

BASIC STRENGTHENING HANDBOOK FOR TIMBER HOUSES

ABOUT THIS HANDBOOK

This basic house strengthening handbook has been developed for community members affected by Typhoon Ompong, particularly those that live in single-family timber houses with a lightweight roof. It can help homeowners and construction workers identify, in a basic way, areas where the house may be especially vulnerable. It also provides examples of simple strengthening measures that may help houses become more resistant to earthquakes and typhoons.

The content compliments and builds upon the **8 Build Back Safer Key Messages** developed by the Philippines Shelter Cluster, in response to Typhoon Haiyan. The 8 Key Messages provide simple accessible advice to families on how they can improve their makeshift shelter or simple home no matter how small their budget. In this handbook, messages are re-ordered from top to bottom, from the roof to the foundation. This is because in many cases, the cheapest and most effective place to start strengthening an existing house is at the roof.

DISCLAIMER

This handbook is not appropriate for developing a full seismic or typhoon strengthening (retrofit) plan and does not provide a complete list of retrofit options. Application of techniques described in this guide and compliance with the observation checklist included does not mean the building meets building code requirements. In some cases, the application of these techniques may not lead to a demonstrable improvement in seismic or typhoon resistance, especially in houses more complex in nature. Other strengthening techniques and construction materials are available and should be considered. The order of the techniques described in the guide does not necessarily correspond with the order of their application. Before applying any of these strengthening measures, or for a complete retrofitting home solution please consult with a qualified construction professional.

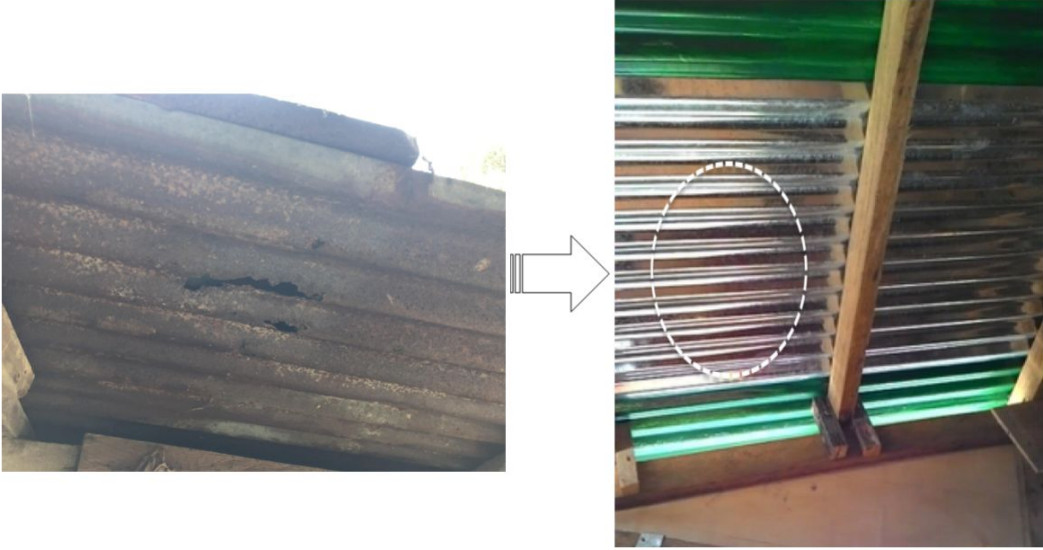
ACKNOWLEDGEMENTS


This simple guide was produced in January 2019 for the Philippines Shelter Cluster by Build Change with generous support from Czech Republic Humanitarian Aid.

INSTRUCTIONS

1. Using a pencil, answer **YES** or **NO** to every question below. The pictures underneath each question serve as guidance.
2. Whenever you mark an item **NO**, add the proposed strengthening measure to the TO-DO LIST on page x.
3. Use the TO-DO LIST as a guide to progressively strengthen the building.
4. When the TO-DO LIST has been done, verify the strengthening work has been completed properly by doing the assessment again.

LIGHTWEIGHT ROOF

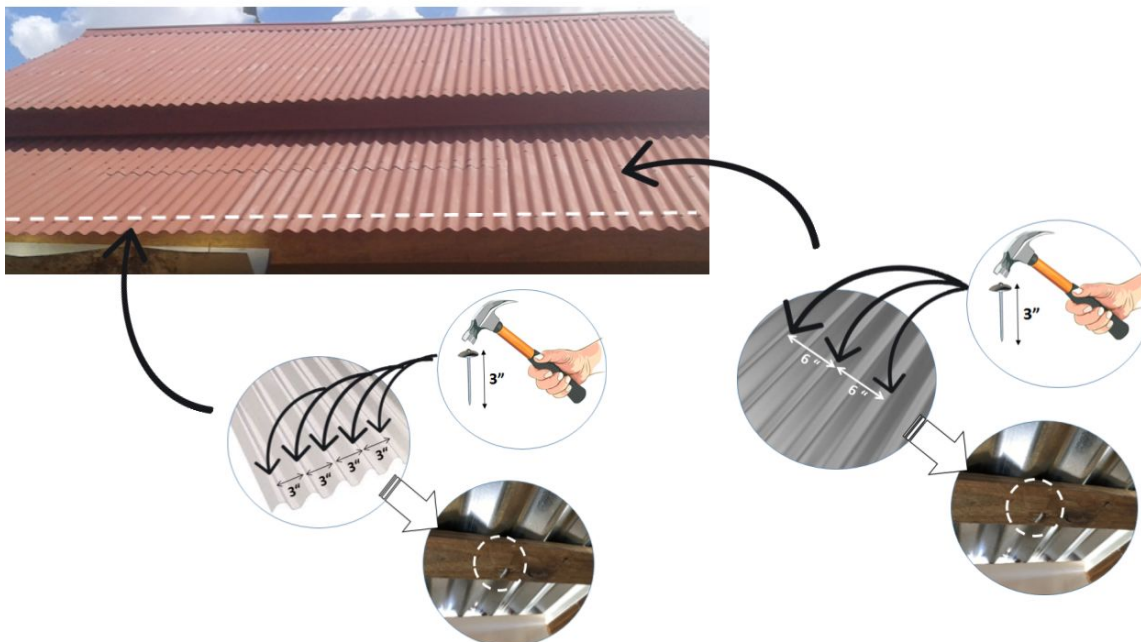
1. Are CGI sheets in good condition (undamaged and without severe rust)?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
If the answer is NO : Change CGI sheets where needed		

2. Do CGI sheets overlap with each other by at least 15 centimeters on all sides?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
If the answer is NO : Reposition CGI sheets and add more where needed.		

3. Are there roofing nails every 7 cm along the perimeter and ridge of the roof AND every 15 cm along the purlins?

☐ YES

☐ NO

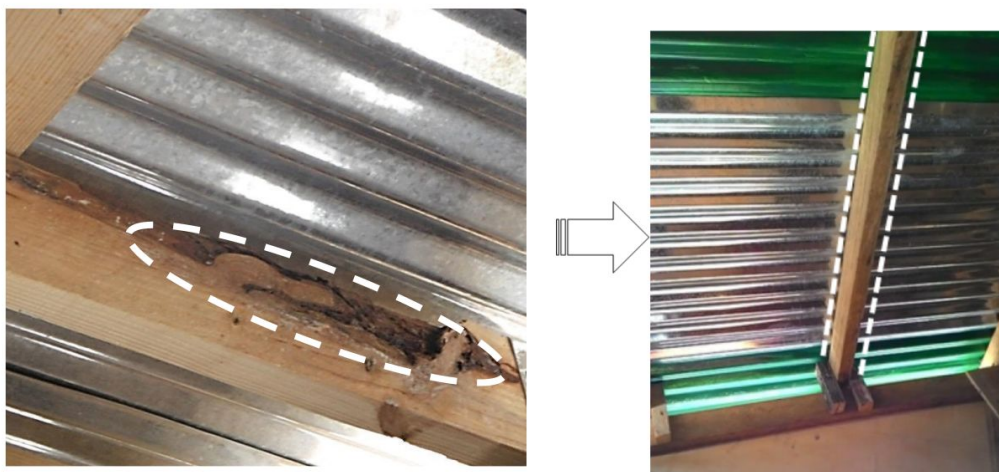


If the answer is **NO**: Add extra roofing nails where needed

4. Is all timber in the house in good condition (not rotten, bowed or broken)?

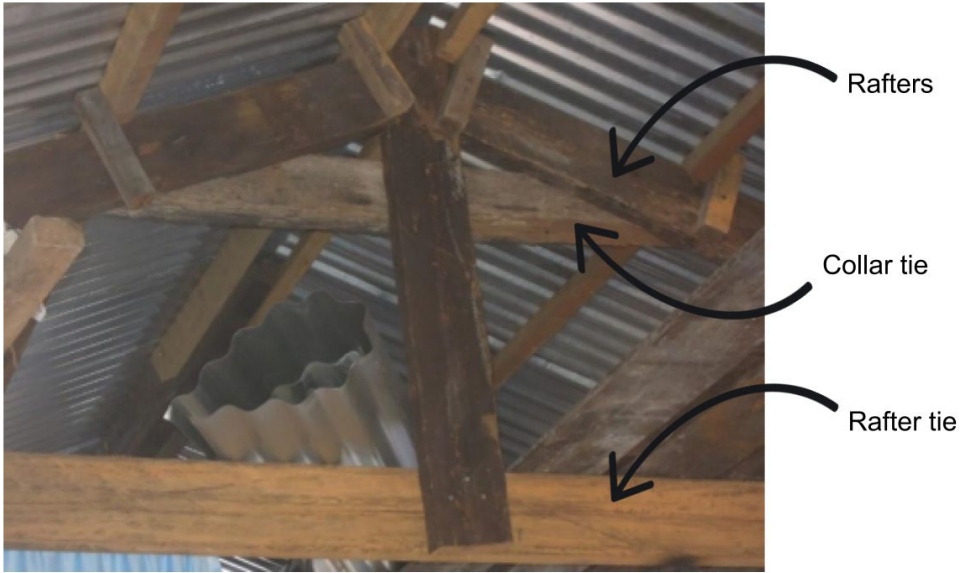
☐ YES

☐ NO



If the answer is **NO**: Exchange bad timber for new timber where needed

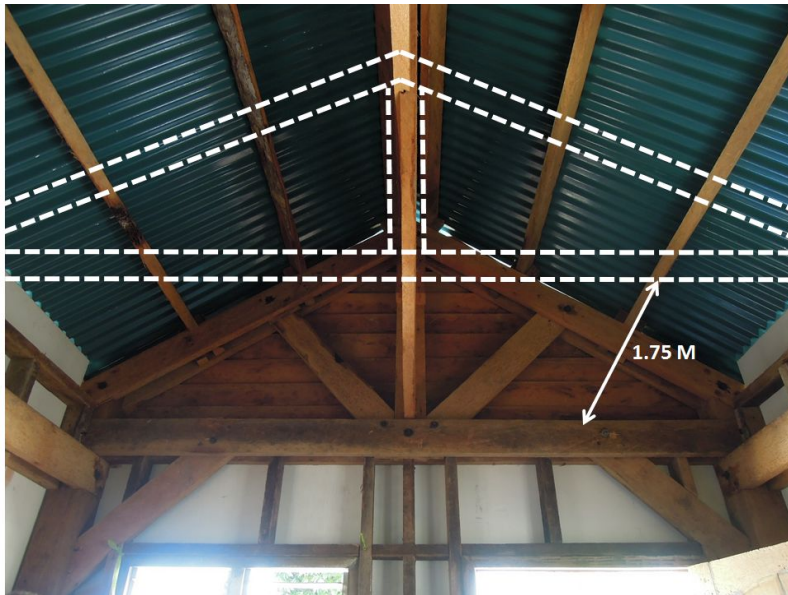
5. Are all purlins 70 centimeters apart (or less)?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
If the answer is NO : Add extra purlins		

6. Are all rafters connected with each other to form an “A” shape (A-frame)?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
If the answer is NO : Add collar ties and rafter ties where needed		

7. Are all A-frames less than 1.75 meters apart?

☐ YES

☐ NO

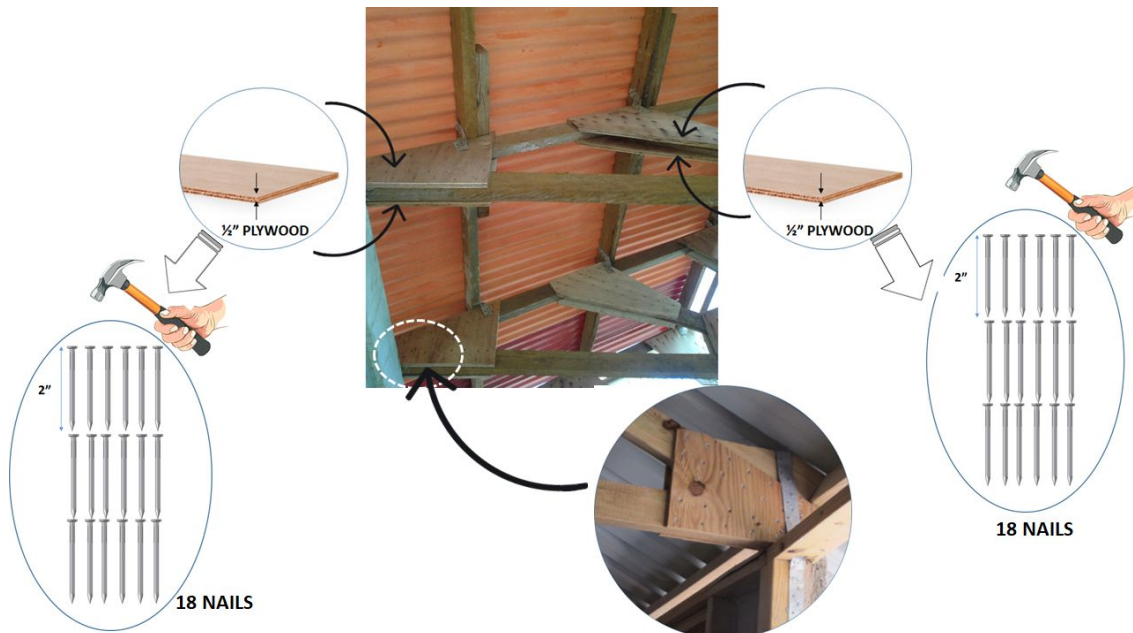


If the answer is **NO**: Add collar ties and rafter ties where needed

8. Are all truss ("A-frames" WITH kingposts and webs) members connected with gusset plates or metal straps?

☐ YES

☐ NO

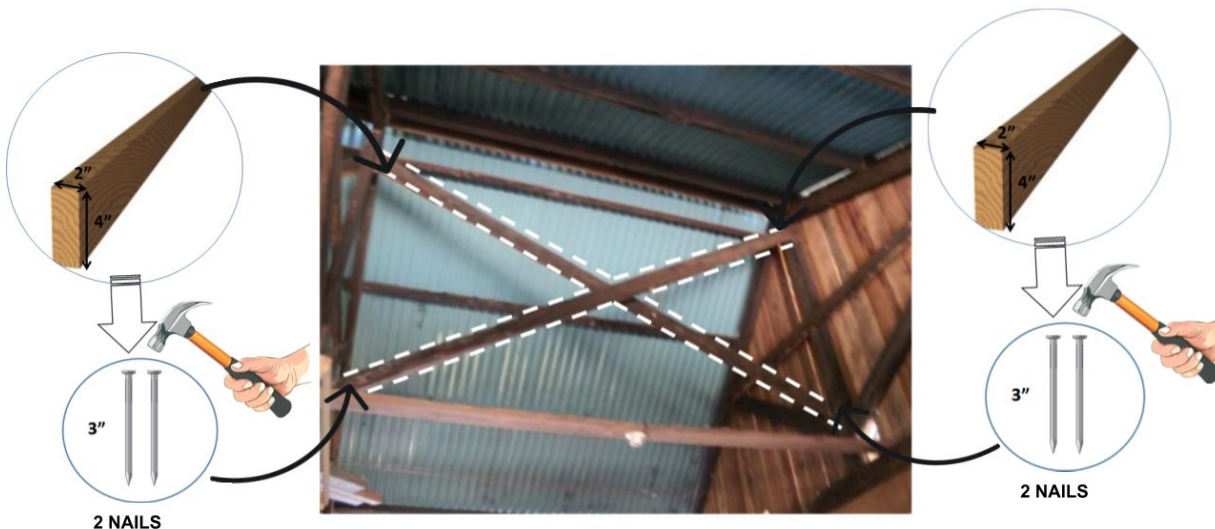


If the answer is **NO**: Add extra A-frames (with kingposts and webs) where needed

9. Are trusses at the gable ends braced at the top and bottom?

☐ YES

☐ NO

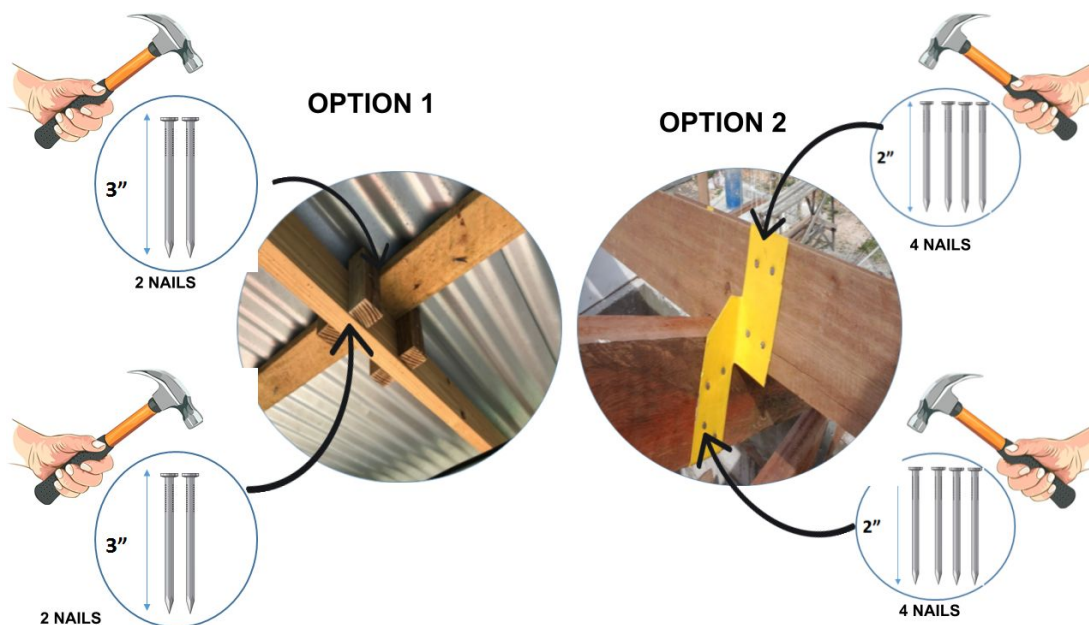


If the answer is **NO**: Add extra A-frames (with kingposts and webs) where needed

10. Are all purlins connected to the top of each A-frame with metal straps or timber?

☐ YES

☐ NO

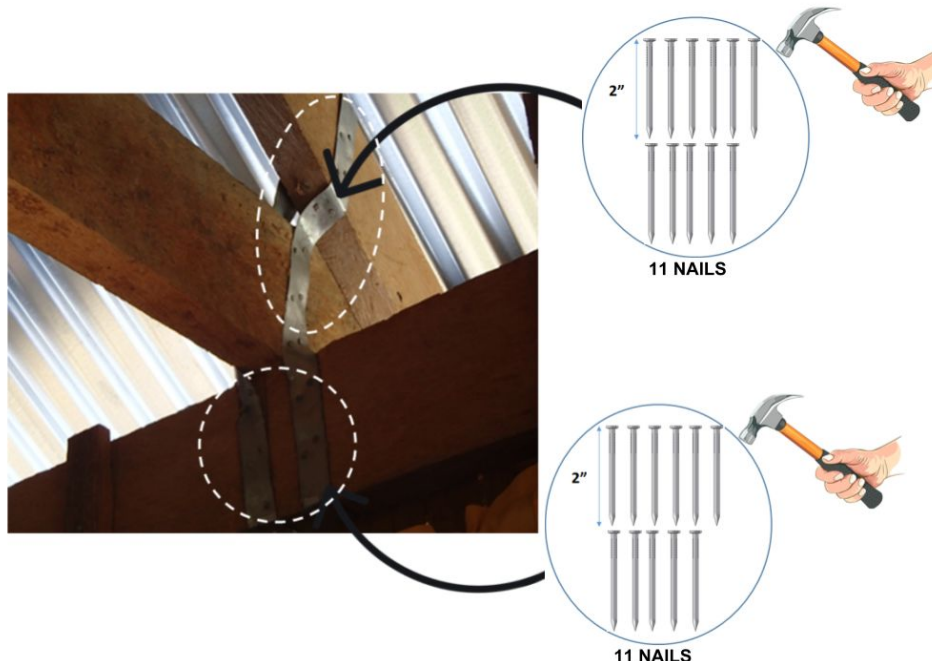


If the answer is **NO**: Add metal straps, timber or tie wire to purlins where needed

11. Are all A-frames connected to each wall with timber cleats, a rebar hook or metal strap?

☐ YES

☐ NO



If the answer is **NO**: Strengthen connection between A-frames and wall where needed.

12. Do all roof eaves overhang 45 centimeters or less?

☐ YES

☐ NO



If the answer is **NO**: Cut back rafters and reposition CGI sheeting where needed

13. Is there a fascia board around the perimeter of the entire roof?

☐ YES

☐ NO



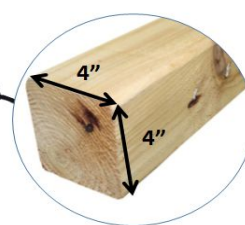
If the answer is **NO**: Add fascia board where needed

WALLS

14. Do all walls have a 4x4" top-plate (even across openings)?

☐ YES

☐ NO

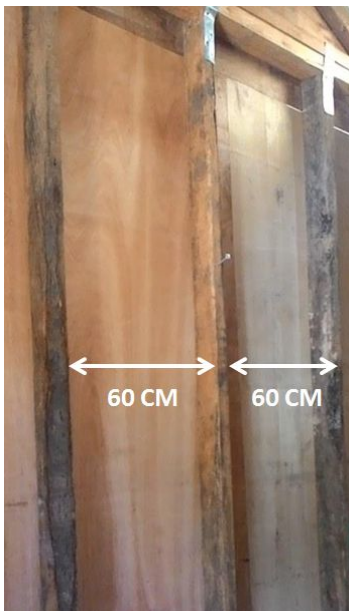


If the answer is **NO**: Add two 2x4" or one 4x4" timber where needed.

15. Are all wall posts 60 centimeters apart (or less)?

☐ YES

☐ NO

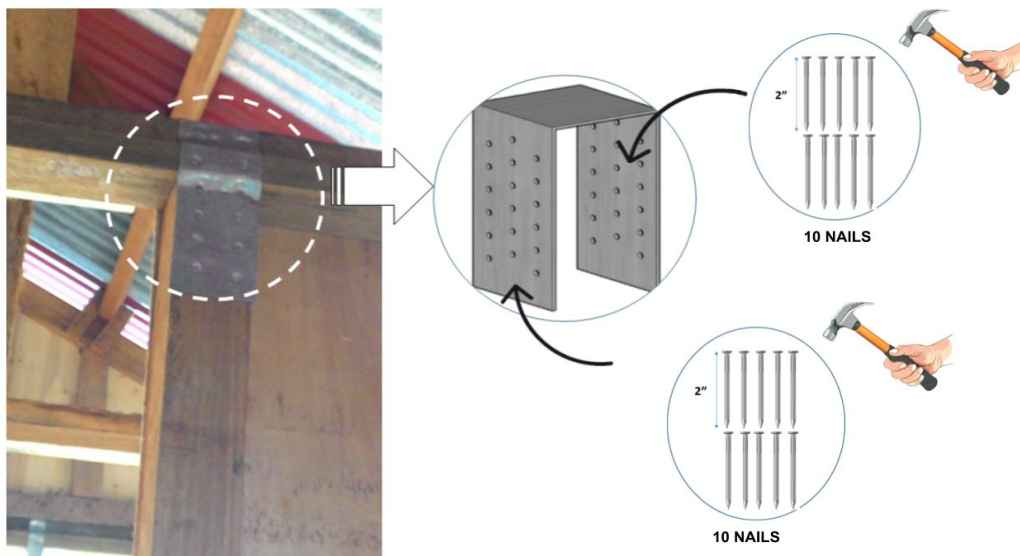


If the answer is **NO**: Add extra posts where needed

16. Are all posts at corners, edges and intersections connected to the top-plate with nailed timber notches or metal straps?

☐ YES

☐ NO

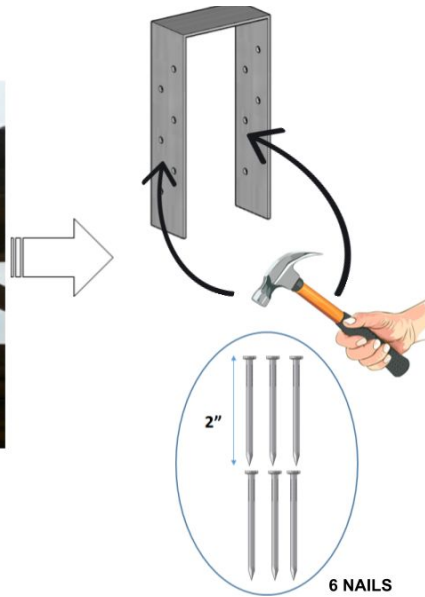


If the answer is **NO**: Add metal straps to the top of posts as needed

17. Are all studs connected to the top-plate with metal straps?

☐ YES

☐ NO

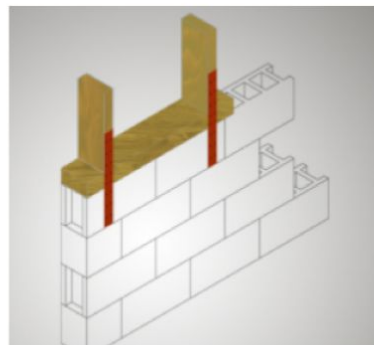
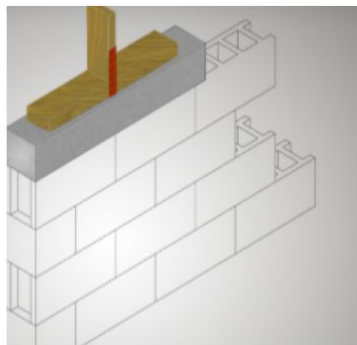


If the answer is **NO**: Add metal straps to the top of studs as needed

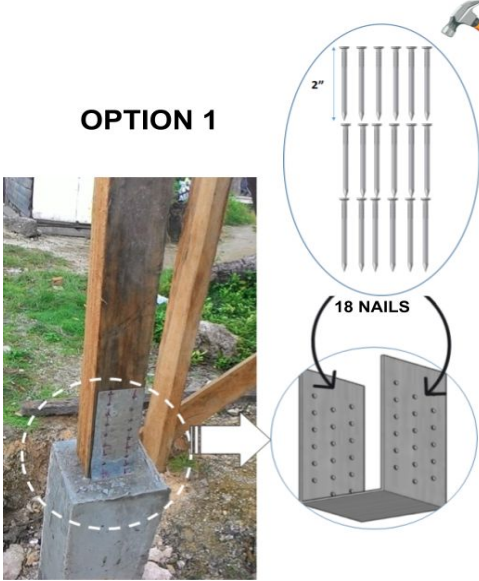
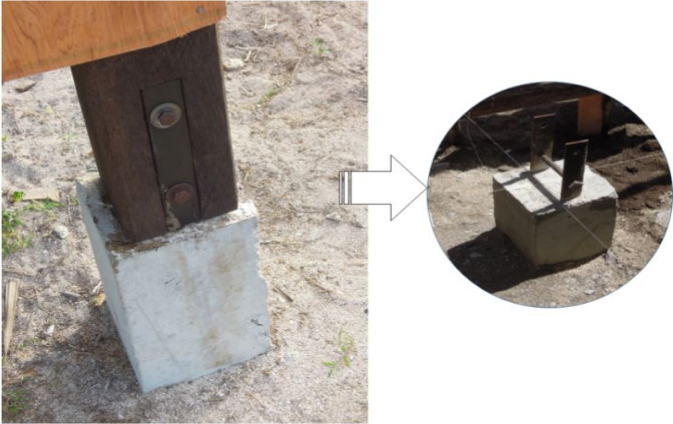
18. Are all studs connected to the sill plate or foundation with metal straps?



☐ YES

☐ NO



If the answer is **NO**: Add metal straps to the top of studs as needed

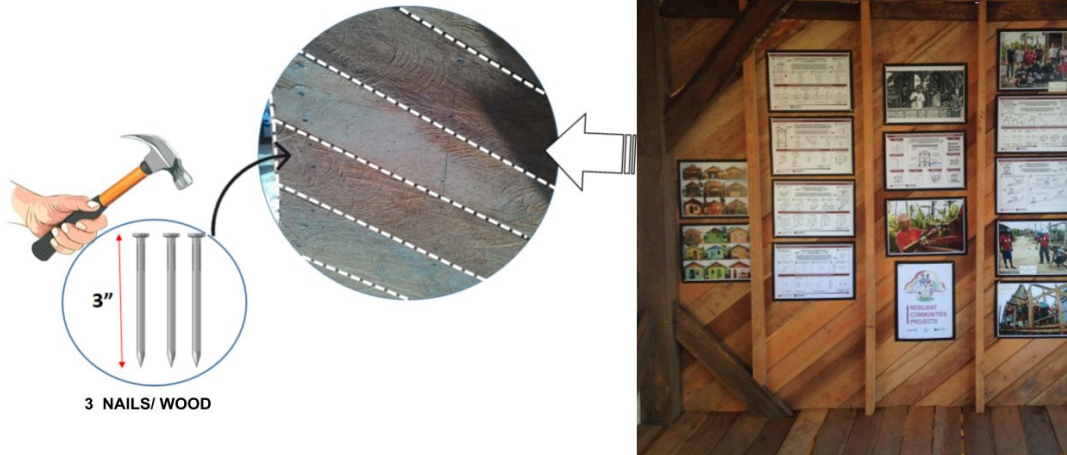
<p>19. Are all posts at corners, edges and intersections connected to the foundation with metal straps or rebar hooks set in the concrete? (also applies to free-standing posts).</p>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>OPTION 1</p>  </div> <div style="text-align: center;"> <p>OPTION 2</p>  </div> </div>		
<p>If the answer is NO: Add metal straps or rebar hooks to post as needed</p>		

<p>20. Are all walls covered with plywood or timber planks on at least one side?</p>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
<div style="display: flex; justify-content: space-around;">   </div>		
<p>If the answer is NO: Replace wall material where needed</p>		

21. If timber planks are used, are they all placed diagonally and nailed at each end with at least three nails?

☐ YES

☐ NO



If the answer is **NO**: Reposition timber planks and add nails where needed

22. If plywood panels are used, are they all at least ½-inch thick and nailed every 10 centimeters around their perimeter?

☐ YES

☐ NO

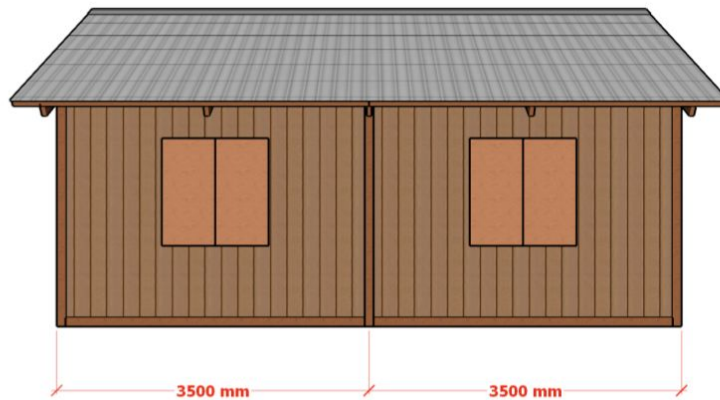


If the answer is **NO**: change plywood and add nails where needed

23. Are all parallel walls less than 3.5 meters apart?

☐ YES

☐ NO



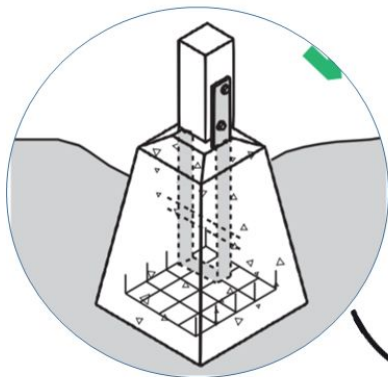
If the answer is **NO**: Add new walls where needed or consult with an engineer for alternatives

FOUNDATIONS

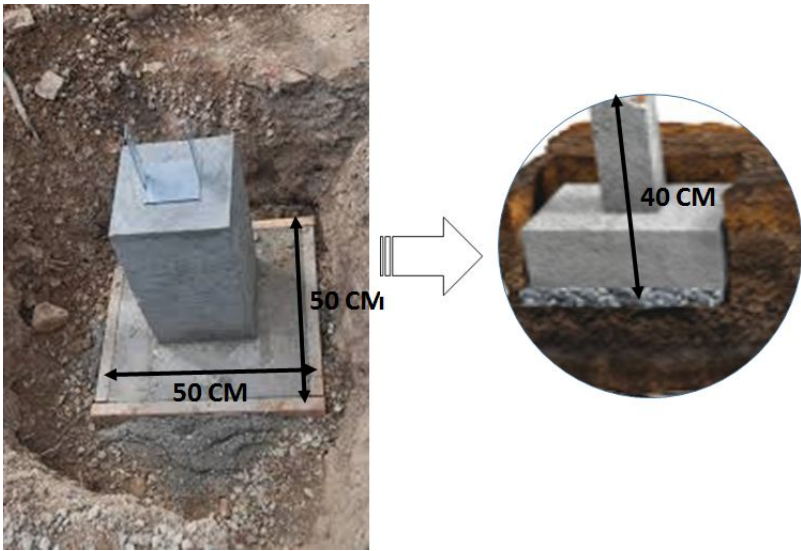
24. Are all foundations made from reinforced concrete?

☐ YES

☐ NO



If the answer is **NO**: Add reinforced concrete foundations where needed

25. Are all foundations 40 cm deep and 50 cm wide (or more)?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
<p>If the answer is NO: Extend the depth of the foundation where needed. Remember to provide alternative support for posts during the work!!</p>		

26. Are the bottom of all posts protected from rot (water)	<input type="checkbox"/> YES	<input type="checkbox"/> NO
		
<p>If the answer is NO: Add protection (paint, tar, metal covering) where needed</p>		

HOUSE STRENGTHENING TO-DO LIST

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#	TO-DO ITEM	NOTES
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