EVALUATION OF BEAM MONOLITH PROTOTYPE IN CEBU

February 15, 2023

Outline

- Objective
- Profile of the houses
- Technical Feasibility
- Cost-Efficiency
- Community Acceptability
- Discussion
- Next steps

Objective

- Evaluate the Beam Monolith protype in Cebu based on technical feasibility, cost-efficiency/economic feasibility, and community acceptability

taken from the Habitat for Humanity Challenge brief

BACKGROUND

05

HABITAT FOR HUMANITY CHALLENGE

new methods to add foundations or otherwise anchor and **strengthen houses** in low-income areas in a **cost-effective** manner, enabling them to withstand earthquake and extreme wind forces

PROJECT BRIEF

Non-invasive structural retrofit

Withstand 6.5 magnitude earthquake and 200-kph strong winds

Compatible with typical CHB construction and incremental building

Adaptable to various soil types

Easy to deploy (at most 12 days to install), cost effective (Php 15,000 for a 25 sqm house), and locally available

ICE-CEMG TEAM

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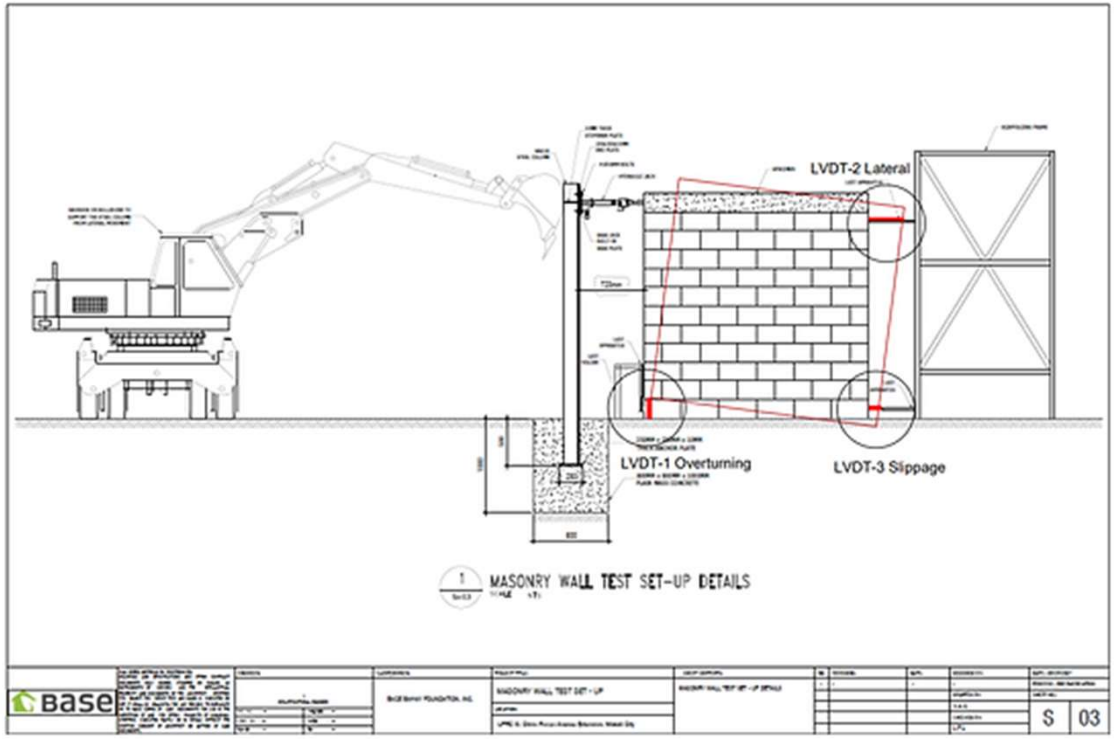
University of the Philippines, in the Construction Engineering and Management Group of the Institute of Civil Engineering won the Innocentive Challenge and their winning solution was titled “Column Footing Grade Beam Monolith”

Figure below shows the sophisticated effort made to simulate earthquake and typhoon forces on a typical Philippines CHB (concrete hollow block) home. The winning solution exceeded the NSCP minimums by at least a factor of two and can be implemented by workers typically found in Philippine communities.



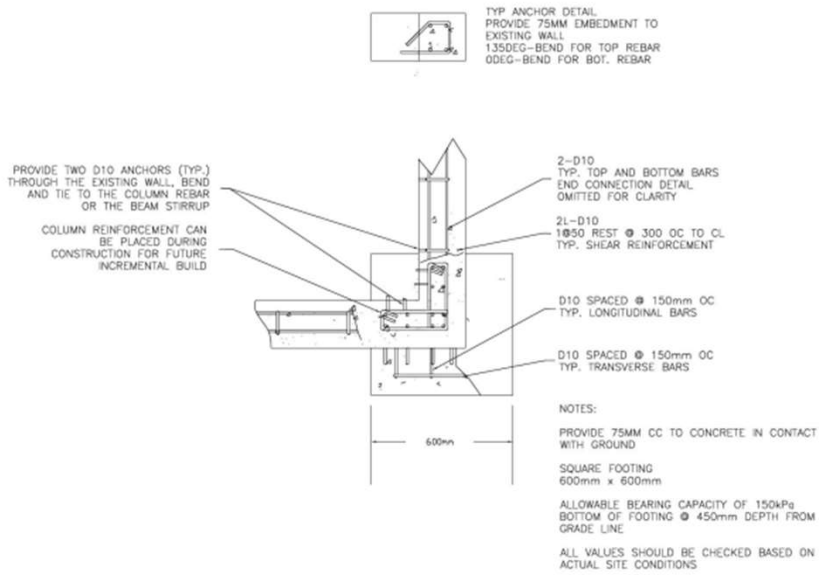
Source: https://www.seafreightlabs.com/post/who-doesn-t-like-a-party-thoughts-on-the-habitat-for-humanity-virtual-awarding-ceremony

TECHNICAL FEASIBILITY

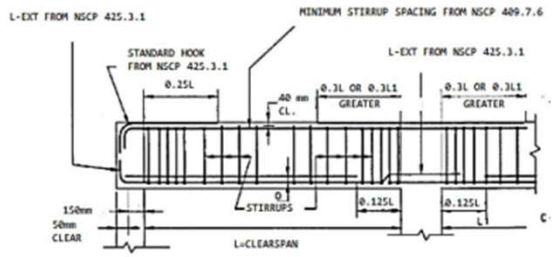
- Is BEAM Monolith solution provide enough structural strength and be flexible to adjust and support the overall house structure?
- Is BEAM Monolith the solution be implemented in less than 12 days?
- Can the solution work as a retrofit to an existing concrete hollow blocks (CHB) home?
- Are the materials used are locally available or easily be purchased?
- Is the design and method can be easily be installed by local laborers, non-skilled workers, and homeowners
- Compliance or exceed the minimum requirements set by National Structural Code of the Philippine
- Can the solutions work two-story house?
- Can it be applicable to a typical low-income households housing typology?

Design Specifications from UP Diliman

2. Preparation of Rebar Cages for Column and Beam



For the development, hooks, and splicing, refer to the figure below:

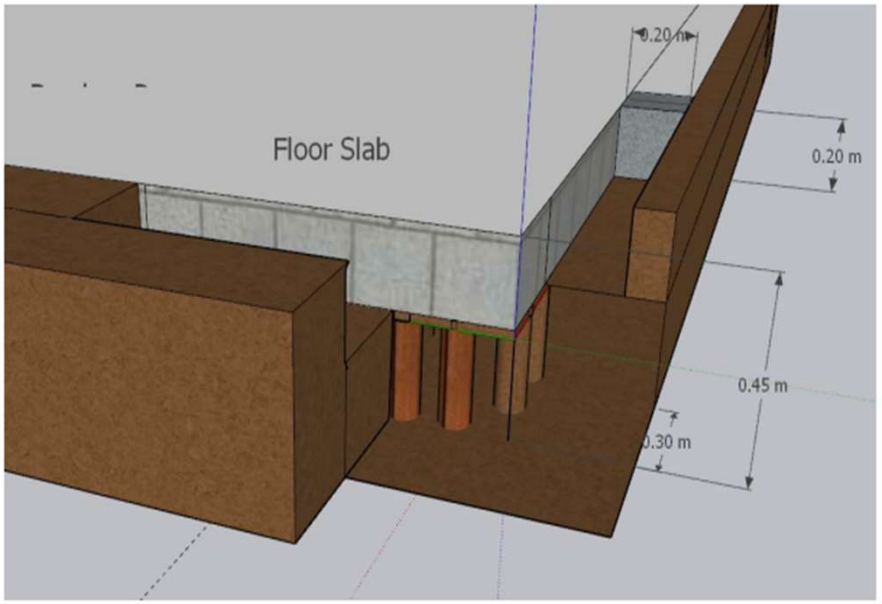


The preceding figure is based on the following provisions:

- Reinforcement continuity: 407.7.3.8
- Structural Integrity: 409.7.7
- Splicing: 425.5.1
- Hooks: 425.3.1

3. Corner Excavation

Excavate 1 meter along the perimeter on both directions starting from the cornerpoint. The depth of excavation for the wall footing is 200 mm. For the corner footing, excavate up to a depth of 450 mm.



4. Installation of Rebar Cages for the Corner Footing System

Rebar cages prepared in part number 2 are installed in the excavated ground. Bamboo props are set up to hold the overhanging corner of the slab.

5. Drilling of Anchor Rods to the CHB

Two sets of anchor rods are to be drilled on the exposed part of the slab. Sufficient grouting should be applied to secure the bond between the rod and the concrete hollow block

Top rod: Inclined 45 degrees
Bottom rod: Horizontal

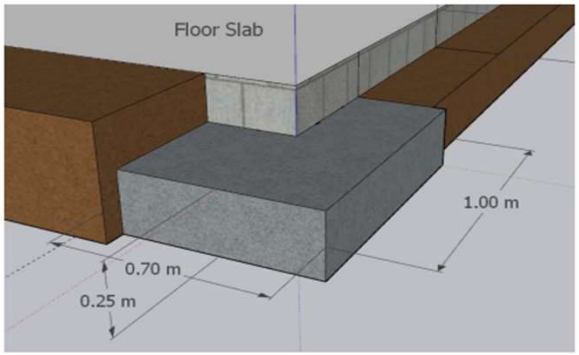
These rods will then be anchored to the rebar cages for the grade beam.

6. Installation of Rebar Cages for the Grade Beam

Once the rebar cages are installed along the excavated perimeter, the anchor rods are tied to the rebar to integrate it to the rebarwork.

7. Concreting

The proportion of concrete to be used is Class A (1:2:4). Concrete mixture is to be prepared by adding together 1 part cement, 2 parts fine aggregates, and 4 parts coarse aggregates by volume, plus enough water to make the mixture into a pliable paste. It should be mixed thoroughly such that there is uniform distribution among the cement and aggregates. Concrete should be vibrated and the forms should be tapped as it is deposited to prevent formation of voids in the concrete members.



Do Steps 3-7 are done for all the corners. The same steps will be employed in excavating and concreting the remaining sides along the perimeter

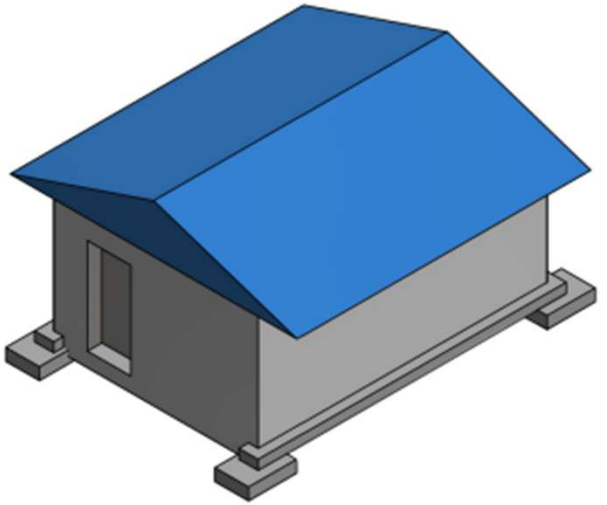
8. Excavate remaining midlength along the sides
The remaining sides that are yet to be excavated are dealt with here.

9. Drilling of Anchor Rods to the CHB

10. Installation of Rebar Cages for the Grade Beam
Once the rebar cages are installed along the excavated perimeter, the anchor rods are tied to the rebar to integrate it to the rebarwork.

11. Concreting

12. Backfilling
This is done once sufficient drying and curing as achieved.



Proposed Solution: Column Footing - Grade Beam Monolith

STRUCTURAL DESIGN CRITERIA
FOR THE SUPERSTRUCTURE AND PROPOSED FOUNDATION

I. PROJECT DESCRIPTION

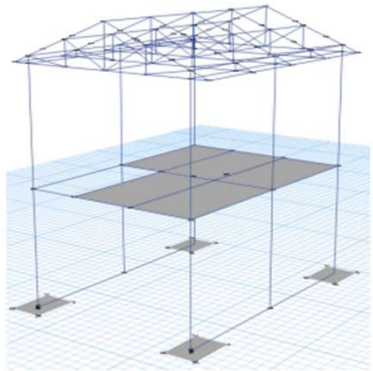
Validation of the proposed foundation as per project specifications. The model of the superstructure was based on the assumed retrofitted typologies given (refer to earlier sections). The following are the typical frame members used:

a) Girders	-	400mmx200mm
b) Beams	-	300mmx200mm
c) Columns	-	300mmx300mm
d) Roof element	-	75mmx50mm
e) Slabs	-	150mm
f) CHB walls	-	200mm (4")

Rationale:

The existing typical beam depth is around 200-300mm. Retrofitting beams would constitute mainly adding on the depth, which can be around 100mm; the existing typical column is 200mm-square. Similarly, retrofitting would constitute an addition of 100mm; the rest of the elements are assumed to be the same as only the frame elements are retrofitted.

The resulting structure shown is a two-story, one-bay by two-bay concrete-frame with a 6m x 4.25m plan and story height of 3m.



ETABS model (walls not shown)

Note that unspecified pertinent site-specific details resulted in various conservative assumptions, especially in the wind and earthquake load parameters.

II. CODES AND SPECIFICATIONS

a) National Structural Code of the Philippines (NSCP) 2015 Volume 1, Buildings, Towers, and Other Vertical Structures, 7th Edition
b) Building Code Requirements for Reinforced Concrete, ACI 318-14, American Concrete Institute (ACI) [reference of NSCP]
c) American Institute of Steel Construction Inc., AISC-ASD/LRFD [reference of NSCP]
d) American Society of Civil Engineers (ASCE) 7-10 [reference of NSCP]
e) Uniform Building Code (UBC) 1997 Edition [reference of NSCP]

III. MATERIAL STRUCTURAL PROPERTIES

The following material strengths shall be used in the design and in the analysis of the structure.

g) Concrete – The concrete compressive strength is as follows:
   i. For Columns - f'c = 21MPa (3,000psi)

h) Reinforcing Steel Bars shall be deformed and shall conform with ASTM A615/A706:
   i. Grade 40 (10mm to 12mm diameter) - fy = 275MPa (40,000psi)

i) Roofing frame shall be constructed from coconut lumber
   i. For coconut lumber[1][2] - E = 9576MPa & f_crushing = 57MPa

IV. LOADS

The design loads are based on the critical combinations of the different types of loads – i.e., dead, live, earthquake, and wind – applied with the appropriate factors. These are experienced by the superstructure which are then transferred to the foundations.

The basic load types and their corresponding magnitudes are taken as follows:

A. DEAD LOADS

Dead loads (Section 204) are vertical loads from the weight of all construction materials which are permanently fastened thereto and supported thereby.

a) Material Weight and Density:

i.	Concrete	-	23.60kN/m^3
ii.	Structural Steel	-	77.30kN/m^3
iii.	Soil	-	18.90kN/m^3

b) Superimposed Dead Load:

i.	Finishing and topping	-	1.58kPa
ii.	Partition	-	1.2kPa
iii.	Ceiling	-	0.24kPa

B. LIVE LOADS

The live loads (Section 205) include loads that may vary in magnitude, and/or distribution during the life of the structure; not including wind load, earthquake, or dead load. The minimum values of these loads depend on the occupancy and are normally specified by the governing codes.

i.	Roof	-	1kPa
ii.	Residential area	-	1.9kPa

C. WIND LOADS

The design wind pressures are determined by the Envelope Procedure for Low-Rise Buildings (Section 207A.1.2).

Velocity pressure, q_z, evaluated at height z was obtained by the following equation

$$q_z = 0.613 K_z K_{zt} K_d V^2; \text{ V in m/s} \qquad (207C.3\text{-}1)$$

[1] http://www.fao.org/3/W7731E/w7731e06.htm
[2] Masseat et al, Properties of Malaysian Solid Coco-Lumber, 2009

where

K_d = wind directionality factor
K_z = velocity pressure exposure coefficient
K_{zt} = topographic factor defined
V = basic wind speed

Below are the Wind Load Parameters used in the design of the structure:

i.	Exposure Category	:	C	(See Section 207A.7.2 and Section 207A.7.3)
ii.	K_d	:	0.85	(See Section 207A.6)
iii.	K_z	:	0.85	(See Table 207C.3-1)
iv.	K_{zt}	:	1.00	(See Section 207A.8.2)
v.	Gust-effect factor, G	:	0.85	(See Section 207A.9.1)
vi.	Basic Wind Speed, V (Occupancy Category: IV (Table 103-1))	:	200kph	(given)

D. SEISMIC LOADS

a) Static Lateral Force Procedure

Seismic forces were determined based on the equivalent static force procedure and computed following the provisions of the NSCP 2015. The structure is analyzed to resist the minimum total service forces assumed to act non-concurrently in the direction of each of the main axes of the structure.

The total design base shear in a given direction shall be determined by the following equation:

$$V = [(C_v I)/(R T)] W \qquad \text{(See Section 208-8)}$$

The total design base shear need not exceed the following:

$$V = [(2.5 C_a I)/R] W \qquad \text{(See Section 208-9)}$$

The total design base shear shall not be less than the following:

$$V = 0.11 C_a I W \qquad \text{(See Section 208-10)}$$

In addition, for Seismic Zone 4, the total base shear shall also not be less than the following:

$$V = [(0.8 Z N_v I)/R] W \qquad \text{(See Section 208-10)}$$

Below are the Seismic Parameters used in the design of the structure:

i.	Seismic Zone Factor	:	0.4	(Table 208-3)
ii.	Occupancy Factor	:	1.0	(Table 208-1)
iii.	Soil Profile Type	:	S_C	(Table 208-2)
iv.	Seismic Source Type (M6.8)	:	B	(Table 208-4)
v.	Distance to Known Seismic Source	:	0.99km	
vi.	Near Source Factor, N_a	:	1.3	(Table 208-5)
vii.	Near Source Factor, N_v	:	1.6	(Table 208-6)
viii.	Seismic Coefficient, C_a	:	0.64	(Table 208-7)
ix.	Seismic Coefficient, C_v	:	0.896	(Table 208-8)
x.	Coefficient, R	:	8.5	(Table 208-11)
xi.	Coefficient, C_t	:	0.0731	(Section 208.5.2.2)

V. LOAD COMBINATIONS

Reinforced concrete and Steel sections shall be designed using the Strength Design or the Load and Resistance Factor Design method using the load factors and the most critical load combination from the following:

$U = 1.4 (D + F)$	(203-1)
$U = 1.2 (D + F + T) + 1.6 (L + H) + 0.5 (L_r \text{ or } R)$	(203-2)
$U = 1.2 D + 1.6 (L_r \text{ or } R) + (f_1 L \text{ or } 0.5W)$	(203-3)
$U = 1.2 D + 1.0 W + f_1 L + 0.5 (L_r \text{ or } R)$	(203-4)
$U = 1.2 D + 1.0 E + f_1 L$	(203-5)
$U = 0.9 D + 1.0 W + 1.6 H$	(203-6)
$U = 0.9 D + 1.0 E + 1.6 H$	(203-7)

where

f_1 = 1.0 for loads in places of public assembly, for live loads in excess of 4.8kPa, and for garage live load or,
= 0.5 for other live loads
D = dead load
E = earthquake load set forth in Section 208.6.1
F = load due to fluids with well-defined pressures and maximum heights
H = load due to lateral pressure of soil and water in soil
L = live load, except roof live load, including any permitted live load reduction
L_r = roof live load, including any permitted live load reduction
W = load due to wind pressure

For the foundation design, the soil bearing pressure shall be determined using the load factors equal to 1.0.

VI. DRIFT LIMITS

Structures or structural members shall be checked for drift limits as stipulated in Table 12.12-1 of ASCE-7.

STRUCTURAL DESIGN REPORT
SUPERSTRUCTURE AND FOUNDATION

I. SUPERSTRUCTURE

As required, the superstructure was designed to meet the specifications in the design criteria. This will not be written in detail as the focus will be on the foundation. Typical designs of the frame members are given below:

- Beam: 4-12M tension bars and 2-10/12M compression bars; minimum stirrups
- Column: 8-12M bars; minimum ties

Again, note that the design values can still be adjusted based on actual site conditions. It is reiterated that conservative estimates were made in the design criteria.

II. FOUNDATION

The proposed isolated footings were mainly analyzed using a spreadsheet program referenced from NSCP section 413 combined with ETABS. The applied loads are the governing reactions from the ETABS model. The solvers could have opted for a more complicated solution but focus was made on more straightforward industry-standard modeling techniques for future users. This is also the rationale why the embedded concrete-filled bamboo elements were not considered in the modeling. In addition, bamboo has a slightly higher compressive strength than concrete and neglecting not only simplifies the analysis but also is more conservative.

Beam

The beam was analyzed and designed using ETABS. As it rests on ground and also transfers its load on the column connected to the footing, the design loads are very small, only requiring the minimum reinforcement

- Typical and minimum flexural bars: Top & Bottom 2-10M
- Typical and minimum stirrups: 2L-10M; 1 bar at 50mm, the rest at 300mm O.C. TO C.L.

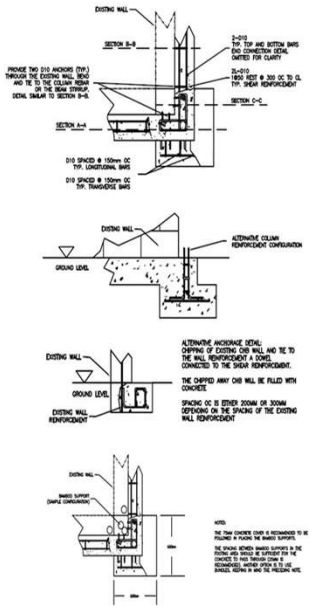
Foundation

The unfactored sum of pressures were obtained from ETABS. A soil capacity of 150kPa was used.

The governing design, flexure, yielded a detail consisting 10M bars @ 150mm C/C. This configuration is safe against one-way and two-way shear. From the combinations of assumptions and typical values, it is therefore recommended that the minimum and typical flexural reinforcement be as follows:

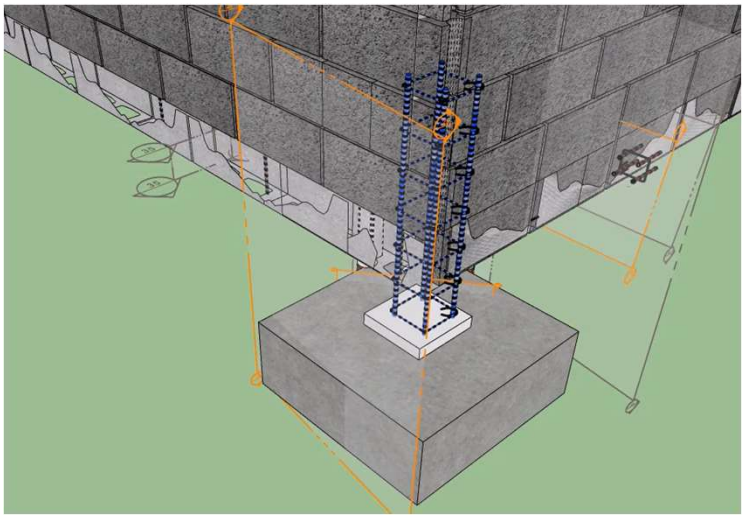
- Typical and minimum footing bars: 10M bars @ 150 C/C

Lastly, note that the grade beam is modelled as supported by the column footing – i.e., negligible pressure is exerted upon the soil.



Proposed Solution: Column Footing Beam Monolith Small-Scale Demonstration

Dean Ashton Plamenco | Ammiel Mac Barros | Diocel Harold Aquino Ph.D. | Fernando Germar Ph.D.
University of the Philippines, Diliman



FINANCIAL/ECONOMIC/COST-EFFECIENCY

- How close is the solution to the original design US$300 dollar?
- Are the household willing to pay the BEAM Monolith solution?
- How much is households' willingness to pay?

Cost Submission Template for Challenge 9934298 - Habitat for Humanity Challenge: Increasing Resilience to Earthquakes and Typhoons for Homes with No Foundations								298.20
	ID #	Description	Quantity	Unit	Unit Price		Cost (USD)	Subtotal	Remarks
1. Material Costs								101.70	
	1	Cement	7	40-kg bags	5.00		35.00		1 cubic meter concrete
	2	Sand	0.50	cu. m.	18.00		9.00		1 cubic meter concrete
	3	Gravel	1.00	cu. m.	24.00		24.00		1 cubic meter concrete
	4	10-mm rebar	12	pcs	2.60		31.20		1 cubic meter concrete
	5	Bamboo	2	pcs	1.25		2.50		
	6								
2. Labor Costs								196.50	
	1	Foreman (1 foreman working on four housing units)	3	man-days	12.00		36.00		
	2	Mason	9	man-days	8.00		72.00		
	3	Steel man	4	man-days	6.00		24.00		
	4	Helper	9	man-days	6.00		54.00		
	5	Excavation	1.5	cu. m.	6.00		9.00		
	6	Backfill	0.5	cu. m.	3.00		1.50		
3. Other Costs (if any)								-	
	1								
	2								
	3								
							GRAND TOTAL	298.20	PHP 16,344.34
									(1USD = P54.81)

Costing proposal from UP Diliman: Beam Monolith (Aug 2021)

BEAM MONOLITH qty: 4 lm

A. MATERIALS

Item Description	qty	unit	price	Total
Portland Cement (any brand)	4.0	bag	230.00	920.00
Washed Sand	7.0	bags	70.00	490.00
3/4" Gravel	13.0	bags	70.00	910.00
10mm dia x 6m RSB	9.0	pcs	235.00	2,115.00
1/2" Marine Plywood (formwork)	1.0	pc	850.00	850.00
3" CWN	0.5	kg	80.00	40.00
2" CWN	0.5	kg	80.00	40.00
GI wire #16	2.0	kgs	90.00	180.00
Total (PHP)				**5,545.00**

B. MANPOWER

Work Item:		man-hour	rate / hr	Total
Excavation	Helper	5	50	250.00
Fabrication and Installation of Rebars	steelman	5	68.75	343.75
Fabrication and Installation of Formworks	carpenter	1	68.75	68.75
Concrete Pouring	Mason	3.5	68.75	240.63
	Helper	3.5	50	175.00
Total (PHP)				**1,078.13**

Summary:

Direct Material Cost	5,545.00
Direct Manpower Cost	1,078.13
Project Management	250.00
Over-all Total	**6,873.13**
Cost per linear meter	1,718.28
Total Cost for a 5x5m House	PHP 34,365.63

Costing proposal from Balay Panday: Beam Monolith (July 2022)

Community/Social Acceptability

- Satisfaction ratings of households, neighbors, and masons
- Ranking of priorities
- Feedback from households, neighbors, and masons for different areas

PART 1. Please rate the following items on a scale of 1 to 5, with 1 being "strongly disagree" and 5 being "strongly agree". Please encircle 1 number for each letter corresponding to the construction method.

Acceptability Criteria		Rate				
1. I find the Beam Monolith retrofit foundation **durable and strong** that can withstand earthquakes and typhoons	Don't know	1	2	3	4	5
2. I find the design of Beam Monolith retrofit foundation **appealing** or attractive to me.	Don't know	1	2	3	4	5
3. The materials used in the construction of the of Beam Monolith retrofit foundation **can easily be found or available** in my area	Don't know	1	2	3	4	5
4. I find the materials used in the Beam Monolith retrofit foundation are of **good in quality that can last more than 10 years**	Don't know	1	2	3	4	5
5. I find the Beam Monolith retrofit foundation **easy to install or construct**	Don't know	1	2	3	4	5
6. I feel **safe and secure** living in the Beam Monolith retrofit foundation	Don't know	1	2	3	4	5
7. I **can easily upgrade and expand** with Beam Monolith retrofit foundation	Don't know	1	2	3	4	5
8. I find Beam Monolith retrofit foundation better **than my previous** constructed house	Don't know	1	2	3	4	5
9. I would recommend the beam monolith to my family, friends and neighbors.	Don't know	1	2	3	4	5
10. I am satisfied with the workmanship of Balay Panday in constructing the beam monolith.	Don't know	1	2	3	4	5
11. Overall, I am satisfied with Beam Monolith retrofit foundation.	Don't know	1	2	3	4	5

Community/Social Acceptability

PART II. AFFORDABILITY. Kindly response to the following questions:

1. What is your estimate of the total cost of the of Beam Monolith retrofit foundation given to you? Php _____

   1.1 **If no idea**, do you think the cost is more than Php 15,000? Yes ____ No_____

   1.1.1 How much is your estimate of the total cost of the Starting Home Kit? Php _____

2. Would you be willing to pay if the cost is between Php 20,000- Php 35,000? Yes ____No____

   2.1.1.1 If yes, how much would you be willing to pay for the Starting Home Kit? Php_____

   2.1.1.2 If no would you be willing to purchase the of Beam Monolith retrofit foundation if you have access to financial products and services (e.g loan/credit)? Yes ____No____Maybe_____

PART III. Please rank each characteristic according to your importance from 1 to 10 (1 very important, 2 next important.....10 least important) and your reasons why?

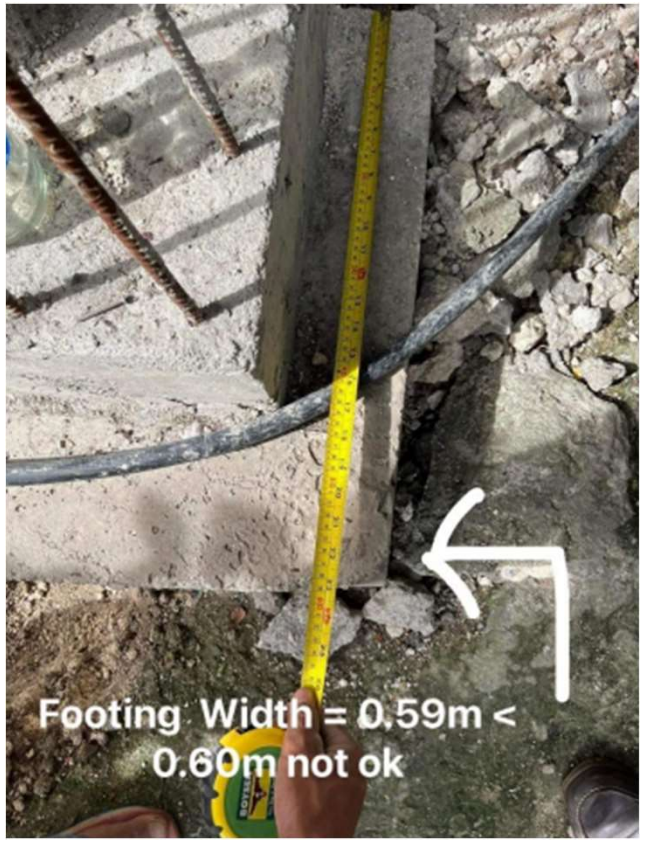
Characteristics	Rank	Reasons
Durability and Strength		
Aesthetics		
Availability of materials		
Quality of materials used		
Affordability		
Easiness of construction/installation		
Comfortability		
Size		
Safety and Security		
Easiness to upgrade and expand		

Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 1: BACULI RESIDENCE **_____ BACULI,** 40 y.o., Lower Capaculan, Tisa Cebu City Contact No: 09277987958 *Wife:* Mrs. Baculi, 39 y.o (09693963828) *Children: 2 (18 and 17)* *Household Monthly Income:* Php 20-25k • House build around 2013 • Mr. Baculi is a technician installer for PLDT Mrs. Baculi works at a salon • House is 25sq feet • House has water and electricity. • Mrs. Baculi has SSS and Pagibig • Family has no loan or financing, source of income is primarily from employment • Aspirational house repairs include wanting to have a build int restroom extension, wants to paint the house, want to eventually build a concrete house with 2nd floor Location (Google) https://goo.gl/maps/2WfBn7qjYjdkHdzb6	CHB, Fiber Cement Board		

House 1: Project Dates August 29 to Sept 2, 2022

House 1: Technical Assessment

HOUSE #01: Jayson Baculi Residence; 5.35m x 4.36m (23.33sq.m.) House Dimensions
Address: Lower Capaculan, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:



House 1: Technical Assessment

House 1: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Date: September 02, 2022
Project **Jayson Baculi**
Covered Dates: August 29, 1pm - Sept 2, 9am
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	August 29 Receipt	1.0	lot	P 6,995.00	6,995.00
	August 30 Receipt	1.0	lot	P 8,954.00	8,954.00
	August 31 Receipt	1.0	lot	P 7,515.00	7,515.00
	September 1 Receipt	1.0	lot	P 3,325.00	3,325.00
	September 1 Receipt	1.0	lot	P 1,875.00	1,875.00
II	**Labor Cost**				
	Arnel Labangon	47.0	hrs	P 62.50	2,937.50
	Norman Boter	47.0	hrs	P 56.25	2,643.75
	Joel Diamante	3.0	hrs	P 75.00	225.00
	Fortunato Diamante	3.0	hrs	P 56.25	168.75
	Workers Provisions	1.0	lot	P 2,000.00	2,000.00
	Supervision	1.0	lot	P 2,000.00	2,000.00
III	**Excess Materials**				
	10mm rebars	-5.0	pcs	P 210.00	(1,050.00)
	Premium Cement	-4.0	bags	P 240.00	(960.00)
	Tie Wire	-1.0	kg	P 90.00	(90.00)
	3/4 Gravel	-13.0	bags	P 75.00	(975.00)
	Washed Sand	-4.0	bags	P 75.00	(300.00)
			GRAND TOTAL		35,264.00

- Total Material Costs: ₱25,289 (72%)
- Total Labor Costs: ₱7,975 (23%)
- Total Professional Fees: ₱2,000 (6%)
- Total ₱35,264

House 1: Social Acceptability Assessment

Households Name	durable and strong	appealing or attractive to me.	materials can easily be found or available in my area	materials are of good in quality that can last more than 10 years	easy to install or construct	feel safe and secure living	upgrade and expand	Beam Monolith: better than my previous constructed house	would recommend the beam monolith to my family, friends and neighbors	satisfied with the workmanship of Balay Panday in constructing the beam monolith	Overall, I am satisfied with Beam Monolith retrofit foundation.
J.Baculi	5	5	4	5	5	5	5	5	5	5	5

Durability and Strength	Reasons	Aesthetics	Reasons	Availability of materials	Reasons	Quality of materials used	Reasons	Affordability	Reasons	Easiness of construction/installation	Reasons	Comfortability	Reasons	Size	Reasons	Safety and Security	Reasons	Easiness to upgrade and expand	Reasons
1	house should be strong to withsand calamities	2	pleasant to live in abeautiful house	9	it is better if matterilas is avilable and delivered immediately	5	choose quality of material versus price	6	it should fit the budget	7	so house be easily finished it could save money	4	nice feeling in a comfortable house	10	not need big space as long evryone will fit	3	it would be difficult for robbers to enter	8	if money is available it would be easy to work on expansion

House 1: Social Acceptability Assessment

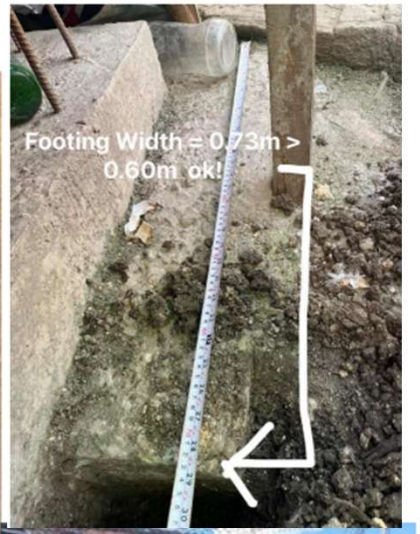
estimate of the total cost of the Beam Monolith retrofit foundation given to you?	*Would you be willing to pay if the cost is between Php 20,000-Php 35,000?*	*If no would you be willing to purchase the of Beam Monolith retrofit foundation if you have access to financial products and services (e.g loan/credit)?*	*PART IV. Please share any additional information you think necessary for this survey.*
40,000	*no*	*no (i will finish the house with lower quality)*	**if the whole upgrade will be done it would be much stronger. Neighbors want to have the same type of construction and materials made beacuse of its proper foundation**

Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 2: CABALERRO RESIDENCE Clinton Caballero, 27 y.o Angela Constantino, 24 y.o Children (4 and 10 y.o) 09662308539 Clinton works as a food delivery for a company. Angela works as a store manager for a restaurant in the city, combined monthly income is approx. P20,000-25,000 1st Ocular visit: August 30, 2022 House size is 8x 10 feet. House was construction during first year of the pandemic, 2020 Land is owned by Mr. Caballeros father (compound with his siblings and family members) Location (Google) https://goo.gl/maps/jUjmkvSa9igev8b78	CHB Wood and plyboard		

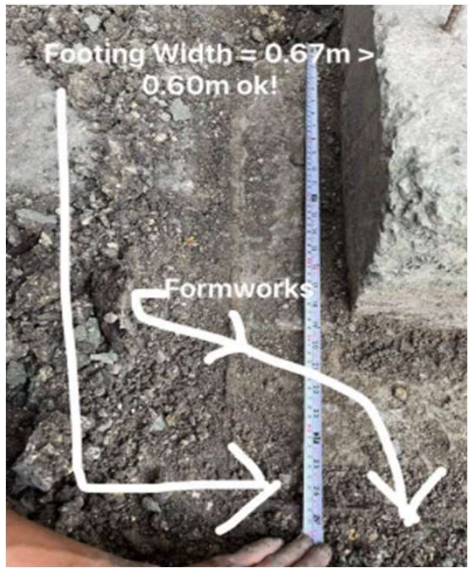
House 2: Project Dates Oct 17-19, 2022

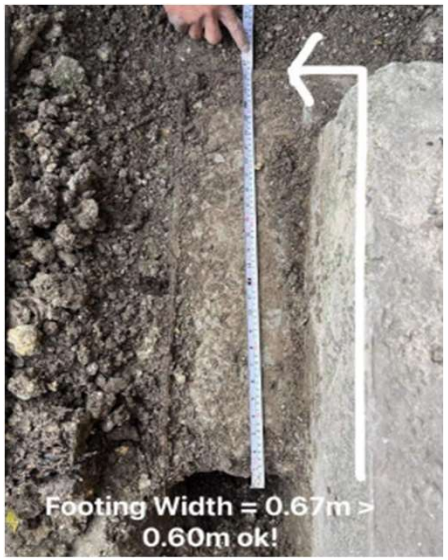
House 2: Technical Assessment

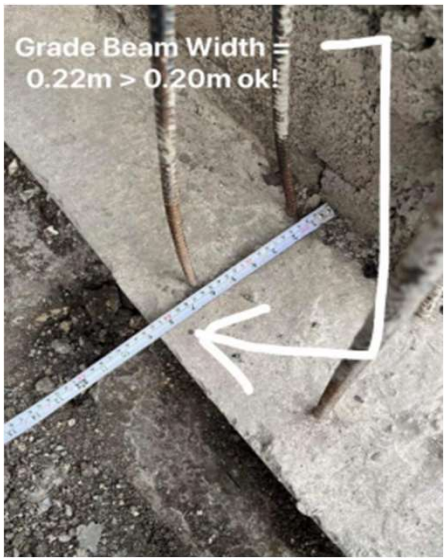
HOUSE #02: Clinton Caballero Residence; 3.30m x 2.70m (8.91sq.m.) House Dimensions
Address: Sitio Capaculan, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:



House 2: Technical Assessment







House 2: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Date: October 21, 2022
Project **Clinton Caballero**
Covered Dates: Oct 17 - 19
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	Oct 17 Receipt	1.0	lot	P 7,235.00	7,235.00
	Oct 18 Receipt	1.0	lot	P 7,840.00	7,840.00
II	**Labor Cost**				
	Arnel Labangon	40.0	hrs	P 62.50	2,500.00
	Norman Boter	40.0	hrs	P 56.25	2,250.00
	Workers Provisions	1.0	lot	P 1,500.00	1,500.00
	Supervision	1.0	lot	P 2,000.00	2,000.00
			GRAND TOTAL		23,325.00

- Total Material Costs: ₱15,075 (65%)
- Total Labor Costs: ₱6,250 (27%)
- Total Professional Fees: ₱2,000 (9%)
- Total ₱23,325

House 2: Social Acceptability Assessment

Households Name	durable and strong	appealing or attractive to me.	materials can easily be found or available in my area	materials are of good in quality that can last more than 10 years	easy to install or construct	feel safe and secure living	upgrade and expand	Beam Monolith: better than my previous constructed house	would recommend the beam monolith to my family, friends and neighbors	satisfied with the workmanship of Balay Panday in constructing the beam monolith	Overall, I am satisfied with Beam Monolith retrofit foundation.
C.Caballero	5	5	5	5	5	5	5	5	5	5	5

Durability and Strength	Reasons	Aesthetics	Reasons	Availability of materials	Reasons	Quality of materials used	Reasons	Affordability	Reasons	Easiness of construction/installation	Reasons	Comfortability	Reasons	Size	Reasons	Safety and Security	Reasons	Easiness to upgrade and expand	Reasons
1	N/A	4	N/A	10	N/A	5	N/A	8	N/A	9	N/A	2	N/A	6	N/A	3	N/A	7	N/A

House 2: Social Acceptability Assessment

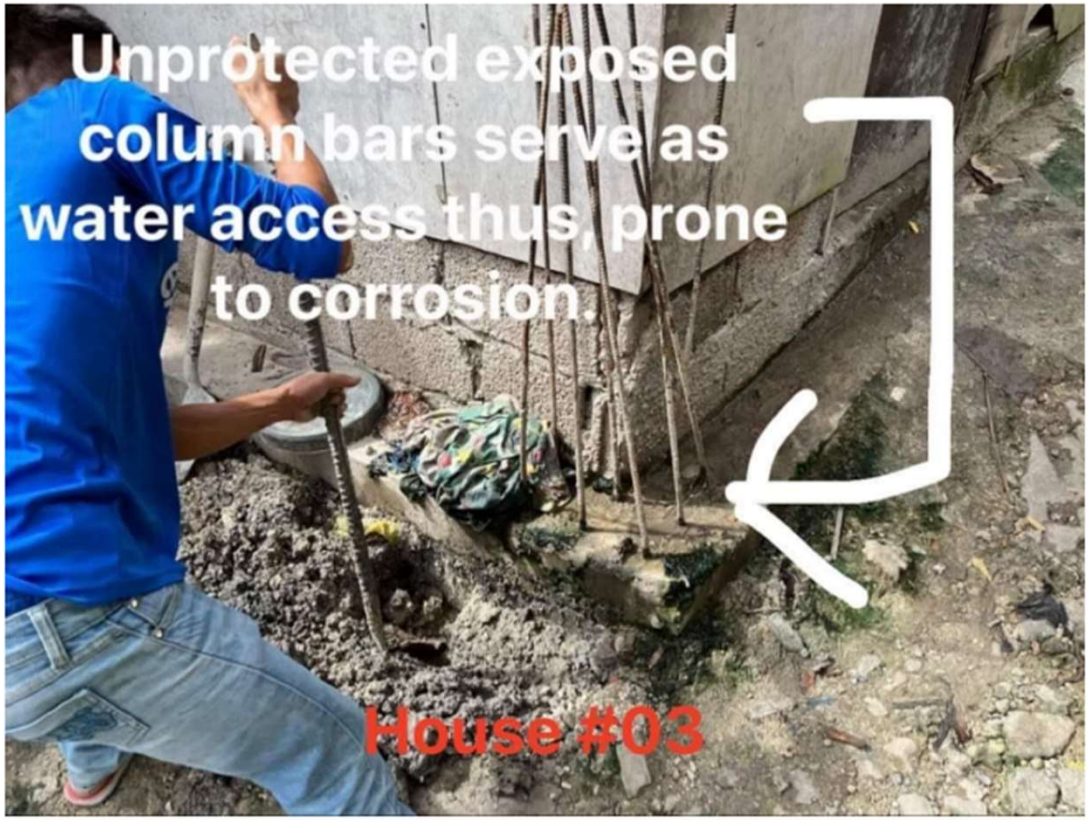
1. What is your estimate of the total cost of the Beam Monolith retrofit foundation given to you? Php	***1.1 If no idea, do you think the cost is more than Php 15,000?***	***Would you be willing to pay if the cost is between Php 20,000- Php 35,000?***	***If no would you be willing to purchase the of Beam Monolith retrofit foundation if you have access to financial products and services (e.g loan/credit)?***	***PART IV. Please share any additional information you think necessary for this survey.***
	30,000	*no*	*yes*	respondent is a bit in a hurry

Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 3: MORENO RESIDENCE **LOUELA MORENO, 34 y.o** Lower Capaculan, Tisa Cebu City Contact No: *Husband: Roger Moreno. 37 y.o.* *Children:* 4 (6,8,13,15 y.o) *Household Monthly Income*: Php 20,00 to 30,000 • House is less than 2 years old. • Doesn't have water connection inside house, toilet is outside • Husband works as a construction worker and earns about P10,000 per month while wife is a vendor earning from 6-8k Per month (Combined monthly income around P 18, 000 per month) 1st Visit preselection: July 28, 2022 Location (Google) https://goo.gl/maps/9hgG94auiD9t3w2w7	Fiber cement board, concrete base / CHB, CGI Sheets		

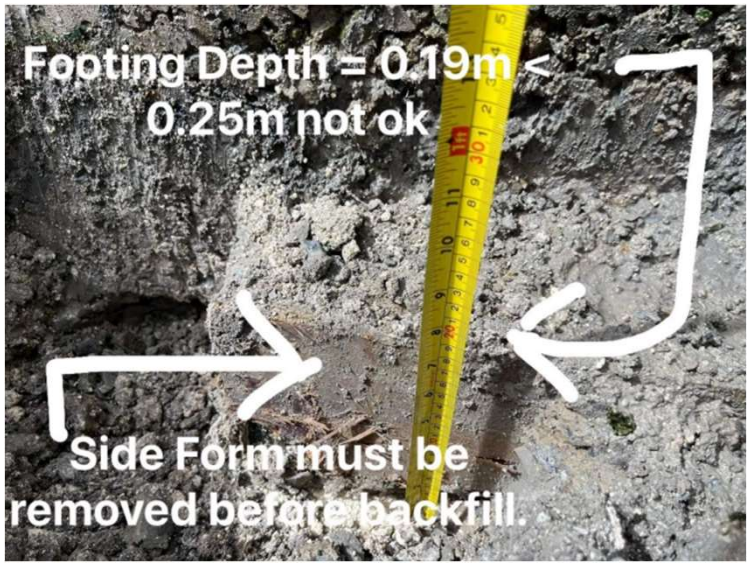
House 3: Project Dates Oct 20,21,24 and 25, 2022

House 3: Technical Assessment

HOUSE #03: Louela Moreno Residence; 6.10m x 4.70m (28.67sq.m.) House Dimensions
Address: Lower Capaculan, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:



House 3: Technical Assessment



House 3: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Project **Roger Moreno**
Covered Dates: Oct 20, 21, 24, 25
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	Oct 20 Receipt	1.0	lot	P 6,080.00	6,080.00
	Oct 21 Receipt	1.0	lot	P 5,340.00	5,340.00
	Oct 24 Receipt	1.0	lot	P 7,840.00	7,840.00
	Oct 25 Receipt	1.0	lot	P 1,445.00	1,445.00
II	**Labor Cost**				
	Arnel Labangon	48.0	hrs	P 62.50	3,000.00
	Norman Boter	48.0	hrs	P 56.25	2,700.00
	Workers Provisions	1.0	lot	P 2,000.00	2,000.00
	Supervision	1.0	lot	P 2,000.00	2,000.00
			GRAND TOTAL		30,405.00

- Total Material Costs: ₱20,705 (68%)
- Total Labor Costs: ₱7,700 (25%)
- Total Professional Fees: ₱2,000 (7%)
- Total ₱30,405

House 3: Social Acceptability Assessment

Households Name	durable and strong	appealing or attractive to me.	materials can easily be found or available in my area	materials are of good in quality that can last more than 10 years	easy to install or construct	feel safe and secure living	upgrade and expand	Beam Monolith: better than my previous constructed house	would recommend the beam monolith to my family, friends and neighbors	satisfied with the workmanship of Balay Panday in constructing the beam monolith	Overall, I am satisfied with Beam Monolith retrofit foundation.
L.Moreno	5	4	5	5	5	4	3	3	4	4	4

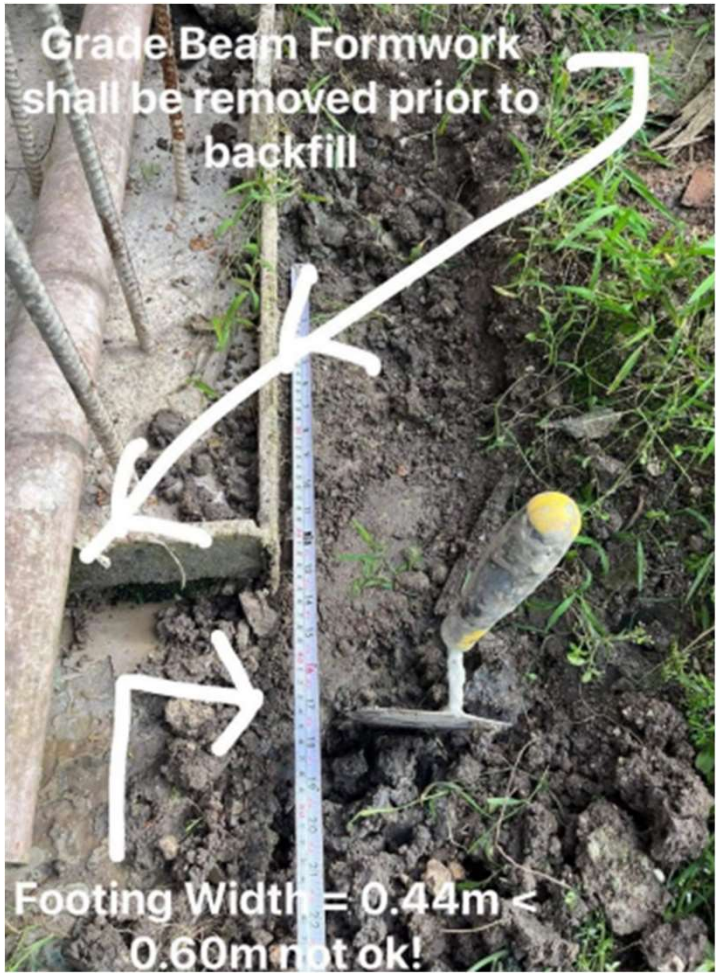
Durability and Strength	Reasons	Aesthetics	Reasons	Availability of materials	Reasons	Quality of materials used	Reasons	Affordability	Reasons	Easiness of construction/installation	Reasons	Comfortability	Reasons	Size	Reasons	Safety and Security	Reasons	Easiness to upgrade and expand	Reasons
2	should not be destroyed by typhoon	9	should have good craftsmanship	3	it should beat hand during construction	5	value of money	8	we dont know the actual price	7	material is available	4	should have no water seeping in "hunob"	6	should accomodate the whole fasmily	1	our house should remain standing during typhoon	10	depends on the budget

Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 4: LABRA RESIDENCE Homeowner 1: Elma Labra Sitio Capaculan Owned the land. Household income: Php15,000 a month, taxi driver Mobile: 09616210207 Ocular visit: Sept 22, 2022 Location (Google) https://goo.gl/maps/KDHgiTAsX7K3YiGk7	CHB, CGI Sheets		

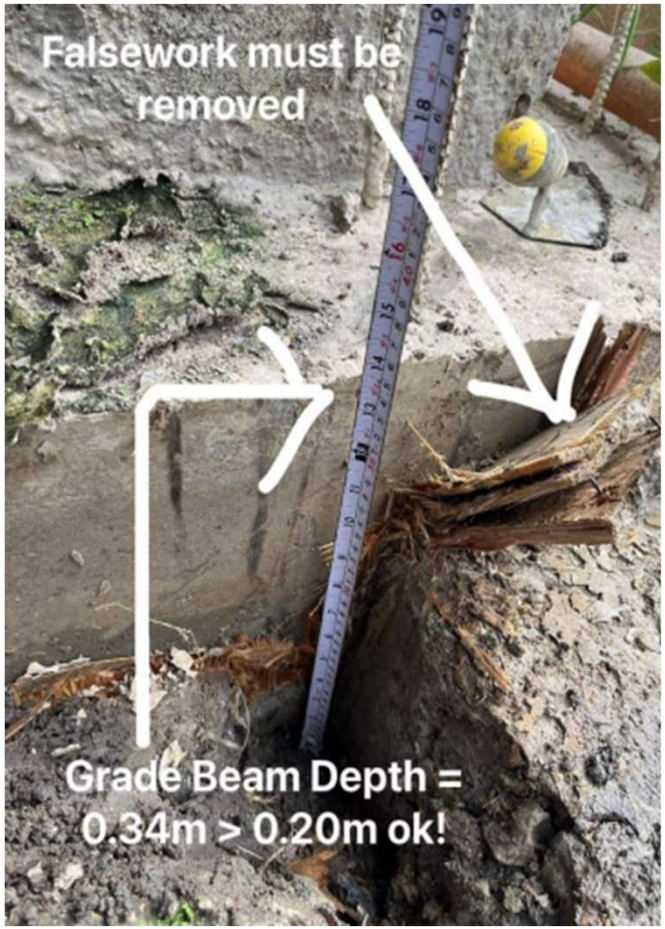
House 4: Project Dates Oct 27 and 28, 2022

House 4: Technical Assessment

HOUSE #04: Elma Labra Residence; 6.80m x 4.40m (29.92sq.m.) House Dimensions
Address: Sitio Capaculan, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:



House 4: Technical Assessment



House 4: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Project **Elma Labra**
Covered Dates: Oct 27,28
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	Oct 27 Receipt	1.0	lot	P 13,210.00	13,210.00
	Oct 28 Receipt	1.0	lot	P 5,205.00	5,205.00
II	**Labor Cost**				
	Arnel Labangon	24.0	hrs	P 62.50	1,500.00
	Norman Boter	24.0	hrs	P 26.25	630.00
					-
					-
				GRAND TOTAL	20,545.00

- Total Material Costs: ₱18,415 (90%)
- Total Labor Costs: ₱2,130 (25%)
- Total Professional Fees: (0%)
- Total ₱20,545

House 4: Social Acceptability Assessment

Households Name	*durable and strong*	*appealing or attractive to me.*	*materials can easily be found or available in my area*	*materials are of good in quality that can last more than 10 years*	*easy to install or construct*	*feel safe and secure living*	*upgrade and expand*	*Beam Monolith: better than my previous constructed house*	*would recommend the beam monolith to my family, friends and neighbors*	*satisfied with the workmanship of Balay Panday in constructing the beam monolith*	*Overall, I am satisfied with Beam Monolith retrofit foundation.*
E Labra	*5*	*4*	*5*	*3*	*5*	*3*	*4*	*4*	*5*	*5*	*5*

Durability and Strength	*Reasons*	***Aesthetics***	*Reasons*	***Availability of materials***	***Reasons***	***Quality of materials used***	***Reasons***	***Afford ability***	***Reasons***	***Easiness of construction/install***	***Reasons***	***Comfort ability***	***Reasons***	***Size***	***Reasons***	***Safety and Security***	***Reasons***	***Easiness to upgrade and expand***	***Reasons***
1	it should withsatnd calamities especially fire	10	it is just for the eyes	6	it should be available so work is fast	3	high quality is stronger	9	if budget is available it be constructed	7	it should be easy done	4	should be comfortable living inside during calamities	8	in a big size you can gather the family	2	nowadays there many thief house should be safe	5	if funds gets bigger it would be easy to expand

House 4: Social Acceptability Assessment

1. What is your estimate of the total cost of the Beam Monolith retrofit foundation given to you? Php	*Would you be willing to pay if the cost is between Php 20,000-Php 35,000?*	*If yes, how much would you be willing to pay for the Starting Home Kit? Ph*	*PART IV. Please share any additional information you think necessary for this survey.*
22,000	*yes*	*22,000*	An Engineer came in the middle of the construction noted that the side walls should have 4 layers of blocks to make it stronger

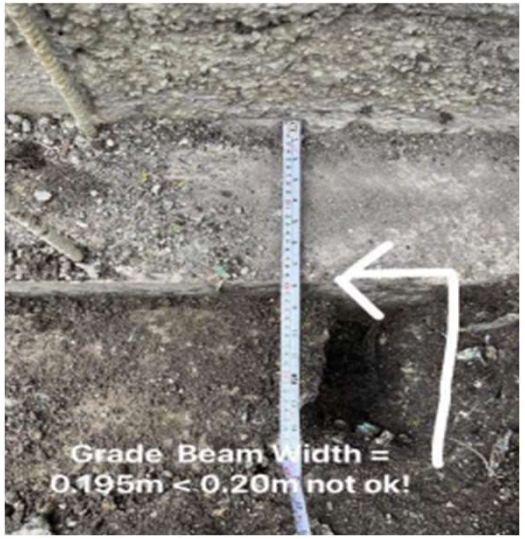
Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 5: RAMO RESIDENCE Mrs. Cara Ramo from Brgy Mansanitas, Tisa (about 500 meters from Urban Deca Homes sa Tisa) cellphone- 09254500830 • Monthly HH income between P15,000-P25,000 • Occupation: Owns sari sari store and husband is Taxi Drive • Owns the land. Ocular visit: Sept 17, 2022 Location (Google) https://goo.gl/maps/k56Vc55F5CzUU6gj7	CHB, CGI roof destroyed during Typhoon Odette)		

House 5: Project Dates Nov 9, 10, and 11, 2022

House 5: Technical Assessment

HOUSE #05: Cara Ramo Residence; 3.68m x 3.65m (13.43sq.m.) House Dimensions
Address: Sitio Mansanitas, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:

House 5: Technical Assessment



House 5: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Date: **Cara Ramo**
Covered Da Nov 9, 10, 11
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	Nov 9 Receipt	1.0	lot	P 11,180.00	11,180.00
	Nov 10 Receipt	1.0	lot	P 6,890.00	8,120.00
*	Nov 16 Receipt	1.0	lot	P 1,410.00	1,410.00
II	**Labor Cost**				
	Arnel Labangon	36.0	hrs	P 62.50	2,250.00
	Norman Boter	36.0	hrs	P 56.25	2,025.00
**	Mobilization	1.0	lot	P 1,000.00	1,000.00
	Workers Provisions	1.0	lot	P 2,000.00	2,000.00
	Supervision	1.0	lot	P 2,000.00	2,000.00
			GRAND TOTAL		29,985.00

**Items were miscommunicated and charged late.*

***Mobilization was added to this project due to the location constraints where workers are being transported daily to site.*

- Total Material Costs: ₱20,710 (69%)
- Total Labor Costs: ₱7,275 (24%)
- Total Professional Fees: ₱2,000 (7%)
- Total ₱29,985

House 5: Social Acceptability Assessment

Households Name	durable and strong	appealing or attractive to me.	materials can easily be found or available in my area	materials are of good in quality that can last more than 10 years	easy to install or construct	feel safe and secure living	upgrade and expand	Beam Monolith: better than my previous constructed house	would recommend the beam monolith to my family, friends and neighbors	satisfied with the workmanship of Balay Panday in constructing the beam monolith	Overall, I am satisfied with Beam Monolith retrofit foundation.
C Ramo	5	4	5	5	5	3	5	5	4	3	4

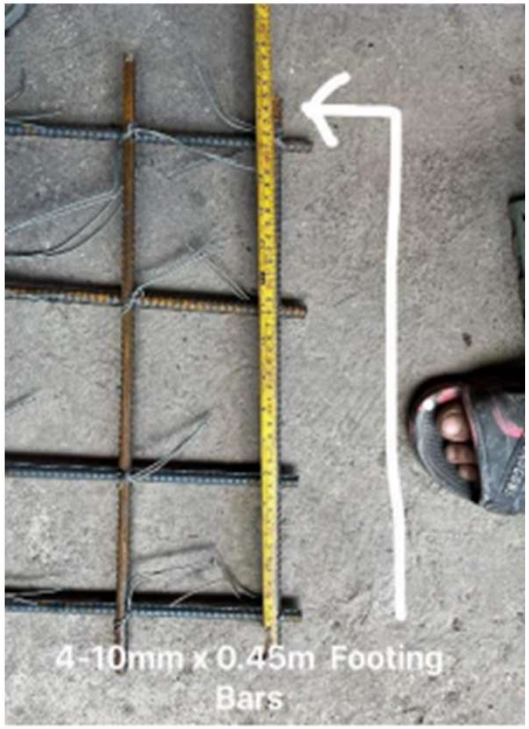
Durability and Strength	Reasons	Aesthetics	Reasons	Availability of materials	Reasons	Quality of materials used	Reasons	Affordability	Reasons	Easiness of construction /installation	Reasons	Comfort ability	Reasons	Size	Reasons	Safety and Security	Reasons	Easiness to upgrade and expand	Reasons
2	so it could last many year	6	hayahay makit an	9	lig-on mukanat	3	so house is strong and not easily damage	4	easily be bought or made when funds are available	10	its just easy to get a carpenter	5	comfortable that no theif could go in	8	should have nice lay out for a sala	1	safe from fire house should no be a fire hazard	7	for extra space for childre

Name of Partner Family	Materials of current house structure	Pictures (Before Construction)	Pictures (after construction)
HOUSE 6: PALANG RESIDENCE Homeowner 2: Mary Doris Palang Mobile: 09254526752 Address: Sitio Lower Capaculan, Brgy Tisa Source of Income: Husband is electrician. Income: More than 10,000 Owned the land. GPS Coordinates: 10.306609, 123.872722 GPS link: https://goo.gl/maps/bWKidZCxtrwb7Mrb7	CHB, Fiber cement board, CGI Roof		

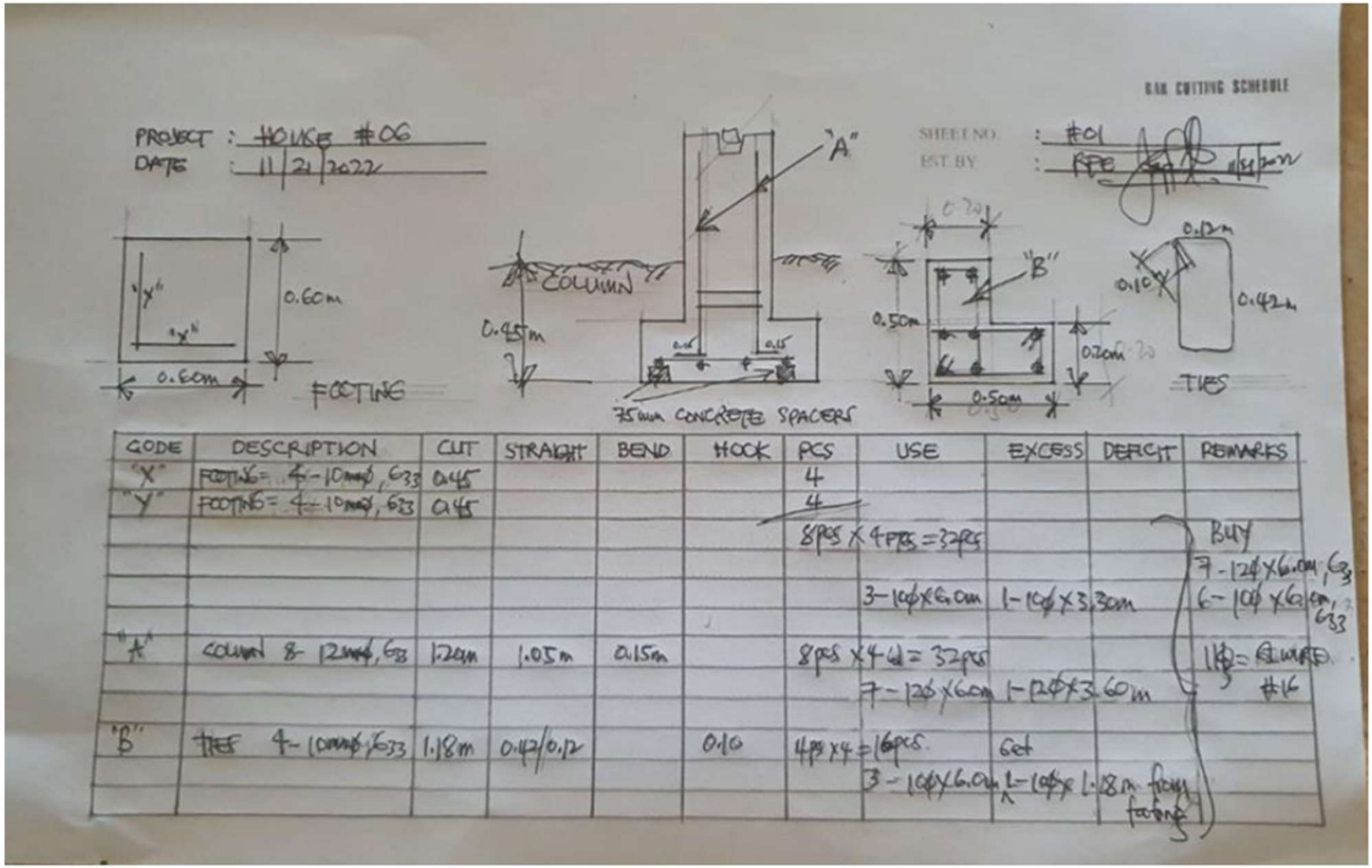
House 6: Project Dates Dec 5-19, 2022

House 6: Technical Assessment

HOUSE #06: Mary Doris Palang Residence; 2.70m x 2.40m (6.48sq.m.) House Dimensions
Address: Sitio Capaculan, Barangay Tisa, Labangon, Cebu City
Actual Measurements taken:



Detailed Construction Notes for Implementation:



BAR CUTTING SCHEDULE

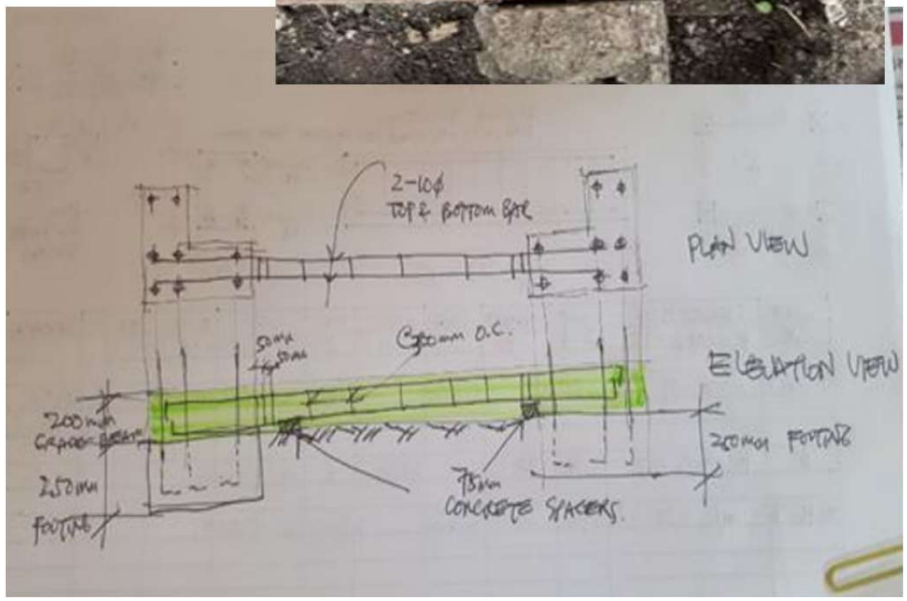
PROJECT : HOUSE #06
DATE : 11/21/2022

SHEET NO : #01
EST BY : REE

FOOTING

TIES

CODE	DESCRIPTION	CUT	STRAIGHT	BEND	HOOK	PCS	USE	EXCESS	DEFICIT	REMARKS
"X"	FOOTING = 4-10mmØ, G33	0.45				4				
"Y"	FOOTING = 4-10mmØ, G33	0.45				4				
						8pcs x 4pcs = 32pcs				BUY
							3-10Ø x 6.0m	1-10Ø x 3.30m		7-12Ø x 6.0m, G33
										6-10Ø x 6.0m, G33
"A"	COLUMN 8-12mmØ, G33	1.20m	1.05m	0.15m		8pcs x 4 = 32pcs				1Kg = 4 LINKED #16
							7-12Ø x 6.0m	1-12Ø x 3.60m		
"B"	TIES 4-10mmØ, G33	1.18m	0.42/0.12		0.10	4pcs x 4 = 16pcs.		Get		
							3-10Ø x 6.0m	1-10Ø x 1.8m from footing		

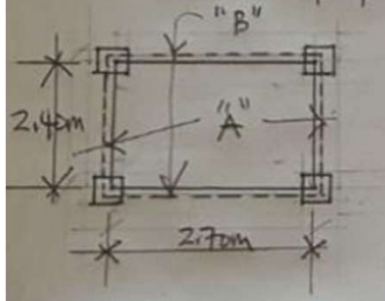

2-16ϕ
TOP & BOTTOM BAR
PLAN VIEW
ELEVATION VIEW
200mm FOOTING
75mm
CONCRETE SPACERS.

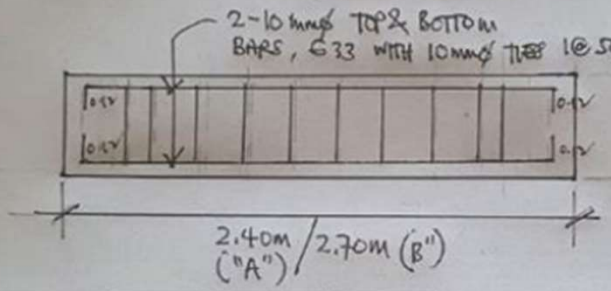
BAR CUTTING SCHEDULE

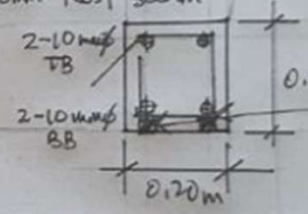
PROJECT : HOUSE #06
DATE : 11/30/2022

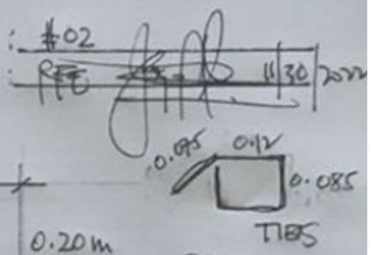
SHEET NO : #02
EST BY : RFE

GRADE BEAM





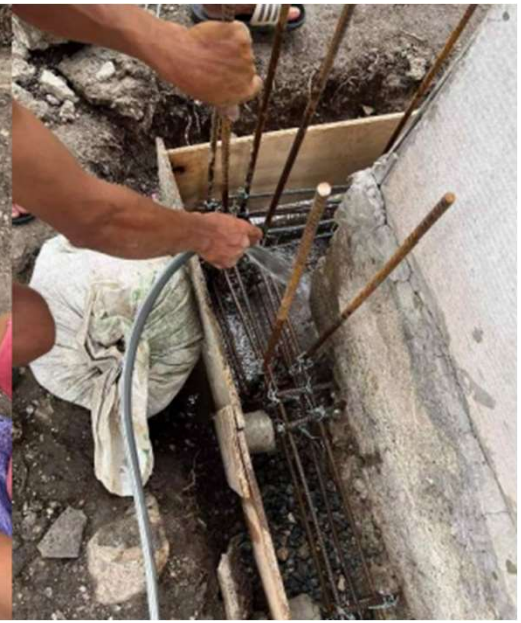


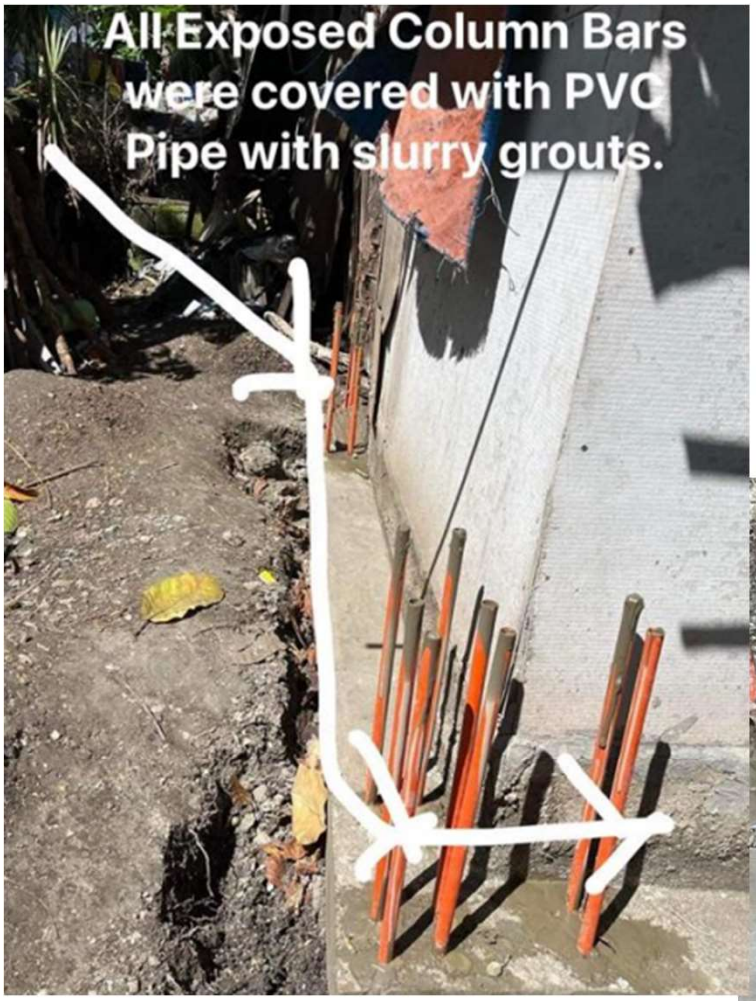


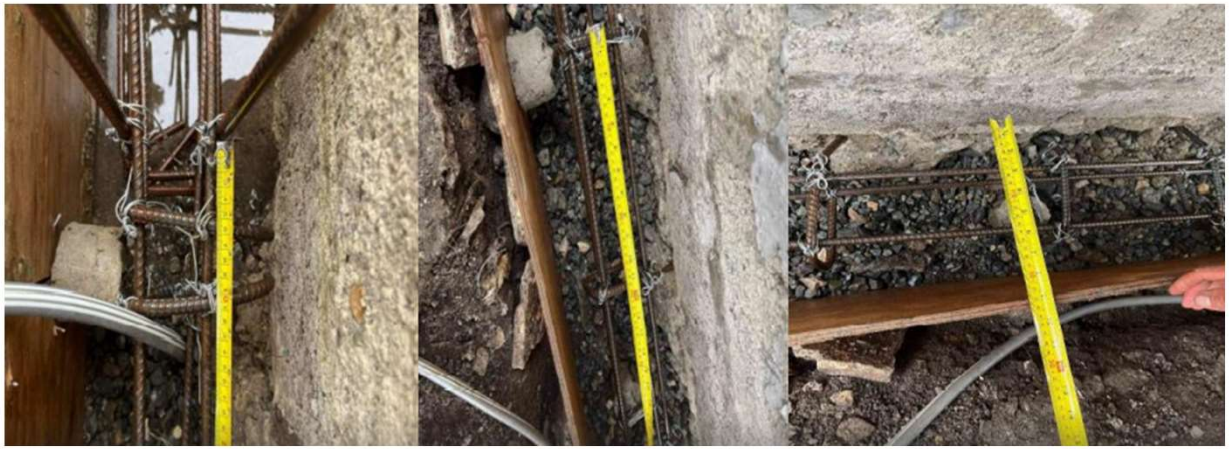
CODE	DESCRIPTION	CUT	STRAIGHT	BEND	HOOKS	PCS	USE	EXCESS	DEFICIT	REMARKS
"A"	4-10mmφ, G33	2.64	2.40		0.12(2)	8	4-10φx6.0m	4-0.72m		
TIES FOR "A"	10mmφ, G33	0.485		2-0.12 2-0.085		11(2)=22	2-10φx6.0m	1-1.15m		ORDER 12-10φx6.0m
"B"	4-10mmφ, G33	2.94	2.70		0.12(2)	8	4-10φx6.0m			
TIES FOR "B"	10mmφ, G33	0.485		2-0.12 2-0.085		12(2)=24	2-10φx6.0m			






All Exposed Column Bars were covered with PVC Pipe with slurry grouts.




Grade Beam Depth @ 0.27m > 0.20m ok!


Footing Depth @ 0.25m per plan, ok!

House 6: Financial/Economic Assessment

EXPENSE RUNDOWN

Project: **Grade Beam Monolith Retrofitting**
Date: December 05, 2022
Project **Mary Doris Palang**
Covered Da Dec. 5-19, 2022
Location Capaculan, Tisa, Cebu City

ITEM	SCOPE OF WORK	QTY	UNIT	UNIT COST	AMOUNT
I	**Materials**				
	Dec 5 Receipt	1.0	lot	P 5,265.00	5,265.00
	Dec 5 Receipt	1.0	lot	P 4,990.00	4,990.00
	Dec 5 Receipt	1.0	lot	P 270.00	270.00
	Dec 12 Receipt	1.0	lot	P 3,118.00	3,118.00
	Dec 14 Receipt	1.0	lot	P 6,555.00	6,555.00
	Dec 19 Receipt	1.0	lot	P 210.00	210.00
				SUBTOTAL	**20,408.00**
II	**Labor Cost**				
	Arnel Labangon	68.0	hrs	P 62.50	4,250.00
	Ayan Villasorda	68.0	hrs	P 56.25	3,825.00
	Workers Provisions	1.0	lot	P 2,000.00	2,000.00
	Supervision	1.0	lot	P 2,000.00	2,000.00
				SUBTOTAL	**12,075.00**
			GRAND TOTAL		**32,483.00**

- Total Material Costs: ₱20,498 (63%)
- Total Labor Costs: ₱10,075 (31%)
- Total Professional Fees: ₱2,000 (7%)
- Total ₱32,483

House 6: Social Acceptability Assessment

Households Name	durable and strong	appealing or attractive to me.	materials can easily be found or available in my area	materials are of good in quality that can last more than 10 years	easy to install or construct	feel safe and secure living	upgrade and expand	Beam Monolith: better than my previous constructed house	would recommend the beam monolith to my family, friends and neighbors	satisfied with the workmanship of Balay Panday in constructing the beam monolith	Overall, I am satisfied with Beam Monolith retrofit foundation.
N Palang	3	5	4	4	4	4	4	5	3	5	5

Durability and Strength	Reasons	Aesthetics	Reasons	Availability of materials	Reasons	Quality of materials used	Reasons	Affordability	Reasons	Easiness of construction/ installation	Reasons	Comfortability	Reasons	Size	Reasons	Safety and Security	Reasons	Easiness to upgrade and expand	Reasons
1		10	it will just be put on later	8		2		7		9		3		6		4		5	

House 6: Social Acceptability Assessment

1.1 If no idea, do you think the cost is more than Php 15,000?	*Would you be willing to pay if the cost is between Php 20,000- Php 35,000?*	*If no would you be willing to purchase the of Beam Monolith retrofit foundation if you have access to financial products and services (e.g loan/credit)?*	*PART IV. Please share any additional information you think necessary for this survey.*
10,000 to 12,000	***no***	***no. i dont want to be in debt***	**second floor is the safest expansion 3rd floor will be a bit not safe. some time materilas in the construction was delayed. some equipment was needed in the contruction especillay on breaking big rocks near the foundatio. Foundation is niot deep enough. There will be some section to be taken out when doing expansion. Not recommending fully to other because the foundation is shallow**

SUMMARY OF 6 HOUSES
COST-EFFECIENCY/ ECONOMIC VIABILITY

Items	Original Design*		Actual Cost Cost (Field Testing)**		Adjusted Budget (pre-implementation)***		Average Actual Cost (6 houses)	
Materials	**5,050**	34%	**17, 565**	70%	**27,725**	80%	**20,100**	69%
Labor	**9,825**	66%	**7,375**	30%	**5,391**	16%	**6,901**	24%
Professional Fees	-	-	**-**	-	**1,250**	4%	**2,000******	7%
Total	**14,875**	100%	**24,940**	100%	**34,366**	100%	**29,001**	100%

* *Cost of BEAM Monolith submitted by UP ICE team to the Challenge Foundation*
** *The actual cost of the BEAM Monolith construction based on the result of field testing in Valenzuela*
*** *Balay Panday estimated budget of BEAM Monolith construction in Cebu including professional fee*
*** *Fixed professional fee*

SUMMARY OF 6 HOUSES COST-EFFECIENCY

Items	House 1		House 2		House 3		House 4		House 5		House 6	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Materials	**25,289**	72%	**15,075**	65%	**20,705**	68%	**18,415**	90%	**20,710**	69%	**20,408**	63%
Labor	**7,975**	22%	**6,250**	27%	**7,700**	25%	**2,130**	10%	**7,275**	24%	**10,075**	31%
Professional Fees	**2,000**	6%	**2,000**	8%	**2,000**	7%	**0**	0	**2,000**	7%	**2,000**	6%
Total	**35,264**	100	**23, 325**	100	**30, 405**	**100**	**20,545**	100	**29, 985**	100	**32,483**	100

SUMMARY OF 6 HOUSES COST-EFFECIENCY

Perceived cost of BEAM Monolith construction (n=14)

Estimated cost (Php)	Households	Neighbors	Masons	Total
Below 15,000	1	1	1	3
15,000-19,999				0
20,001- 24,999	1	1	1	3
25,000-29,999	1			1
30,000-34,999	2	2		4
35,000-39,999		1		1
40,000 and above	1	1		2
Total	6	6	2	14

SUMMARY OF 6 HOUSES COST-EFFECIENCY

Willingness to pay (n=14)

- Yes = 10
- No = 4 (target households)

Estimated cost (Php)	Households (n=2)	Neighbors (n=6)	Masons (n=2)	Total (n=10)
Below 15,000		1	1	2
20,001- 24,999	1	2		3
25,000-29,999	1	1	1	3
30,000-34,999		1		1
Above 35,000		1		1
Total	2	6	2	10

COMMUNITY ACCEPTABILITY

- Satisfaction ratings of households, neighbors, and masons
- Feedback from households, neighbors, and masons for different areas

Statements (HOUSEHOLDS)	H1	H2	H3	H4	H5	H6	Ave
OVER-ALL SATISFACTION	**5**	**5**	**4**	**5**	**4**	**5**	**4.7**
Easy to install or construct	5	5	5	5	5	4	**4.8**
Durability and strength	5	5	5	5	5	3	**4.7**
Materials are easily be found or available	4	5	5	5	5	4	**4.7**
Better than before (constructed houses, materials used)							**4.5**
Material used are of good in quality that can last more than 10 years	5	5	5	3	5	4	**4.5**
Workmanship of Balay Panday in constructing the beam monolith	5	5	4	5	3	5	**4.5**
Design is appealing or attractive (aesthetics)	5	5	4	4	4	5	**4.5**
Easy to upgrade and expand with Beam Monolith retrofit foundation	5	5	3	4	5	4	**4.3**
Can easily recommend to my family, friends and neighbors	5	5	4	5	4	3	**4.3**
Safety and Security	5	5	4	3	3	4	**4.0**

* Likert Scale of 5: 1 lowest satisfaction, 5 highest satisfaction

Statements (NEIGHBORS)	N1	N2	N3	N4	N5	N6	Ave
OVER-ALL SATISFACTION	**4**	**5**	**5**	**5**	**5**	**3**	**4.5**
Easy to upgrade and expand with Beam Monolith retrofit foundation	4	5	5	5	5	3	4.5
Easy to install or construct	4	4	3	5	5	5	4.3
Material used are of good in quality that can last more than 10 years	3	5	5	5	5	3	4.3
Safety and Security	4	3	5	5	5	3	4.2
Materials are easily be found or available	4	2	4	5	4	5	4.0
Durability and strength	3	5	4	5	5	2	4.0
Design is appealing or attractive (aesthetics)	3	4	3	5	5	1	3.5

* Likert Scale of 5: 1 lowest, 5 highest

Statements (MASONS)	Mason 1	Mason 2	Ave
OVER-ALL SATISFACTION	**5**	**5**	**5.0**
Easy to install or construct	5	5	5.0
Materials are easily be found or available	5	5	5.0
Material used are of good in quality that can last more than 10 years	5	5	5.0
Safety and Security	5	5	5.0
Design is appealing or attractive (aesthetics)	5	4	4.5
Easy to upgrade and expand with Beam Monolith retrofit foundation	4	5	4.5
Durability and strength	4	4	4.0

* Likert Scale of 5: 1 lowest satisfaction, 5 highest satisfaction

Statements (HOUSEHOLDS)	Average (n=14)
OVER-ALL SATISFACTION	**4.5**
Easy to install or construct	**4.6**
Better than before (constructed houses, materials used)	**4.6**
Material used are of good in quality that can last more than 10 years	**4.5**
Workmanship of Balay Panday in constructing the beam monolith	**4.5**
Materials are easily be found or available	**4.4**
Easy to upgrade and expand with Beam Monolith retrofit foundation	**4.4**
Durability and strength	**4.3**
Can easily recommend to my family, friends and neighbors	**4.3**
Safety and Security	**4.2**
Design is appealing or attractive (aesthetics)	**4.1**

* Likert Scale of 5: 1 lowest, 5 highest

COMMUNITY ACCEPTABILITY

	Feedback
House 1	*“ if the whole upgrade will be done it would be much stronger. Neighbors want to have the same type of construction and materials made because of its proper foundation” -*
House 2	No feedback
House 3	*“people who have seen the new beam would like to copy it - strong, and workmanship is good. No more water seeping after the construction. But budget constrains prevent us on improving and expanding”*
House 4	*“the side walls should have 4 layers of blocks to make it stronger”*
House 5	*Thankful and happy that chosen as beneficiary*
House 6	*“ Second floor is the safest expansion 3rd floor will be a bit not safe. some time materials in the construction was delayed. some equipment was needed in the construction especially on breaking big rocks near the foundation. Foundation is not deep enough. There will be some section to be taken out when doing expansion. Not recommending fully to other because the foundation is shallow”*

COMMUNITY ACCEPTABILITY

	Feedbacks
Neighbor 1	*"The problem if it will not be expanded. the grant will be pointless. There is a service cost I'm delivering goods in the area. The challenge if the recipient would be ably to finish upgrading"*
Neighbor 2	"*possibility of copying design when my family will build a house. I am hoping if any of my children will build a strong house when budget and opportunity comes"*
Neighbor 3	*"If house will be upgraded, it should not be done in haste- use quality materials so that the retrofitting will not go to waste*
Neighbor 4	*"Retrofitting was properly made and of good quality"*
Neighbor 5	*No feedback*
Neighbor 6	*"It would last only 5 years if not completed. The foundation must be redone when expanding"*

COMMUNITY ACCEPTABILITY

	Feedbacks
Mason 1	*"I am willing to build a house back in the province with similar strength and technique .* *If given an opportunity I am willing to teach and demonstrate the technique I learned to others. It would strengthen the house up to second floor and no longer on the 3rd floor. 2 stories 97% strong 3rd floor 60%".*
Mason 2	*"Very okay if technology will be transferred to another mason. I will apply the same technique to my own house if i will make one"*

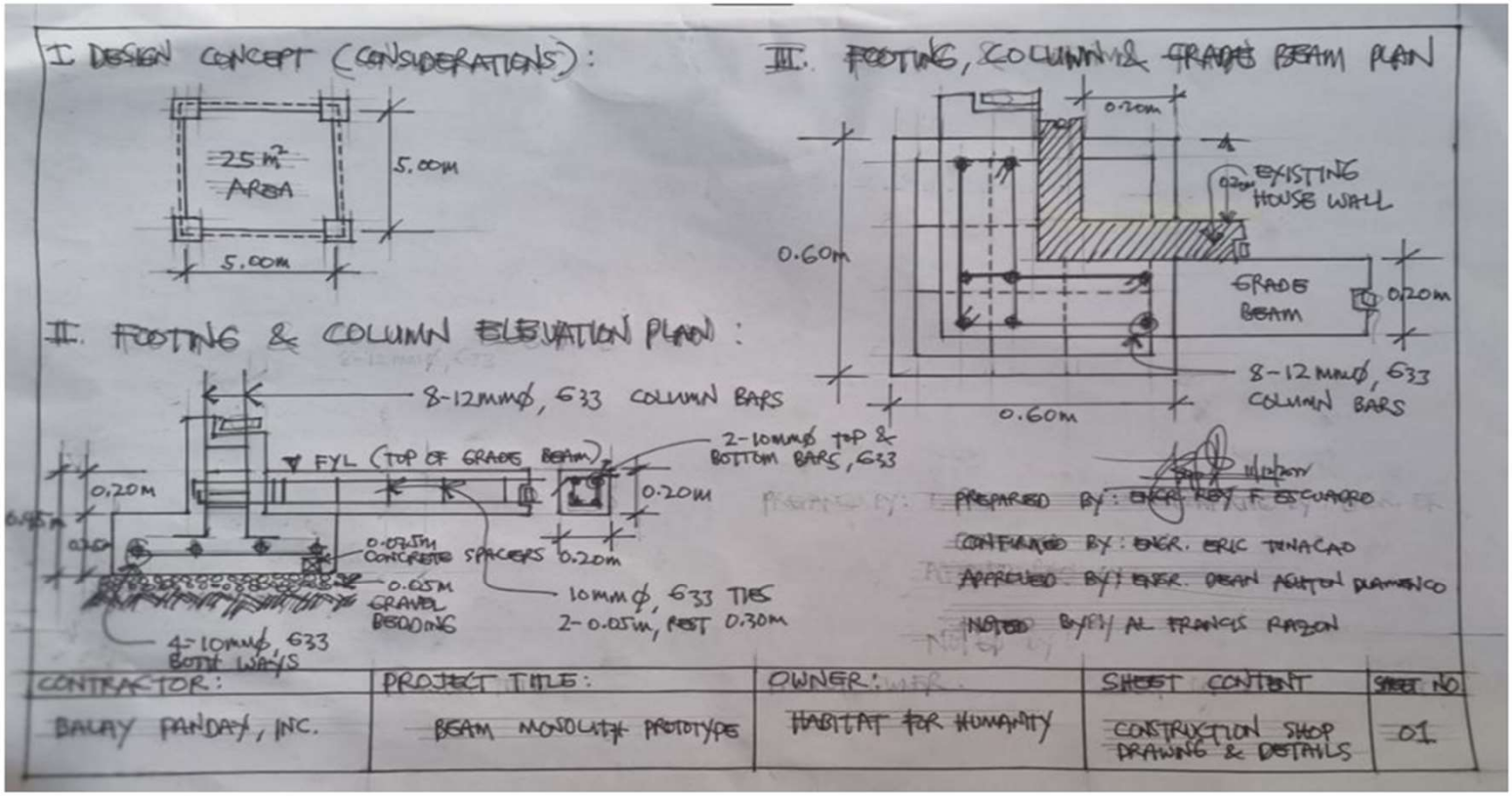
Recommendation from Engr Rey Escuadro

Conclusion and Recommendation for House #01-#05:

- Conduct further a non-destructive quality testing of the materials used like Smith Hammer Compression Testing for Concrete and Tensile Strength Test for the G-33 (33,000psi) Deformed Bars
- Re-run the structural analysis and calculations based on actual parameters collated/measured at each unit if still safe or not to carry a second floor system per original design.
- If result is safe, considered compliance but if failed, HFHI to initiate the necessary documentations informing the respective House Owner otherwise another retrofitting design shall be introduced.
- All exposed column bars shall be protected against corrosion, pilferage risk and safety hazards by inserting PVC Pipe with slurry grouts exactly the same with House #06.
- Technical site inspection visits if incase natural calamities/disaster occur like earthquake and typhoon to validate sustainability.

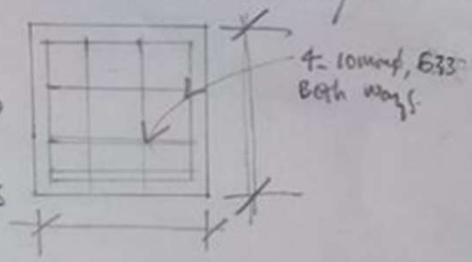
Conclusion and Recommendation from Engr Rey Escuadro

- There must be a For Construction Plan as standard duly signed and sealed by the Designers (UP) and approved by Owner (Habitat for Humanity International).



I. REBAR & CONSUMABLES REQUIREMENTS / HOUSE UNIT

A. FOOTING



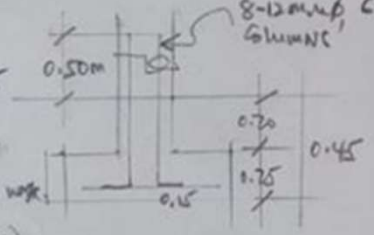
Cut = 0.60 - 0.075(2)
= 0.45m

Total = 4(2) x 4 Ftgs
= 32 pcs

Get from 6.0m (13 pcs)

∴ Buy 3 lengths - 10mmφ x 6.0m, 633

B. COLUMN

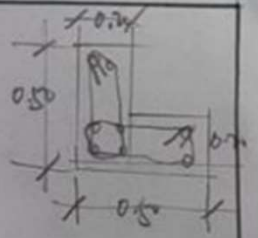


Cut = 0.50 + 0.45 - 0.075
+ 0.15
= 1.025m ≈ use
≈ use 1.20m, no wast

Total = 8 (4) = 32 pcs
Get from 6.0m (5 pcs)

∴ Buy 7 lengths - 12mmφ x 6.0m, 633

C. COLUMN TIES



Cut = 0.50 - 0.04(2) +
0.20 - 0.04(2) + 0.10
= 0.64m

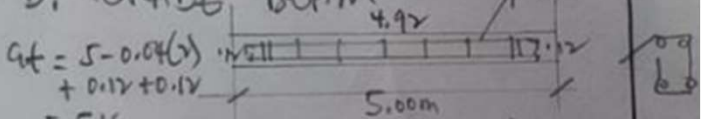
Assume 3 layers.

Total = (3 x 2) (4 sets)
= 24 pcs.

Get from 6.0m (9 pcs)

∴ Buy 3 lengths - 10mmφ x 6.0m, 633

D. GRADE BEAM



Cut = 5 - 0.04(2)
+ 0.12 + 0.12
= 5.16

Total = 4 (4 sides)
= 16 pcs
Get from 6.0m (1 pc)

∴ Buy 16 lengths - 10mmφ x 6.0m, 633
+4
20

Ties 2-0.05m rest @ 0.30m
Cut = 0.2 - 0.04(2)
+ 0.20 - 0.04 -
0.075 + 0.075
= 0.28m

Total = 19(
= 76
∴ Buy 4 [illegible]

CONTRACTOR:	PROJECT TITLE:	OWNER:	SHEET CONTENT	SHEET NO.
BALAY PANDAY, INC.	~~BEAM~~ MONOLITH PROTOTYPE	HABITAT FOR HUMANITY	~~CUTTING~~ LISTS	02

PREPARED BY: ~~ECE~~ [illegible] ESCUADRO

11/13/20

II.) CONCRETE & CONSUMABLES REQUIREMENTS / HOUSE UNIT

A. FOOTING

$V = 0.60 \times 0.60 \times 0.25$
$= 0.09\ m^3$

Total = 0.09 (4 ftgs)
$= 0.36\ m^3$

Using $f'c = 3{,}000$ psi (1:3:3)
@ 9~11 bags/m^3

Cement = 4 bags
Sand = 12 bags
3/4 Graud = 12 bags

B. GRADE BEAM

$V = 0.20 \times 0.20 \times 5$
$= 0.20\ m^3$

Total = 0.20 (4 sides)
$= 0.80\ m^3$

Cement = 8 bags
Sand = 24 bags
3/4 Graud = 24 bags.

C.) GRAVEL BEDDING

$V_1 = 0.60 \times 0.06 \times 0.05$
$V_T = \quad \times 4 = 0.072\ m^3$

$V_2 = 0.20 \times 5 \times 0.05 \times 4$
$V_2 = 0.20\ m^3$

$V_T = 0.272 \times 10$ bags

III. SUMMARY OF MATERIAL REQUIREMENTS / HOUSE UNIT

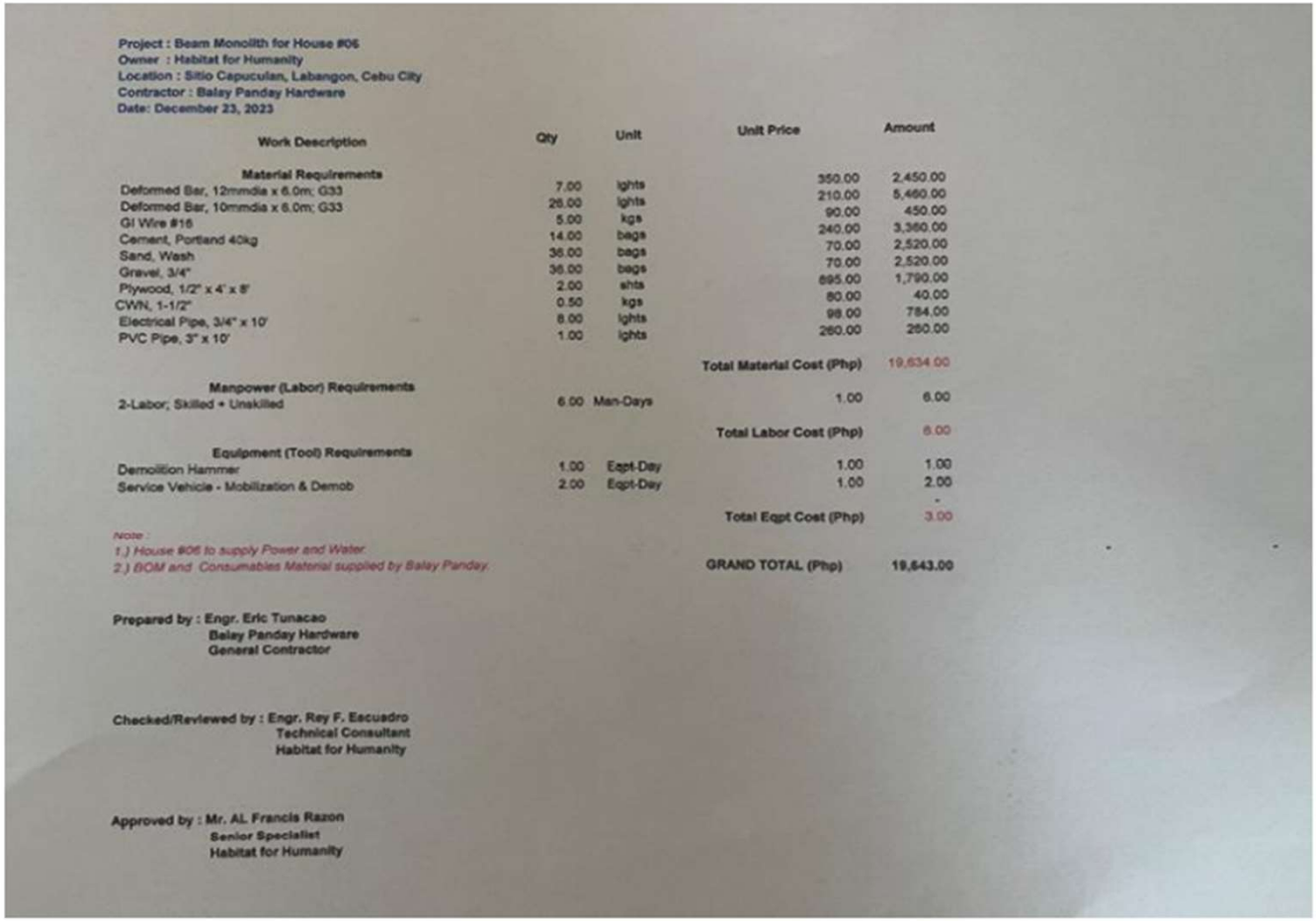
1.) 7 lgths – Deformed Bars, 12mmØ x 6.0m, G33
2.) 26 lgths – Deformed Bars, 10mmØ x 6.0m, G33
3.) 3 kg – GI WIRE #16
4.) 12 bags – CEMENT, PORTLAND
5.) 36 bags – Wash Sand
6.) 36 bags – Graud 3/4
7.) 10 bags – Graud 1½"

+ LABOR + EQUIPMENT + MOB & DEMOB

CONTRACTOR:	PROJECT TITLE:	OWNER:	SHEET CONTENT	SHEET NO
BALAY PANDAY, INC.	BEAM MONOLITH PROTOTYPE	HABITAT FOR HUMANITY	BILL OF MATERIALS	03

PREPARED BY: ENGR. ROY F. ESCUADRO 11/3/2011

- Based on the approved For Construction Plans, an agency estimate shall be formulated as Budget commissioned by independent Quantity Surveyor directly with HFHI.
- The awarded/commissioned Contractor shall submit cost proposal to every House (with different configuration) for approval to HFHI (serve as formal contractual obligation).



Project : Beam Monolith for House #06
Owner : Habitat for Humanity
Location : Sitio Capuculan, Labangon, Cebu City
Contractor : Balay Panday Hardware
Date: December 23, 2023

Work Description	Qty	Unit	Unit Price	Amount
Material Requirements				
Deformed Bar, 12mmdia x 6.0m; G33	7.00	lghts	350.00	2,450.00
Deformed Bar, 10mmdia x 6.0m; G33	26.00	lghts	210.00	5,460.00
GI Wire #16	5.00	kgs	90.00	450.00
Cement, Portland 40kg	14.00	bags	240.00	3,360.00
Sand, Wash	36.00	bags	70.00	2,520.00
Gravel, 3/4"	36.00	bags	70.00	2,520.00
Plywood, 1/2" x 4' x 8'	2.00	shts	895.00	1,790.00
CWN, 1-1/2"	0.50	kgs	80.00	40.00
Electrical Pipe, 3/4" x 10'	8.00	lghts	98.00	784.00
PVC Pipe, 3" x 10'	1.00	lghts	260.00	260.00
			Total Material Cost (Php)	19,634.00
Manpower (Labor) Requirements				
2-Labor; Skilled + Unskilled	6.00	Man-Days	1.00	6.00
			Total Labor Cost (Php)	6.00
Equipment (Tool) Requirements				
Demolition Hammer	1.00	Eqpt-Day	1.00	1.00
Service Vehicle - Mobilization & Demob	2.00	Eqpt-Day	1.00	2.00
				-
			Total Eqpt Cost (Php)	3.00
			GRAND TOTAL (Php)	**19,643.00**

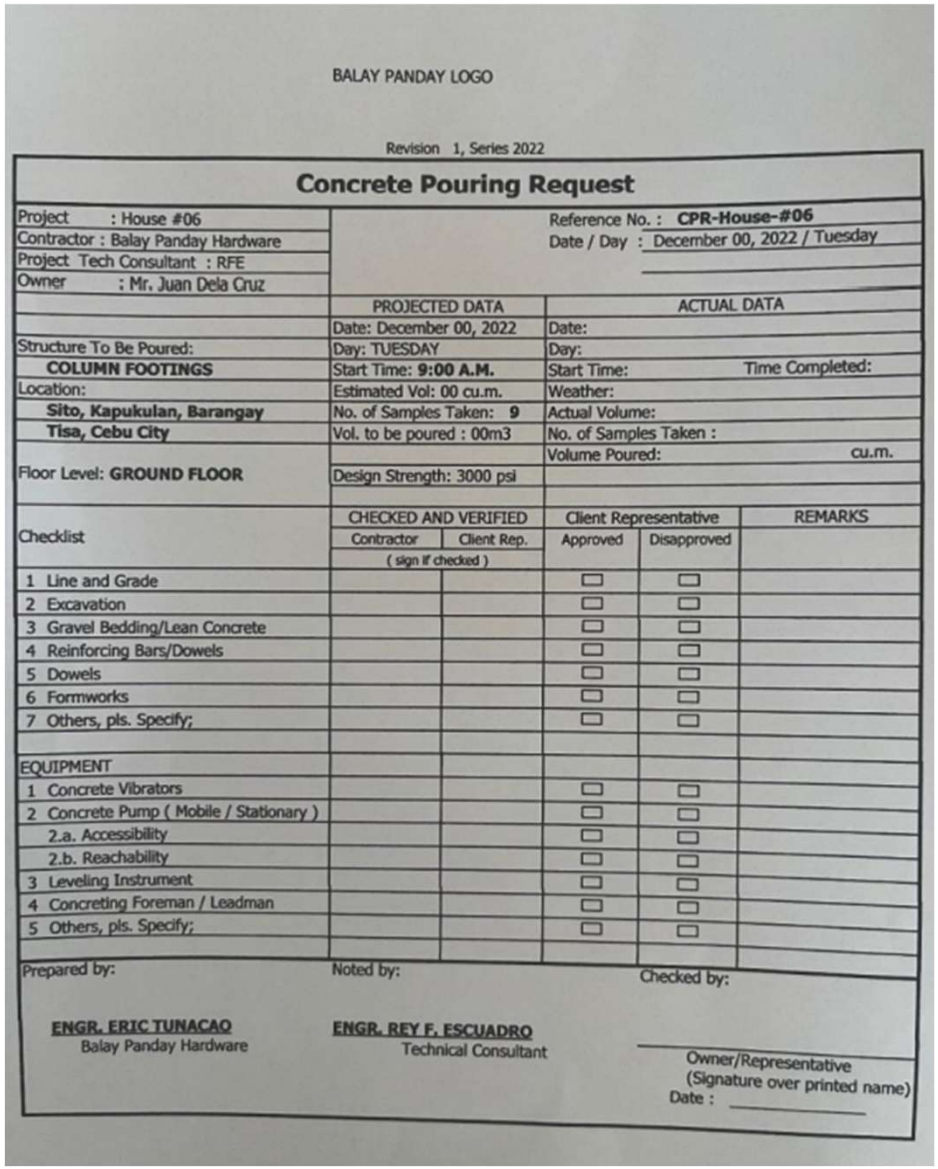
Note :
1.) House #06 to supply Power and Water.
2.) BOM and Consumables Material supplied by Balay Panday.

Prepared by : Engr. Eric Tunacao
Balay Panday Hardware
General Contractor

Checked/Reviewed by : Engr. Rey F. Escuadro
Technical Consultant
Habitat for Humanity

Approved by : Mr. AL Francis Razon
Senior Specialist
Habitat for Humanity

Once approved, a Pre-Construction meeting as kick-off shall be initiated to set expectations as to methods, system, quality, schedule, completion, communications, etc. See Quality Control Measures Tools.



BALAY PANDAY LOGO

Revision 1, Series 2022

Concrete Pouring Request

Project : House #06
Contractor : Balay Panday Hardware
Project Tech Consultant : RFE
Owner : Mr. Juan Dela Cruz

Reference No. : **CPR-House-#06**
Date / Day : December 00, 2022 / Tuesday

	PROJECTED DATA	ACTUAL DATA
	Date: December 00, 2022	Date:
Structure To Be Poured:	Day: TUESDAY	Day:
COLUMN FOOTINGS	Start Time: **9:00 A.M.**	Start Time: Time Completed:
Location:	Estimated Vol: 00 cu.m.	Weather:
Sito, Kapukulan, Barangay	No. of Samples Taken: **9**	Actual Volume:
Tisa, Cebu City	Vol. to be poured : 00m3	No. of Samples Taken :
		Volume Poured: cu.m.
Floor Level: **GROUND FLOOR**	Design Strength: 3000 psi	

Checklist	CHECKED AND VERIFIED (sign if checked)		Client Representative		REMARKS
	Contractor	Client Rep.	Approved	Disapproved	
1 Line and Grade			☐	☐	
2 Excavation			☐	☐	
3 Gravel Bedding/Lean Concrete			☐	☐	
4 Reinforcing Bars/Dowels			☐	☐	
5 Dowels			☐	☐	
6 Formworks			☐	☐	
7 Others, pls. Specify;			☐	☐	
EQUIPMENT					
1 Concrete Vibrators			☐	☐	
2 Concrete Pump (Mobile / Stationary)			☐	☐	
2.a. Accessibility			☐	☐	
2.b. Reachability			☐	☐	
3 Leveling Instrument			☐	☐	
4 Concreting Foreman / Leadman			☐	☐	
5 Others, pls. Specify;			☐	☐	

Prepared by:

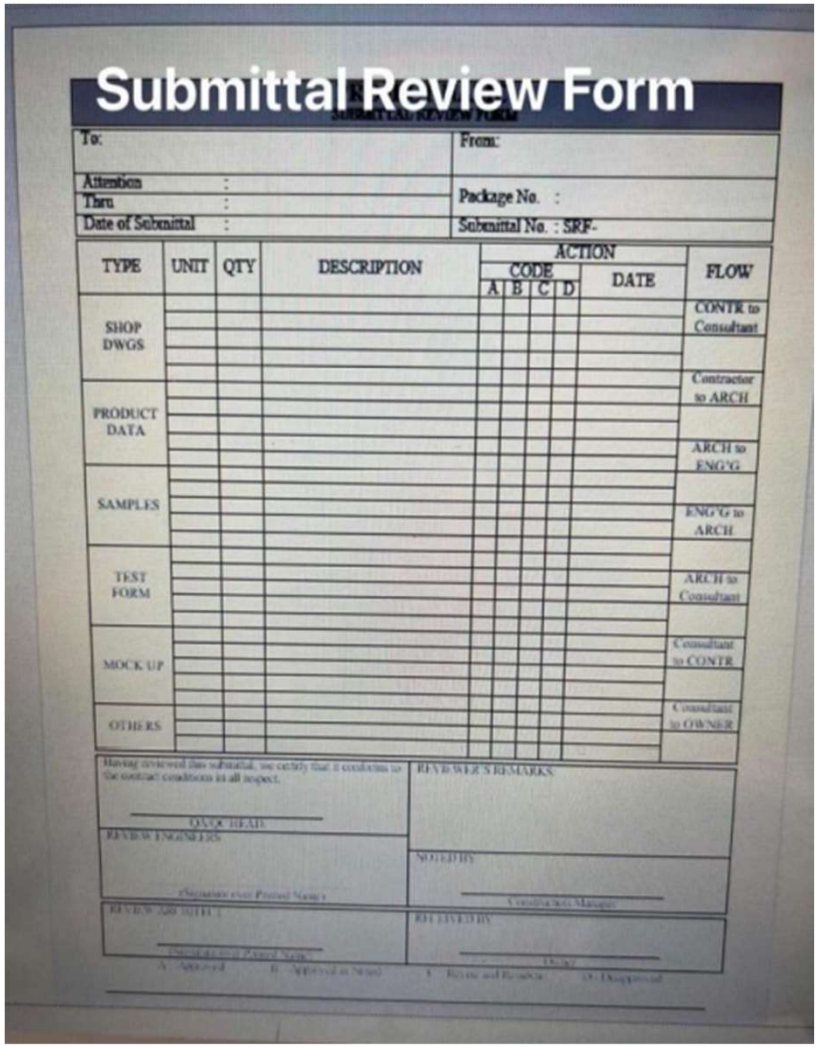
ENGR. ERIC TUNACAO
Balay Panday Hardware

Noted by:

ENGR. REY F. ESCUADRO
Technical Consultant

Checked by:

Owner/Representative
(Signature over printed name)
Date : _____



Submittal Review Form

To: | From:

Attention :
Thru :
Date of Submittal :

Package No. :
Submittal No. : SRF-

TYPE	UNIT	QTY	DESCRIPTION	ACTION CODE A	B	C	D	DATE	FLOW
SHOP DWGS									CONTR to Consultant
PRODUCT DATA									Contractor to ARCH
SAMPLES									ARCH to ENG'G
TEST FORM									ENG'G to ARCH
MOCK UP									ARCH to Consultant
OTHERS									Consultant to CONTR
									Consultant to OWNER

Having reviewed this submittal, we certify that it conforms to the contract conditions in all respect.

DAQC HEAD

REVIEWER'S REMARKS

REVIEWED BY:

Signature over Printed Name

REVIEWED BY:

Construction Manager

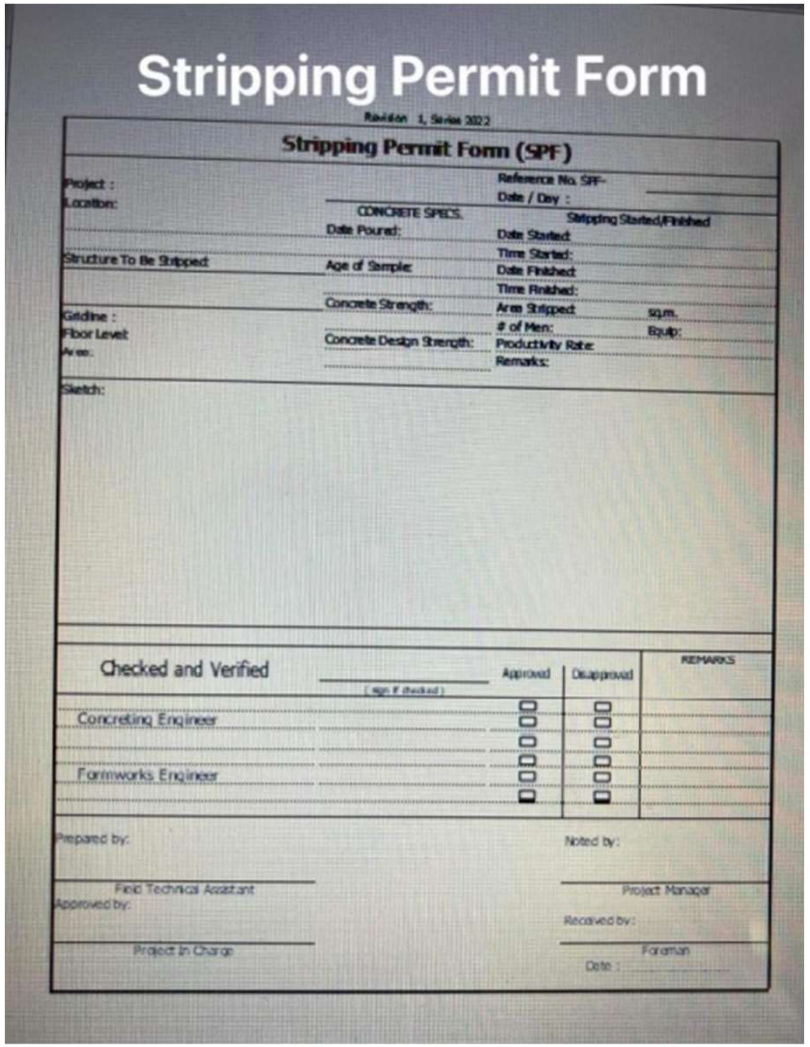
REVIEWED BY:

Designation and Printed Name

RECEIVED BY:

Date

A - Approved B - Approved as Noted C - Revise and Resubmit D - Disapproved



Stripping Permit Form

Revision 1, Series 2022

Stripping Permit Form (SPF)

Project :
Location:

Reference No. SPF-
Date / Day :

CONCRETE SPECS.
Date Poured:
Age of Sample:
Concrete Strength:
Concrete Design Strength:

Stripping Started/Finished
Date Started:
Time Started:
Date Finished:
Time Finished:
Area Stripped: sq.m.
# of Men: Equip:
Productivity Rate:
Remarks:

Structure To Be Stripped:

Gridline :
Floor Level:
Area:

Sketch:

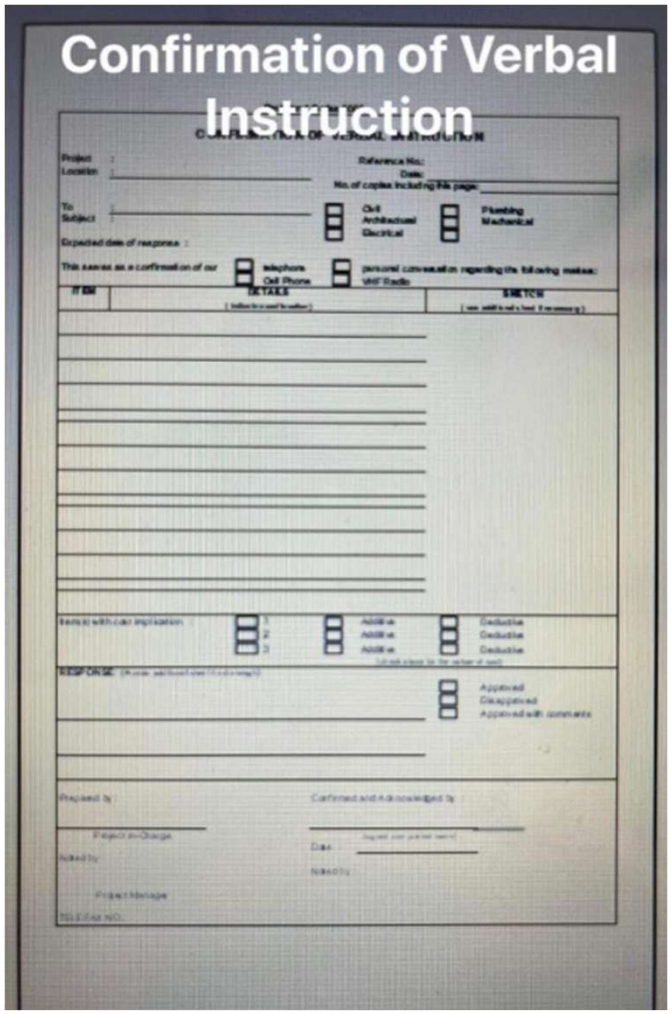
Checked and Verified (sign if checked)	Approved	Disapproved	REMARKS
Concreting Engineer	☐	☐	
Formworks Engineer	☐	☐	
	☐	☐	

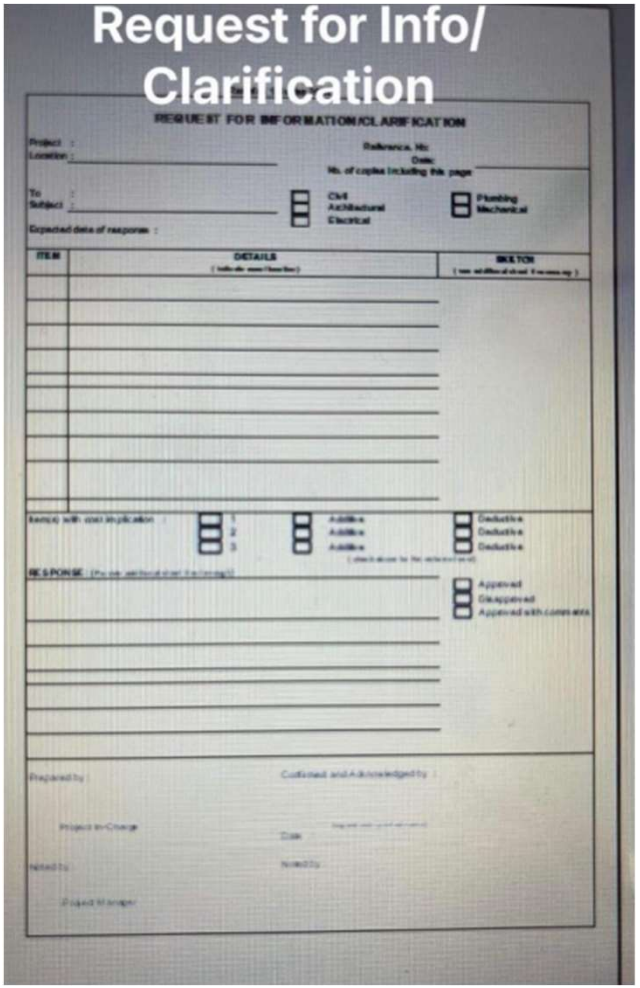
Prepared by:
Field Technical Assistant

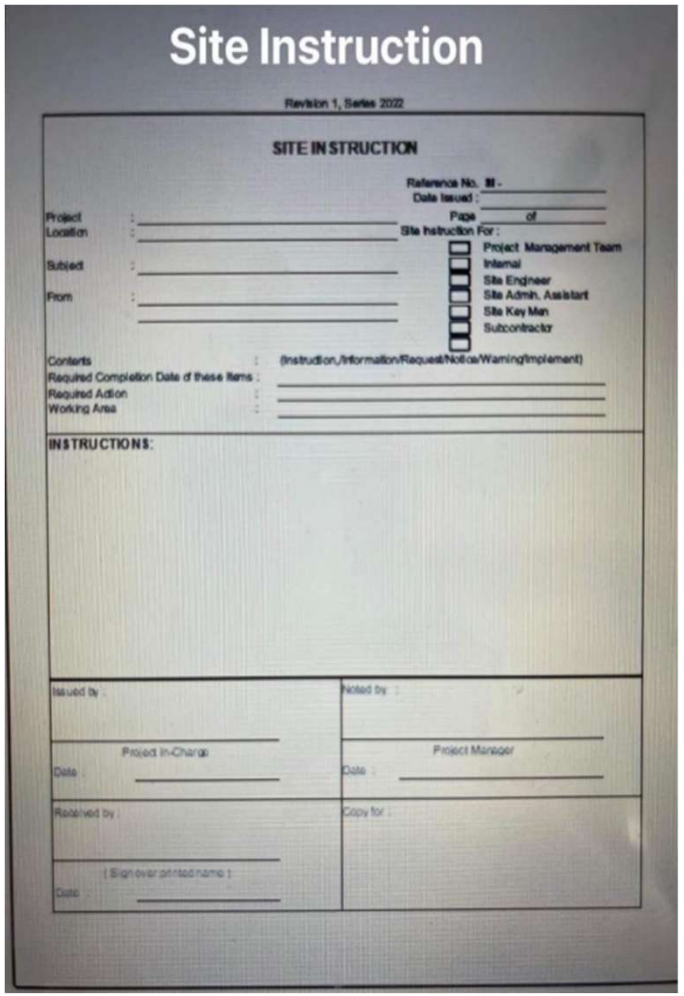
Noted by:
Project Manager

Approved by:
Project In Charge

Received by:
Foreman
Date :


Confirmation of Verbal Instruction


Request for Info/ Clarification


Site Instruction
Revision 1, Series 2022
SITE INSTRUCTION
Project Management Team
Internal
Site Engineer
Site Admin. Assistant
Site Key Man
Subcontractor
INSTRUCTIONS:
Project In-Charge
Project Manager

- During the Construction, a weekly progress/coordination meeting shall be set for the project development updates.
- Once completed, a Post-Construction meeting shall be realized as the final Project meeting of closure and the release of Certificate of Completion and Turnover.

CERTIFICATE OF PROJECT TURNOVER AND ACCEPTANCE

This is to certify that BALAY PANDAY HARDWARE has satisfactorily completed on **December 00, 2022** the construction of **House #06 Column and Grade Beam Perimeter Footing** (see attached approved Concrete Pouring Form) located at **Sitio Capukulan, Barangay Tisa, Cebu City**, in accordance to the approved plans and specifications of Beam Monolith Retrofit Foundation.

This document serves as an acceptance of the project and assurance that Balay Panday Hardware guarantees the work stipulated in the contract and shall make good any known defect in workmanship, which makes itself evident within one year after project completion; which is **December 00, 2023**.

Prepared by:

ENGR. ERIC TUNACAO
Balay Panday Harware
General Contractor

Acknowledged & Accepted by:

Mr. JUAN DELA CRUZ
House #06 Owner

Checked/Reviewed by:

ENGR. REY F. ESCUADRO
Technical Consultant
Habitat for Humanity

Noted by:

MR. AL FRANCIS RAZON
Senior Specialist
Habitat for Humanity

Cc: File

Next Steps