there is a shortage of thatching material. This will prevent water coming through the roof and damaging the walls

Evaluation:

- Check wall roof construction on site



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Doors and Windows

Time: 20 Mins

Venue: Training Room (outside)

Resources: Blackboard

Learning Objectives:

- That participants understand the basics principle and standards for fitting doors and windows

Activities:

- Ask how doors and windows are fitted and what standards there should be and tips for good fitting. Should include:
 - Frames should be plumb and kept square . Use a diagonal piece of wood nailed the frame to keep it square
 - Door frames should have mid – bracing to stop the frame bowing in as it is built

Evaluation:

- Check door and window fitting on site



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Protection and Maintenance of house and environment

Time: 20 Mins

Venue: Training Room (outside)

Resources: Blackboard

Learning Objectives:

- That participants understand the importance of creating a protective environment; and the need for regular maintenance of house and environment

Activities:

- Use the original Hazard List. In groups list ideas for the protection of the house.
- Use the Safer guide to illustrate the protection measures
 - Slopes, drains, and banks to manage surface water
 - Tree planting as wind and rain break, shading, soil stabilisation
 - Other wind breaks
- Use the guide to illustrate and list the maintenance
 - Trees
 - Banks and drains
 - Maintain the ground levels around the house. The ground level may be lower due to sweeping and water. This may cause water to pool against the building and expose the foundations.
 - Render
 - Thatch

Evaluation:

- Run through the maintenance checklist on site



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Quiz

Time: 10 Mins

Venue: Training Room

Have the group in teams of 4 or 5

QUESTION	ANSWER
1. Name 2 main hazards and what are the risks to buildings	Refer back to notes
2. Where would you locate a latrine	Refer to notes
3. What happens if there is too much clay in mud for bricks?	Shrinkage and cracks
4. How can you test that there is not too much water in mud for bricks	Roll it in your hand and it should not stick
5. Give 2 reasons why foundations should be 50cm deep	Refer to notes
6. Give 2 reasons why the back fill needs to be carefully compacted	1. Stop subsidence 2. Protect foundations from damp
7. Describe the steps to setting out using a 3,4,5 triangle	Refer to notes
8. What is a gauge rod and why should we use it	To keep the walls at the same height
9. Why should brick be laid with stepped corners?	To make sure the joints are strong and filled with mortar
10. Why should a wallplate be fitted?	To attach the rafters and support the roof if the walls fail



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Quiz

Time: 10 Mins

Venue: Training Room

Have the group in teams of 4 or 5

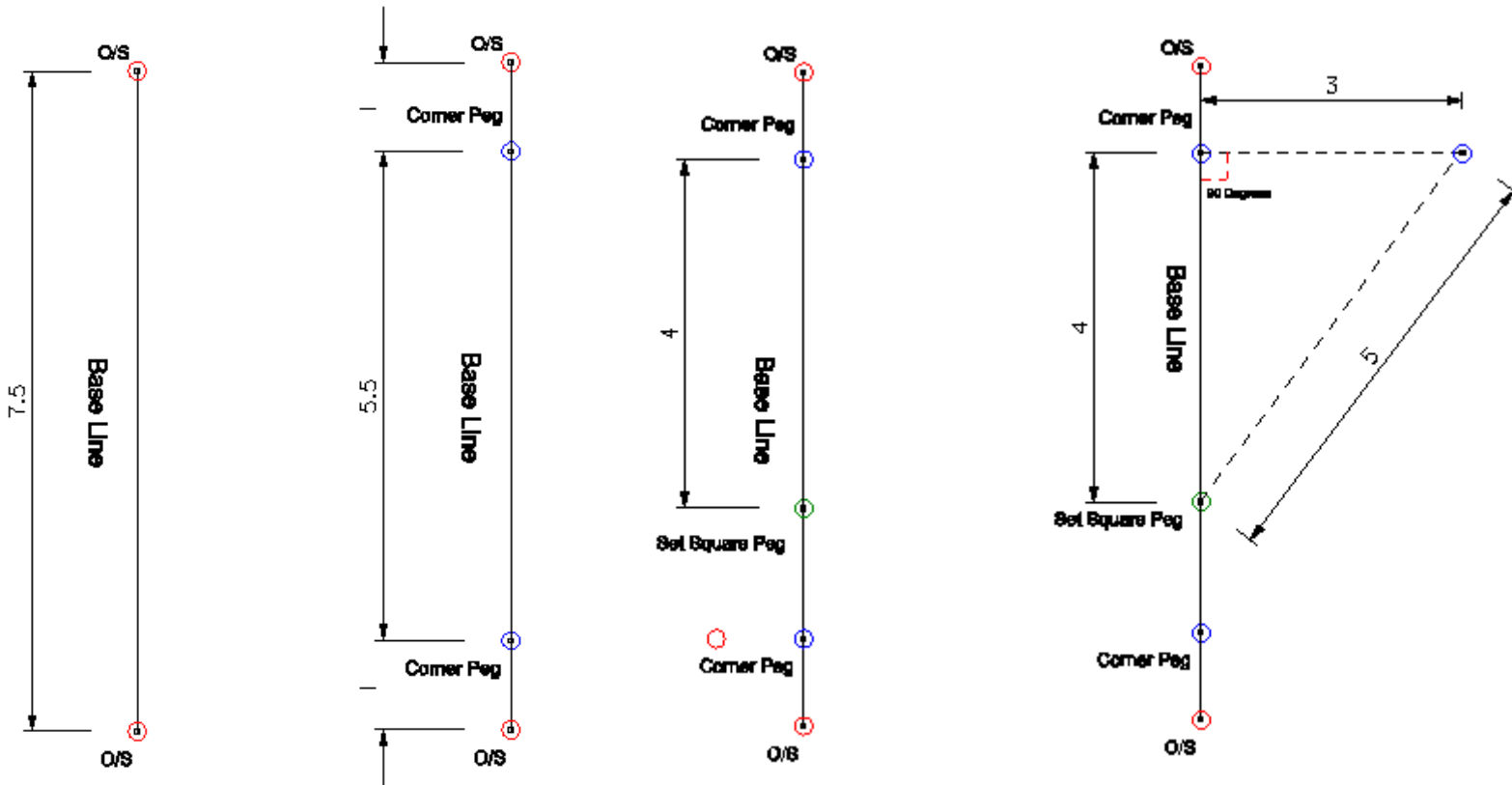
QUESTION	ANSWER
11. What is the benefits of fitting plastic paper	Keeps the water out when the re is not much thatch and protects the walls
12. What are the best ways to fit doors and windows	Refer to notes
13. What are the benefits of planting trees	Timber, firewood, protection from wind and rain, soil stabilisation, shade
14. 3 ways to manage surface water around the buildings	Maintain levels and slopes, ditches and drains, banks
15. List 4 ways to maintain the house and site	Refer to notes



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Appendix – Setting Out



1. Put in two pegs on the line of the longest wall. This line should be 2m longer than the wall. These are called the Off Set (O/S) pegs.

2. From one Off Set peg measure 1m and fit the corner peg. Fit a nail at the top of the peg to mark exactly where the corner is on the line. Then measure and fit the second corner peg

3. From the first corner peg measure 4m and fit in a temporary Set Square Peg with a nail in the top to mark the exact position

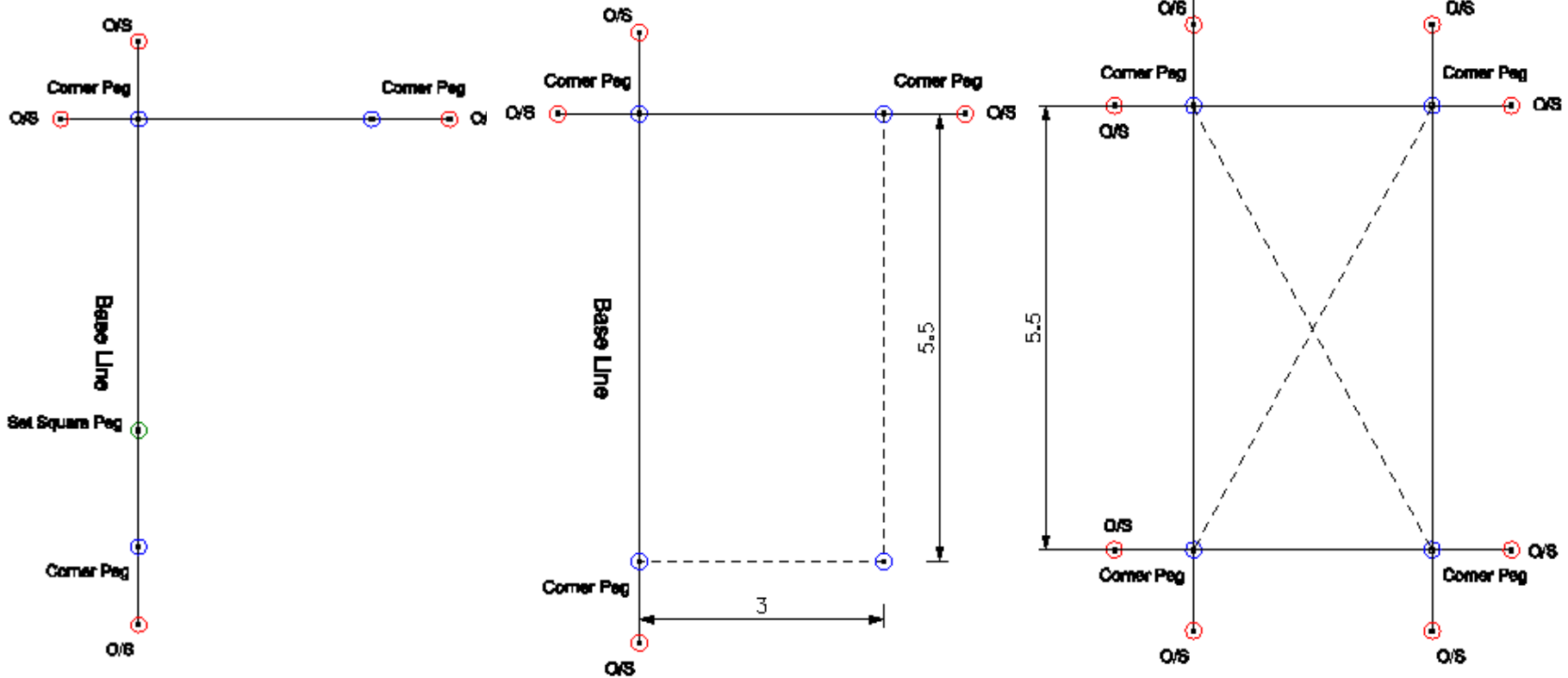
4. Using 2 x tapes or measured lengths of string, find the point where the 5m and 3m length join. Fit a corner peg in this position and mark with a nail the exact position.



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Appendix – Setting Out



5. Line a string between the corner pegs and extend either end by at least 1m and fit the Off Set pegs.

6. Again use two tapes or measured string to find the position of the last corner peg.

6. Fit the last Off Set pegs and check the diagonal measures. If the setting out is accurate the measures will be the same.



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