Construction Training Facility

(ESSU Philippines)

A Senior Project
Presented to
James Mwangi from the Department of Architectural Engineering

By
Omar Ramirez
May 2016

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ABSTRACT:

The purpose of this project was to work hand in hand with the engineers and construction managers from the non-profit organization Build Change in order to build a training facility in The Philippines. Thus, this project is consistent of three major components and a general image album for every section. The three major components are as follows:

The first section (Background) of this report exposes the finding and inspiration of this project. This section also includes estimating the cost of the project and reviewing the structural details to ensure that all of the necessary components are included. Along with this there is also a brief summary of the challenges faced when coordinating a project that is being constructed over 7,000 miles away.

The secondary focus of this report (Training Station Layout) describes in essence the role that every layout of the training facility and gives a detailed description of the importance that every step in this training has.

The third section of this report (The Outcome) describes what the experience of working with Build Change was like. There are also more descriptions about preparing for construction and how my participation in the project concluded. Lastly it describes the benefits of overcoming the challenges and the personal growth that I have seen in myself as a professional.

BACKGROUND:

Throughout the past five years in the Architectural Engineering program at California Polytechnic State University I have experienced a multitude of great life changing experiences. These experiences include challenges anywhere from learning how to cook to learning how to manage the time to work full time while also attending school full time. From all my life changing experiences in this program there are two that are the most memorable. One is the Structural Engineering Students for Humanity (SESH) trip to Haiti in the summer of 2014, and the other is my senior project. For my senior project I had the opportunity to work with the Build Change non profit organization in the Philippines. Even though both projects were in very different locations, they both resemble one another very much. Both projects served one purpose and this purpose was to help those who are in greater need than us.

After being a part of SESH I decided that I wanted to focus my senior project on something that would be more geared towards helping the less fortunate. *Figure 1* is an image of my trip to Haiti. The simplicity of an image discloses that the need of the people from third world countries is greater one can imagine. With this in mind, I knew the right person to approach for something like this. Professor James Mwangi has been the one professor in the Architectural Engineering department who has seen it all. He was there right after the Haiti Earthquake helping assess buildings and he was also there supporting the people in Nepal after their recent earthquake.

After discussing with him what my goal was with my senior project he contacted me with the right people. My direct contact for my senior project would be Michael Collins. Michael is the Director of Education for The Build Change Group and the person behind the construction and design of all of the training centers that are built by Build Change. The first live chat that I had with Michael was when he was in Bogota, Colombia. During this FaceTime chat with Michael, He gave me a general overview of Build Change and then expanded by asking me several questions about myself.

As mentioned by Michael, Build Change is an organization dedicated to serve the communities in third world countries by educating the locals with better building techniques. The Build Change group focuses their efforts to establish a consistent building pattern that is broken down into different phases which include: determining suitable construction material, establishing a stable building foundation, reinforcing appropriately in accordance to the use of the facility, assuring quality control throughout the extent of the construction, and lastly tracking costs during construction amongst other essentials tied in with construction management.

Michael then proceeded by asking me what my interests were and what he could do to make a project more interesting for me. I then expressed to him my interest in construction management along with my interest in making an impact on the lives of people. He immediately knew exactly what project to place me on. Michael expressed how there was an Eastern Samar State University (ESSU) project that was expected to start in Guiuan which is located in The Philippines. The ESSU project consists of building a facility to better train local construction workers to perform greater quality construction. This construction includes the basic tips to improve building performance during catastrophic events such as hurricanes and earthquakes. The goal of Build Change in the Philippines is to push the locals to construct a safe room in case a catastrophic event occurs. Build Change understands the cost behind constructing a strong stable home and they know that the locals will not be able to afford such a drastic modification but they will definitely be able to afford something smaller and still efficient such as a safe room.

When I became a part of this project, there was already a general structural design made for this safe room. Therefore my first task would be to do a takeoff for the design in order to get quantities for the construction material. This task was conducted by using a general template that was sent to me by Michael and which can be at the end of this section. Michael was very specific about using their template because this would allow anyone on the design team to make any necessary changes at any time. During the time that I was doing my takeoff I ran into several conflicts. I encountered issues with the spread sheet, I had to do research on the currency used in The Philippines, I had to keep in touch with Michael while he was on a different zone, and lastly I had to begin using metric units for all of my quantity calculations and this is something that I was not familiar with.

In the documents attached after this section there are copies of the structural plans and details that were designed and drafted by Build Change engineers as a reference for this project. The majority of these plans were provided to me after my initial talk with Michael and it was stated to reference these plans to complete a quantity takeoff for what would be an individual unit (safe room). I will state that I replicated some of the structures in these plans with Revit in order to obtain a greater understanding of the building but all of the structural design credit goes to Build Change. The preliminary models that I created can be seen in *Figures 2,3, and 4* and they were created in a n effort to find any design flaws and to assure that the rebar in the safe room would fit accordingly.

Figure 1: This is an image taken in Haiti during the 2014 Structural Engeering Students for Humanity (SESH) trip.
(From left to right: James Mwangi, Omar Ramirez, Hatian Children)

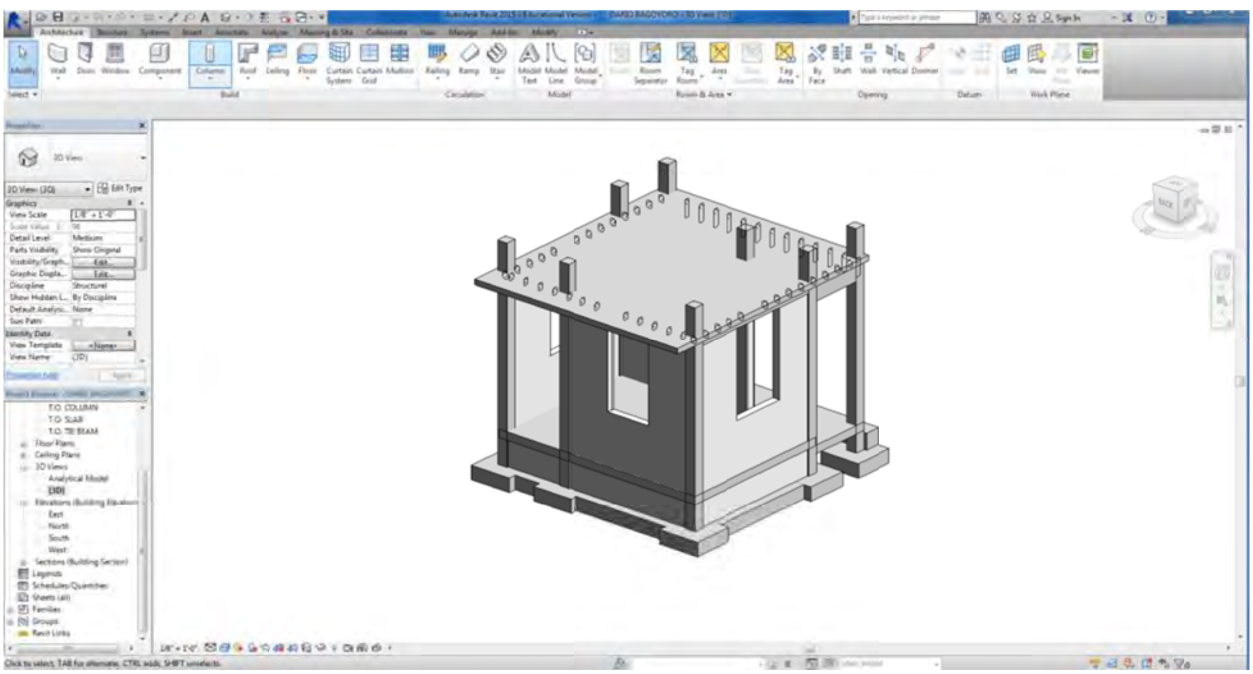


Figure 2: This model was made by using the set of plans provided by Build Change and a an Autodesk software product called Revit 2015 to provide further detail of the building itself. I made sure to incorporate the rebar in this model to ensure that the spacing would not be too congested for when real construction began.

Bill of Quantities - Basic Design Inputs

TECHNICAL ASSISTANCE & TRAINING FOR FAMILY-DRIVEN RECONSTRUCTION IN SULANGAN

Last updated: 2014-12-11

Homeowner:	**DARIO BAGOYORO**	Design Date:	**2/5/2015**
Address:	**S1-12 (PUROK1, SULANGAN PROPER, GUIUAN)**	Printing Date:	**2015/02/09 3:39 PM**
Telephone:		Engineer/Architect:	**Clement**

			front	back	left	right		
Design Code	B 1	CV	CU 1.02	CU 1.02	CU 1.02	CU 1.02	E	OK

Plan Type:	B		**Warnings:**
No. of Stories:	1	Check front wall pier:	1 OK
Veranda Type:	CV		2 OK
Front Elevation Type:	CU	Check rear wall pier:	3 OK
Front Wall Pier Length:	1.02 m		4 OK
Front Qty Wall Piers:	2	Check left wall pier:	5 OK
Rear Elevation Type:	CU		6 OK
Rear Wall Pier Length:	1.02 m		7 OK
Rear Qty Wall Piers:	2	Check right wall pier:	8 OK
Left Elevation Type:	CU		9 OK
Left Wall Pier Length:	1.02 m		10 OK
Left Qty Wall Piers:	2		
Right Elevation Type:	CU		
Right Wall Pier Length:	1.02 m		
Right Qty Wall Piers:	2		
Extension Option:	E		
Verandah Bench:	No		
Shading:	No		
Parapet:	No		

Wall Pier Lengths for Block Units(m)

3.5m Front and Back						
SW-						
CU-	1.02					
EU-	1.64	1.85	2.06			
EF-	1.64	1.85	2.06	2.48		
4m Front and Back						
SW-		1.47				
CU-	1.02	1.23				
EU-	1.64	1.85	2.06	2.27	2.48	
EF-	1.64	1.85	2.06	2.27	2.48	2.90
3.1m Side Elevation (TV)						
CU-	1.02	1.23	1.44			
EU-	1.65	1.86	2.07	2.28	2.49	
EF-	1.85	2.06	2.27	2.48		
2.9m Side Elevation (CV)						
CU-	1.02	1.23				
EU-	1.65	1.86	2.07	2.28		
EF-	1.85	2.06	2.27			

Building Info

Footprint Area: 16.4 m2

Price of the House

₱167,262

₱10,199 /m2

English
PHP

BUILD CHANGE Cordaid

Homeowner DARIO BAGOYORO
Address S1-12 (PUROK1, SULANGAN PROPER, GUIUAN)
GPS: 0
Design Code B1-CV-CU1.02-CU1.02-CU1.02-CU1.02-E

Evaluation Date: 2015/02/05 12:00 AM
Print Date: 2015/02/09 3:43 PM
Engineer: Clement

Last updated: 12/16/2014

			TRANCHE 1		TRANCHE 2		TRANCHE 3		TRANCHE 4 Holdback/ Additional		TOTAL FOR ALL TRANCHES	
Item	Unit Price (Php)	Unit	Qty.	Cost (Php)	Qty.	Cost (Php)	Qty.	Cost (Php)	Qty.	Cost (Php)	Qty.	Cost (Php)
Cement	₱270	/bag	36.00	₱9,720	35.00	₱9,450	36.00	₱9,720	0.00	₱0	107.0	₱28,890
Black Sand	₱1,300	/m3	2.50	₱3,250	3.50	₱4,550	3.50	₱4,550	0.00	₱0	9.5	₱12,350
Gravel 12-20	₱1,300	/m3	2.50	₱3,250	2.00	₱2,600	2.50	₱3,250	0.00	₱0	7.0	₱9,100
15cm Block	₱38	/each	63.00	₱2,394	234.00	₱8,892	0.00	₱0	0.00	₱0	297.0	₱11,286
10cm Block	₱20	/each	0.00	₱0	0.00	₱0	8.00	₱160	0.00	₱0	8.0	₱160
Rebar 8	₱98	/Bar	40.00	₱3,920	0.00	₱0	20.00	₱1,960	0.00	₱0	60.0	₱5,880
Rebar 10	₱135	/Bar	6.00	₱810	38.00	₱5,130	0.00	₱0	0.00	₱0	44.0	₱5,940
Rebar 12	₱170	/Bar	79.00	₱13,430	0.00	₱0	60.00	₱10,200	0.00	₱0	139.0	₱23,630
Binding Wire	₱75	/kg	8.50	₱638	2.00	₱150	6.00	₱450	0.00	₱0	16.5	₱1,238
1x2 Coconut Lumber	₱2	/foot	0.00	₱0	0.00	₱0	71.00	₱142	0.00	₱0	71.0	₱142
2x2 Coconut Lumber	₱4	/foot	0.00	₱0	0.00	₱0	18.00	₱72	0.00	₱0	18.0	₱72
Door (1.1mx2.8m)	₱1,500	/each	0.00	₱0	0.00	₱0	2.00	₱3,000	0.00	₱0	2.0	₱3,000
Window (1.2mx1.6m)	₱583	//m	0.00	₱0	0.00	₱0	4.00	₱2,333	0.00	₱0	4.0	₱2,333
Cost of Materials				**₱37,412**		**₱30,772**		**₱35,837**		**₱0**		**₱104,021**
Plywood sheet (4'x8'x1/4") Formwork	₱370	/sheet	3.00	₱1,110	8.00	₱2,960	0.00	₱0	0.00	₱0	11.0	₱4,070
Plywood sheet (4'x8'x3/4") Formwork	₱980	/sheet	0.00	₱0	0.00	₱0	7.00	₱6,860	0.00	₱0	7.0	₱6,860
2x2 Coconut Lumber Formwork	₱4	/foot	245.00	₱980	918.00	₱3,672	0.00	₱0	0.00	₱0	1163.0	₱4,652
2x4 Coconut Lumber Formwork	₱8	/foot	0.00	₱0	0.00	₱0	170.00	₱1,360	0.00	₱0	170.0	₱1,360
1.5" Nails Formwork	₱75	/kg	3.00	₱225	0.00	₱0	0.00	₱0	0.00	₱0	3.0	₱225
2.5" Nails Formwork	₱65	/kg	4.00	₱260	0.00	₱0	0.00	₱0	0.00	₱0	4.0	₱260
Cost of Formwork				**₱2,575**		**₱6,632**		**₱8,220**		**₱0**		**₱17,427**
Cost of Labor				₱12,733		₱10,404		₱10,171		₱0		**₱33,309**
Holdback: 25% of the cost of labor				-₱3,183.35		-₱2,601		-₱2,543		₱8,327		**₱0**
Amount Provided for Labor				**₱9,550**		**₱7,803**		**₱7,628**		**₱8,327**		**₱33,309**
Cost of Transport				**₱1,999**		**₱1,870**		**₱2,203**		**₱0**		**₱6,072**
Sub-Total				**₱54,719**		**₱49,678**		**₱56,431**		**₱0**		**₱160,829**
04% for unforseen costs				**₱2,189**		**₱1,987**		**₱2,257**		₱0		**₱6,433**
Supplemental unforseen	0%			**₱0**		**₱0**		**₱0**				**₱0**
Totals				**₱53,725**		**₱49,064**		**₱56,146**		**₱8,327**		**₱167,262**

TRANCHES	COST	FROM CORDAID	FROM BENEFICIARY
1st	₱53,725	₱46,463	₱7,262
2nd	₱49,064	₱49,064	
3rd	₱56,146	₱56,146	
4th	₱8,327	₱8,327	
TOTAL	₱167,262	₱160,000	₱7,262

STRUCTURAL AND ARCHITECTURAL DRAWINGS FOR THE

DARIO BAGOYORO FAMILY RESIDENCE
(S1-12)

PUROK 1, SULANGAN, GUIUAN

HOME OWNER INFORMATION

NAME: DARIO BAGOYORO
PHONE NUMBER:

DRAWINGS LIST

LOCATION

GENERAL BUILDING INFORMATION

AREA	GROUND FLOOR (M2)	UPPER LEVEL (M2)
HABITABLE AREA	17.3m2	0.0
INTERIOR AREA	12.5m2	0.0
VENTILATION AREA REQUIRED	1.25m2	0.0
VENTILATION AREA PROVIDED	6.768m2	0.0

TECHNICAL ASSISTANCE AND TRAINING FOR FAMILY DRIVEN RECONSTRUCTION IN SULANGAN

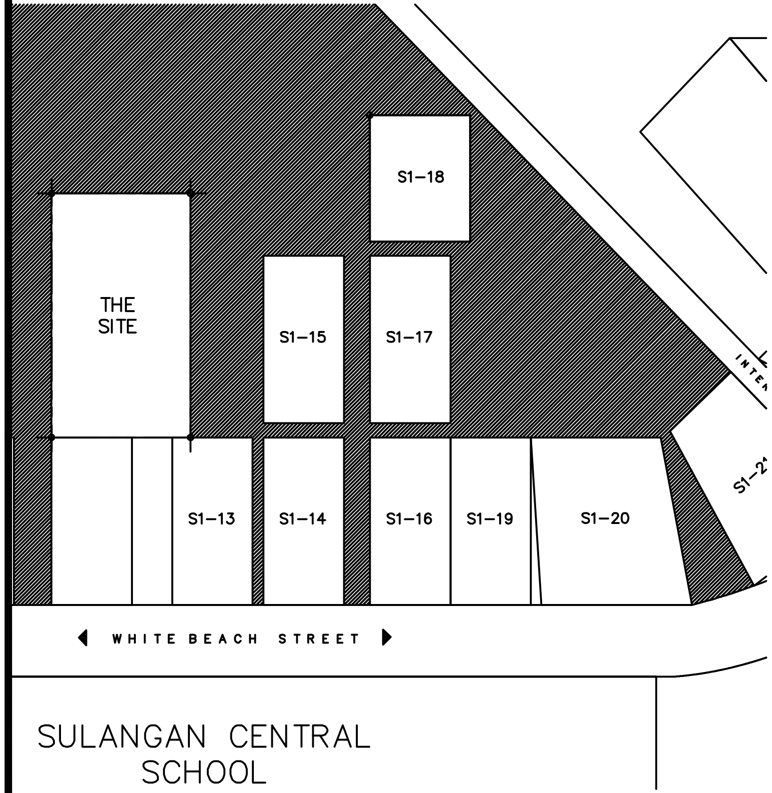
BUILD CHANGE · Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF DARIO BAGOYORO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-12

TITLE PAGE	
DATE : 05/02/2015	SCALE: N/A
REV :	DRAWN BY: MLB

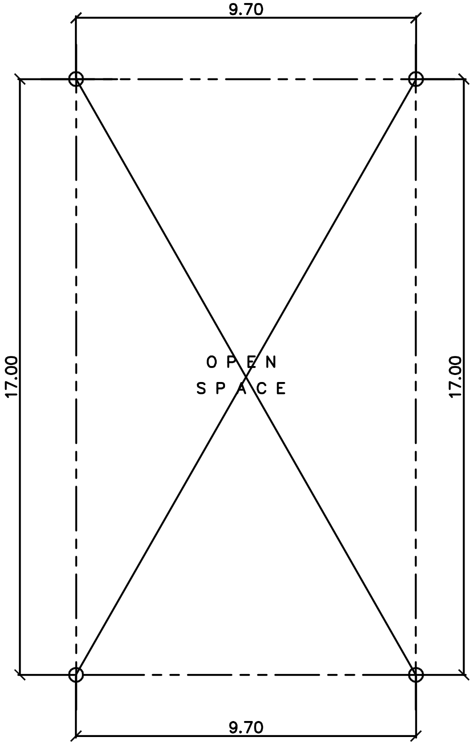
T-100

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



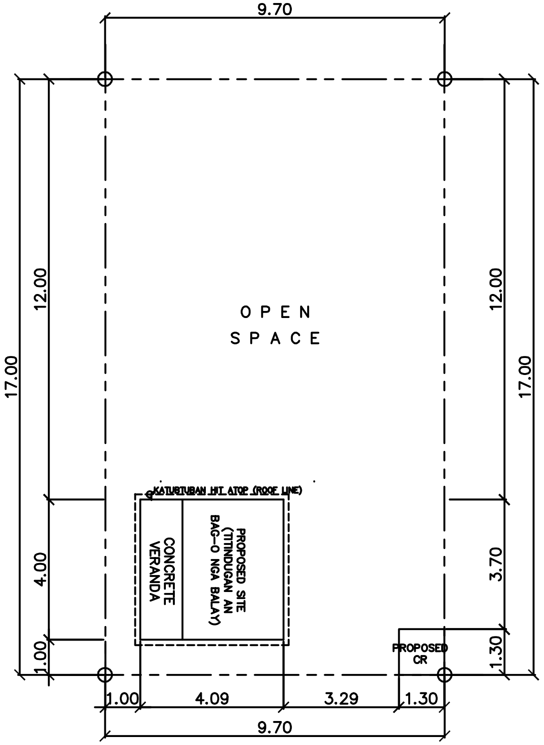
A 1 SITE PLAN

NOT TO SCALE



A 2 EXISTING SITE PLAN

SCALE 1: 200MTS.



A 3 PROPOSED SITE PLAN

SCALE 1: 200MTS.

BUILD CHANGE

Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF DARIO BAGOYORO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-12

SITE PLAN	
DATE : 05/02/2015	SCALE: N/A
REV :	DRAWN BY: MT

A-001

GENERAL NOTES

I. GENERAL

A. AN DESINYO HAN BALAY IN NABASE HAN REQUIREMENTS HAN 2010 NATIONAL STRUCTURAL CODE OF THE PHILIPPINES (NSCP)

B. AN MAGHIHIMU HAN BALAY IN RESPONSABLE HAN PAG COORDINATE HAN MGA TRABAHO NGADA HAN MGA TRABAHANTE NGAN PAG CHECK HAN MGA DIMENSIONS. IGSUMAT HAN ENGINEER NGIN MAYDA PAGKAKAIBA HAN DIMENSION NGAN MAAYUS HIYA BAG O MAG PASIGE AN TRABAHO

C. AN MAGHIHIMU HAN BALAY IN DAPAT MAGHINAY PARA DIRE MAHIBANG AN ESTRAKTURA. DAPAT GUMAMIT HIN MGA BRACING NGAN SHORING PARA HAN BUG AT HAN ESTRAKTURA.

D. AN MAGHIHIMU HAN BALAY NGAN AN TAG BALAY IN MAGSUSUMAT HAN ENGINEER AN MGA NATATABO HA SITE NGA DIRE NAAYON HAN DRAWING.

E. AN MAGHIHIMU HAN BALAY IN DAPAT ISIGURADO AN SIGURIDAD HA SITE BASE WARAY MADISGRASYA NGA TAWO.

II. PUNDASYUN

A. AN DESINYO HAN PUNDASYUN IN BASE HAN MGA RESULTA NGA RECOMENDASYON HAN GEOTECHNICAL INVESTIGATION NGAN "RETROFITTING AND RECONSTRUCTION OF ONE - TWO STOREY HOMES NGOLOS AND SULUNGAN, GUIUA, EASTERN SAMAR" NGA GUINBUHAT HAN A.M. GEOCONSULT AND ASSOCIATES, INC, HAN AUGUST 2014.

B. DESINYO NG PUNDASYON PARAMETERS:

1. GINAMIT AN 150KPA NGA ALLOWABLE SOIL BEARING CAPACITY UG AN PERMITTED 133% NGA PAGHATAAS HAN LOAD UPOD AN TRANSIENT LOADS SUGAD HAN HANGIN O DI KAYA AN LINUG.
2. AN FRICTION COEFFECIENT PARA HAN SLIDING IN 0.45 AN GINAMIT PARA MAPUDNGAN AN LATERAL LOADS.

C. PARA MASUNOD AN NSCP, SITE PREPARATION NGAN FOUNDATION WORK IN DAPAT SUMUNOD HAN MGA MASUNOD:

1. DAPAT MALINIS AN PAGTRATRABAHUAN BAG O MAG LEVEL HAN TUNA.
2. WARAY DAPAT BATO NGA MAS MADAKU PA HAN 20CM NGA AADA HAN PAGTRATRABAHUAN
3. AN TAMBAK IN DAPAT NA COMPACT NGA DIRI MAHATAAS AN DAKMUL HIN 20 CM NGAN MAY PINAKAGUTI NGA MAXIMUM DRY DENSITY NGA 95 %
4. PAGLAY OUT HAN PUNDASYON NGAN LOKASYON GAMIT AN NYLON NGAN KAHOY

D. FOUNDATION TRENCHES IN DAPAT MABUHAT BASE HAN MGA MASUNOD:

1. MARKAHE AN FOUNDATION TRENCH GAMIT HIN CHALK O NYLON PARA HAN MGA DIMENSYUN NGA TIKANG HAN PLANO. DAPAT NAKA 90 DEGREE AN LINYA
2. AN MGA GUIN UKAD PARA PUNDASYON IN DAPAT MALINIS NGAN DAPAT WARAY MGA BUTANG NGA MADALI MADUNOT
3. AN PINAKAILARUM HAN GUIN UKAD DAPAT NAKA LEVEL, MALINIS NGAN WARAY TINAMBAK NGA TUNA

E. TURUYA NGAN PROTEKTAHE AN MGA UTILITIES NGA AADA HABANG NGAN PAGKATAPUS HAN CONSTRUCTION.

F. TANGGALA AN MGA DATI PA NGA FOOTING , UTILITIES ,ETC NGA POSSIBLE MAKAULANG HIT BAG O NGA CONSTRUCTION, PWERA NALA NGIN NAKABUTANG HA PLANO.

G. PAGSUMAT HAN ENGINEER NGIN MAYDA MAKIT AN NGA MGA ESTRACTURA SUGAD HAN CESSPOOLS, CISTERNS, PUNDASYON NGA WARA HA PLANO .

H. AN MAGHIHIMO HAN BALAY IN RESPONSABILIDAD HAN PAG UKAD UPOD NA AN LAGGING, SHORING, UNDERPINNING NGAN PAGPROTEHIT HAN AADA NA NGA GUINBUBUHAT.

I. DAPAT MATANGGAL AN NA EXCAVATE NGA TUNA NGAN NABUBUO NGA DAMU NGA TUBIG BAG O MAGBUHOS HAN CONRETO

III. PORMA

A. AN PORMA IN DAPAT MAUPAY NGA KLASE ,TADUNG NGAN DI BUKOL BUKOL

B. AN PORMA NGA AADA HIT SALUG IN DAPAT DIRE MAHABUBU HIN $\frac{3}{4}$" NGA PLYWOOD. AN PANELS IN DAPAT SUPORTADO HIN 2X4 BIGA NGA KAHOY NGA IT HIGRAYO IN USA KAMETRO IT PINAKAHARAYO. DAPAT MASUPORTAHAN AN BIGA(KAHOY) HIN METAL NGA POSTE O DI KAYA 2X4 NA POSTE NGA KAHOY O DI KAYA 6CM DIAMETRO NGA POSTE (KAHOY) NGA MAYDA PINAKAHATAAS NGA KAHIGRAYO NGA USA KAMETRO. PAGBUTANG HIN SHIMS NGADA HAN ILARUM HAN POSTE PARA HIYA MAGING ESTABLE

C. AN MGA PORMA IN DAPAT MAUPAY AN KAHIMU PARA DIRE TUMURO AN CEMENT PASTE.

D. AN PORMA IN DAPAT MAUPAY AN KABRACE O AN KAHIGUT PARA MAMINTINAR AN IYA POSISYON NGAN PORMA

E. DAPAT DIRE MAHIBANG AN AADA NA NGA GUINHIMO NGA ESTRACTURA HAN PAGHIMU HAN PORMA NGAN SUPORTA.

F. BAG O MAGBUHOS DAPAT AN MGA BUBUHOSAN IN TUBIG TUBIGAN HIN TALA NGAN DAPAT TANGGALUN AN PARTE NGA DAMU AN TUBIG. .

G. BAG O MAG BUTANG HIN PORMA PARA CONCRETO NGA POSTE DAPAT TAPUS ANAY AN PAGCONSTRUCT HAN WALLING .

H. CONDUITS, PIPES NGAN SLEEVES NGA NAAGI HIT SALUG, WALLING NGAN BIGA IN DIRE NAKAKAAPEKTO HAN KUSOG HAN ESTRACTURAL NGIN DIRE MAS MAMADAKU HIN ONE THIRD HAN DAKMUL HAN SALUG, WALLING NGAN BIGA. .

I. GAMIT HIN BRACE PARA HAN PORMA PARA MAMINTINAR AN TAMA NGA POSISYON.

J. KAHUMAN HAN BUHOS AYAW DIRETSO TANGGALA AN PORMA NGAN SUPORTA. DAPAT DI HIYA MAS MAMAGUTI HAN MGA NAKALISTA:

1. VERTICAL TIES NGAN HORIZONTAL RING BEAM NGA DIRETSO NASUPORTA HAN WALLING: 24 ORAS
2. PUNDASYON: DUHA KA ADLAW
3. SUSPENDED SLAB NGAN BIGA NGA DIRE DIRETSO NA SUPORTA HAN WALLING: 14 KA ADLAW

K. PAG UPAYA DIRETSO AN MGA AMPAW HIN BALUR HIN TULO KAADLAW PAGKAHUMAN MATANGGAL AN MGA PORMA :

1. DIRETSO PAGSUMAT HIT ENGINEER PARA MAPANGINANO BAG O MAGPASIGE AN PAGTUHAY
2. NGIN AN AMPAW IN NAKIT AN AN BAKAL DAPAT BASAGUN AN TANAN NGA ESTRACTURA NGA NASASAKUPAN HAN MAY AMPAW. BUHUSI NADAMAN PARA WARA NA AMPAW NGA MATABO.
3. KUN GUTI LA NGA AMPAW NGAN DI NAKIKIT AN AN BAKAL - TAPALI NALA HIN MAS PURO NGA HALO

IV. KABILYA

A. AN KABILYA IN DAPAT MAYDA PINAKAGUTI NGA KAKUSUGON HIN 40,000 PSI O 280 MPA (GRADE 40)

B. AN MGA KABILYA NGA NAKADA HAN DRAWING IN DAPAT SUMUNOD HAN PINAKAGUTI NGA KADAKUUN:

DESIGNATION	DIAMETER	LAP LENGHT
Ø 8MM	8.0MM	30CM
Ø 10MM	10.0MM	40CM
Ø 12MM	12.0MM	50CM
Ø 16MM	16.0MM	65CM

C. DAPAT DIRE GUINTATAUY AN BAKAL. AN MGA NABILIN O AN MGA TAPSIK NGA CONCRETO NGA NAPIDAR HAN BAKAL IN DAPAT MATANGGAL GAMIT HIN WIRE BRUSH BAG O MAGBUHOS HIN CONCRETO .

D. DAPAT AN MGA HOOKS IN NASUNOD HAN STANDARD PWERA LA NGIN IBA AN GUIN AARO HAN DRAWING.

E. DAPAT SUNDUN KUN ANU AN PINAPAKITA HAN PLANO O KUN MAY PUTOL AN KABILYA NGAN PUYDE IDIRETSO NALA MAS MAUPAY KUN MAGIGING MAS TIPID HIYA

F. ISIGURADO NGA MAUPAY AN KINAKAPTAN HAN MGA KABILYA BAG O MAGBUHOS

V. CAST-IN-PLACE CONCRETE, MORTAR NGAN CEMENT PLASTER

A. AN DESINYO HAN CONCRETO IN NABASE HAN COMPRESSIVE STRENCTH,f'C , NGA 2500 PSI O 17MPA (PINAKAGUTI) PAGKA 28 DAYS.

B. CEMENTO: PORTLAND, TYPE 1, MAMARA NGAN DIRE ABRE NGA BAG.

C. SAND: BLACK SAND ,MALINIS NGAN NAHUGASAN. BARAS IN PARA PAG PLASTER NGAN MORTAR, GRABA PARA CONCRETO

D. AGGREGATE: CRUSHED, ANGULAR GRAVEL NGA MAS MAGUTI HI 2CM AN KADAKUUN PARA CONCRETO.

E. TUBIG: MALINIS, DIRE MAASIN NGAN WARAY LAGAY

F. AN CONCRETE SPACERS IN DAPAT NAKABUTANG HIT KADA 0.8 METERS NGAN DAPAT MAYDA BINDING WIRE NGA NAKAKABIT HA KABILYA BAG O MAGBUHOS HAN CONCRETO

LOKASYON	SPACER LENGHT (COVER)
ILARUM NGAN LIGID HAN PUNDASYON	7.5 CM
LIGID HIT BIGA NGAN POSTE	4.0 CM
BUTNGA HAN TIE REINFORCING NGAN MASONRY WALL	2.5 CM
ILARUM HAN SUSPENDED SLAB REINFORCING	6.0 CM

G. DESINYO HAN HALO:

USE	CEMENT	SAND	AGGREGATE	WATER(MAX)
CONCRETE	1	2	3	1
MORTAR	1	5		1
GROUT	1	5		1
PLASTER	1	5		1

H. PAGPROPOTION, PAGHALO, PAGDARA NGA PAGBUTANG HAN CONCRETO IN NAKABUTANG HAN MGA NASUNOD:

1. DAPAT DIDA HIT MALINIS NGA CONCRETO O ASPALTO NGIN MAGHAHALO HIN CONCRETO DIRE NGADA HIN TUNA
2. HALUA ANAY HIN MAUPAY AN BARAS, CEMENTO NGAN BATO BAG O BUTNGAN HIN TUBIG
3. PAGDUGANG HIN TUBIG NGIN KAULANGAN PARA MAKUHA AN SAKTO NGA LAPUT HAN HALO NGA DIRE MASOBRA HAN NAKADESINYO NGA HALO
4. AN LAPUT IN DAPAT MAGRESULTA HIN 5CM NGADTU HAN 10CM SLUMP O PAGTESTING GAMIT AN KAMUT NGA DIRE MAGAWAS AN TUBIG NGIN GUINKAKAPTAN AN HALO NGAN AN CONCRETO IN DIRE MABUO NGIN BUL IWAN NA

I. KUN MAGLALATAG HIN CHB O BAG O NGA BUHOS NGADA HIT MAY CONCRETO, KAULANGAN MASILSILAN ANAY AN CONCRETO PARA DUMUKOT AN BAG O NGA BUHOS.

J. BAG O MAGPALITADA ,HULSA NGAN LINISI O SILSILAN AN PAPALITADAHAN PARA DUMUKOT AN CONCRETO.

K. PAGTUBIGI AN PORMA NGAN BAKAL BAG O MAGBUHOS HIN CONCRETO

L. DAPAT BAGO MAG USA KA ORAS KAHUMAN MAGHALO DAPAT AN CONCRETO IN MAIBUHOS NA. PWERA LA HAN COLUMN NGA MAYDA USA NGA COLD JOINT NGADAN INTERMEDIATE BEAM LEVEL IN DAPAT TANAN HIRA MABUHOSAN HIN USA LA KAADALAW

M. GAMIT HIN VIBRATOR O MARTILYO NGAN ROD PARA DIRE MAG AMPAW AN CONCRETO.

N. PAGKATAPUS MATANGGAL AN PORMA, HULSA AN CONCRETO LIMA KABESES HIT USA KA ADLAW NGADA HIT IKA TULO KAADLAW O MAS MADAKU PA PARA MA CURE AN CONCRETO

O. BASAGA NGAN BALYUI AN CONCRETO HA TANAN NGA APEKTADO NGA ESTRACTURA NGIN AN BAG O NGA CONCRETO IN MAYDA HAN MGA NASUNOD : KITA AN BAKAL , MAS DAKO HAN 3MM NGA BUTAK HAN CONCRETO, DAMU AN MGA BUTAK O DIAGONAL O PATAAS NGA BUTAK HAN BIGA

VI. CONCRETE MASONRY

A. AN PAGPALIT HAN MAUPAY NGA KLASE HIN CHB IN RESPONSABILIDAD HAN TAG ADA HAN BALAY. BAG O PUMALIT HIN CONCRETE HALLOW BLOCKS DAPAT MATESTINGAN ANAY HAN TAG ADA HAN BALAY AN KALIDAD HAN CHB TIKANG HAN GUIN PROPOS NGA PARAGHIMU HAN CHB.

B. AN DESINYO HAN CHB IN DAPAT MAYDA MINIMUM COMPRESSION STRENGTH NGA 4MPA NGAN MYDA KADAKUUN NGA 15CMX20CMX40CM NGAN DAPAT MAYDA MGA 55% NGA KAHALAPADUN NGADA TULO NGA BUHO HAN CHB

C. TANAN NGA BUHO HAN CHB IN BUTANGAN HIN GROUT

D. DAPAT TANAN NGA WALLING IN MAYDA PALITADA . DAPAT IT PALITADA IN MAYDA MGA 1.5 CM NGA KADAKMULUN NGAN DAPAT PALUYO PERO KUN AN DRAWING IN DIRE PALUYO DAPAT MASUSUNOD AN DRAWING.

E. DAPAT AN KADAKMULUN HAN GROUT HAN PAGITAN HAN CHB IN DIRE MAGUTI HIN 1CM NGAN DIRE MAMANDAKU HIN 2CM.

F. DAPAT AN PAGLATAG HIT CHB IN KATUNGA HAN IYA HALABA PARA MAS MAKUSOG AN IYA PAGKABUTANG.

G. MORTAR NGAN GROUT: PAGHALUA AN BARAS NGAN CEMENTO NGAN DUGANGI HIN TUBIG. DAPAT MAGAMIT HIYA DIRETSO BAG O MAG 30 MINUTES

H. HULSA HIN MALINIS NGA TUBIG AN CHB BAG O IASINTADA

I. AYAW GAGAMIT HIN HIBANG NGAN MAYBUTAK NA NGA CHB. NGIN KAULANGAN HIN DIRE BUG OS NGA CHB HIT PAG ASINTADA DAPAT KATUNGA HIT BUG OS NGA KAHALABA HAN CHB

J. IBUTANG ANAY TANAN NGA CHB PALIBUT BAG O MAGBUTANG HIN MORTAR O GROUT PARA LEBELADO AN PAGKABUTANG .

K. DIIN AN KABILYA IGBUBUTANG NGADA HAN CHB
1. NGADA HAN BUTNGA HAN VERTICAL REINFORCING HAN WALL, PERO KUN ANU NAKABUTANG HAN PLANO ASYA AN MASUSUNOD.
2. DAPAT NAKALINYA AN MGA BUHO HAN CHB
3. SUDLAN HIN GROUT AN BUHO HAN CHB
4. LINISAN ANAY AN BUHO HAN CHB BAG O MAGBUHOS
5. FOUNDATION IN DAPAT PAREHO AN KADAKUUN NGAN LOKASYON HAN KABILYA NGADA HAN WALLING

L. DAPAT HULSON AN WALL HIN TULO KA BESES HA USA KA ADLAW NGADAN TULO KA ADLAW PARA HIYA MA CURE

VII. CARPENTRY
A. FRAME NGA KAHOY PARA STRUCTURE: LAWAAN, MAHOGANY, MATIG A NGA COCO LUMBER O BISAN ANU NA APROBADO.
B. ROUGH HARDWARE:
1. RAYSANG : COMMON WIRE (ASTM F1667):
a. HALABA TIKANG HAN STRAP PAKADTU HAN KAHOY : 1.5"
b. HALABA TIKANG HAN KAHOY NGADTO HAN KAHOY : 3.5"
RAYSANG HAN ATUP NGA MAYDA 1 CM AN DIYAMETRO HAN ULO:
c. HALABA HAN METAL DECK NGADTO HAN KAHOY : 2.5"
2. METAL STRAPS : 18 GAGE, ILUBONG AN STRAP HA RING BEAM O NGADA HAN POSTE NGA MAAGI NGADA HAN STIRRUP O HAN BAKAL.

VIII. METAL ROOFING
A. AN METAL DECKING IN DAPAT MGA 26 GAGE(0.48mm) O MAS MADAKMUL PA.

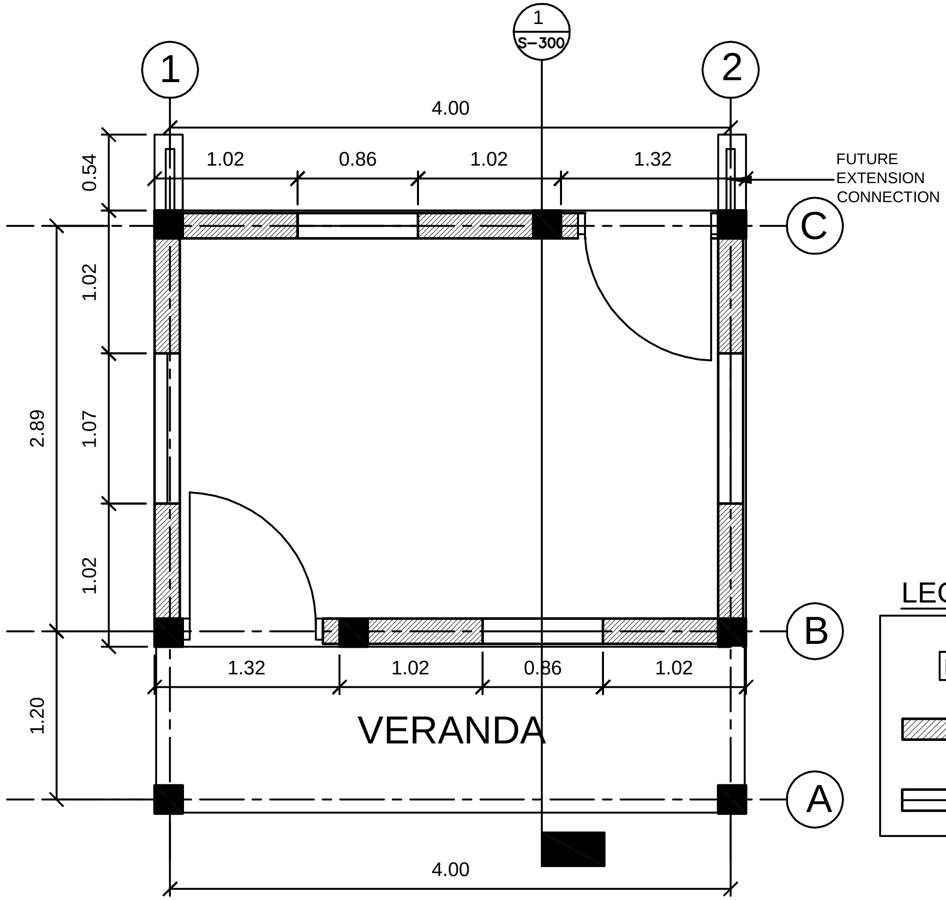
IX. STRUCTURAL OBSERVATIONS
X. AN ENGINEER IN MAG OOBSERBA HAN STRUCTURAL SYSTEM PARA HAN GENERAL CONFORMANCE PARA HAN APPROVED CONSTRUCTION DOCUMENTS. AN TAG IYA HAN BALAY DAPAT MASIGURADO NGA MAARAM HAN STRUCTURAL OBSERVATIONS:
1. PUNDASYON (BAG O MAGBUTANG HIN CONCRETO)
a. PAGPREPARAR HAN PAG UKAD HAN TUNA
b. PAGBUTANG HAN MGA KABILYA
c. PAGBUTANG HAN MGA DOWEL
2. BAG O IBUTANG AN CONCRETO
a. LAY OUT PARA FORMWORKS NGAN AN MGA DIMENSION
b. AN KADAKO HAN KABILYA NGA KUN DIIN IBUBUTANG
c. AN REINFORCING COVER / SPACER NGA GAMIT
d. AN NAKALUBONG NGA STRAP
e. SLAB NGAN SLAB ON GRADE
3. MASONRY
a. MATERYALES HAN WALLING - BLOCK NGAN MORTAR
b. KADAKU HAN WALLING NGAN IYA HALABA
c. KADAKU HAN KABILYA NGAN AN IYA PAGBUTANG
d. KADAKU HAN MORTAR JOINT
4. METAL STRUCTURES
a. PAGBUTANG HAN METAL DECKING
5. ESTRUKTURA NGA KAHOY
a. AN KLASE, LAY OUT NGAN KADAKUUN HAN MGA GAGAMITUN
b. DUGTONGAN HAN MGA FRAMING
c. DUGTONGAN HAN MGA METAL DECK
d. DUGTONGAN HAN WALLING NGAN FRAMING
B. NGIN MAKITA HAN ENGINEER HAN UNA NGA PAG OBSERBA NGA MAY MALI NGA DI NAAYON HAN DRAWING NGAN SPECIFICATIONS, MISMO AN MAGHIHIMU IN MAGASTO HAN PAGTUHAY.

X. DESIGN CRITERIA
A. AN DESINYO HAN BALAY IN GUINHIMU HIN DUHA KA BAHIN. GUINHIMO HIYA NGA GUINKUNSIDIRAR HAN PLANO PAGPADAKU HAN BALAY NGA MAYDA NGA 3 METER NGAN AN HA IGBAW NGA PAG EXTEND HAN BALAY NGA MAYDA KAHATAAS-ON NGA 2.4 M NGA PWEDE FLAT CONCRETE ROOF O LIGHT - WEIGHT 30 - DEGREE MAX GABLE ROOF HA IGBAW. AN DESINYO IN NA BERIPIKA PARA HAN NAIBANAN NA NGA KADAKUUN NGA BALAY NGA IPINAPAKITA HIT DRAWING.
B. OCCUPANCY CATEGORY IV
C. GRAVITY LOADS:
1. DEAD LOADS - POSSIBLE MAG IBA DEPENDE HAN ACTUAL NGA BUG AT HAN BUILDING
CONCRETE SLABS: 4.07kN/m2
LIGHT WEIGHT ROOFS: 0.34kN/m2
MASONRY WALLS: 3.53kN/m2
2. LIVE LOADS: ROOF 1.0 KPa, FLOOR 1.9 KPA

D. SEISMIC DESIGN:
SEISMIC ZONE FACTOR: Z=0.40, SOURCE TYPE A > 15KM DISTANCE
SOIL TYPE = D
Na=1 Nv=1
Ca= 0.44 Cv = 0.64
IMPORTANCE FACTOR, I = 1.0
R-FACTOR = 2.5
BASE SHEAR, V = 0.32*W

E. WIND DESIGN:
EXPOSURE CATEGORY = C
IMPORTANCE FACTOR = 1.0
BASIC WIND SPEED = 250 KPA
ENCLOSED STRUCTURE

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



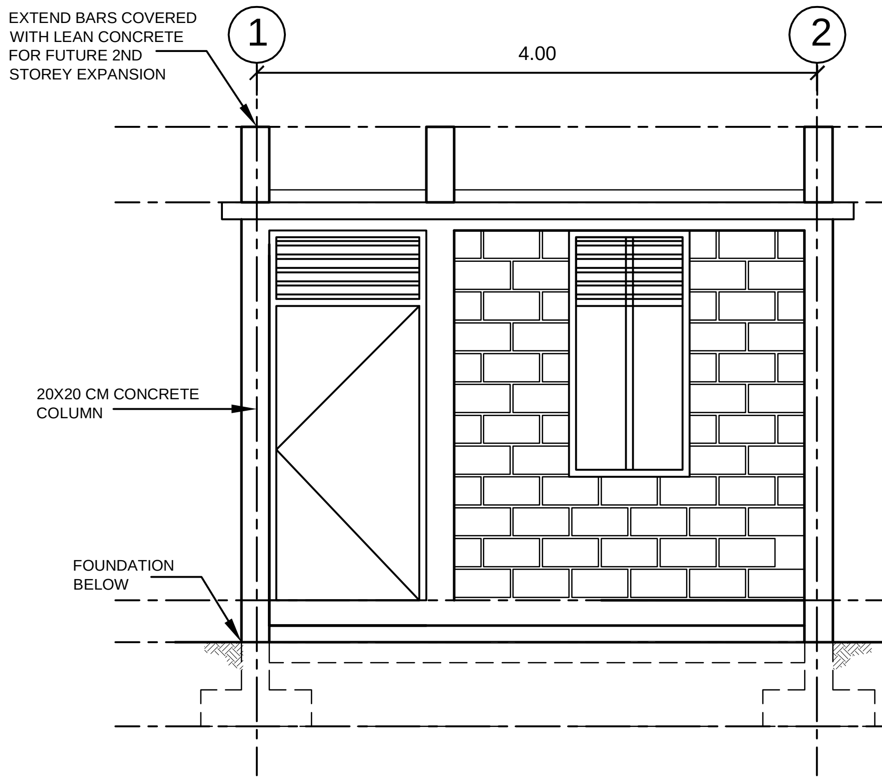
LEGEND

⊠	10X10CM TIMBER POST
(hatched)	15 CM THICK FULL HEIGHT HOLLOW CONCRETE BLOCK WALLS, GROUTED AND REINFORCED, SEE STRUCTURAL DETAILS
(open)	WINDOW OPENING WITH TIMBER FRAME

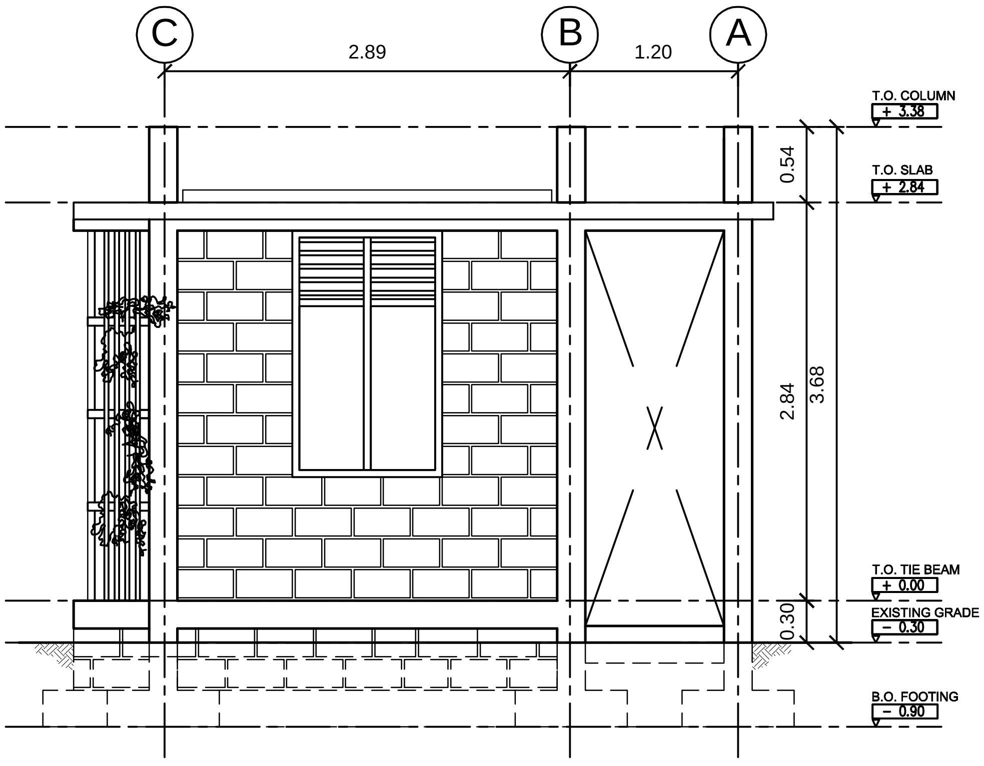
1 A-100 GROUND FLOOR PLAN
1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	FLOOR PLAN	A-100
		DATE : 05/02/2015 / SCALE: 1:50	
		REV : / DRAWN BY: MT	

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



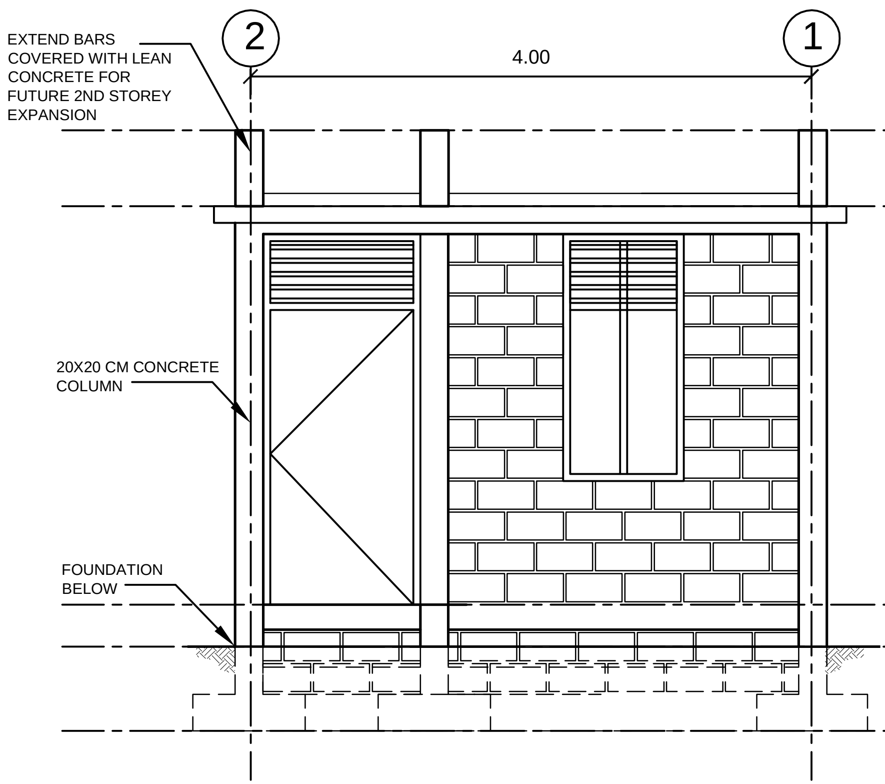
1 A–200 FRONT ELEVATION
1:50



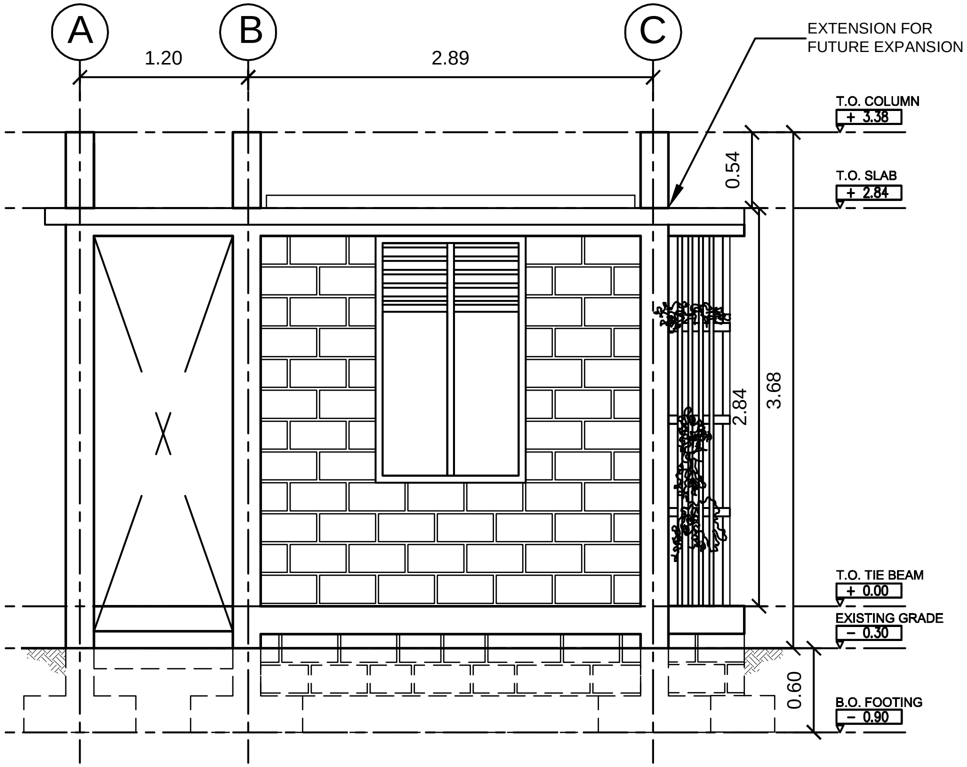
2 A–200 LEFT ELEVATION
1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	FRONT AND LEFT ELEVATION DATE : 05/02/2015 — SCALE: 1:50 REV : — DRAWN BY: MT	A-200

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



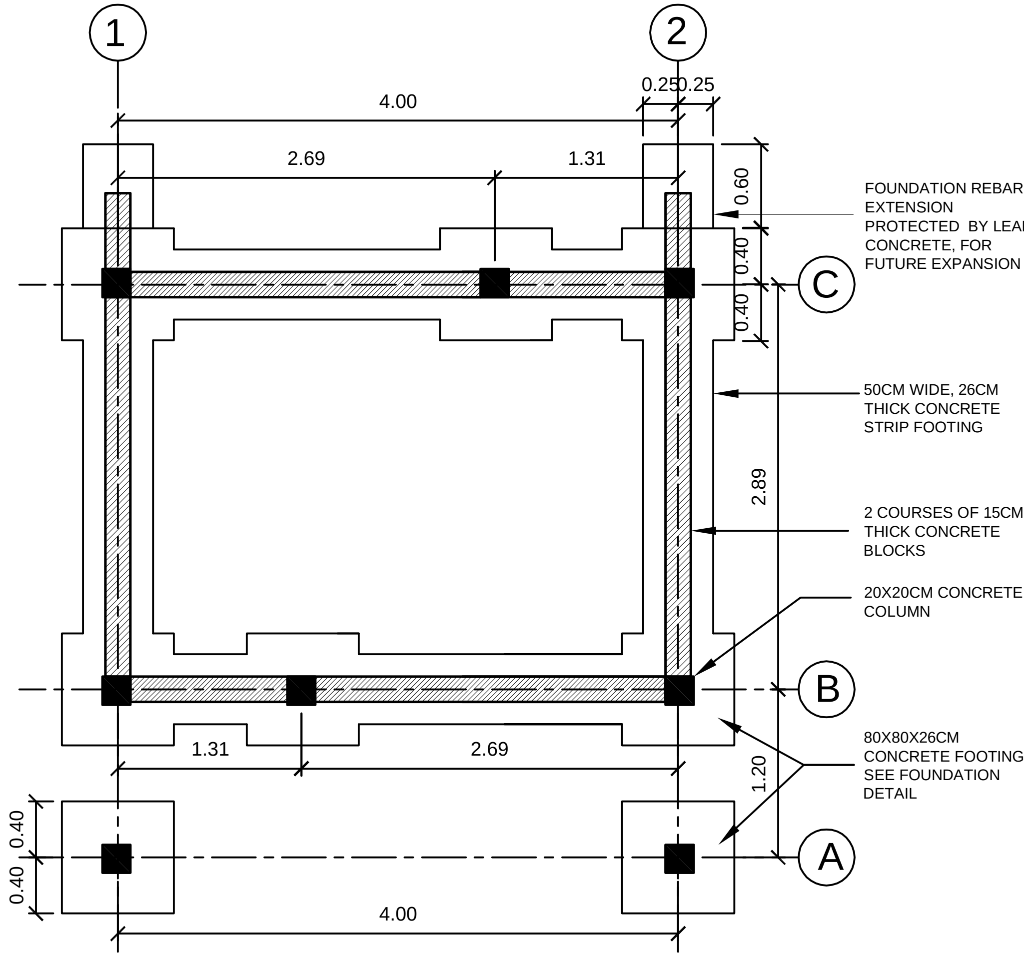
1 A-201 REAR ELEVATION
1:50



2 A-201 LEFT ELEVATION
1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	FLOOR PLAN DATE : 05/02/2015 / SCALE: 1:50 REV : / DRAWN BY: MT	A-201

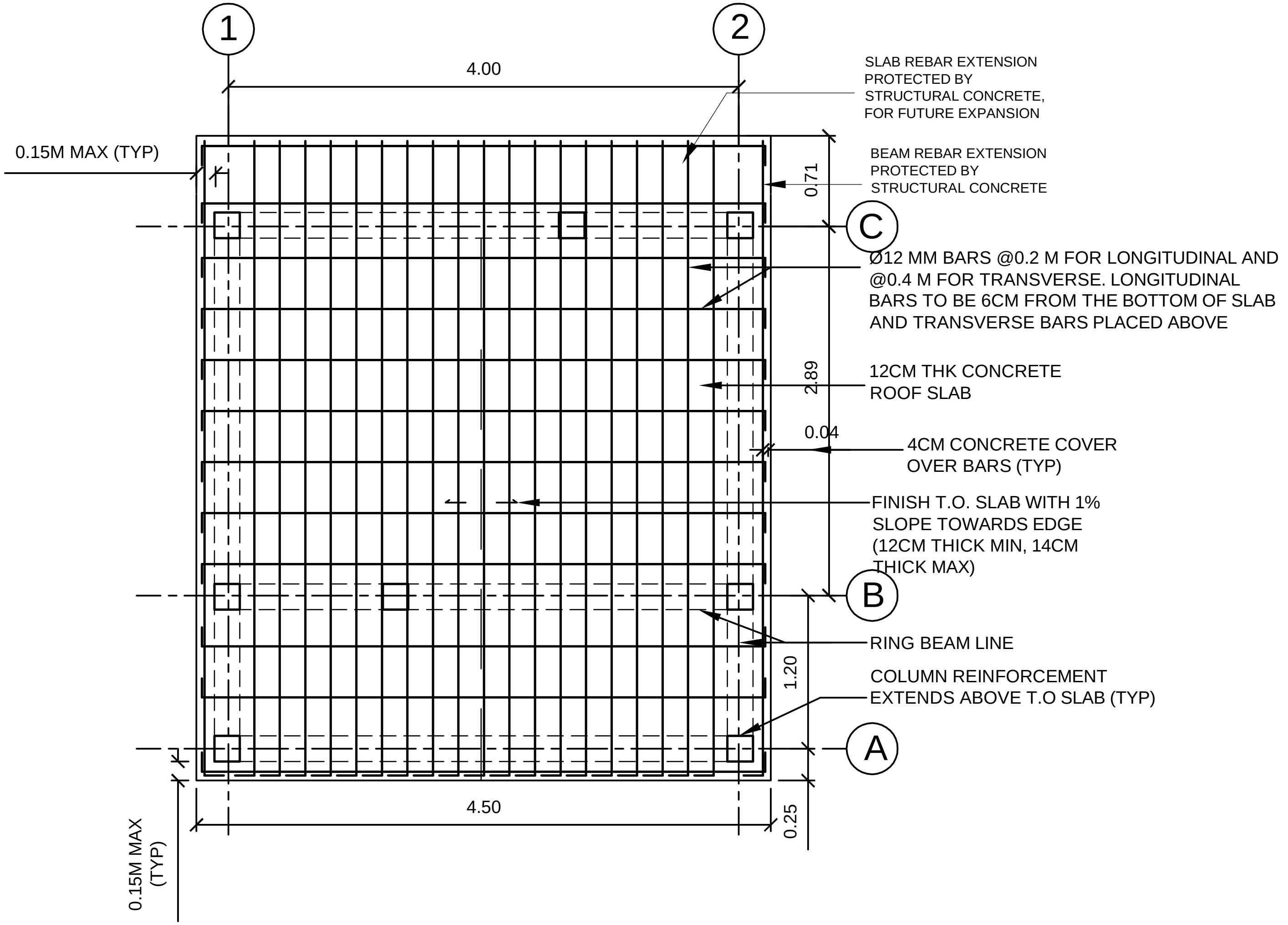
DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



1 S–100 FOUNDATION PLAN
1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	FOUNDATION PLAN		S-100
		DATE : 05/02/2015	SCALE: 1:50	
		REV :	DRAWN BY: MT	Page 17 of 63

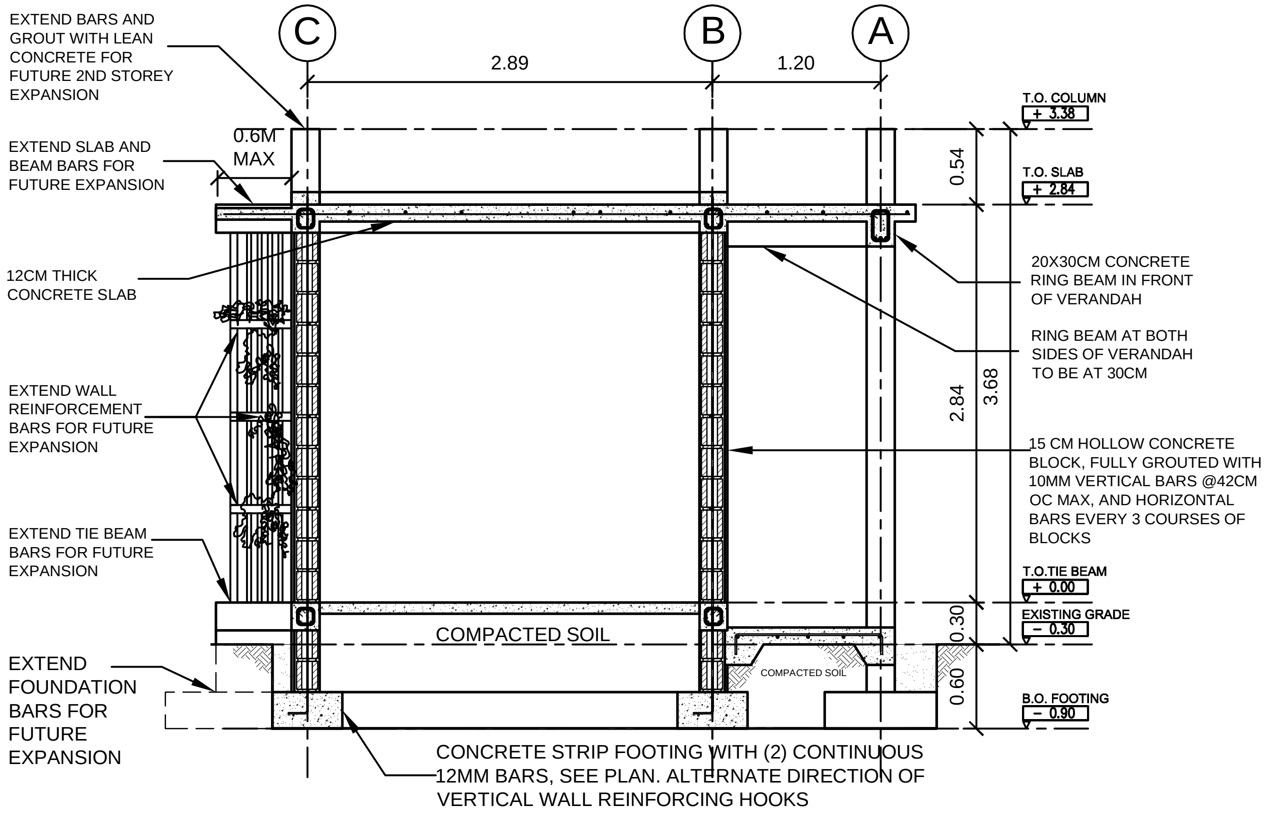
DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



1 ROOF PLAN
S–101 1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	ROOF PLAN DATE : 05/02/2015 SCALE: 1:50 REV : DRAWN BY: MT	S-101

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E

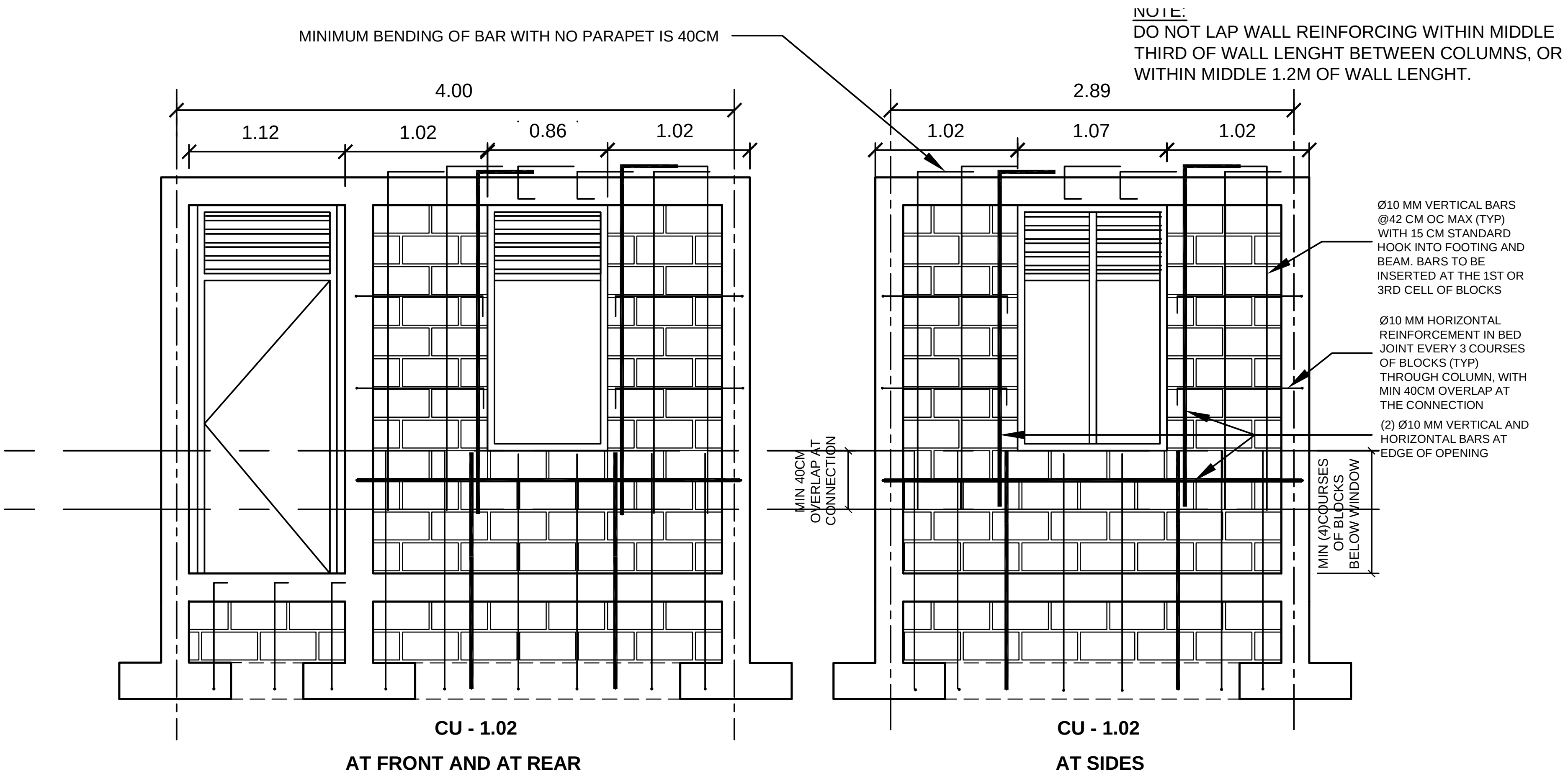


1 LONGITUDINAL SECTION
S–300 1:50

RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	SECTION		S-300
	DATE : 05/02/2015	SCALE: 1:50	
	REV :	DRAWN BY: MT	

BUILD CHANGE — Cordaid BUILDING FLOURISHING COMMUNITIES

DESIGN CODE : B1 - CV - CU 1.02 - CU 1.02 - CU 1.02 - CU 1.02 - E



D2.1 WALL REINFORCEMENT LAYOUT
NOT TO SCALE

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF DARIO BAGOYORO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-12	DETAILS DATE : 05/02/2015 — SCALE: N/A REV : — DRAWN BY: MT	S-503

STRUCTURAL AND ARCHITECTURAL DRAWINGS FOR THE

FRANCISCO CABERIO FAMILY RESIDENCE (S1-24)

PUROK 1, SULANGAN, GUIUAN

HOME OWNER INFORMATION

NAME: FRANCISCO CABERIO
PHONE NUMBER: 09265390622

DRAWINGS LIST

LOCATION

GENERAL BUILDING INFORMATION

AREA	GROUND FLOOR (M2)	UPPER LEVEL (M2)
HABITABLE AREA	18.40	0.0
INTERIOR AREA	12.40	0.0
VENTILATION AREA REQUIRED	2.00	0.0
VENTILATION AREA PROVIDED	7.00	0.0

TECHNICAL ASSISTANCE AND TRAINING FOR FAMILY DRIVEN RECONSTRUCTION IN SULANGAN

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

TITLE PAGE	
DATE : 01/12/2015	SCALE: N/A
REV :	DRAWN BY: MLB

T-100

GENERAL NOTES

I. GENERAL

A. THE DESIGN OF THIS HOUSE IS BASED ON THE REQUIREMENTS OF THE 2010 NATIONAL STRUCTURAL CODE OF THE PHILIPPINES (NSCP).

B. THE BUILDER IS RESPONSIBLE FOR COORDINATING THE WORK OF ALL WORKERS AND FOR CHECKING DIMENSIONS. NOTIFY THE ENGINEER OF ANY DISCREPANCIES AND RESOLVE BEFORE PROCEEDING WITH THE WORK.

C. THE BUILDER SHALL PROVIDE MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES INCLUDE, BUT MAY NOT BE LIMITED TO, BRACING AND SHORING FOR LOADS DURING CONSTRUCTION.

D. THE BUILDER AND HOMEOWNER SHALL REPORT TO THE ENGINEER ANY CONDITIONS ON SITE THAT CONFLICT WITH THE DRAWINGS.

E. THE BUILDER SHALL ASSURE THAT SITE SAFETY IS RESPECTED TO PREVENT INJURY OF PERSONS ON SITE OR ANY DAMAGE.

II. FOUNDATIONS

A. THE DESIGN OF THE FOUNDATIONS IS BASED ON THE RESULTS AND RECOMMENDATIONS OF THE GEOTECHNICAL INVESTIGATION AND REPORT "RETROFITTING AND RECONSTRUCTION OF ONE-TWO STOREY HOMES NGOLOS AND SULUNGAN, GUIUAN, EASTERN SAMAR" PERFORMED BY A.M. GEOCONSULT AND ASSOCIATES, INC, AND DATED AUGUST 2014.

B. FOUNDATION DESIGN PARAMETERS:

1. AN ALLOWABLE SOILD BEARING CAPACITY OF 150KPA WAS USED, WITH A PERMITTED 133% INCREASE FOR LOAD CASES INCLUDING TRANSIENT LOADS, SUCH AS WIND OR EARTHQUAKE.
2. A FRICTION COEFFEICENT FOR SLIDING OF 0.45 WAS USED TO RESIST LATERAL LOADS.

C. IN ACCORDANCE WITH THE NSCP, SITE PREPARATION AND FOUNDATION WORK SHALL CONFORM TO THE FOLLOWING:

1. CLEAR THE SITE OF ORGANIC MATERIAL PRIOR TO LEVELING THE SOIL.
2. NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN 20CM SHALL BE PLACED IN FILLS.
3. ALL FILLS SHALL BE COMPACTED IN LIFTS NOT EXCEEDING 20CM IN THICKNESS TO A MINIMUM OF 95 PERCENT OF MAXIMUM DRY DENSITY.
4. LAYOUT THE FOUNDATION GEOMETRY AND LOCATION USING NYLON STRING AND STAKES.

D. FOUNDATION TRENCHES SHALL BE CONSTRUCTED WITH THE FOLLOWING REQUIREMENTS:

1. MARK THE FOUNDATION TRENCH LOCATIONS WITH CHALK OR STRING LINE ACCORDING TO THE DIMENSIONS SHOWN ON PLAN. LINES SHALL BE AT RIGHT ANGLES.
2. TRENCHES SHALL BE FREE FROM ORGANIC MATTER.
3. THE BOTTOM OF THE TRENCH MUST BE LEVEL, CLEAN AND FREE OF LOOSE SOIL.

E. LOCATE AND PROTECT EXISTING UTILITIES TO REMAIN DURING AND/OR AFTER CONSTRUCTION.

F. REMOVE ABANDONED FOOTINGS, UTILITIES, ETC. WHICH INTERFERE WITH NEW CONSTRUCTION, UNLESS OTHERWISE INDICATED.

G. NOTIFY THE ENGINEER IF ANY BURIED STRUCTURES NOT INDICATED, SUCH AS CESSPOOLS, CISTERNS, FOUNDATIONS, ETC., ARE FOUND.

H. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR EXCAVATION PROCEDURES INCLUDING LAGGING, SHORING, UNDERPINNING AND PROTECTION OF EXISTING CONSTRUCTION.

I. REMOVE LOOSE SOIL AND STANDING WATER FROM FOUNDATION EXCAVATIONS PRIOR TO PLACING CONCRETE.

III. FORMWORK

A. FORMWORK SHALL BE OF GOOD QUALITY, STRAIGHT AND UNWARPED.

B. FORMWORK BELOW SLABS SHALL CONSIST OF ¾" PLYWOOD MINIMUM. THE PANELS SHALL BE SUPPORTED BELOW BY 2X4 WOOD BEAMS SPACED AT 1 METER MAXIMUM. SUPPORT EACH WOOD BEAM WITH METAL POSTS, 2X4 WOOD POSTS OR 6CM MINIMUM DIAMETER WOOD LOGS AT 1 METER MAXIMUM SPACING. PROVIDE SHIMS AT THE POST BASES AS REQUIRED FOR STABILITY.

C. FORMS SHALL BE SUBSTANTIAL AND SUFFICIENTLY TIGHT TO PREVENT LEAKAGE OF CEMENT PASTE.

D. FORMS SHALL BE PROPERLY BRACED OR TIED TOGETHER TO MAINTAIN POSITION AND SHAPE.

E. FORMS AND SUPPORT SHALL NOT DAMAGE PREVIOUSLY BUILT STRUCTURE.

F. IMMEDIATELY BEFORE NEW CONCRETE IS PLACED, ALL CONSTRUCTION JOINTS SHALL BE WETTED AND STANDING WATER REMOVED.

G. INSTALL FORMWORK AT THE VERTICAL TIES AFTER THE WALL CONSTRUCTION IS COMPLETE AND USE A LEVEL TO CHECK THAT THE FORMWORK IS INSTALLED PLUMB.

H. CONDUITS, PIPES AND SLEEVES PASSING THROUGH A SLAB, WALL OR BEAM SHALL NOT IMPAIR SIGNIFICANTLY THE STRENGTH OF THE CONSTRUCTION. THEY SHALL NOT BE LARGER IN OUTSIDE DIMENSION THAN ONE THIRD THE OVERALL THICKNESS OF SLAB, WALL OR BEAM IN WHICH THEY ARE EMBEDDED.

I. USE BRACES AS REQUIRED TO MAINTAIN ALL FORMWORK FIRMLY IN THE CORRECT POSITION.

J. DO NOT REMOVE FORM WORK and supports SOONER THAN THE TIMES INDICATED BELOW AFTER CASTING THE CONCRETE:

1. VERTICAL TIES AND HORIZONTAL RING BEAMS DIRECTLY SUPPORTED ON WALLS: 24 HOURS
2. FOUNDATIONS: TWO DAYS
3. SUSPENDED SLABS AND BEAMS NOT DIRECTLY SUPPORTED ON WALLS: FOURTEEN DAYS

K. REPAIR ALL VOIDS IN CONCRETE WITHIN (3) DAYS AFTER FORMS ARE REMOVED AS FOLLOWS:

1. IMMEDIATELY NOTIFY THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PROCEEDING WITH A REPAIR.
2. VOIDS THAT LEAVE REINFORCING STEEL EXPOSED - CHIP OUT ENTIRE STRUCTURAL ELEMENT. RE-POUR CONCRETE SO THAT NO VOIDS ARE FORMED.
3. SMALL VOIDS WITH NO REINFORCING STEEL EXPOSED - FILL VOIDS WITH CEMENT RICH MORTAR.

IV. REINFORCING STEEL

A. REINFORCEMENT SHALL BE DEFORMED REINFORCEMENT.

B. REINFORCING TO HAVE A MINIMUM STRENGTH OF 40,000 PSI OR 280 MPA (GRADE 40).

C. BARS INDICATED IN THE DRAWINGS SHALL CONFORM TO THE FOLLOWING MINIMUM DIMENSIONS:

DESIGNATION	DIAMETER	LAP LENGTH
Ø8MM	8.0MM	30CM
Ø10MM	10.0MM	40CM
Ø12MM	12.0MM	50CM
Ø16MM	16.0MM	65CM

D. STEEL SHALL BE RUST FREE. CONCRETE FROM PREVIOUS POURS SHALL BE REMOVED WITH A WIRE BRUSH PRIOR TO POURING CONCRETE.

E. TERMINATE REINFORCING STEEL IN STANDARD HOOKS, UNLESS OTHERWISE SHOWN.

F. PROVIDE REINFORCING SHOWN OR NOTED CONTINUOUS IN LENGTHS AS LONG AS PRACTICABLE.

G. PROVIDE MEASURES NECESSARY TO STABLIZE REINFORCING ASSEMBLIES PRIOR TO PLACING CONCRETE.

V. CAST-IN-PLACE CONCRETE, MORTAR AND CEMENT PLASTER

A. THE DESIGN IS BASED ON CONCRETE COMPRESSIVE STRENGTH, f'C, AT 28 DAYS TO BE 2500 PSI OR 17.0 MPa, MINIMUM.

B. CEMENT: PORTLAND CEMENT, TYPE 1, DRY AND UNOPENED BAGS.

C. SAND: BLACK SAND, CLEAN AND WASHED. FINE FOR CEMENT PLASTER AND MORTAR, COARSE FOR CONCRETE.

D. AGGREGATE: CRUSHED, ANGULAR GRAVEL LESS THAN 2CM IN SIZE FOR CONCRETE.

E. WATER: CLEAN, NOT SALTY OR MUDDY

F. CONCRETE SPACERS SHALL BE PLACCED AT 0.8M ON CENTER MAXIMUM AND SECURED WITH BINDING WIRE TO THE REINFORCING BARS PRIOR TO PLACING CONCRETE IN ACCORDANCE WITH THE FOLLOWING, UNLESS OTHERWISE NOTED IN THE DRAWINGS:

LOCATION	SPACER LENGTH (COVER)
BELOW AND AT SIDES OF FOUNDATION REINFORCING	7.5CM
SIDES OF BEAMS AND COLUMNS	4.0CM
BETWEEN TIE REINFORCING AND MASONRY WALLS	2.5CM
BELOW RAISED SLAB REINFORCING	6.0CM

G. MIX DESIGN PROPORTIONS SHALL BE AS FOLLOWS:

USE	CEMENT	SAND	AGGREGATE	WATER (MAX)
CONCRETE	1	2	3	1
MORTAR	1	5		1
GROUT	1	5		1
PLASTER	1	5		1

H. PROPORTION, MIX, TRANSPORT AND PLACE CAST-IN-PLACE CONCRETE AS NOTED BELOW:

1. MIX ON A CLEAN CONCRETE OR ASPHALT SURAFCE, NOT ON SOIL.
2. MIX DRY UNTIL MATERIALS REACH A CONSISTENT COLOR, THEN ADD WATER.
3. ADD WATER ONLY AS NEEDED TO REACH DESIRED CONSISTENTCY, NOT EXCEEING THE AMOUNT NOTED IN THE MIX DESIGN PROPORTIONS BELOW.
4. CONSISTENCY SHALL RESULT IN SLUMP OF 5CM TO 10CM, OR A HAND TEST THAT RESULTS IN NO WATER SPILLING OUT WHEN CONCRETE IS HELD TIGHTLY IN THE HAND, BUT THE CONCRETE DOES NOT HOLD ITS FORM WHEN RELEASED.

I. AT LOCATIONS WHERE BLOCKS OR NEW CONCRETE WILL BE PLACED ABOVE CONCRETE, SCRAPE THE SURFACE AT ALL INTERFACES AFTER CASTING TO CREATE A ROUGHENED SURFACE.

J. AT LOCATIONS WHERE CONCRETE IS CAST OR CEMENT PLASTER APPLIED AGAINST MASONRY, WET SURFACES PRIOR TO PLACEMENT AND CLEAN OF LAITANCE, FOREIGN MATTER, AND LOOSE PARTICLES WITH A WIRE BRUSH OR BY CHIPPING.

K. WET FORMWORK AND STEEL PRIOR TO PLACING CONCRETE.

L. PLACE CONCRETE WITHIN 60 MINUTES AFTER MIXING. WITH THE EXCEPTION OF COLUMNS WHICH CAN HAVE A SINGLE COLD JOINT AT THE INTERMEDIATE BEAM LEVEL, PLACE AN ENTIRE ELEMENT (I.E. BEAM) WITHIN ONE DAY.

M. USE A VIBRATOR OR HAMMER AND ROD TO CONSOLIDATE CONCRETE AROUND REINFORCING.

N. AFTER REMOVING FORMS, CURE THE CONCRETE BY WETTING FIVE TIMES PER DAY FOR THREE DAYS MINIMUM.

O. CHIP OUT CONCRETE FOR THE ENTIRE ELEMENT AND REPOUR ALL CONCRETE ELEMENTS THAT CONTAIN ANY OF THE FOLLOWING: EXPOSED STEEL REINFORCING, CRACKS LARGER THAN 3MM, NUMEROUS CRACKS IN A LOCALIZED AREA, OR DIAGONAL OR VERTICAL CRACKS IN A BEAM.

VI. CONCRETE MASONRY

A. THE PURCHASE OF GOOD QUALITY BLOCKS IS THE HOMEOWNERS RESPONSIBILITY. PRIOR TO THE PURCHASE OF CONCRETE HOLLOW BLOCKS, THE HOMEOWNER SHALL CONFIRM VIA TESTING, THE QUALITY OF THE BLOCKS MADE BY THE PROPOSED PRODUCER WHO WILL SUPPLY BLOCKS FOR THE HOUSE CONSTRUCTION.

B. THE DESIGNS ARE BASED ON BLOCKS WITH A MINIMUM COMPRESSION STRENGTH OF 4 MPa AND OVERALL DIMENSIONS OF 15cm x20cmx40cm AND AT LEAST 55% NET AREA, WITH THREE CELLS.

C. ALL BLOCK CELLS TO BE GROUTED SOLID.

D. PROVIDE CEMENT PLASTER FINISH TO ALL MASONRY WALLS. PLASTER TO BE AT LEAST 1.5cm THICK AND APPLIED AT EACH SIDE OF THE WALL, UNLESS OTHERWISE NOTED

E. THE VERTICAL AND HORIZONTAL JOINT THICKNESS SHALL BE BETWEEN 1CM MINIMUM AND 2CM MAXIMUM.

F. USE A MINIMUM OF 1/2 BLOCK LENGTH BONDING.

G. MORTAR AND GROUT: FIRST MIX SAND AND CEMENT AND THEN ADD WATER. USE WITHIN 30 MINUTES OF MIXING OR DISCARD.

H. WET BLOCKS WITH CLEAN WATER PRIOR TO PLACING.

I. DO NOT USE DAMAGED BLOCKS. IF USING PARTIAL BLOCKS, USE AT LEAST ½ OF BLOCK.

J. PLACE BLOCKS SO THAT THE UPPER FACE IS LEVEL BEFORE PLACING MORTAR OR GROUT.

E.

GENERAL NOTES

K. WHERE BARS ARE PLACED WITHIN THE BLOCKS :

1. CENTER THE VERTICAL REINFORCING IN THE WALL, UNLESS OTHERWISE NOTED.
2. VERTICALLY ALIGN THE BLOCK CELLS.
3. FILL ALL CELLS WITH GROUT
4. CLEAN THE CELLS OF MORTAR AND DEBRIS PRIOR TO PLACING THE GROUT.
5. BARS IN THE FOUNDATION SHOULD CORRESPOND WITH THE SIZE AND LOCATIONS OF THE WALL REINFORCING WITHIN THE BLOCKS.

L. CURE THE WALL BY LIGHTLY WETTING 3 TIMES PER DAY FOR 3 DAYS.

VII. CARPENTRY

A. STRUCTURAL WOOD FRAMING: LAWAAN, MAHAGONY, HARD COCO LUMBER OR APPROVED EQUAL.

B. ROUGH HARDWARE:

1. NAILS : COMMON WIRE (ASTM F1667):
   - a. LENGTH AT STRAP-TO-WOOD CONNECTION: 1.5"
   - b. LENGTH AT WOOD-TO-WOOD CONNECTION: 3.5"
   - ROOFING NAILS WITH 1cm DIA. HEADS:
   - c. LENGTH AT METAL DECK-TO-WOOD CONNECTION: 2.5"
2. METAL STRAPS : 18 GAGE, EMBED STRAPS IN RING BEAM OR COLUMN, PASSING THE STRAP AROUND THE REINFORCING STIRRUP OR BAR.

VIII. METAL ROOFING

A. THE METAL DECKING SHOULD BE AT LEAST 26 GAGE (0.48mm) OR THICKER.

IX. STRUCTURAL OBSERVATIONS

X. THE ENGINEER WILL PROVIDE VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM FOR GENERAL CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS. THE HOMEOWNER SHALL ENSURE ACCESS FOR THE FOLLOWING STRUCTURAL OBSERVATIONS:

1. FOUNDATIONS (PRIOR TO PLACEMENT OF CONCRETE)
   - a. EXCAVATION PREPARATION
   - b. REINFORCEMENT PLACEMENT
   - c. PLACEMENT OF DOWELS
2. CONCRETE, PRIOR TO PLACEMENT
   - a. FORMWORK LAYOUT AND DIMENSIONS
   - b. REINFORCING STEEL SIZE AND PLACEMENT
   - c. REINFORCING COVER/SPACERS USED
   - d. EMBEDDED STRAPS
   - e. SLABS AND SLABS ON GRADE
3. MASONRY
   - a. WALL MATERIALS - BLOCK AND MORTAR
   - b. WALL SIZES AND LENGTHS
   - c. WALL REINFORCING STEEL SIZE AND PLACEMENTS
   - d. MORTAR JOINT SIZE
4. METAL STRUCTURES
   - a. METAL DECKING INSTALLATION
5. WOOD STRUCTURES
   - a. THE TYPE, LAYOUT AND SIZE OF ELEMENTS
   - b. CONNECTIONS BETWEEN FRAMING ELEMENTS
   - c. CONNECTION TO THE METAL DECK
   - d. CONNECTIONS TO THE WALLS AND FRAMING

B. IF INITIAL OBSERVATIONS MADE BY THE ENGINEER REVEAL THAT ANY PORTION OF THE WORK DOES NOT COMPLY WITH THE DRAWINGS AND SPECIFICATIONS, THE NECESSARY REPAIRS WILL BE MADE AT THE BUILDER'S EXPENSE.

X. DESIGN CRITERIA

A. THE DESIGN OF THIS HOME WAS PERFORMED FOR TWO CASES. THE DESIGN WAS PERFORMED CONSIDERING A HORIZONTAL EXTENSION TO THE REAR OF THE HOME WHICH IS 3M LONGER THAN THE FLOOR PLAN INCLUDED IN THESE DRAWINGS AS WELL AS A VERTICAL EXPANSION OF ONE 2.4M LEVEL WITH EITHER A FLAT CONCRETE SLAB ROOF OR LIGHT-WEIGHT 30-DEGREE MAX GABLE ROOF ABOVE. THE DESIGN WAS ALSO VERIFIED FOR THE REDUCED SIZE OF THE BUILDING PRESENTED IN THESE DRAWINGS.

B. OCCUPANCY CATEGORY IV

C. GRAVITY LOADS:

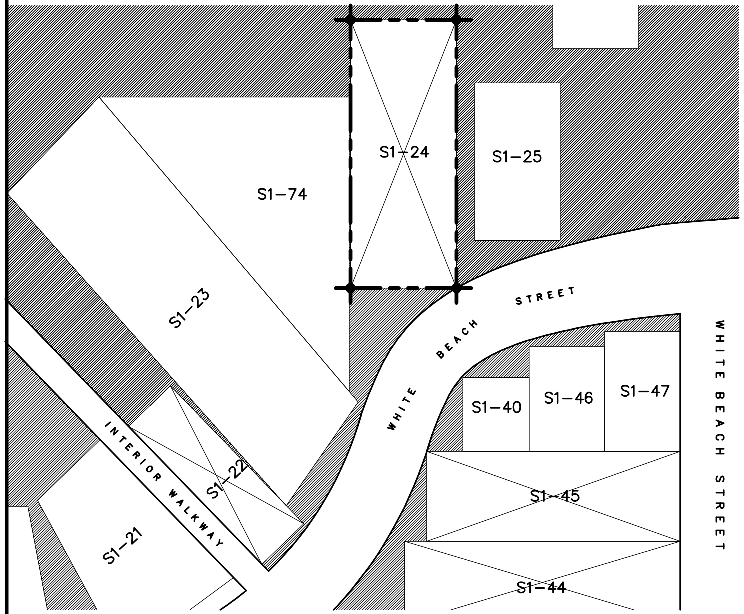
1. DEAD LOADS - VARY BASED ON ACTUAL BUILDING WEIGHTS
   - CONCRETE SLABS: 4.07kN/m2
   - LIGHT WEIGHT ROOFS: 0.34kN/m2
   - MASONRY WALLS: 3.53kN/m2
2. LIVE LOADS: ROOF 1.0 KPa, FLOOR 1.9 KPA

D. SEISMIC DESIGN:

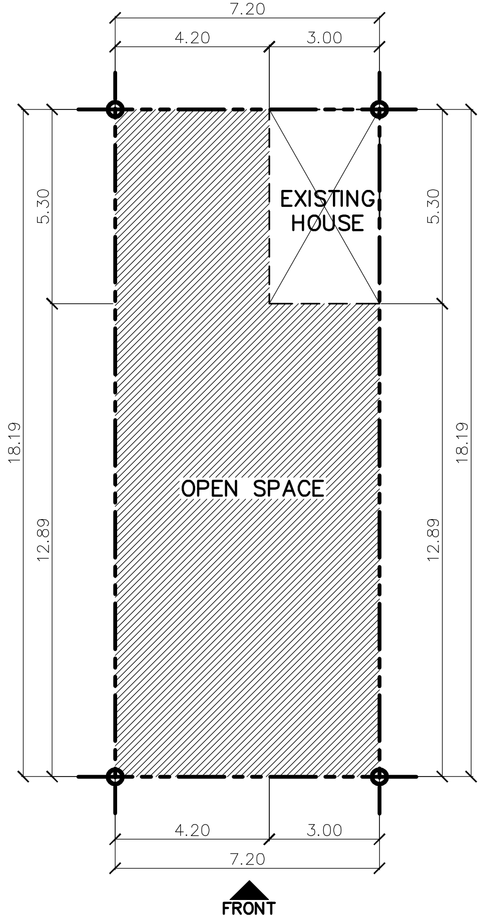
SEISMIC ZONE FACTOR: Z=0.40, SOURCE TYPE A > 15KM DISTANCE
SOIL TYPE = D
Na=1 Nv=1
Ca= 0.44 Cv = 0.64
IMPORTANCE FACTOR, I = 1.0
R-FACTOR = 2.5
BASE SHEAR, V = 0.32*W

E. WIND DESIGN:

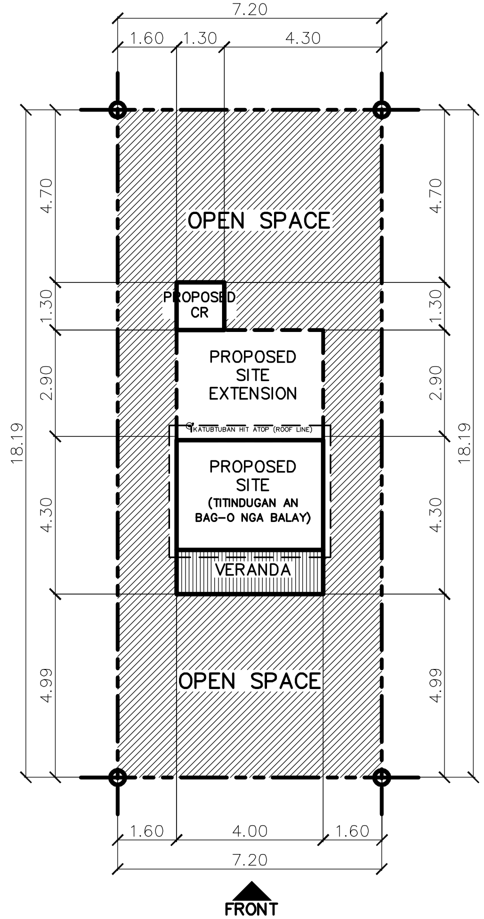
EXPOSURE CATEGORY = C
IMPORTANCE FACTOR = 1.0
BASIC WIND SPEED = 250 KPA
ENCLOSED STRUCTURE



A1 SITE PLAN
NOT TO SCALE



A2 EXISTING SITE PLAN
SCALE 1:150 MTS.

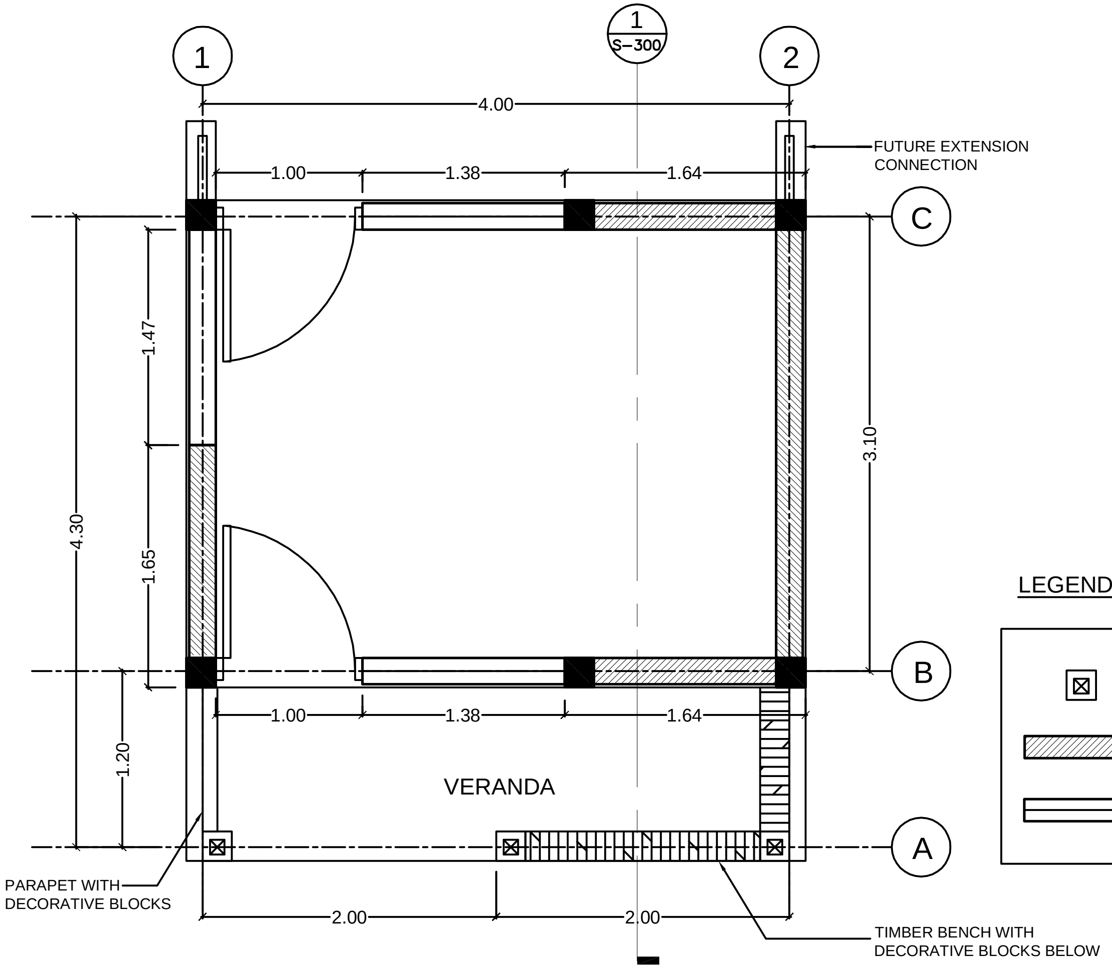


A3 PROPOSED SITE PLAN
SCALE 1:150 MTS.

N

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	SITE PLAN DATE : 01/12/2015 SCALE: 1:100 REV : DRAWN BY: MT	A-001

DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



LEGEND

⊠	10X10 CM TIMBER POST
(hatched)	15 CM THICK FULL HEIGHT HOLLOW CONCRETE BLOCK WALLS, GROUTED AND REINFORCED, SEE STRUCTURAL DETAILS
(open)	WINDOW OPENING WITH TIMBER FRAME

1 / A–100 GROUND FLOOR PLAN
1:50

N

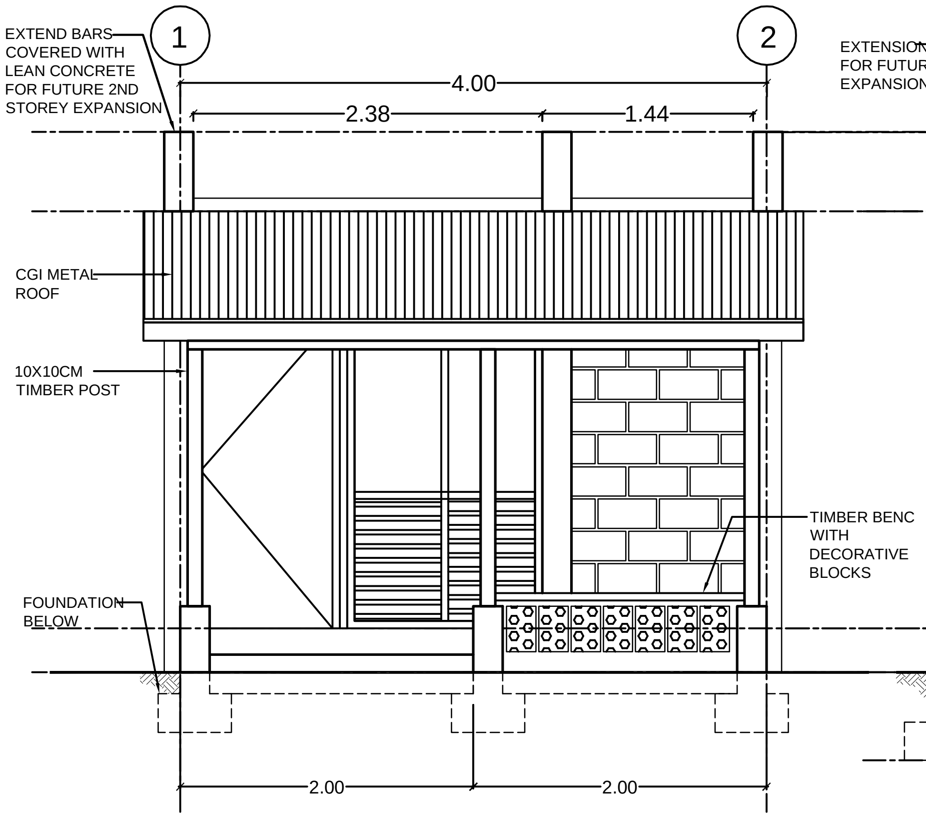
BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF FRANCISCO CABERIO
PUROK 1, SULANGAN, GUIUAN
HOUSE NO.S1-24

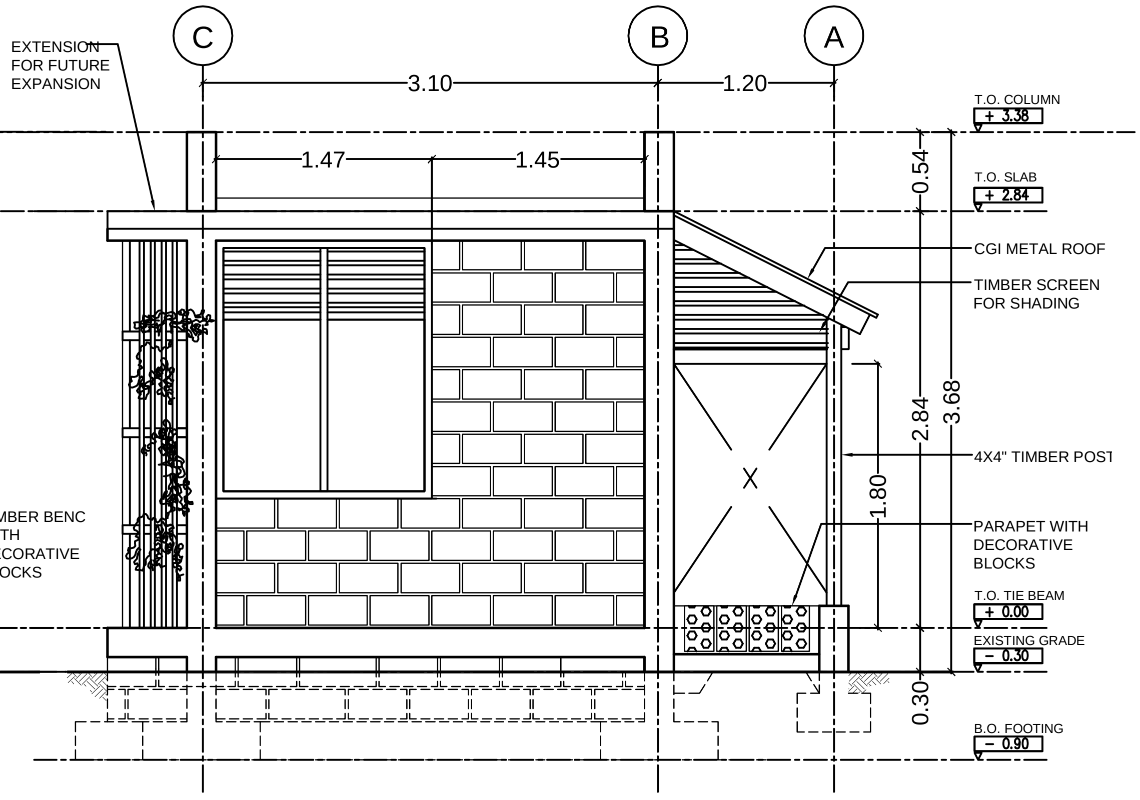
FLOOR PLAN	
DATE : 01/12/2015	SCALE: 1:50
REV :	DRAWN BY: MT

A-100

DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



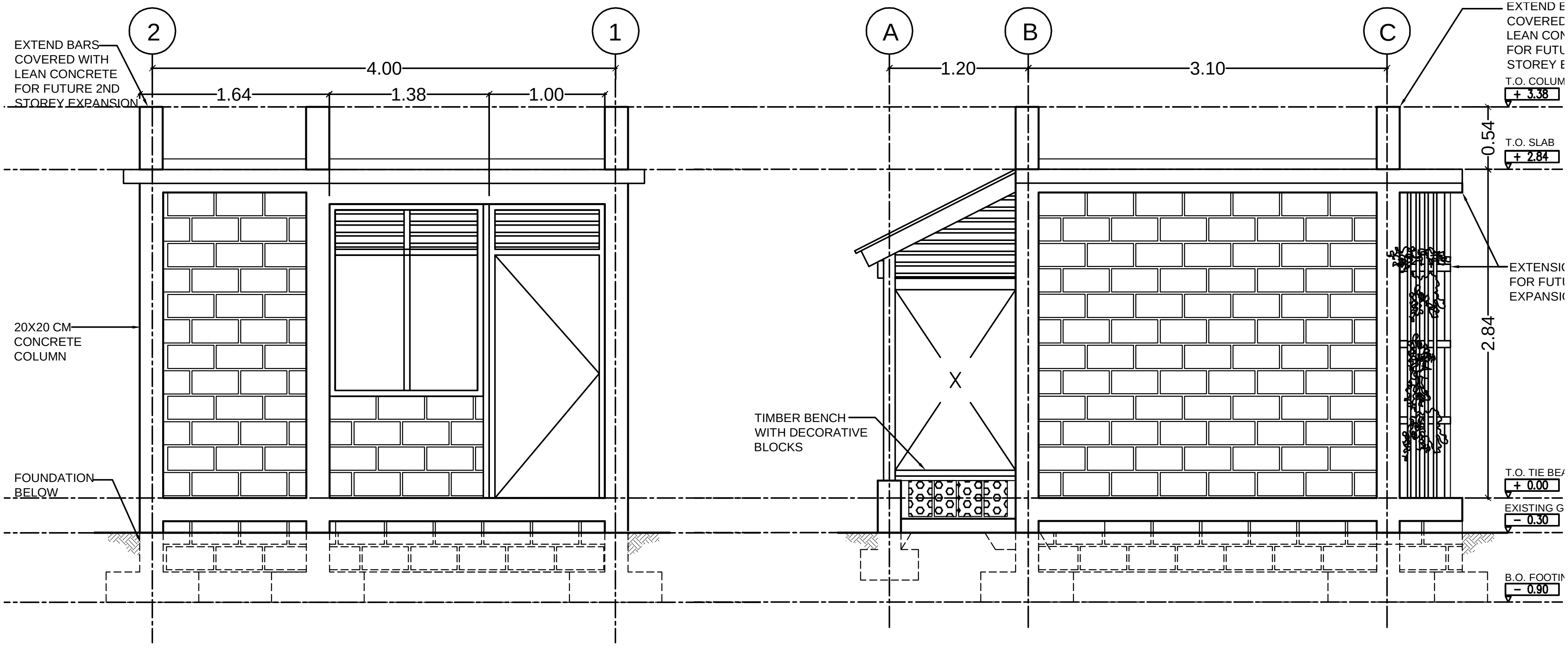
1 A–200 FRONT ELEVATION 1:50



2 A–200 LEFT ELEVATION 1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	ELEVATIONS DATE : 01/12/2015 — SCALE: 1:50 REV : — DRAWN BY: MT	A-200

DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



1 REAR ELEVATION
A–201 1:50

2 RIGHT ELEVATION
A–201 1:50

BUILD CHANGE
Cordaid
BUILDING FLOURISHING COMMUNITIES

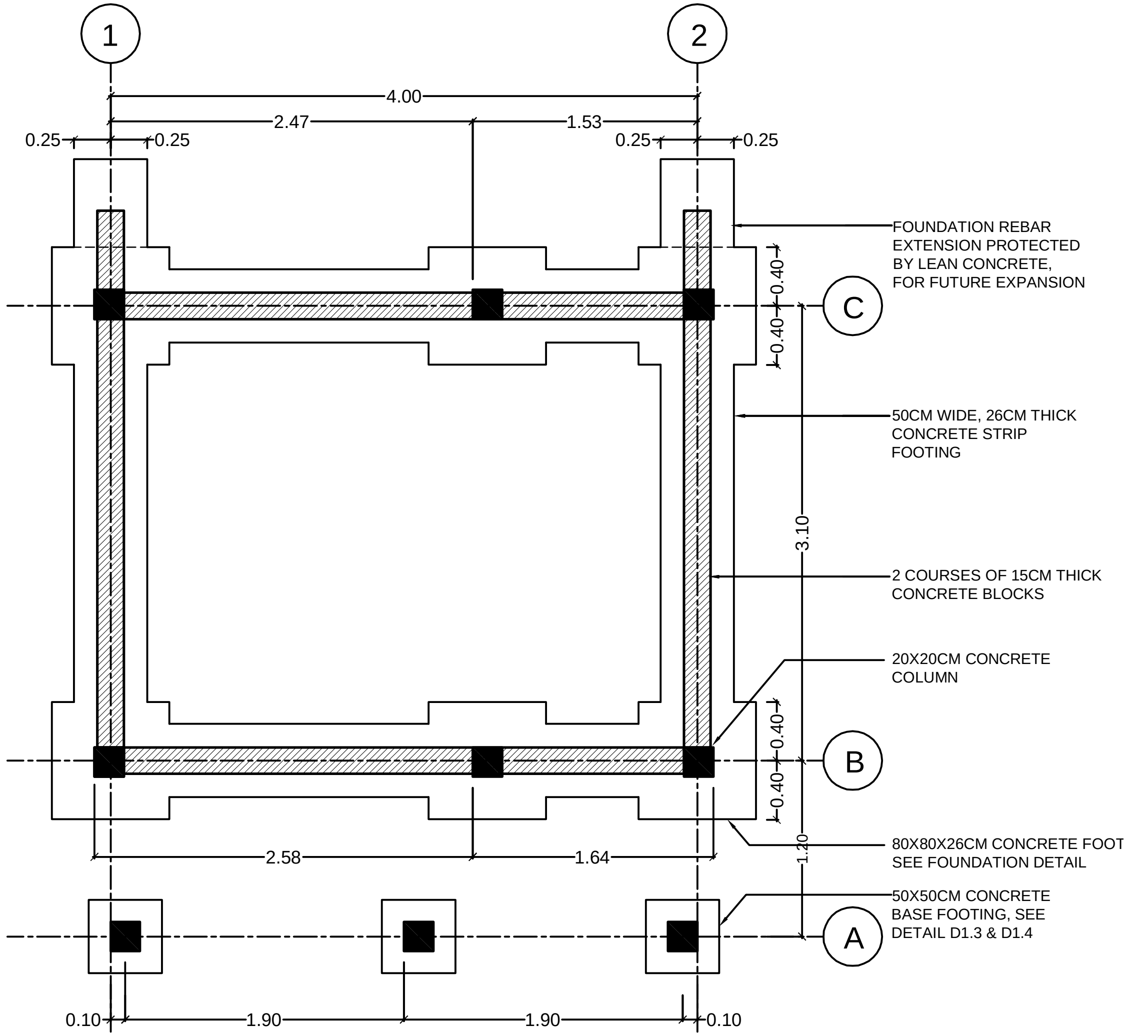
RESIDENCE OF FRANCISCO CABERIO
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

ELEVATIONS

DATE : 01/12/2015
SCALE: 1:50
REV :
DRAWN BY: MT

A-201

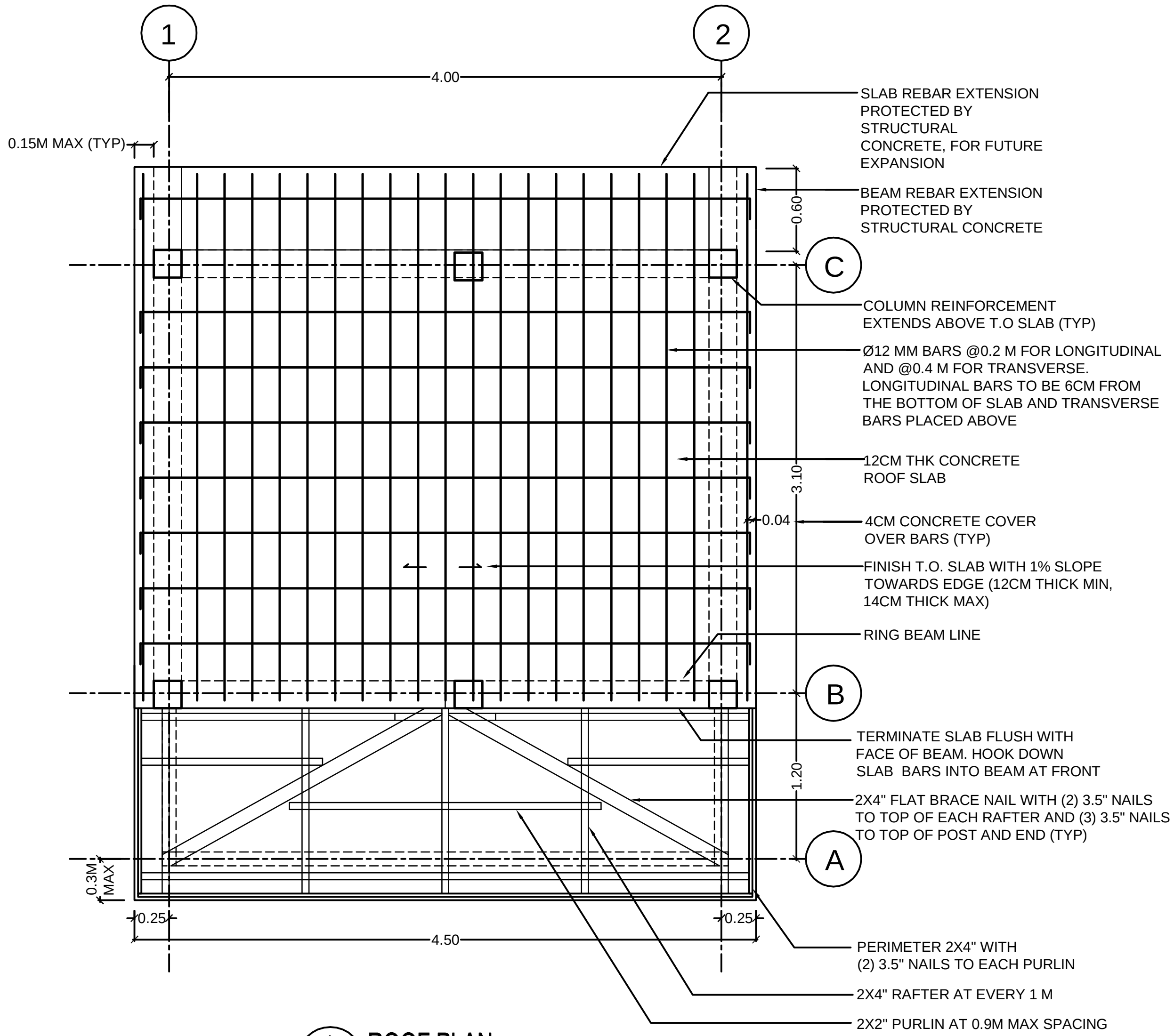
DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



1 FOUNDATION PLAN
S–103 1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	FOUNDATION PLAN DATE : 01/12/2015 — SCALE: 1:50 REV : — DRAWN BY: MT	S-100

DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



1 S–101 ROOF PLAN
1:50

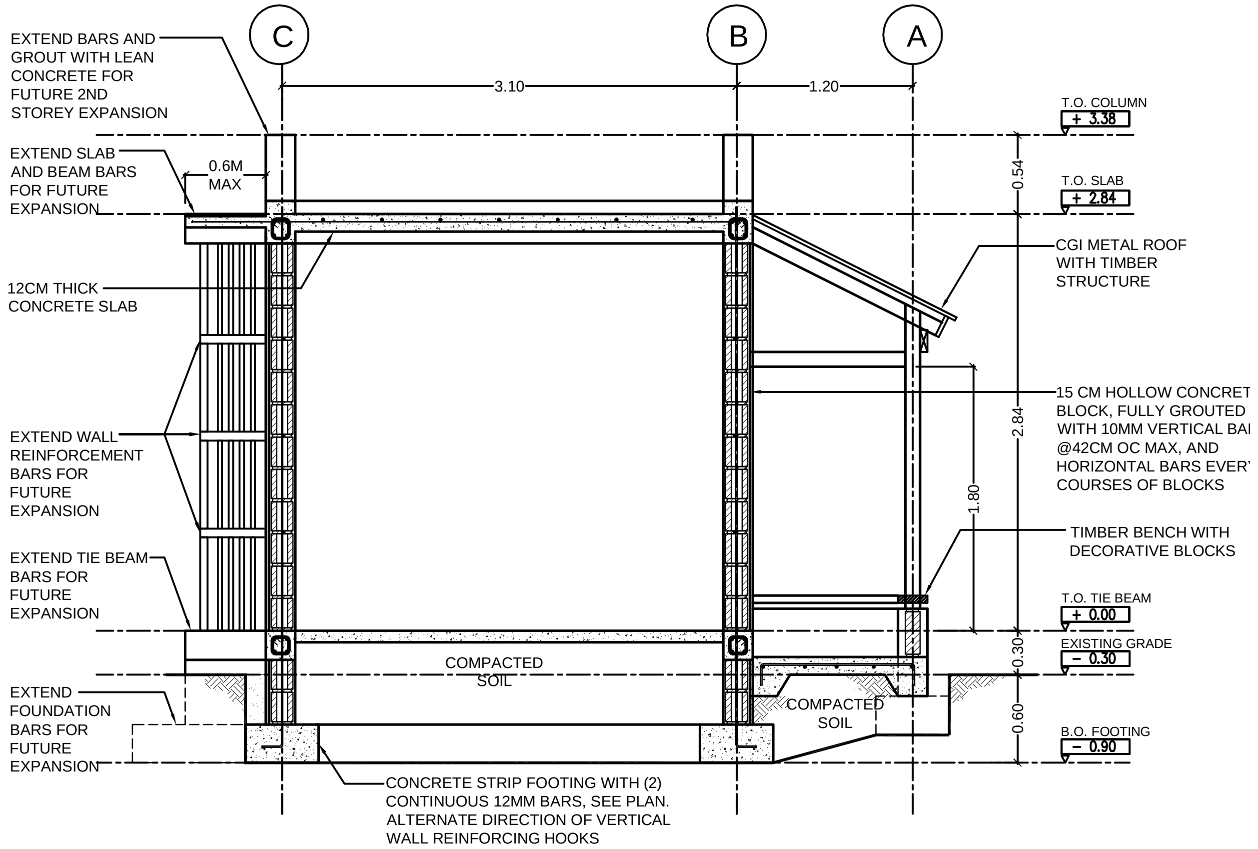
BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF FRANCISCO CABERIO
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

ROOF PLAN	
DATE : 01/12/2015	SCALE: 1:50
REV :	DRAWN BY: MT

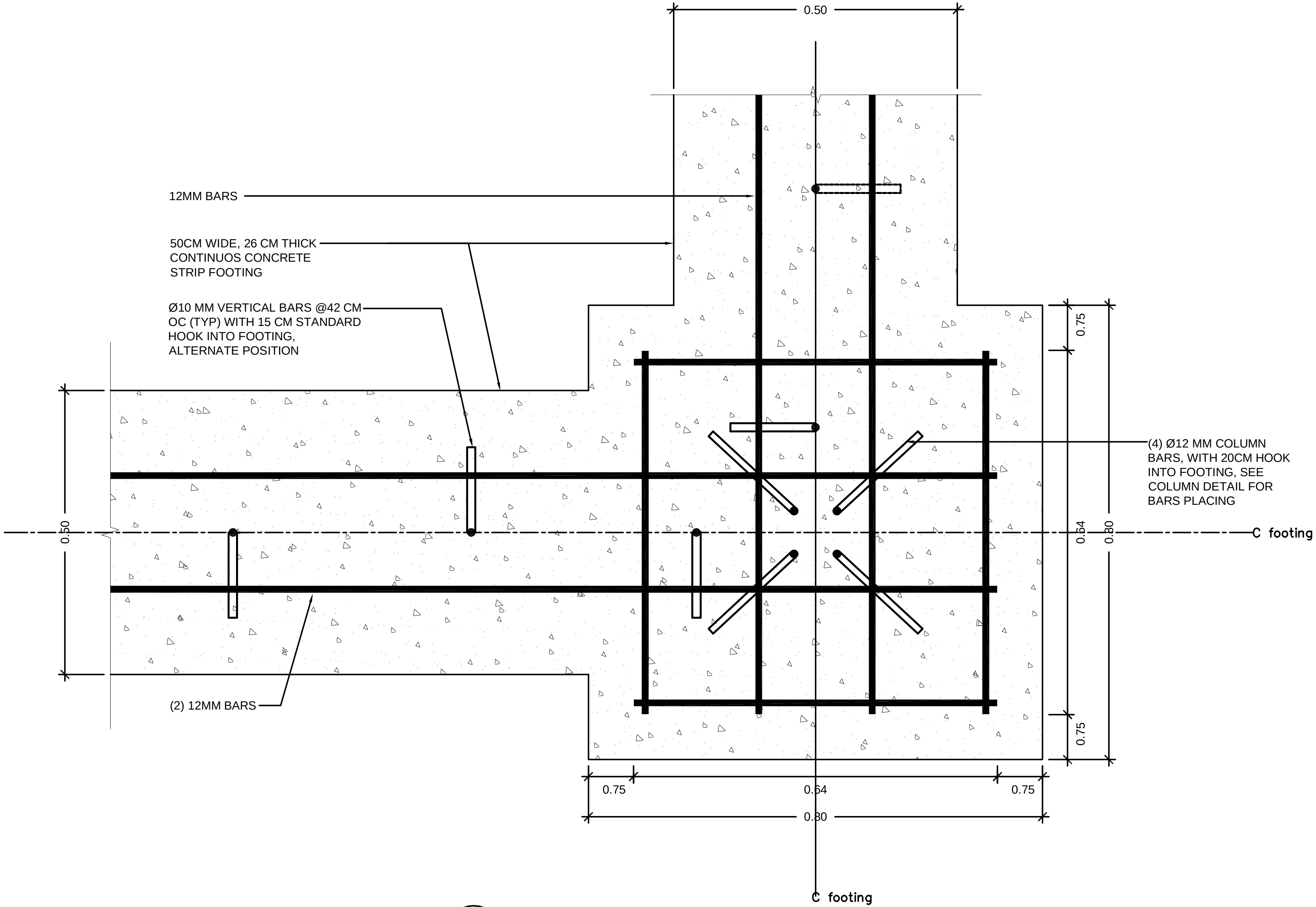
S-101

DESIGN CODE : B1 - TV - EF 1.64 - EU 1.64 - EU 1.65 - SO - E



1 S-300 LONGITUDINAL SECTION
1:50

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	SECTIONS		S-300
		DATE : 01/12/2015	SCALE: 1:50	
		REV :	DRAWN BY: MT	



D1.1 FOUNDATION PLAN DETAIL
1:10

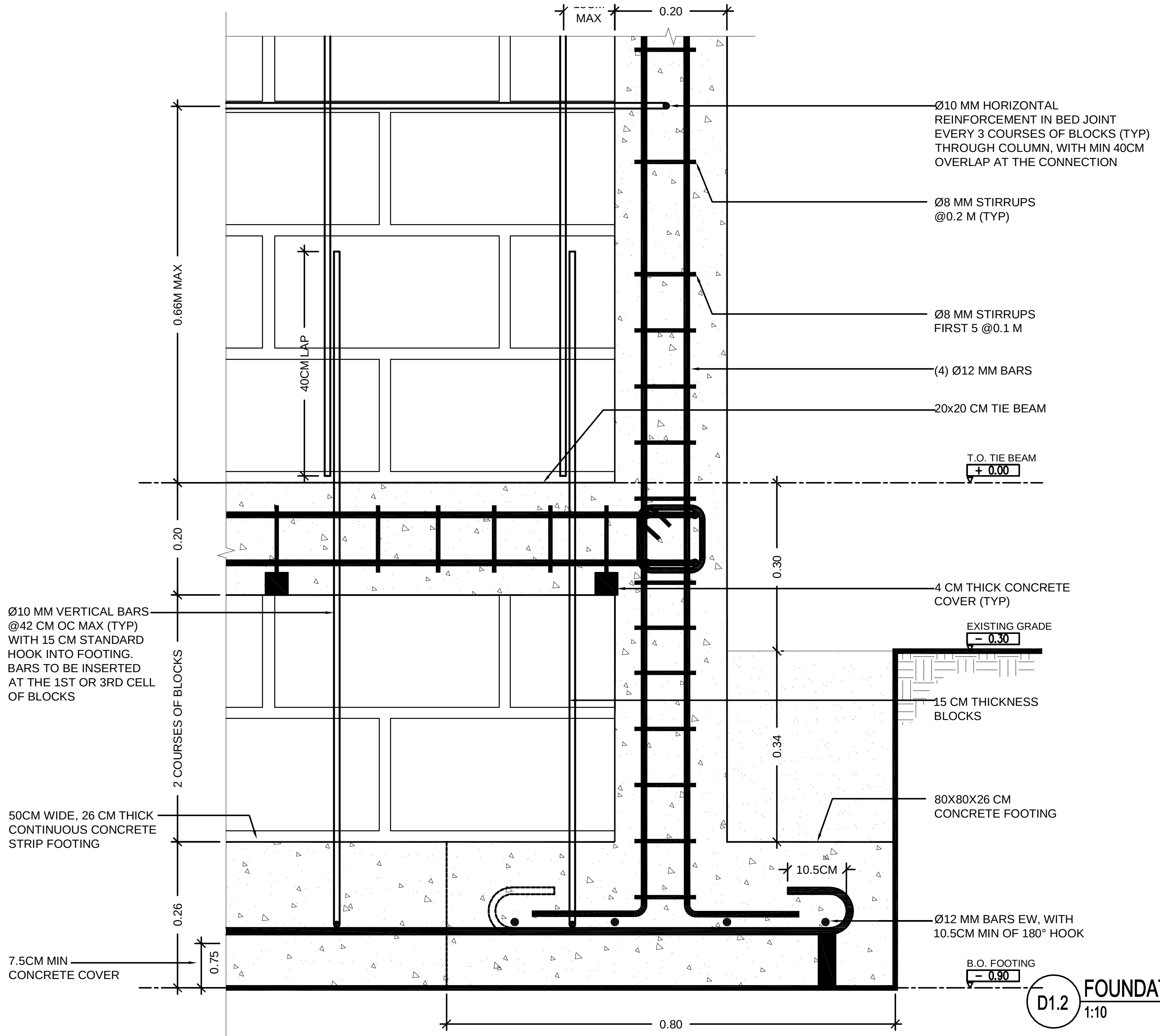
BUILD CHANGE

Cordaid
BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-500



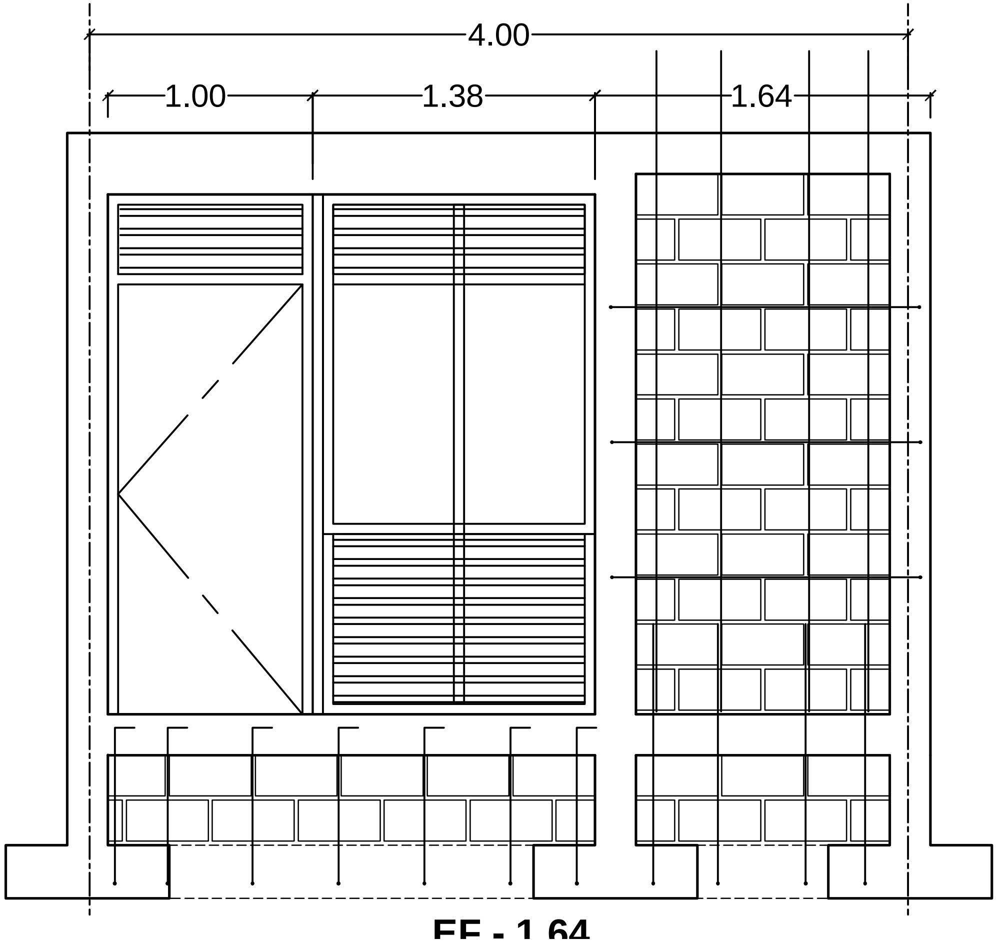
D1.2 **FOUNDATION SECTION DETAIL**
1:10

RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

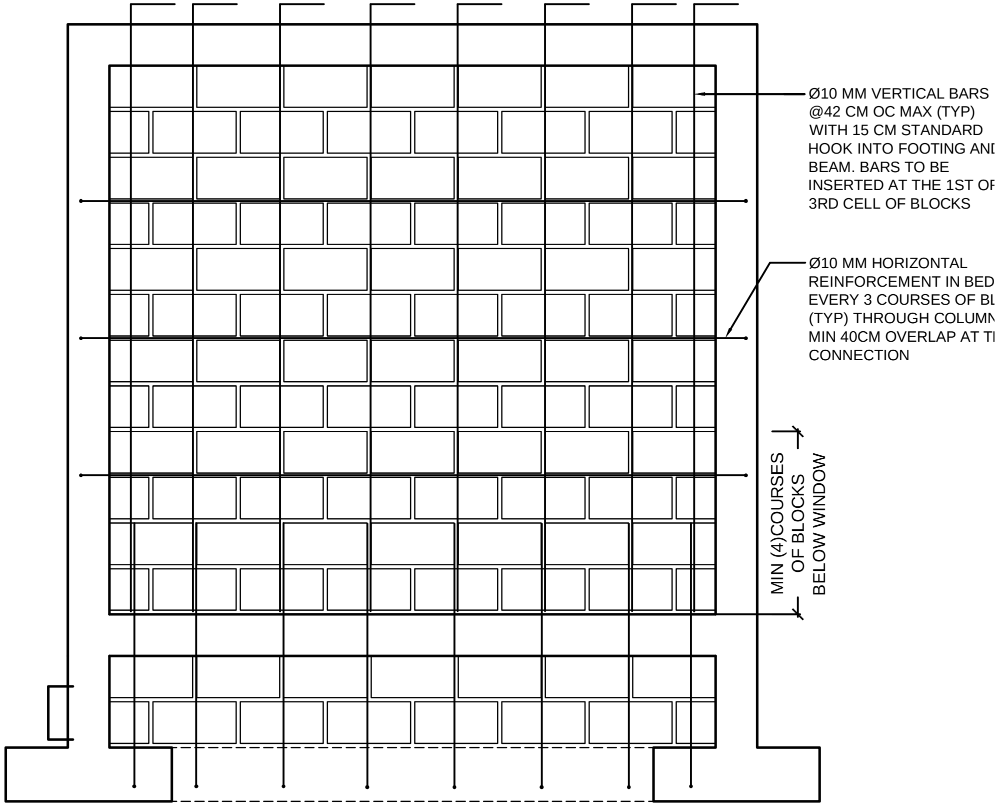
BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-501



AT FRONT

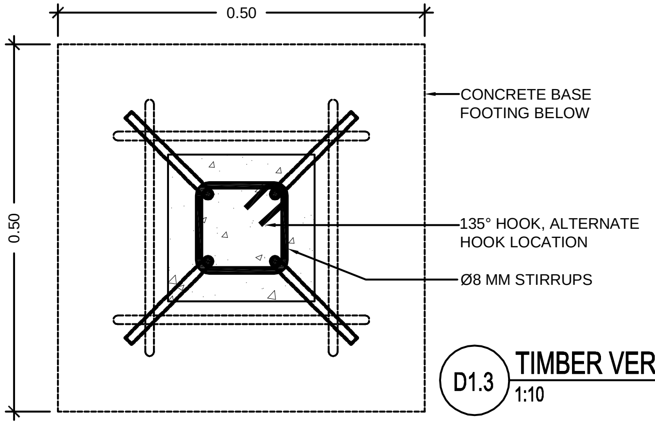


AT WINDOW

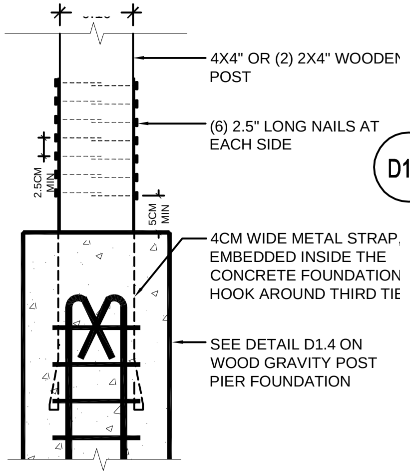
D2.1 WALL REINFORCEMENT DETAIL

NOT TO SCALE

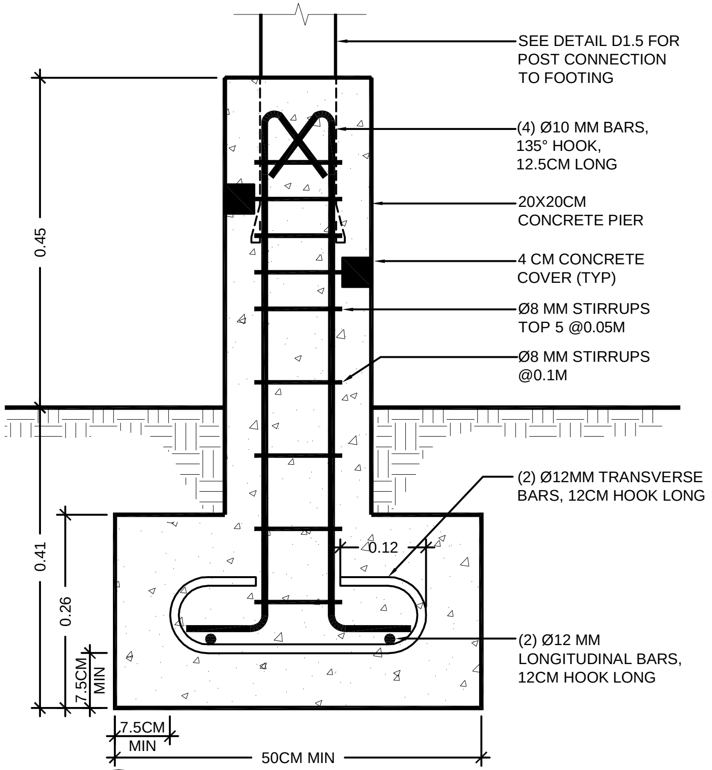
BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	SECTIONS DATE : 01/12/2015 — SCALE: 1:50 REV : — DRAWN BY: MT	S-503



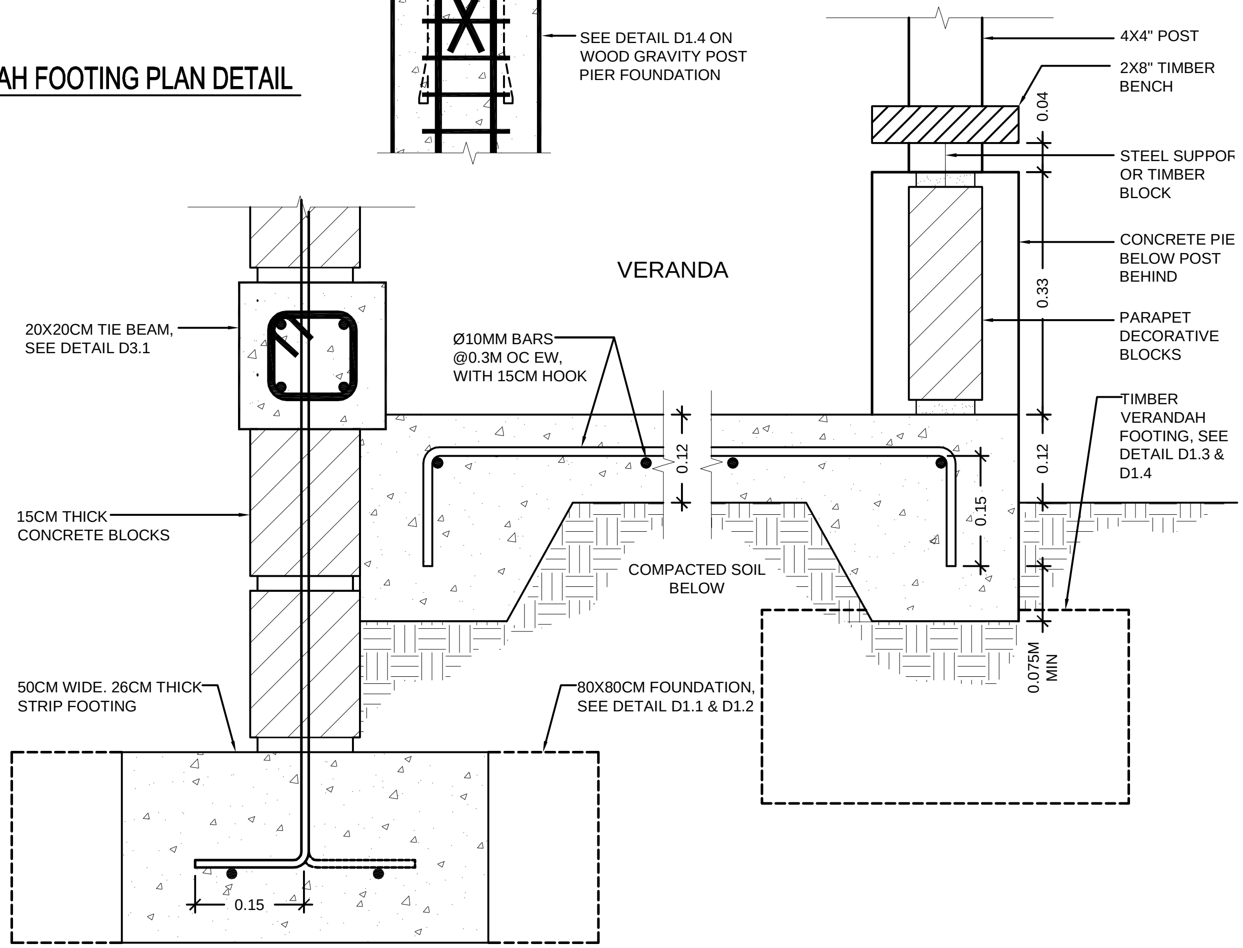
D1.3 TIMBER VERANDAH FOOTING PLAN DETAIL
1:10



D1.5 POST CONNECTION TO FOOTING
1:10



D1.4 TIMBER VERANDAH FOOTING SECTION DETAIL
1:10



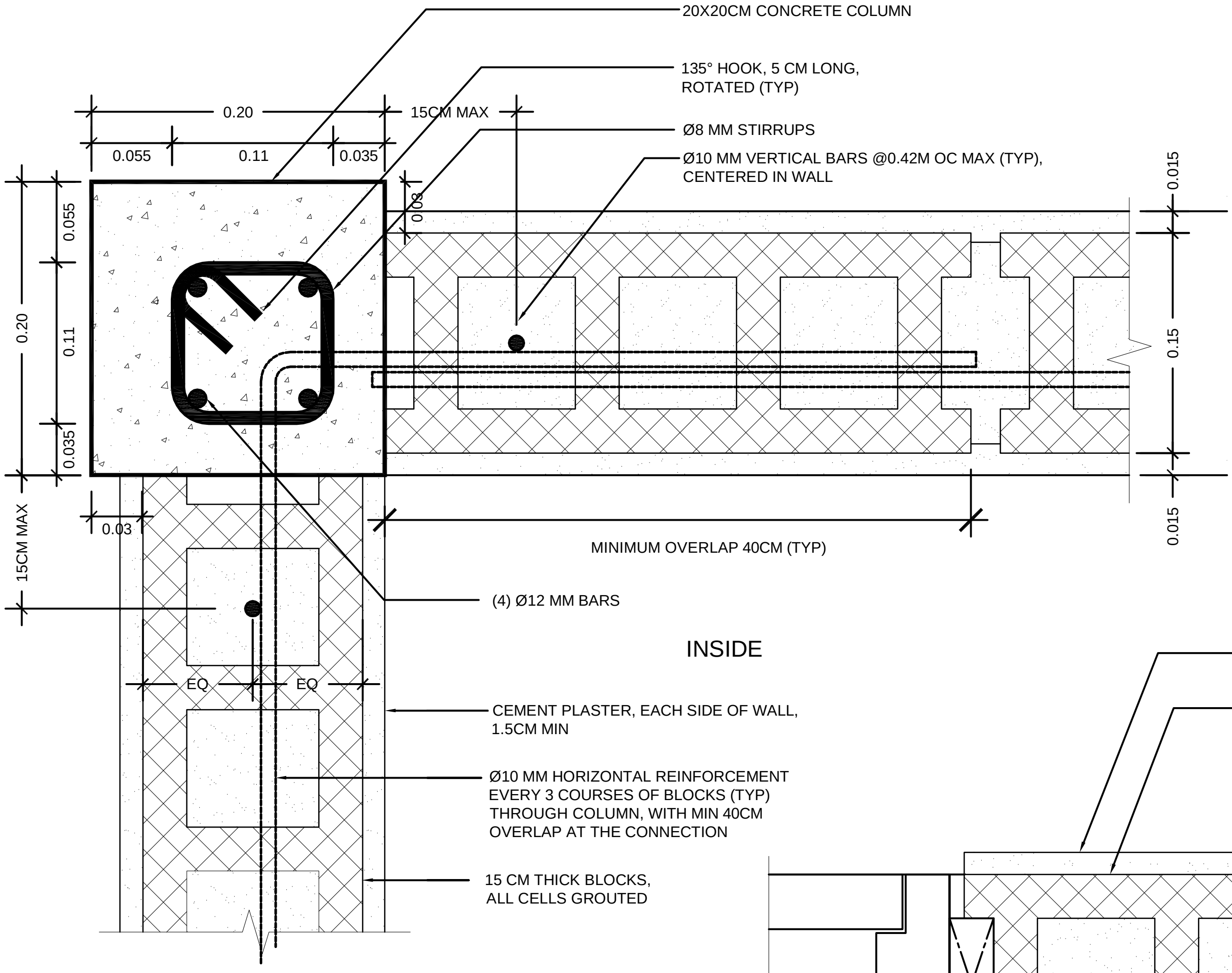
D1.6 TIMBER VERANDAH CONCRETE SLAB DETAIL
1:10

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

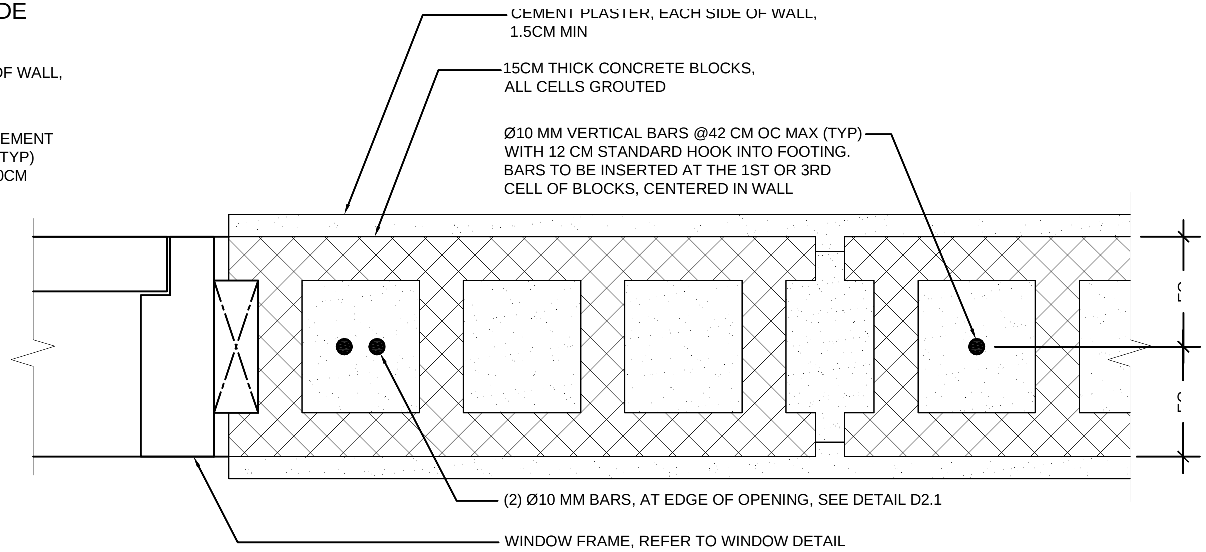
RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-502



D2.2 COLUMN SECTION DETAIL
1:5



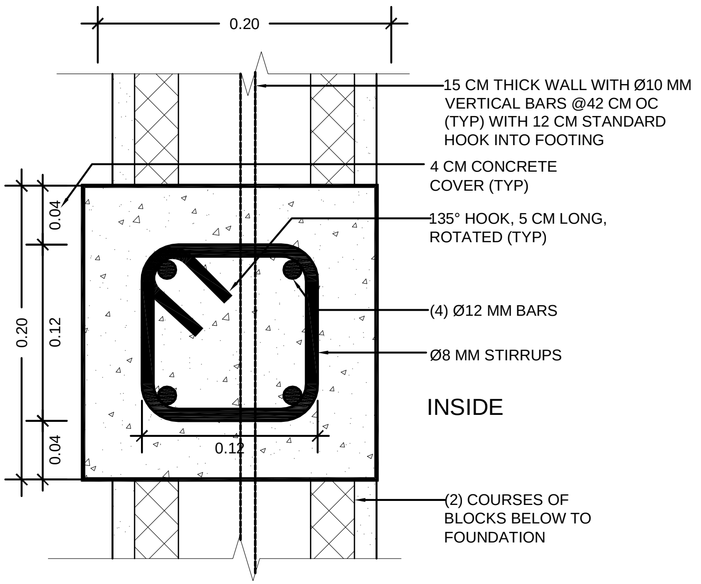
D2.3 REINFORCEMENT SECTION DETAIL AT OPENING
1:5

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

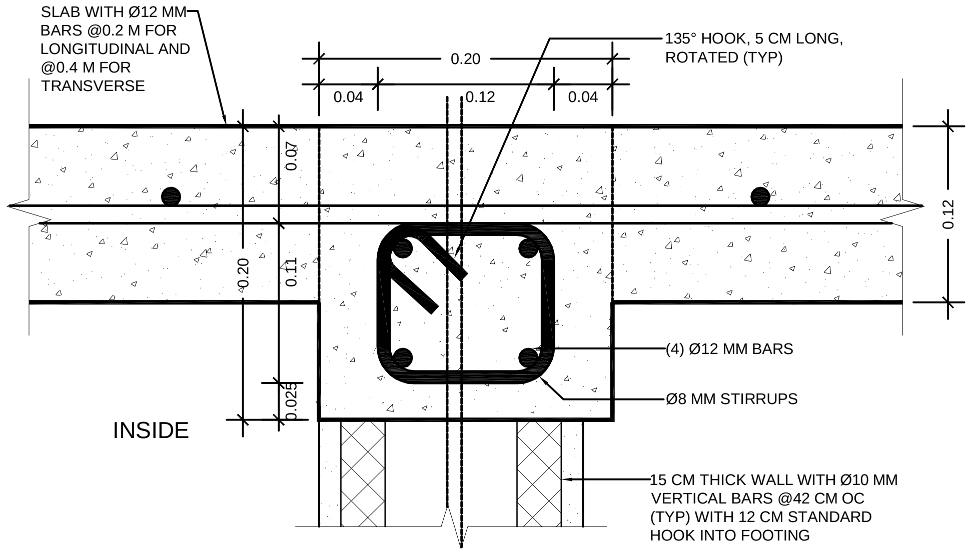
RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

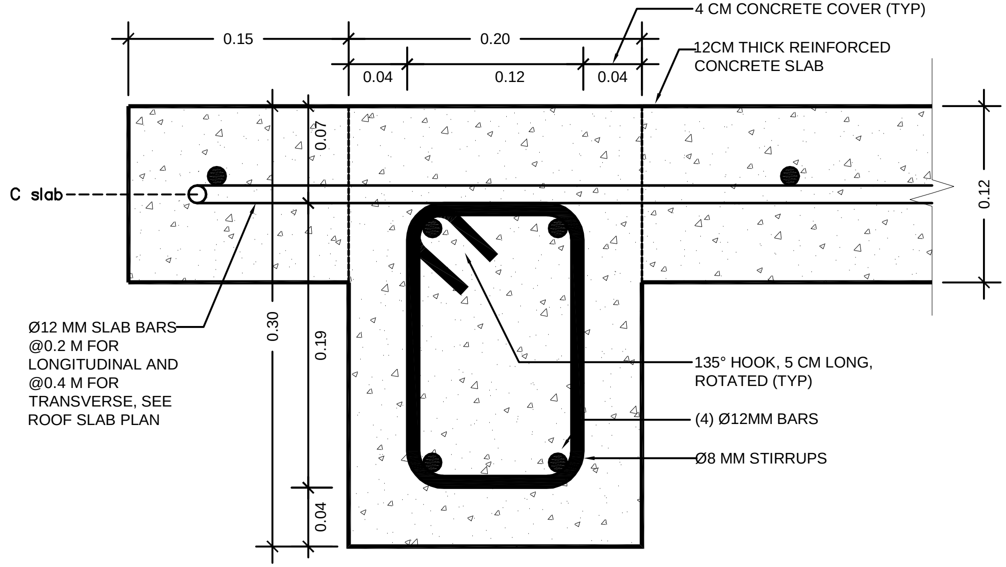
S-504



D3.1 **TIE BEAM SECTION DETAIL**
1:5



D3.2 **20X20CM RING BEAM SECTION DETAIL**
1:5



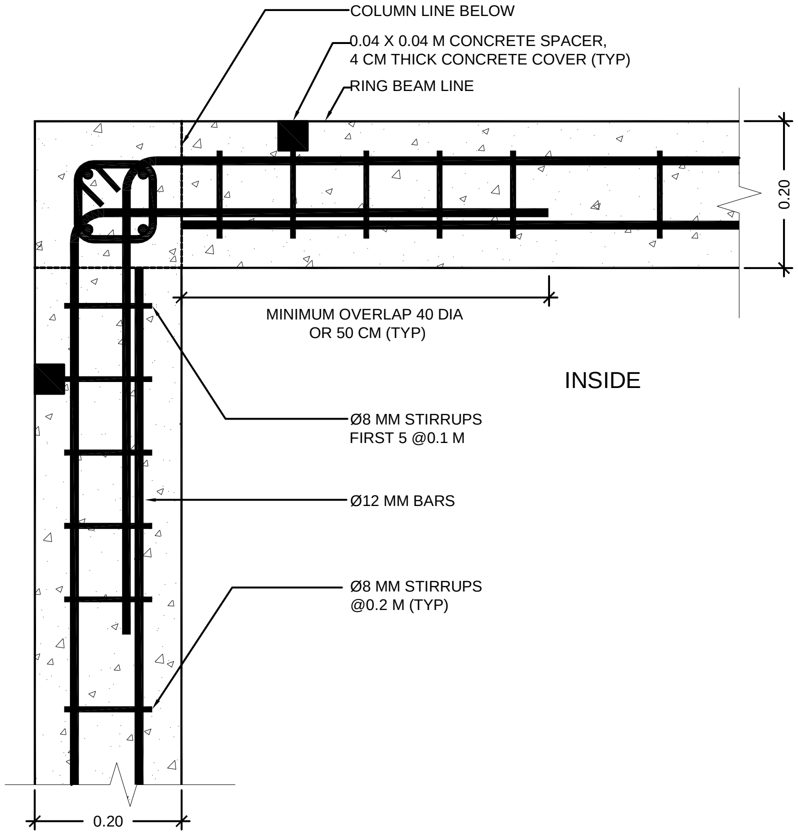
D3.3 **20X30CM RING BEAM SECTION DETAIL**
1:5

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

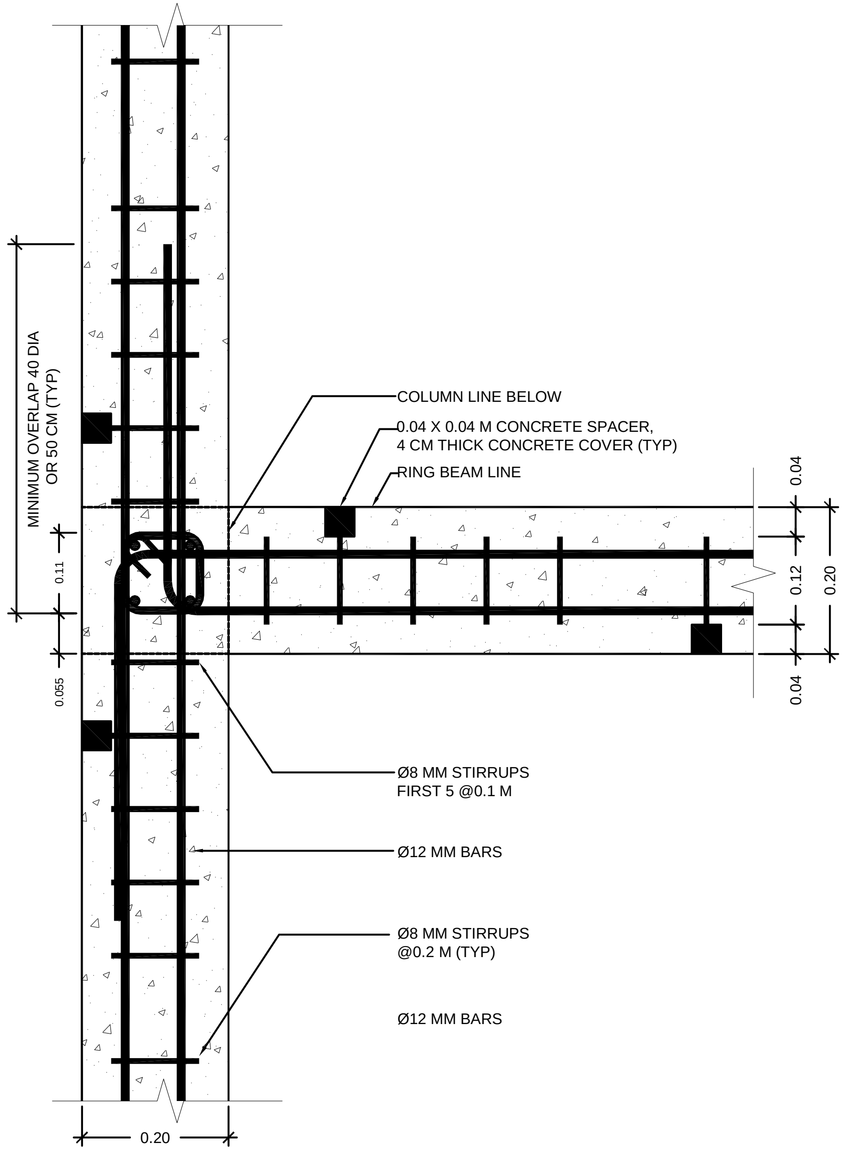
RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-505



D3.4 RING BEAM AND COLUMN PLAN DETAIL AT L-CORNER
1:10



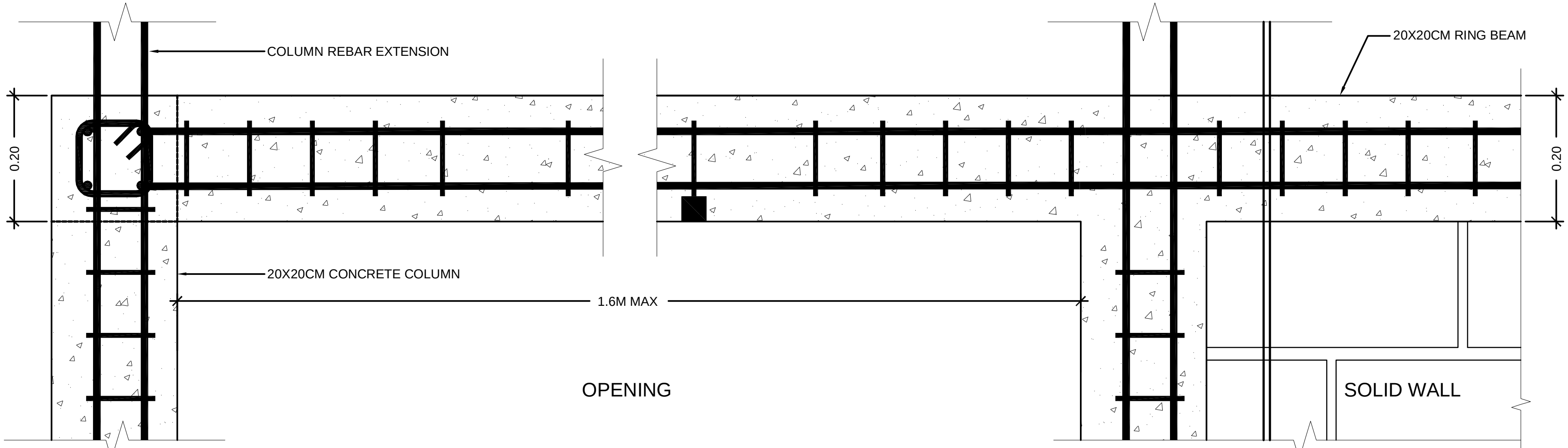
D3.5 RING BEAM AND COLUMN PLAN DETAIL AT T-CORNER
1:10

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

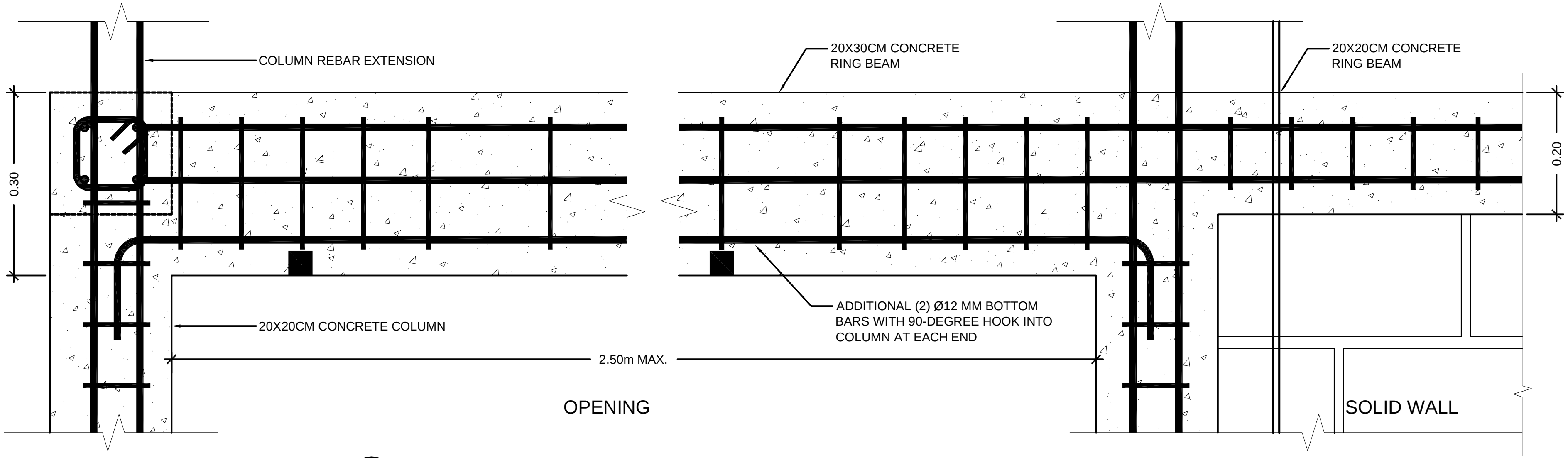
RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-506



D3.6 **RING BEAM ELEVATION AT OPENING WITH MAX 1.6M WIDE**
1:10



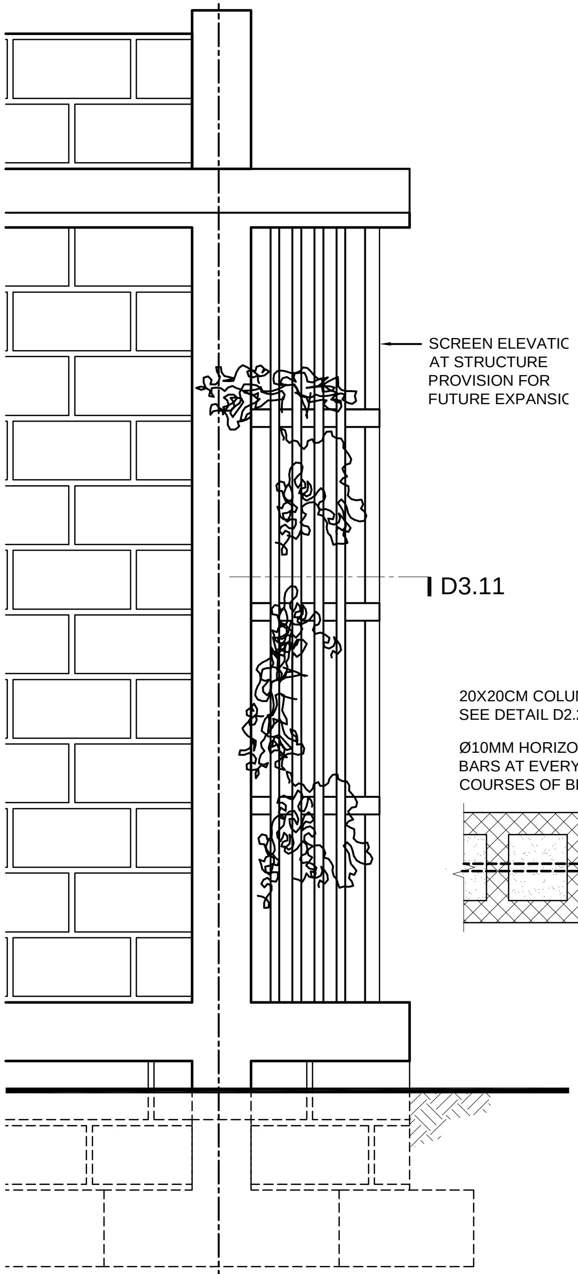
D3.7 **RING BEAM ELEVATION AT OPENING WITH MAX 2.5M WIDE**
1:10

BUILD CHANGE
Cordaid
BUILDING FLOURISHING COMMUNITIES

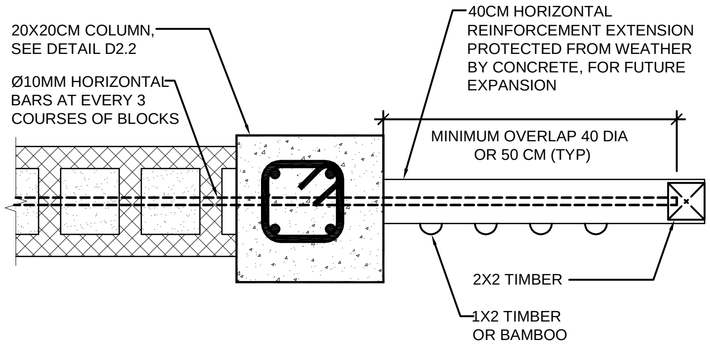
RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

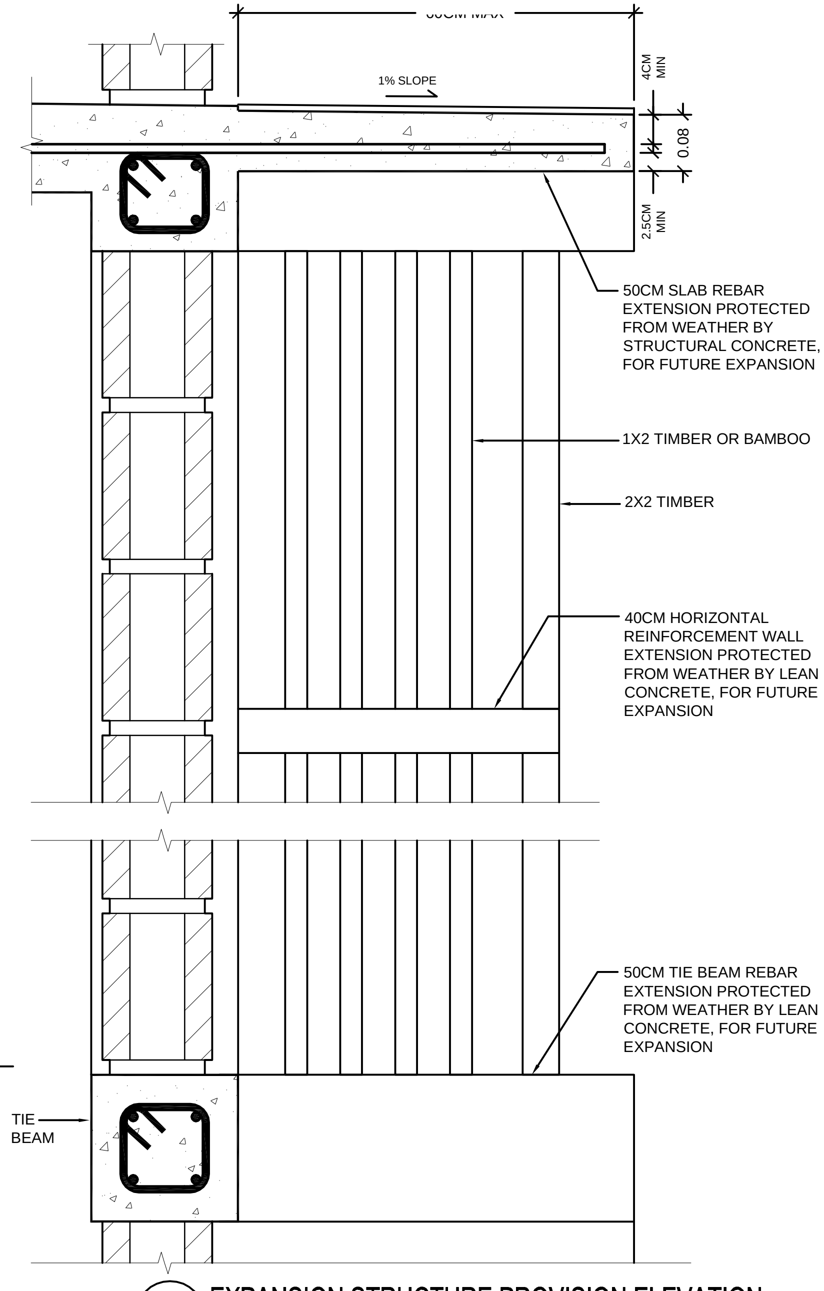
S-507



D3.10 EXPANSION STRUCTURE PROVISION WITH SCREEN
1:25



D3.11 EXPANSION STRUCTURE PROVISION PLAN
1:10



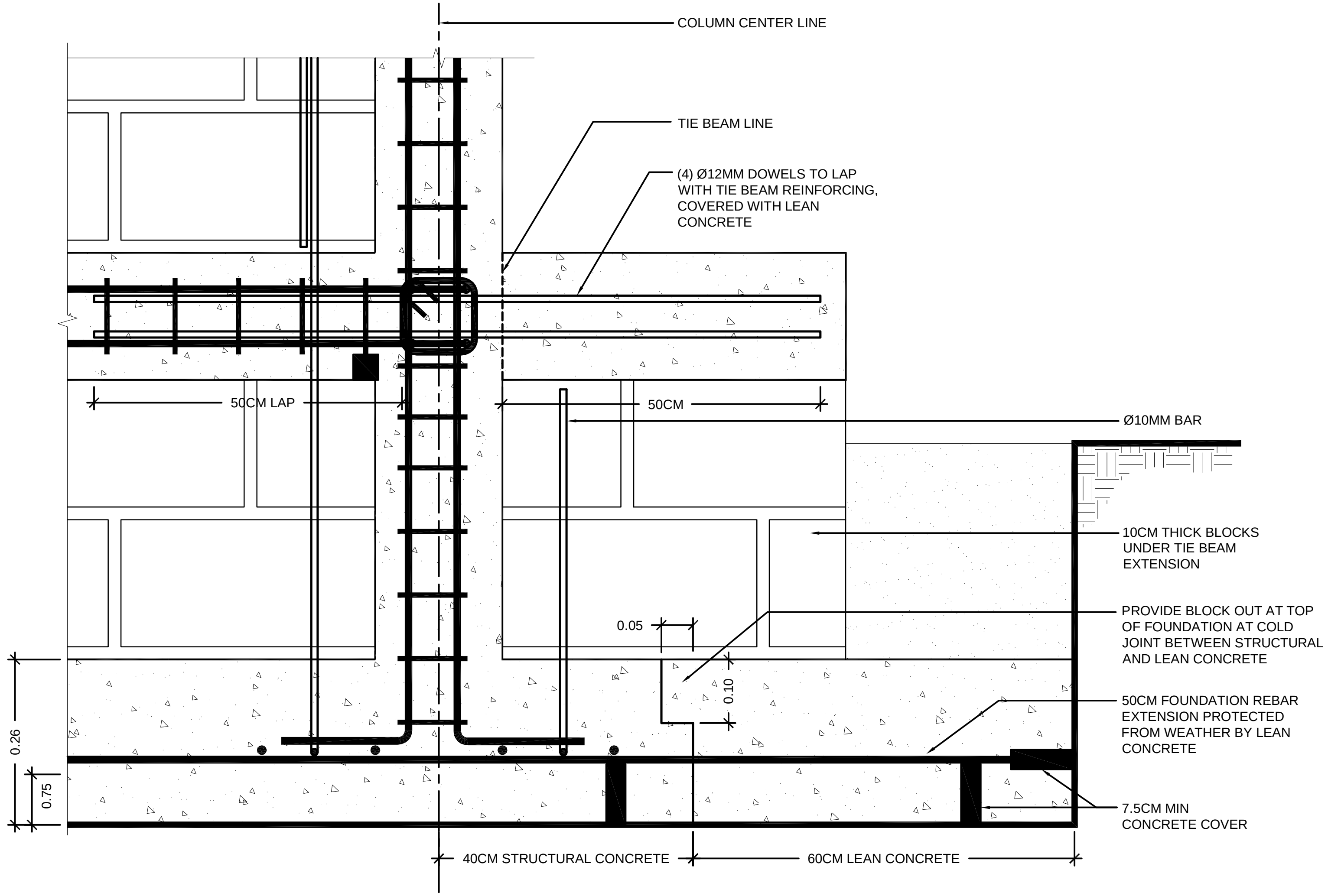
D3.12 EXPANSION STRUCTURE PROVISION ELEVATION
1:10

BUILD CHANGE | Cordaid BUILDING FLOURISHING COMMUNITIES

RESIDENCE OF FRANCISCO CABERIO FAMILY
PUROK 1, SULANGAN, GUIUAN
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

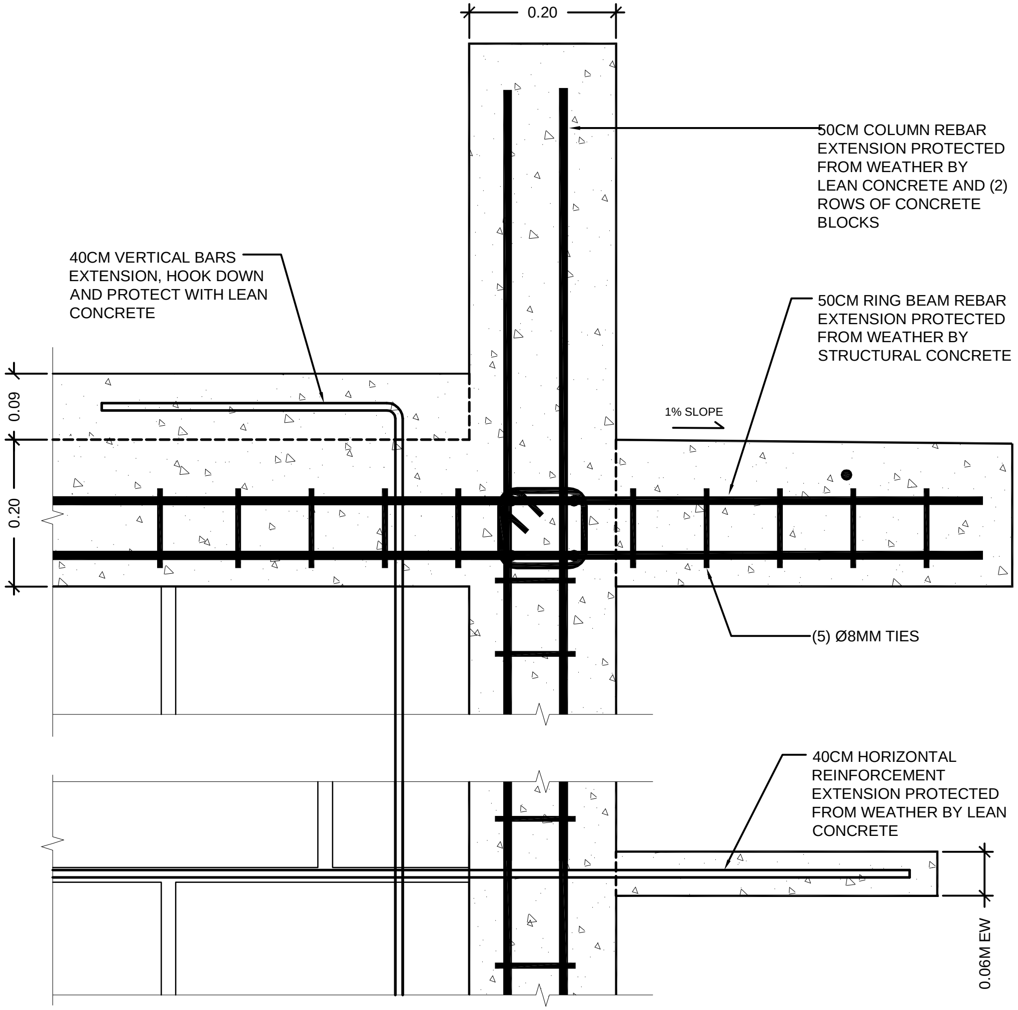
S-509



D3.13 **FOUNDATION AND TIE BEAM EXPANSION DETAIL**

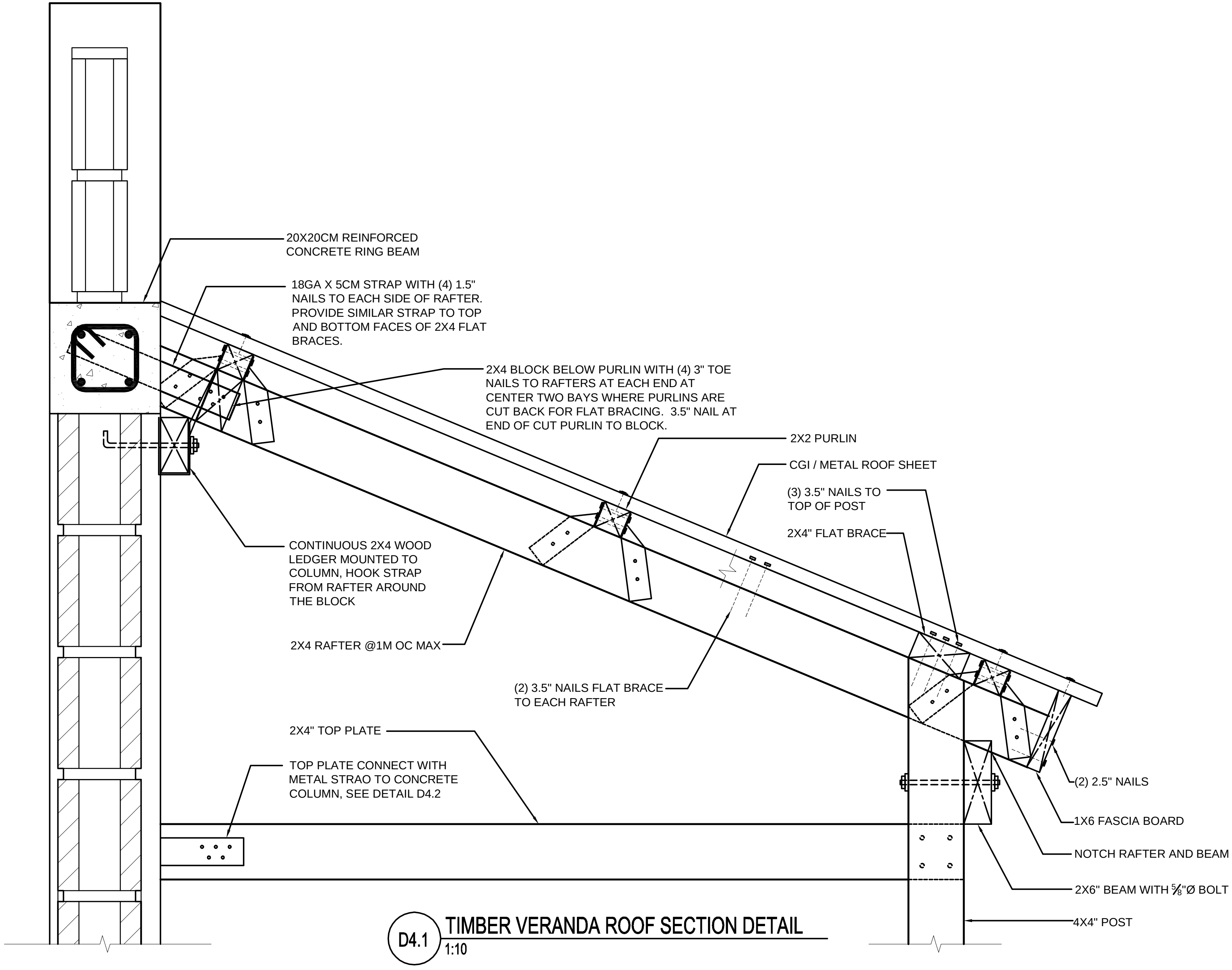
1:10

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	DETAILS DATE : 01/12/2015 — SCALE: AS NOTED REV : — DRAWN BY: MT	S-510



D3.14 **ROOF SLAB AND REINFORCEMENT EXPANSION DETAIL**
1:10

BUILD CHANGE / Cordaid BUILDING FLOURISHING COMMUNITIES	RESIDENCE OF FRANCISCO CABERIO FAMILY PUROK 1, SULANGAN, GUIUAN HOUSE NO. S1-24	DETAILS DATE : 01/12/2015 — SCALE: AS NOTED REV : — DRAWN BY: MT	S-511



D4.1 **TIMBER VERANDA ROOF SECTION DETAIL**
1:10

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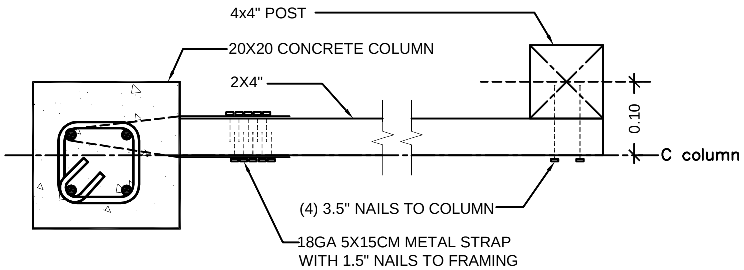
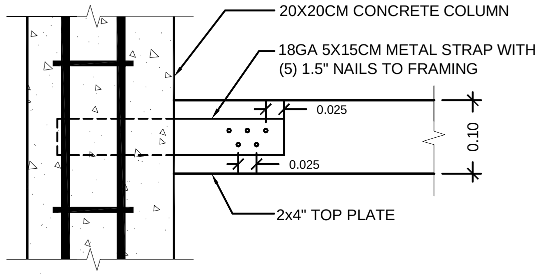
HOUSE NO. S1-24

DETAILS	
DATE : 01/12/2015	SCALE: AS NOTED
REV :	DRAWN BY: MT

S-512



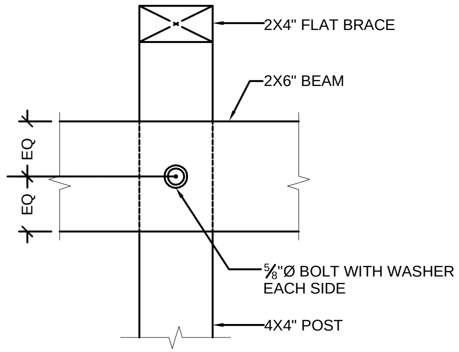
PLAN



SECTION

D4.2 TOP PLATE - CONCRETE COLUMN CONNECTION DETAIL

1:10



D4.3 BEAM - POST CONNECTION DETAIL

1:10

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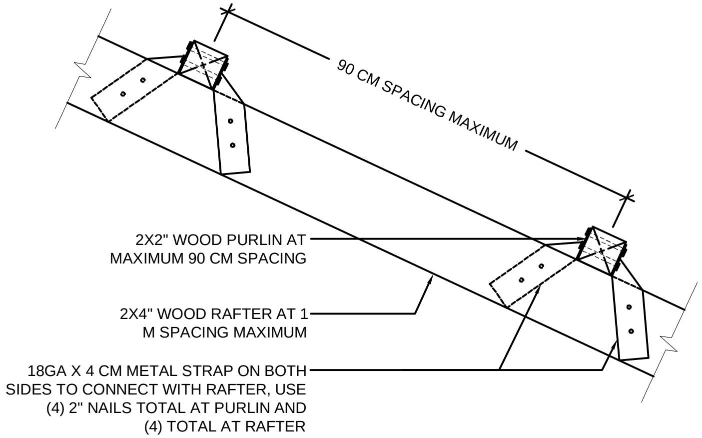
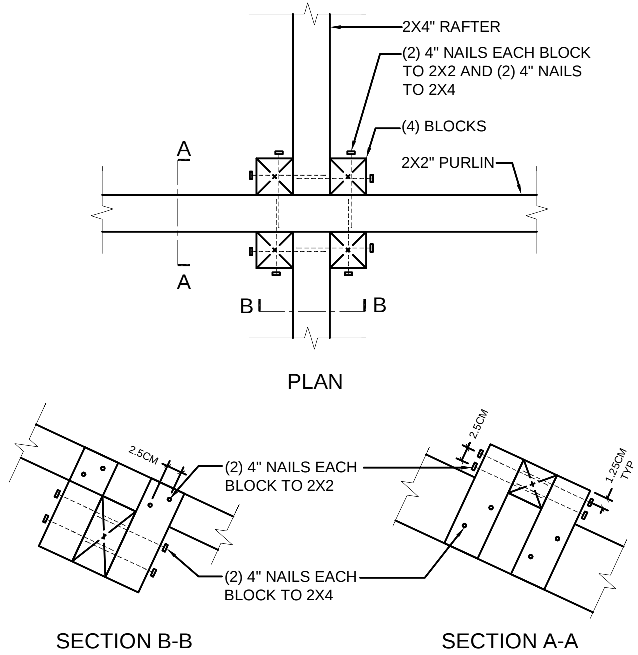
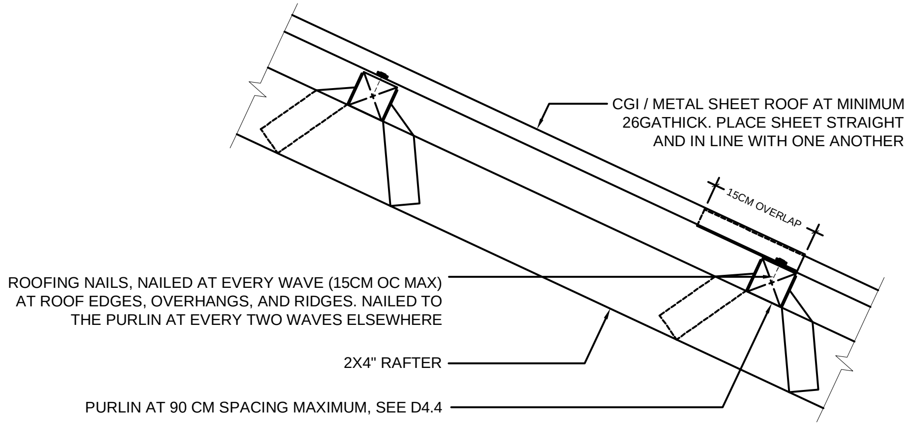


D4.4 **PURLIN TO RAFTER CONNECTION (OPTION 1)**
1:10



D4.5 **PURLIN TO RAFTER CONNECTION (OPTION 2)**
1:10



D4.6 **METALROOF SHEET CONNECTION**
1:10

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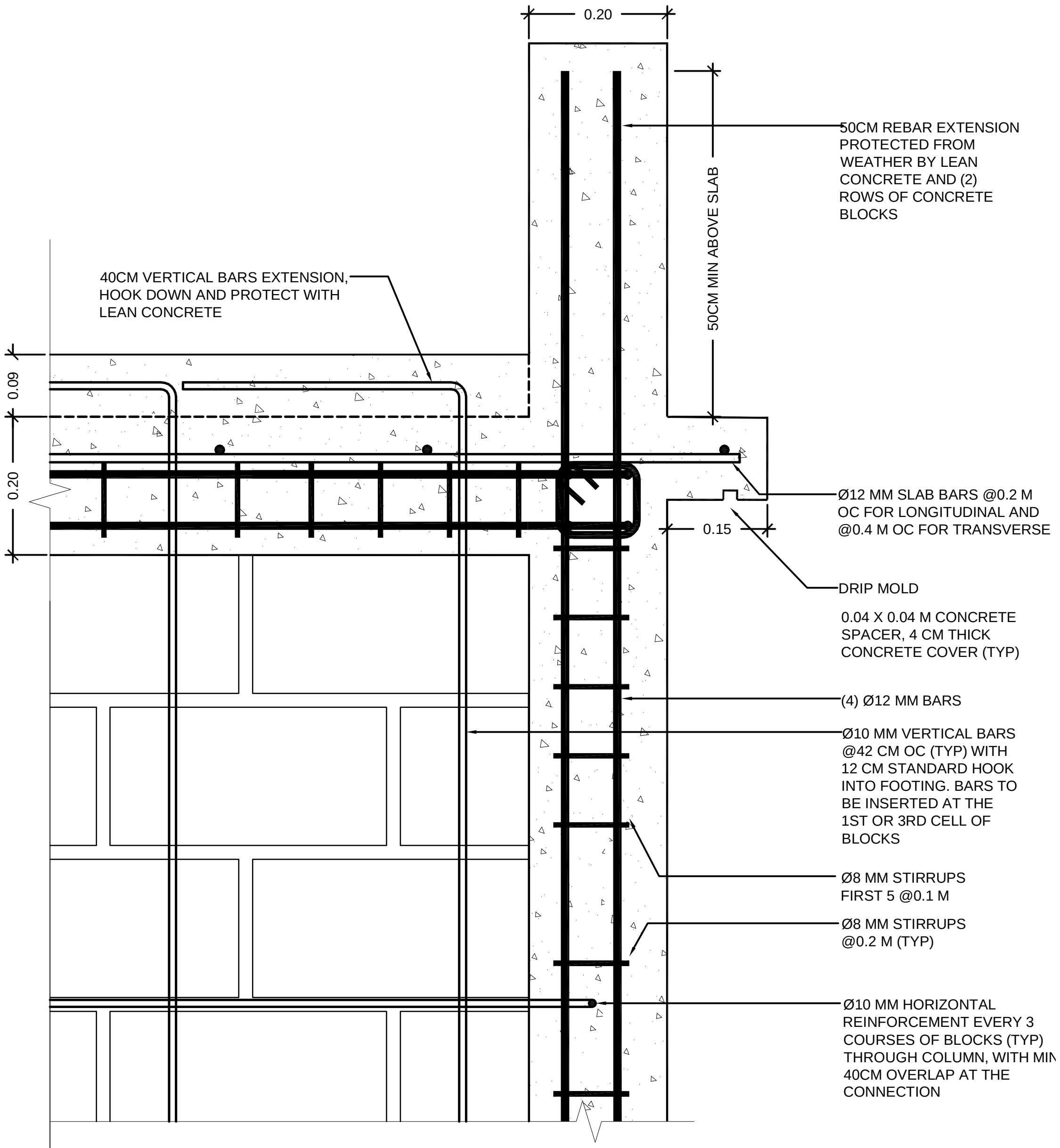
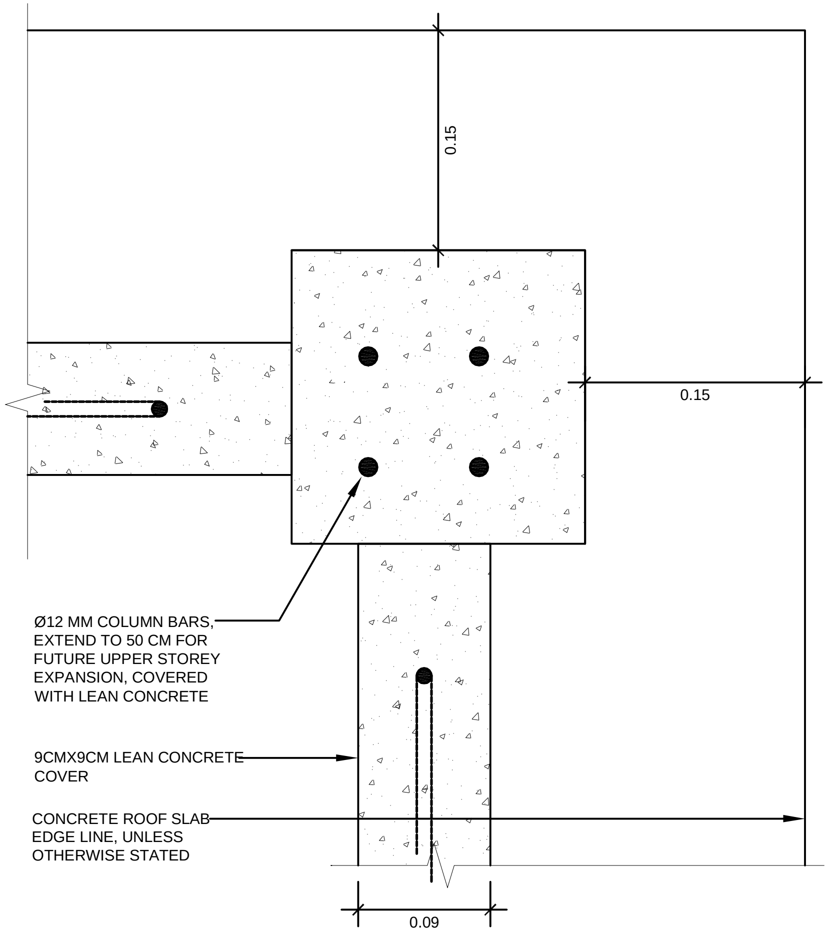
REV :	DRAWN BY: MT

S-514



D3.8A **SMALL PARAPET WITH LEAN CONCRETE**
1:10



D3.9A **EXTENSION REBAR COVER DETAIL**
1:5

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TRAINING STATION LAYOUT:

The concept behind The ESSU Training Center is to have qualified people training builders to use their local materials in an effort to build structurally stable buildings. The sequence of training at this center has been set up to assimilate every day construction. By dividing the learning phases into seven different training stations, Build Change believes that the locals will be able to have a better understanding of what building seismically sound building consists of.

The first training station of the facility addresses site lay-out along with assuring the appropriate material usage before starting. Laying out the site, which is often done through a surveyor in this country, is essential to getting a project started at the correct location. *Figure 5* shows the local Build Change engineer showing the locals how to lay-out a site. Keeping in mind that most of these less fortunate countries use masonry for the majority of their construction, Build Change has found ways to provide both builders and suppliers with the appropriate information to determine whether or not their material is adequate for seismically stable construction.

In order to select a good material for construction, the builder must know where the aggregates for the supply are being pulled from. A lot of times the sand used sill contain corrosive materials which will affect the chemical reaction within the aggregates during the CMUs cure time. Having CMUs that look good but do not perform as they should, determines whether a building will stand or collapse during severe weather conditions and other natural disasters.

The second training station, and probably one of the most critical is the placement of the rebar reinforcement in the foundation (*Figures 6,7,and 8* for more details). As I learned in my

Masonry Design Class at California State University San Luis Obispo with Professor James Mwangi, CMU is mainly strong in compression. Knowing and understanding a materials strengths and weaknesses is important. Logically we believe that a heavy material such as a CMU will be strong in every way due to its appearance but what we do not see is what makes it strong. In order to make CMUs the amazing material that it is, one must place rebar inside during construction. Assuring that rebar is securely placed is just as important as assuring that it is properly tied. Rebar is the strengthening component that allows a greater tolerance when tension is applied to the members. It is important to know that when a building is standing still the majority of its components act in compression. However, when movement is incorporated into the equation, the CMU components begin to fluctuate between compression and tension forces. This is when a materials real strength is tested. How much force can be applied on a material before failure, and when failure occurs will this failure be detrimental to the stability of the remainder of the structure. In simpler terms, will a falling wall make the entire building collapse?

Rebar placement is so crucial that the third station continues to address the handling of rebar in beams and columns (See *Figure 9*). As previously mentioned, setting up rebar appropriately and tying it accordingly can go a long way. The main structural designers in this case are the engineers from build change. I had no input on the actual structural designs implemented on this project; however, I did manage to obtain essential knowledge about the importance of blending two materials such as rebar and CMUs.

Fourthly, the continuing station is dedicated to the masonry layout. Placing CMU in a proper fashion is a crucial step in construction. In accordance to the engineering knowledge obtained from the various material classes that I participated in throughout my college career, I can affirm that in order to appropriately design masonry, one must consider the joint thickness of the CMU placement during the structural design phase. Setting an appropriate joint thickness and making sure that this joint thickness is consistent during construction will give assurance that the building is acting in accordance to its design. In order to comply with this necessity, the walls must be string lined during erection. By string lining, the mason laying down the CMUs will be able to maintain a level wall both vertically and horizontally. The term string lining is generally setting up a string that runs on the upper portion of the CMU blocks that are being placed. This string line will already have the appropriate joint thickness taken into account and when laying down the blocks the mason must align the blocks to the string line by taping the corners accordingly until the block is leveled.

In station five, the locals are trained to properly stage the construction of the building. It is obvious that a building cannot be started at the roof and work its way down to the foundation, but there are other steps that are not as obvious. An example is displayed in *Figure 10* found in the image section of this report. In this image you can see the difference between two column designs. One is a typical square concrete column that is formed and poured straight from the foundation and then the masonry is placed to fill in the holes. This is in fact the way that Build Change opted to design these trainings. The other is an example of an interlocking system that requires the CMU wall placement before the column can be poured. This system, even though very effective, was not necessary in this project. From both of these examples it is possible to see how one will require columns to be poured prior to laying down a wall and the other requires a wall to be placed before a column can be poured. Once all of the walls are poured there comes the part that most people are skeptical about during an earthquake; the roof.

The sixth training station elaborates on the construction and assembly of the roof. After experiencing the fear in the people of Haiti of being trapped under the collapse of a heavy roof, many people have opted to go back to a light weight roof which is of course not as efficient during a hurricane if the anchorage is not designed accordingly. Studies have shown that with the proper fasteners and the proper assembly, a light weight roof can perform just as good as a heavy solid roof. It is conceptually important to know how both roofs are assembled because a well-designed solid roof/ceiling must be in place if the owner intends to ever use it as a floor for an additional story. A brief engineering explanation for this would be that a second story floor will experience larger loads that a typical roof, therefore the structural design for this would possibly require additional rebar and possibly a thicker slab in order to support the loads.

The last station is more of an observational station. Station seven explicitly demonstrates a finished product allowing the trainees to view a finished product of what they are training for. By observing and knowing the importance of every component of a building the trainees will be able to make appropriate decisions during construction. Without a good understanding of what is being built it is hard to have a nice deliverable product. With something as simple as the connection from the foundation to the walls and the connections from the walls/beams to the roof, it is possible to maximize the structural performance of a building during a seismic event. In essence a good structural design is one that ensures that all of its connections will yield before they fail. Yielding is an important factor in structural design because it allows the different components to give a warning before failure. In essence a yielding connection will allow for two things such as a roof and a wall to remain connected even though there might be signs of deformation. Allowing this connection to remain acting as one is important because if this connection were to fail, then roof and the walls would act as separate components and then the roof would most likely collapse as it is separated from its only vertical support, the wall.

Figure 5: Build Change Resident Engineer Gilbert Appa wearing a white hard hat and a black shirt is explaining the site specific dimensions to begin construction.

Figure 6: This rebar is for the column foundation which will be poured after the CMU is placed on the sides as seen in some of the following figures.

Figure 7: Local Pilipino mason places foundation CMU blocks and is getting ready to place the horizontal rebar above the CMU. The horizontal rebar can be seen laying besides the CMU.

Also a good idea to observe the string line method used to keep the CMU lined up correctly.

Figure 8: This image shows the initial digging of the foundation trenches. Pay close attention to the small work area of the work station as it plays a huge roll in the design of the general site layout.

Figure 9: In this image the locals are observing how rebar
should be tied in columns. On the right side of the picture
there is column steelwork that is all tied up and ready for concrete.
notice that the column steelwork has been leveled out and supported
with wood cross braces in preparation for the concrete pour.

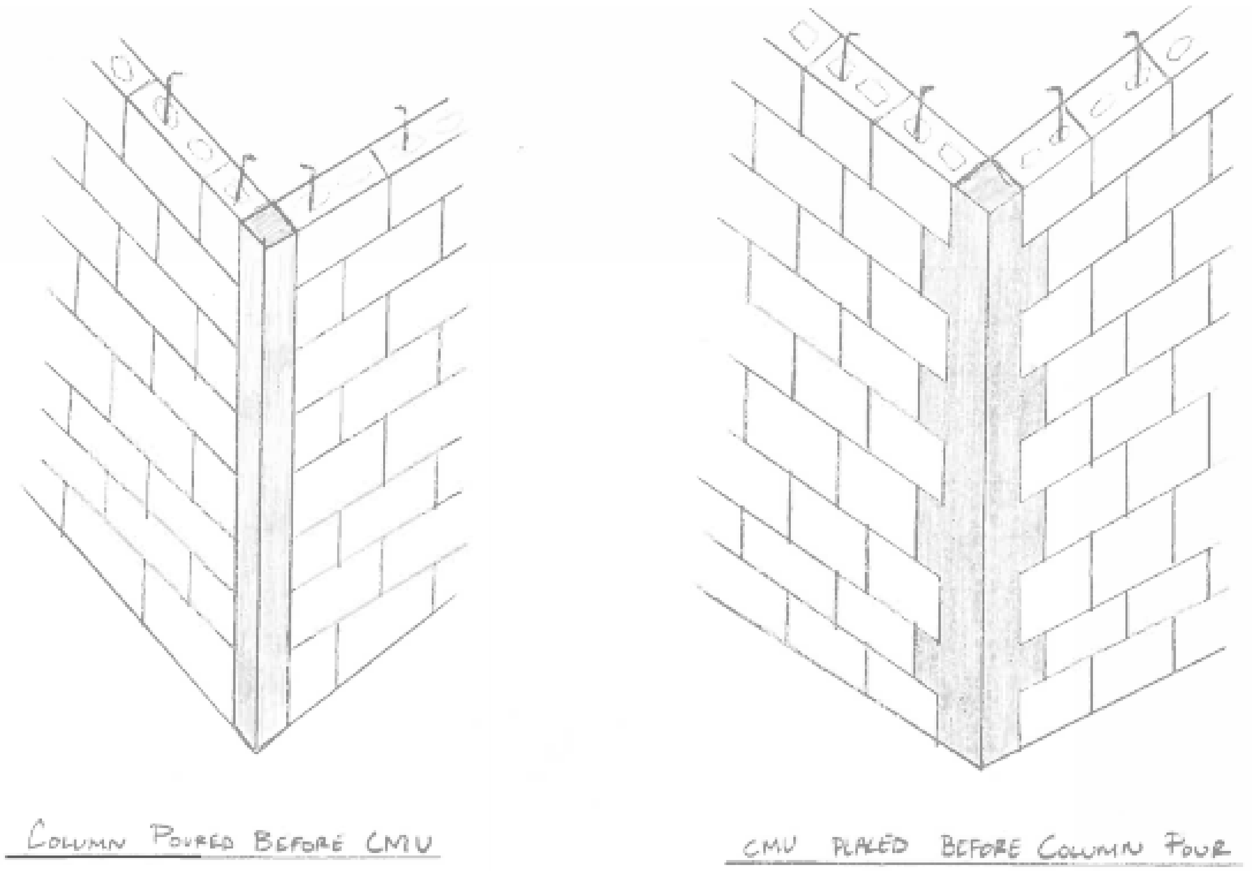

Figure 10: This is a demonstration of two types of columns in masonry. To the left is a column poured before the placement of any CMU. To the right is a column poured after the placement of concrete. Note that the interlocking pattern on the left helps to keep the walls united to the column and it also creates a better lateral support for the walls by creating moment connections on the sides.

<u>The Outcome</u>

Building the ESSU Training Facility was not an easy task. One of the largest challenges to begin the project was cleaning the rumble that was found in the existing site. The existing rumble can be seen in *Figures 11 and 12* at the end of this section. Aside from the entire rumble, the chosen site was also a very compact site. This means that the majority of the work during the stripping of the site was manual labor.

While the cleaning of the site was being done, Michael and myself coordinated together to establish the best fit for the training station layout. In order to do this we had to take into account the necessary spacing between each station to allow for appropriate movement when constructing. This site layout planning also entailed incorporating accessibility to transfer material in and out of the site during construction. The proposed and final layouts can be seen in *Figures 13, 14, and 15*. Once our general layout was established, the takeoff that was originally done had to be manipulated accordingly to account for the building material in each training station. Once all of the material was accounted for the following step was trying to find the material through the websites of the local vendors. This is when Google Translator came in handy.

Throughout the project, maintaining communication with Michael out of Colombia was challenging enough. Later in the project, maintaining communication with Gilbert Appa, the resident engineer in The Philippines, became even more challenging. In occasions our calls would be at 3:00am just so that all three of us could be in the call at once. Managing waking up at that time while having to manage going to school, doing homework, and working early shifts on a daily basis really helped me become a better organized person. Another challenge that expanded my knowledge and made me a more resourceful person was fact that I had to learn the use of software programs such as Sketchbook, which is the primary aesthetic design program used by Build Change.

Prior to this project the majority of my experience with drafting had been done through Revit and AutoCAD. When I initially started this project I modeled the safe room in Revit and then I made typical details in AutoCAD. After a couple of weeks the majority of my work was being performed in Sketchup.

Being a part of the College of Architecture and Environmental Design was a great benefit for me. Luckily while doing my project I was taking an interdisciplinary class with a few architects and construction managers. These people really helped me out to learn such programs. The one architect student who helped me out the most through this entire project was Thomas Husser. Thomas was a foreign exchange student from France who was attending CalPoly for a year and who had a clear understanding of the project and an extensive knowledge of all of the programs that I was using.

Right after the clearing of the site and prior to the official start of construction, Thomas asked me if he could assist with doing anything else for the project. He then volunteered to model out some of the sketch up model while I assisted Michael and Gilbert with assuring that the material that would be ordered would meet quality standards for building. Once the visual model was finished and presented to Michael we all agreed that some necessary changes had to be made to the overall project. Having a visual understanding of what the site would look like through the model, we were able to point out some flaws and downsides to the elected order of the construction phasing. In addition to the changes in phasing, Gilbert noted that it would be best if we incorporated a station to demonstrate the construction of light weight roofs. The reason being is because the material cost for building a light weight tin roof is typically cheaper than a heavy solid roof. These substantial changes obligated us to start redesigning the layout from scratch.

As imagined, these design changes caused frustration amongst many of us. Thomas was no longer able to create another model due to availability issues, contacting the material suppliers to change the original orders became hectic, and the intended time of completion for the project had to be extended. Even though these changes caused frustration they were also a great learning experience. It has been proven through this project that even though the changes caused frustration, the right decisions were made by making these changes. Overall the purpose of this project was to help the locals to improve their building skills and by expanding their training through the changes made, the locals were able to obtain more out of the learning experience.

In conclusion I can state that the experience of being a part of a project focused on saving lives through proper living was great. The outcome of the project has had and will continue having a positive impact in my life and in the life of those that go through the training of this program. Attached in *Figure 16* it is possible to see the attentiveness in which the locals grasp all of the given information. It is because of images like this that this project was worth the time, effort, and stress to complete.

Figure 11: This image displays the rumble that had to be cleared from the site location for the ESSU Construction Training Facility in Guiuan, the Philippines. Mini Excavator in the back (Northeast Corner)

Figure 12: This image displays the rumble that had to be cleared from the site location for the ESSU Construction Training Facility in Guiuan, the Philippines. (South Side)

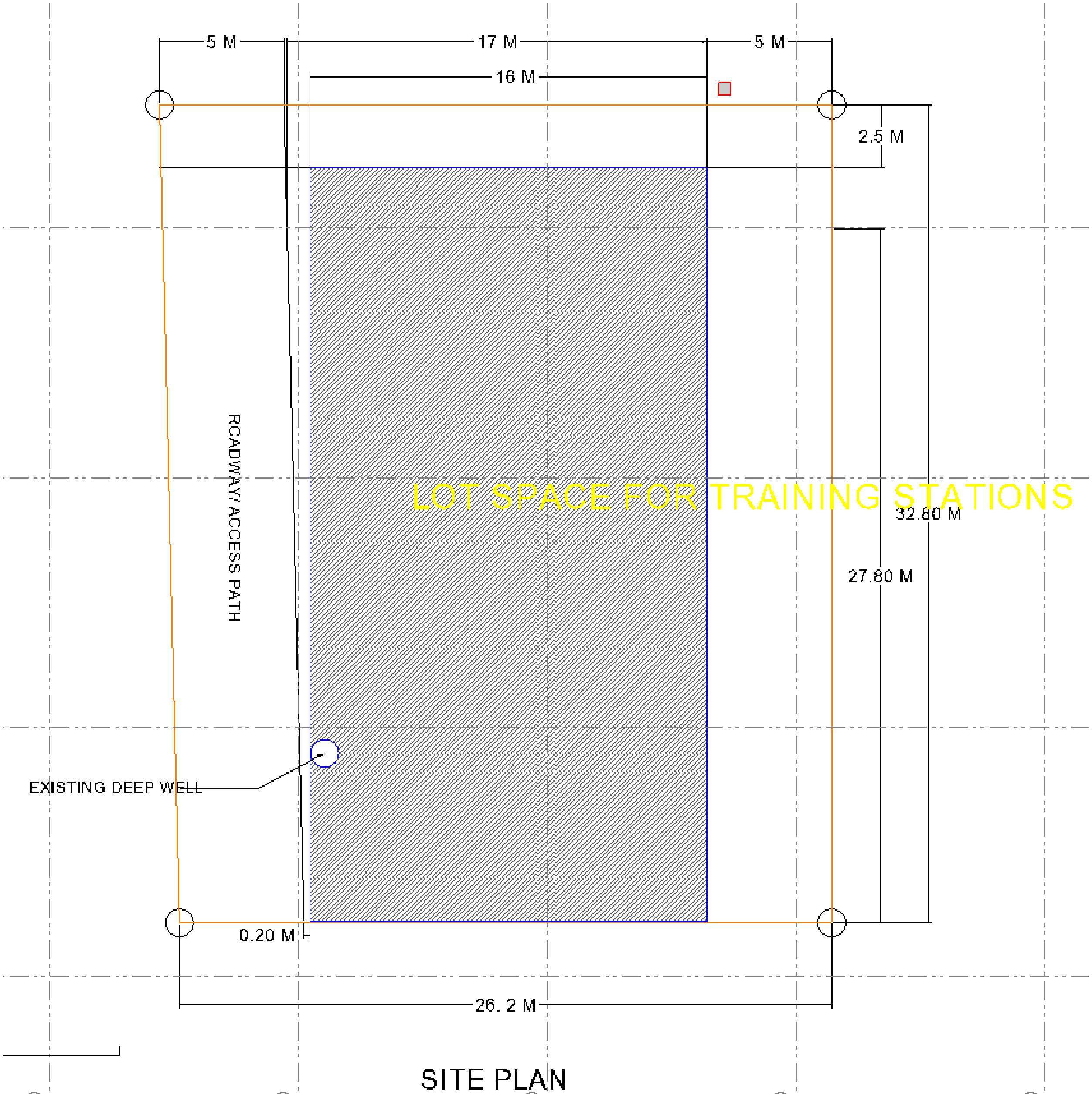

Figure 13: This it the general site plan dimensions that were given to me by Gilbert to begin working on a site layout. The usable space for the Training Facility would be a 16 meter by 30.3 meter lot.

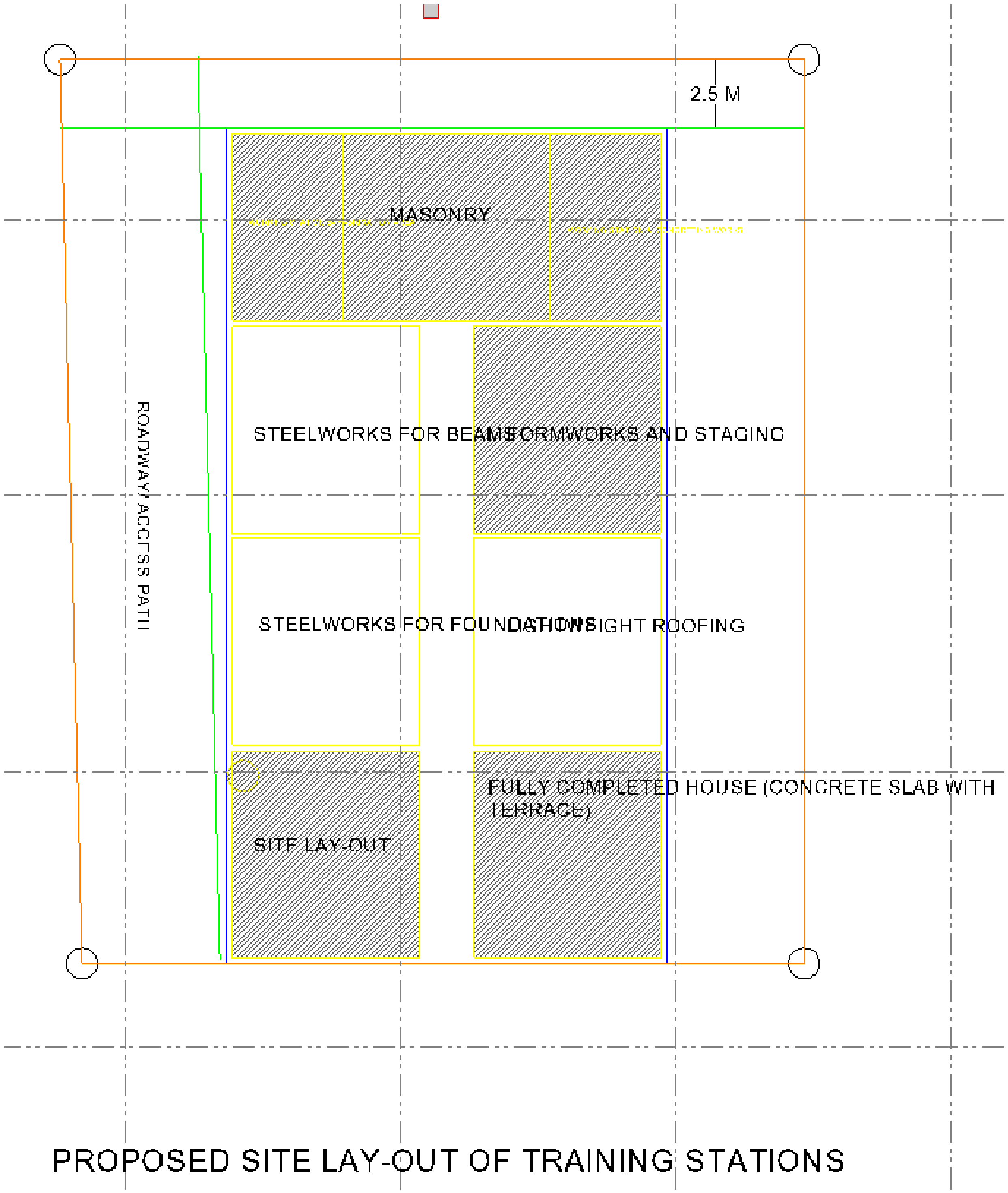

Figure 14: This is the proposed site layout plan for the training stations that I submitted to the Build Change staff for approval.

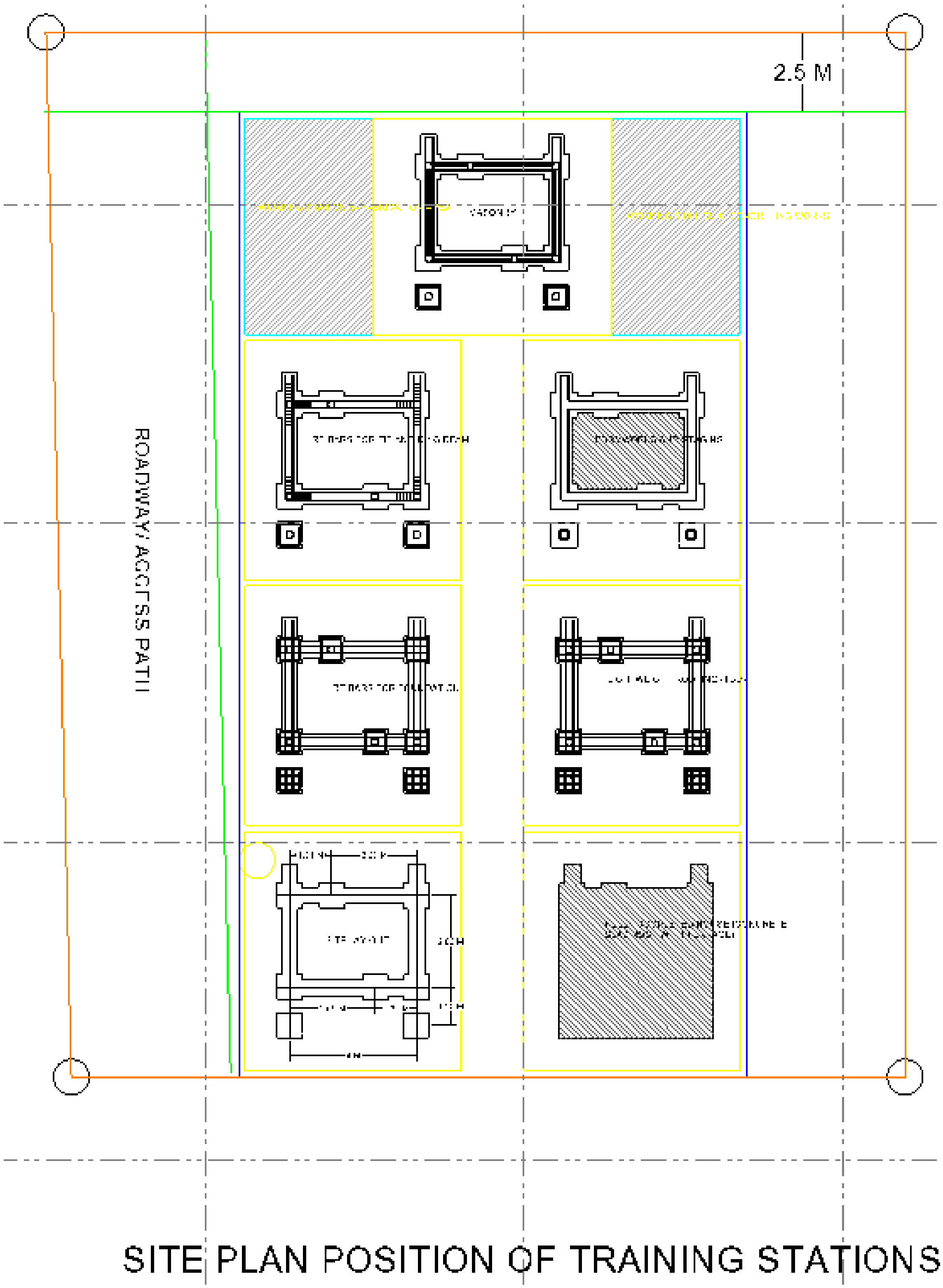

Figure 15: This was the final site plan position of training stations that was approved by Build Change and that was constructed as part of the ESSU Construction Training Facility.

Figure 16: This image reveals the eagerness in learning as Gilbert Appa, The Build Change Resident Engineer, explains the structural details of the foundation to the locals.

<u>ACKNOWLEDGEMENTS:</u>

I would like to express my deepest appreciation to all of those who provided me the possibility to complete this project. A special gratitude I give to my Senior Project Advisor Professor **James** Mwangi for contacting me with the right people and for being my foundational support throughout my years at Cal Poly.

In addition I would like to also acknowledge the crucial role of the **Staff of Build Change**, who gave me the permission to use all of the required material to make this project possible. A special thanks goes to the Director of Education of Build Change, **Michael Collins**, and the Build Change Resident Engineer in The Philippines, **Gilbert Appa**. Without these two people, The HSSU Training Facility would not exist.

One last acknowledgment goes to **Thomas Husser**, a Cal Poly colleague, for providing his time and dedication to this project without asking for anything in return. Without the people listed above, this project could not have been made possible. Thank you all for sharing your time, knowledge, and passion for this project.