
Column Footing - Grade Beam Monolith

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Challenge Name

Date Added

Habitat for Humanity Challenge: Increasing Resilience to Earthquakes and Typhoons for Homes with No Foundations

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Solution Abstract

A number of low income houses in the Philippines are constructed without a foundation system because of the lack of expertise and/or budget. As it is, the existing structure offers little resistance against lateral forces from earthquake and wind. It is therefore significant that a standard and validated retrofitting scheme be created considering the said conditions.

The proposed method can withstand the required gravity and special loads (earthquake and wind), accounting future incremental builds (two-stories) from the existing structure. Isolated reinforced concrete footings are placed on the four corners, and ALL sides of the structure is connected by a plinth beam. Aside from adding the aforementioned resistance, this also adapts the foundation to different subsurface conditions, especially those that can cause differential settlement. For houses that fully rely on these walls (i.e., no existing columns), such differential settlement can induce cracks that can lead to failure. Detailed drawings and calculations are shown in the following sections.

Solution Conclusion

As shown, the proposed scheme is similar to the existing solutions. This is so it can be easily accepted and implemented by the locals and even homeowners.

During construction, concrete-filled bamboo props are used, which are not removed as concrete is poured. Treated and dried bamboo should be used in this process to prevent degradation. Concrete is filled inside the bamboo to further prevent its deterioration and add compressive resistance. The use of this method is both cost effective and safe (compared to the steel and coco lumber props currently used), enabling the dwellers to remain in their house during construction at a low cost - i.e., the concrete-filled bamboo should be able to resist the loads even before the concrete reaches its target strength.

The estimated cost of the project is USD 298 and the construction duration is within 12 days. The details are given in the succeeding sections.