



MAIN RESIDENCE

# PRESCRIPTIVE PROTOTYPE #1 DESIGN FOR ONE STORY MASONRY STRUCTURE MODEL WITH CONCRETE FLAT ROOF HOME IN PUERTO RICO

## PREFACE:

THIS PRESCRIPTIVE HOME DRAWING SET PRESENTS RECOMMENDATIONS FOR THE CONSTRUCTION OF A ONE STORY HOME. THIS GUIDANCE DISPLAYS INFORMATION FOR A PARTICULAR SIZED HOME. THE DESIGN INFORMATION PROVIDED HEREIN INCORPORATES SEISMIC AND WIND CRITERIA BASED UPON THE LATEST PUERTO RICO BUILDING CODE WHICH REFERENCES THE 2018 INTERNATIONAL RESIDENTIAL CODE (2018 IRC), 2018 INTERNATIONAL BUILDING CODE (2018 IBC), AND THE AMERICAN SOCIETY OF CIVIL ENGINEERS ASCE/SEI 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES.

ALL RECOMMENDED DESIGN WORK, INCLUDING THOSE PARTS COVERED BY THIS DOCUMENT, SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL SUCH AS A REGISTERED PROFESSIONAL ENGINEER OR A LICENSED ARCHITECT IN PUERTO RICO. WHEN THESE GUIDANCE DRAWINGS ARE USED FOR A PROJECT, THEY SHOULD BE MODIFIED AS NEEDED IN ORDER TO COMPLY WITH ALL OF THE APPLICABLE CODE REQUIREMENTS FOR A GIVEN PROJECT SITE, THEN SIGNED AND SEALED IN ACCORDANCE WITH PUERTO RICO LAWS, BUILDING CODE, AND DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC). THIS SET ASSUMES A FLAT PROJECT SITE . IF THE SITE IS NOT FLAT, A REGISTERED PROFESSIONAL ENGINEER OR A LICENSED ARCHITECT WILL NEED TO MODIFY THE FOUNDATION DESIGN. A GEOTECHNICAL ENGINEER MAY ALSO BE REQUIRED TO PERFORM A SLOPE STABILITY ANALYSIS AND PROVIDE SOIL CONDITIONS FOR THE DESIGN OF A REVISED HOUSE FOUNDATION.

THE FOLLOWING BOUNDARY CONDITIONS SHALL BE MET IN ORDER TO USE THIS DRAWING SET. THIS DRAWING SET IS NOT VALID IF THE PROJECT PARAMETERS ARE OUTSIDE OF THESE BOUNDARY CONDITIONS:

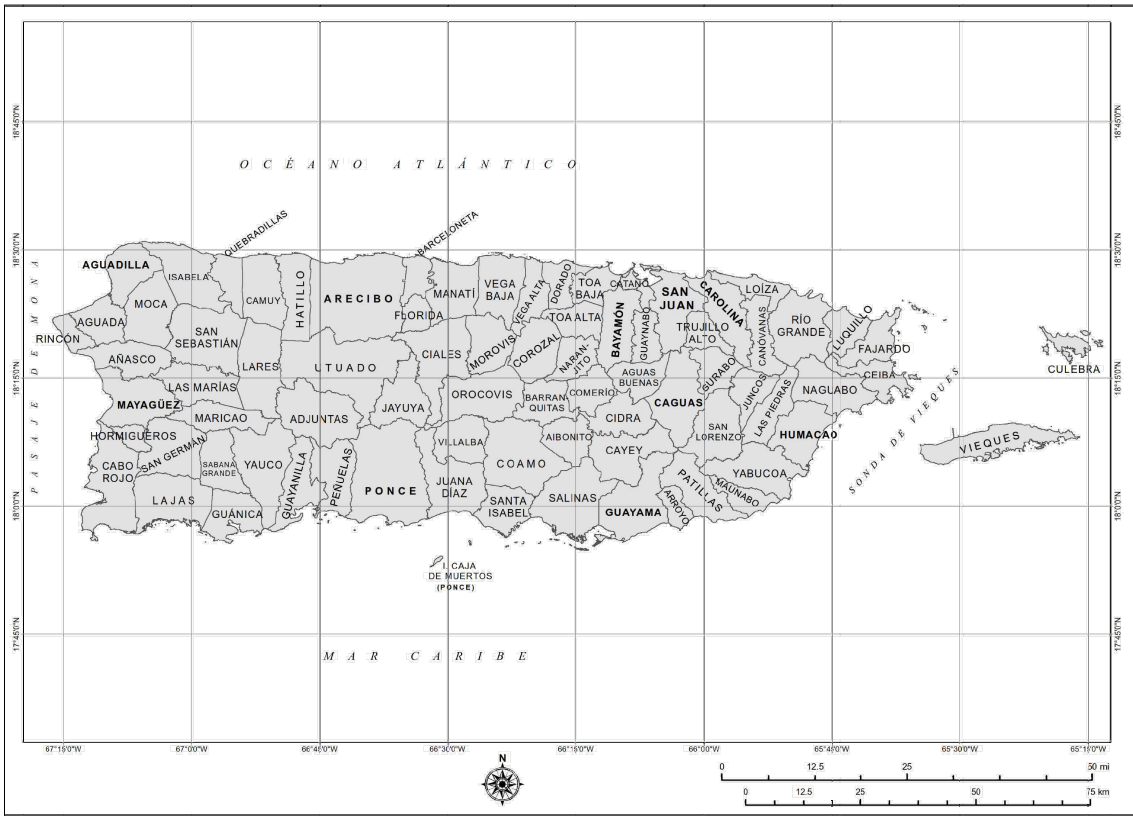
- SINGLE STORY BUILDING WITH THE MAXIMUM MEAN ROOF HEIGHT AS SHOWN IN THE DRAWING SET.
- GABLE ROOF AS SHOWN IN THE DRAWING SET.
- BUILDING WIDTH AND LENGTH AS SHOWN IN THE DRAWING SET.

ALL CONSTRUCTION MUST COMPLY WITH THE PUERTO RICO BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGPe-DDEC).

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION. INFORMATION ABOUT STORM SURGE CAN BE ACCESSED AT [HTTPS://NHc.NOAA.GOV/NATIONALSURGE/](https://nhc.noaa.gov/nationalsurge/), BY CLICKING ON PUERTO RICO. ADDITIONAL FLOOD DESIGN INFORMATION CAN BE ACCESSED AT THE FEMA FLOOD MAP SERVICE CENTER [HTTPS://MSC.FEMA.GOV/PORTAL/ADVANCESEARCH](https://msc.fema.gov/portal/advancesearch) BY SELECTING PUERTO RICO FOR THE STATE AND THEN SELECTING THE APPROPRIATE COUNTY FOR PROJECT LOCATION. REFER TO PLANNING REGULATION 13: SPECIAL FLOOD HAZARD AREAS REGULATION, WHICH PROVIDES ADDITIONAL FLOOD HAZARD REQUIREMENTS AT [HTTP://JP.PR.GOV/](http://JP.PR.GOV/)

FEMA/DDEC DOES NOT SPECIFICALLY ENDORSE THE PRODUCTS OF ANY MANUFACTURER. PRODUCTS THAT EQUAL THE SPECIFICATIONS OF THE NOTED PRODUCTS MAY BE SUBSTITUTED

DRAWING INDEX	
SHEET NUMBER	SHEET NAME
ARCHITECTURAL	
A-001	Title Sheet
A-100	Floor Plan, Elevations, Sections and Roof Plans
A-101	Notes, Windows, Doors, Finishes, Bathrooms & Kitchen Schedules
A-500	Wall Sections
A-510	Doors and Windows Details
A-511	Roofing Details
A-512	Module Joint Details
STRUCTURAL	
S-001	Title Sheet
S-002A	General Notes
S-002B	General Notes
S-003	Wind Diagrams-Flat Roof
S-004	Safe Room Wind Diagrams
S-005	Foundation Plans
S-006	Wall Framing Plan
S-007	Roof Framing Plans
S-008	Elevations
S-009	Sections
S-010	Typical Details
S-011	Typical Details
S-012	Slab Typical Details
PLUMBING	
PL-100	Plumbing layout
PL-200	Plumbing notes and details
ELECTRICAL	
E-100	Electrical layout
E-101	Electrical notes and details



MAP OF PUERTO RICO (N.T.S.)

### GENERAL LEGEND

ROOM NAME  
#

ROOM KEY:  
ROOM NAME  
ROOM NUMBER

ELEV  
25'-0"

SPOT ELEVATION  
KEY

ALIGN KEY

DIMENSION LINE

C.5

C.5

COLUMN LINE INDICATORS

DOOR NUMBER  
#

1  
A90

DETAIL KEY:  
DETAIL NUMBER  
DRAWING NUMBER

1  
A-101

ENLARGED PLAN KEY

1  
A90

EXTERIOR ELEVATION KEY

1  
A80  
2

INTERIOR ELEVATION KEY

1  
A80  
2  
3

MULTIPLE INTERIOR  
ELEVATIONS

1

REVISION KEY

1

KEYNOTE INDICATOR

### ABBREVIATIONS

& - And  
< - Angle  
@ - At  
C - Center Line  
Ø - Diameter  
# - Pound  
± - Tolerance Dimension  
A/E - Architect / Engineer  
ADDL - Additional  
ADH - Adhesive  
ADJ - Adjustable  
ADJC - Adjacent  
AF - Access Floor  
AFF - Above Finished Floor  
AL - Aluminum  
ALT - Alternate  
APPROX - Approximately  
ARCH - Architect  
BD - Board  
BETW - Between  
BLDG - Building  
BLKG - Blocking  
BM - Beam  
BO - By Others  
BOT - Bottom  
CLG - Ceiling  
CL - Closet  
CLR - Clear  
CMU - Concrete Masonry Unit  
CNTR - Counter  
COL - Column  
CONC - Concrete  
CONSTR - Construction  
CONT - Continuous  
CONTR - Contractor  
CORR - Corridor  
CT - Ceramic Tile  
DIA - Diameter  
DIM - Dimension  
DN - Down  
DOP - Door Opening  
DR - Door  
DTL - Detail  
DWG - Drawing  
EA - Each  
EJ - Expansion Joint  
EL - Elevation  
ELEC - Electrical  
ENCL - Enclosure  
ENGR - Engineer  
ENTR - Entrance  
EQ - Equal  
EQUIP - Equipment  
EXT - Exterior  
F/F - Face to Face  
FDN - Foundation  
FIN - Finish  
FLR - Floor  
FT - Foot or Feet  
FTG - Footing  
FUT - Future  
GC - General Contractor  
GR - Grade  
GWB - Gypsum Wall Board  
HDW - Hardware  
HT - Height  
HMD - Hollow Metal Door  
HNDRL - Handrail  
HORIZ - Horizontal

HP - High Point  
IN - Inch or Inches  
INSUL - Insulation  
INT - Interior  
JT - Joint  
KIT - Kitchen  
KO - Knockout  
L - Length or Left  
LAV - Lavatory  
LF - Linear Foot or Feet  
LINTL - Lintel  
LONG - Longitudinal  
LP - Low Point  
LT - Light  
LTG - Lighting  
LTWT - Lightweight  
MAS - Masonry  
MATL - Material  
MAX - Maximum  
MECH - Mechanical  
MED - Medium  
MEMB - Membrane  
MF - Metal Flashing  
MFR - Manufacturer  
MIN - Minimum  
MIR - Mirror  
MISC - Miscellaneous  
ML - Metal Lath  
MLDG - Molding  
MLWK - Millwork  
MO - Masonry Opening  
MTD - Mounted  
MTR - Mortar  
MTL - Metal  
MVBL - Movable  
N - North  
NA - Not Applicable  
NIC - Not In Contract  
NO - Number  
NOM - Nominal  
NTS - Not To Scale  
OA - Overall  
OC - On Center  
OPNG - Opening  
OPP - Opposite  
PAR - Parallel  
PERF - Perforated  
PERIM - Perimeter  
PERP - Perpendicular  
PL - Plate  
PLAS - Plaster  
PLBG - Plumbing  
PLYWD - Plywood  
PNL - Panel  
POL - Polished  
PR - Pair  
PREFIN - Prefinished  
PT - Pressure Treated  
PTD - Painted  
PTN - Partition  
QTY - Quantity  
QUAL - Quality  
RCP - Reflected Ceiling Plan  
REC - Recessed  
REF - Reference  
REFR - Refrigerator  
REINF - Reinforced or Reinforcing  
REM - Removable  
REQD - Required  
REQMTS - Requirements

RFG - Roofing  
RLG - Railing  
RM - Room  
RO - Rough Opening  
S - South  
SCHED - Schedule  
SCR - Screw  
SECT - Section  
SF - Square Foot or Feet  
SHR - Shower  
SHT - Sheet  
SHTG - Sheathing  
SIM - Similar  
SK - Sink  
SM - Sheet Metal  
SPEC - Specifications  
SQ - Square  
SS - Stainless Steel  
SSF - Solid Surface  
STD - Standard  
STL - Steel  
STRUCT - Structural  
SUSP - Suspended  
SYM - Symbol  
SYMM - Symmetrical  
SYP - Southern Yellow Pine  
SYS - System  
T - Treads (Stairs)  
T&B - Top and Bottom  
T&G - Tongue and Groove  
TBD - To Be Determined  
TBM - Top of Beam  
TC - Top of Concrete  
TEMP - Temporary  
TF - Top of Footing  
TFF - Top of Finished Floor  
THK - Thickness  
THRES - Threshold  
THRU - Through  
T.O. - Top Of  
TOC - Top Of Concrete  
TOF - Top of Footing  
TOL - Tolerance  
TOM - Top Of Masonry  
TOP - Top of Pavement  
TOS - Top Of Steel  
TOSL - Top of Slab  
TOW - Top Of Wall  
TYP - Typical  
UNFIN - Unfinished  
UN - Unless Otherwise Noted  
VB - Vapor Barrier or Vinyl Base  
VER - Verify  
VERT - Vertical  
VEST - Vestibule  
VIF - Contractor to Verify In Field  
VR - Vapor Retarder  
W - West  
W/ - With  
W/O - Without  
WC - Water Closet  
WD - Wood  
WLD - Welded  
WP - Working Point  
WT - Weight  
WTH - Width  
WTPRF - Waterproofing  
WWF - Welded Wire Fabric

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY  
CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGPe-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

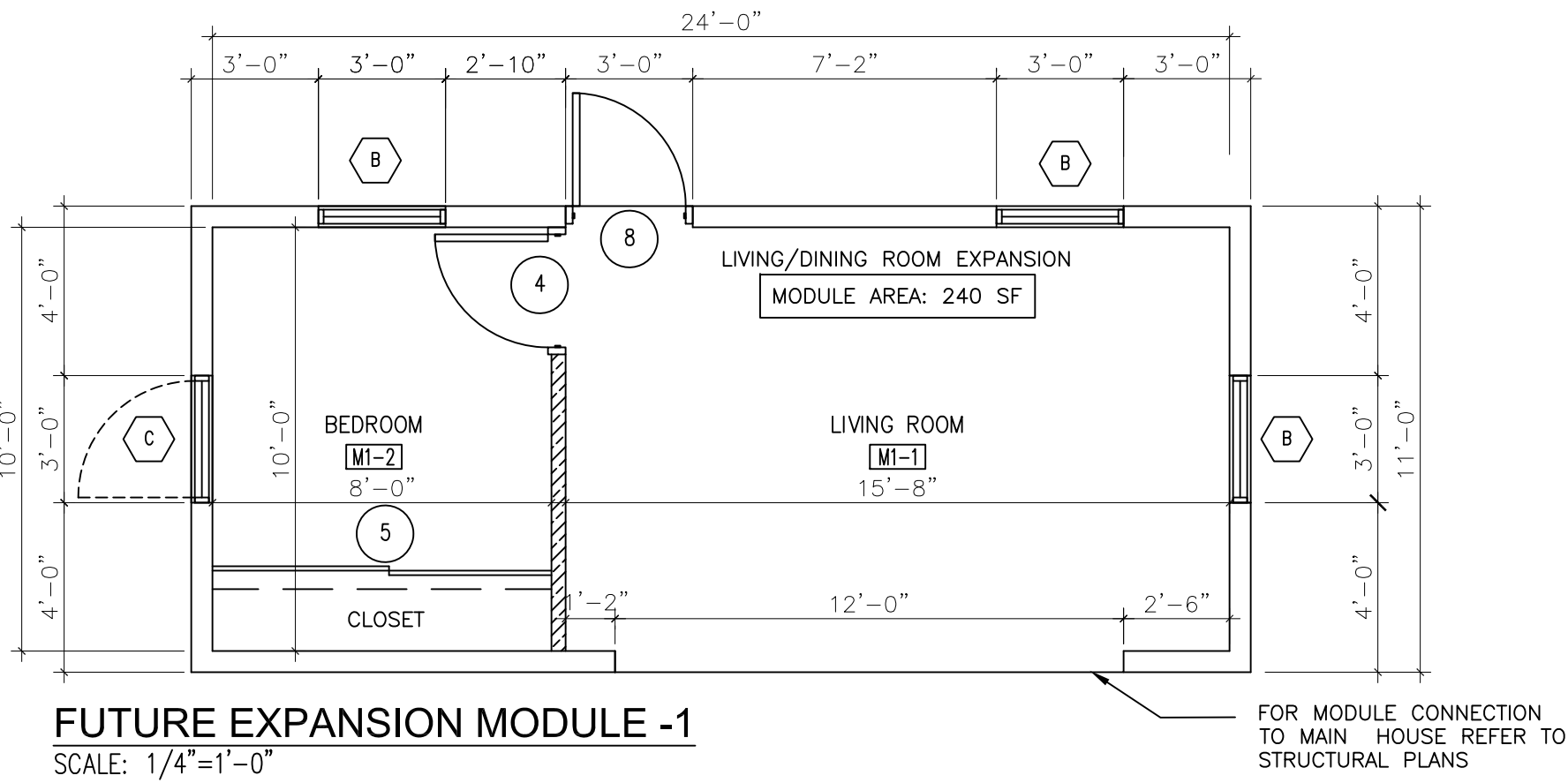
Title Sheet

SHEET INFORMATION:

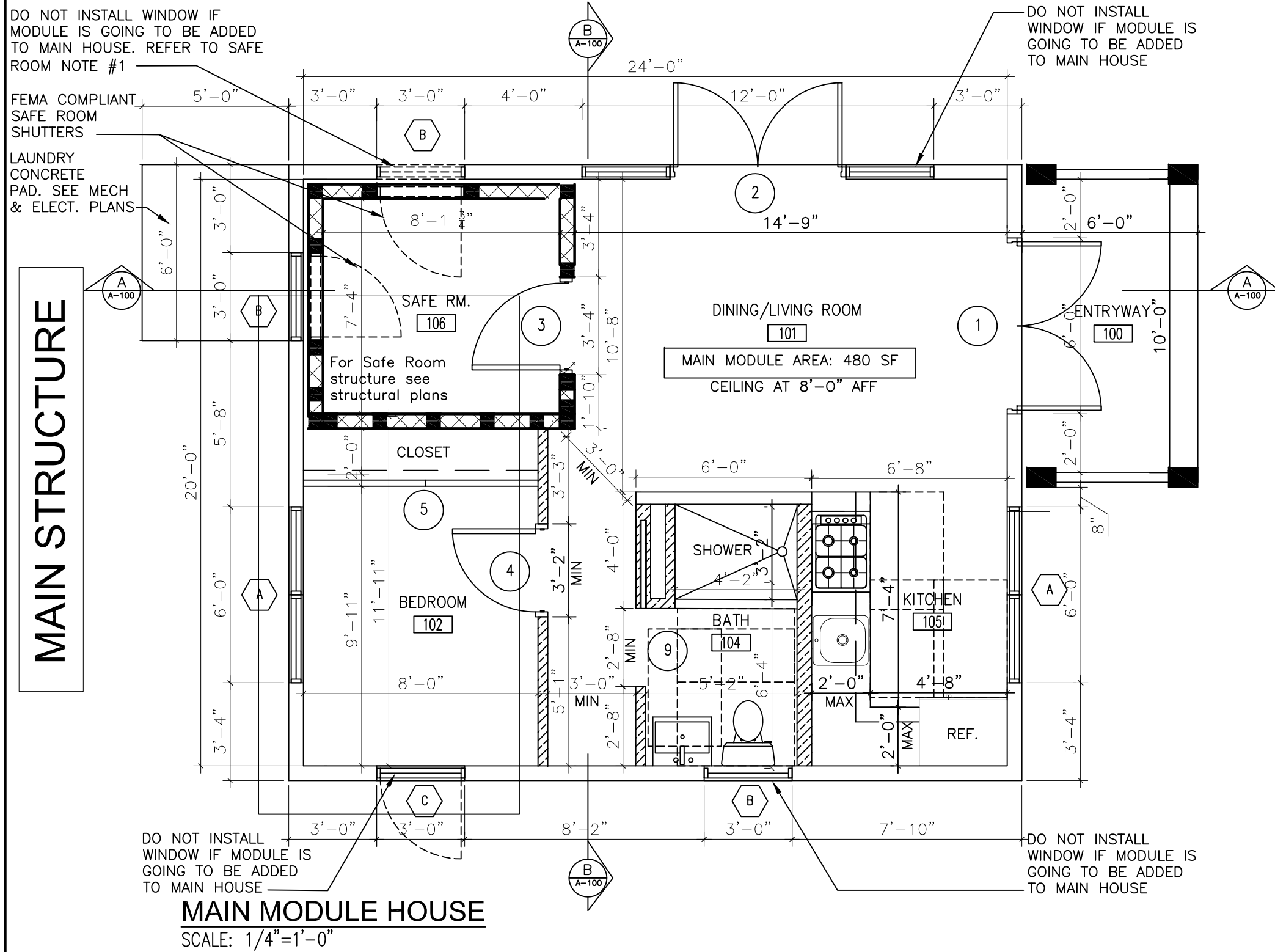
JOB No.	Date Issued:	05/08/20
Drawn By:	Sheet Number:	A-001
Checked By:		
QC Review:		
Phase:		



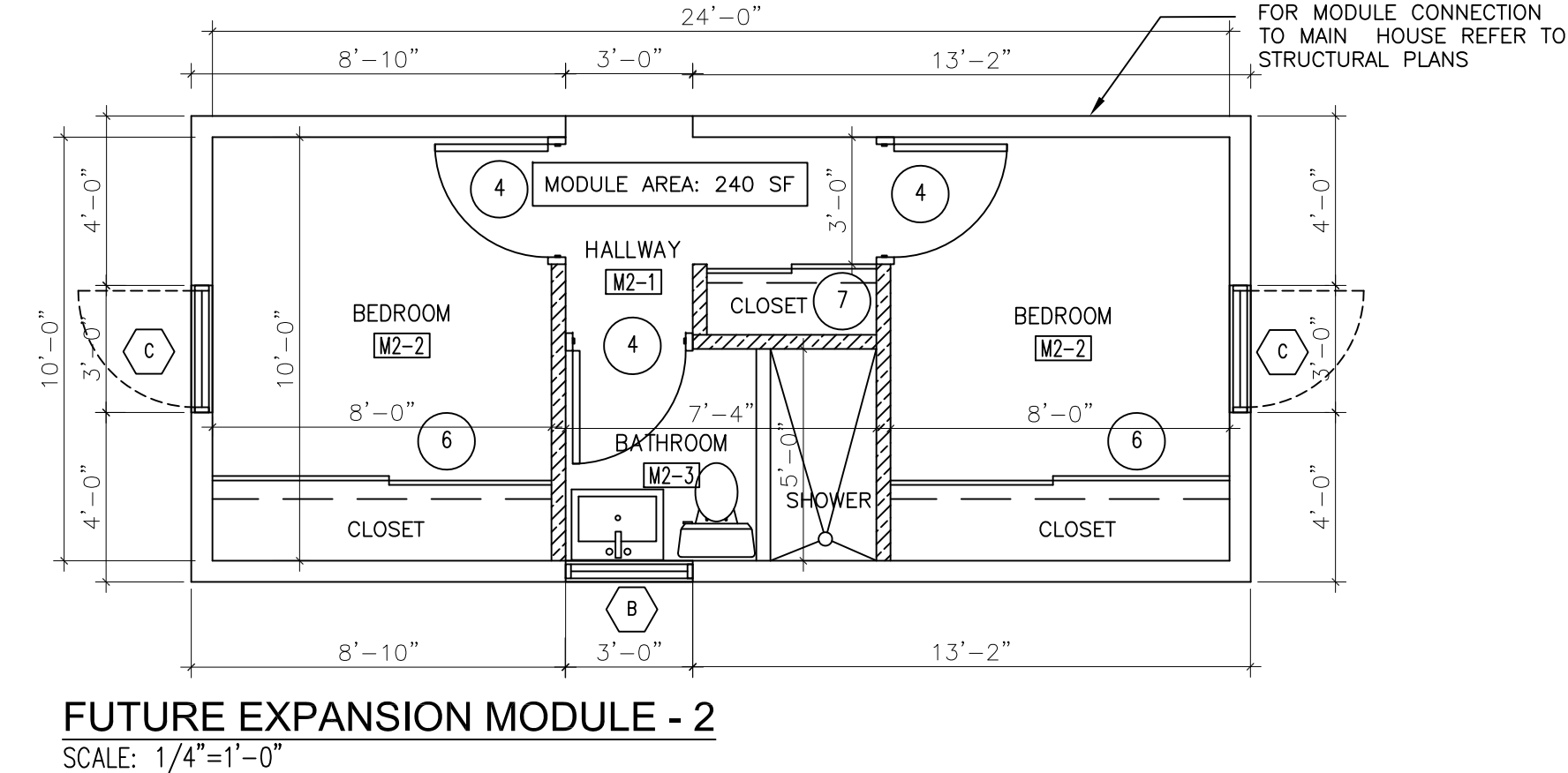
ADDITION OPTION



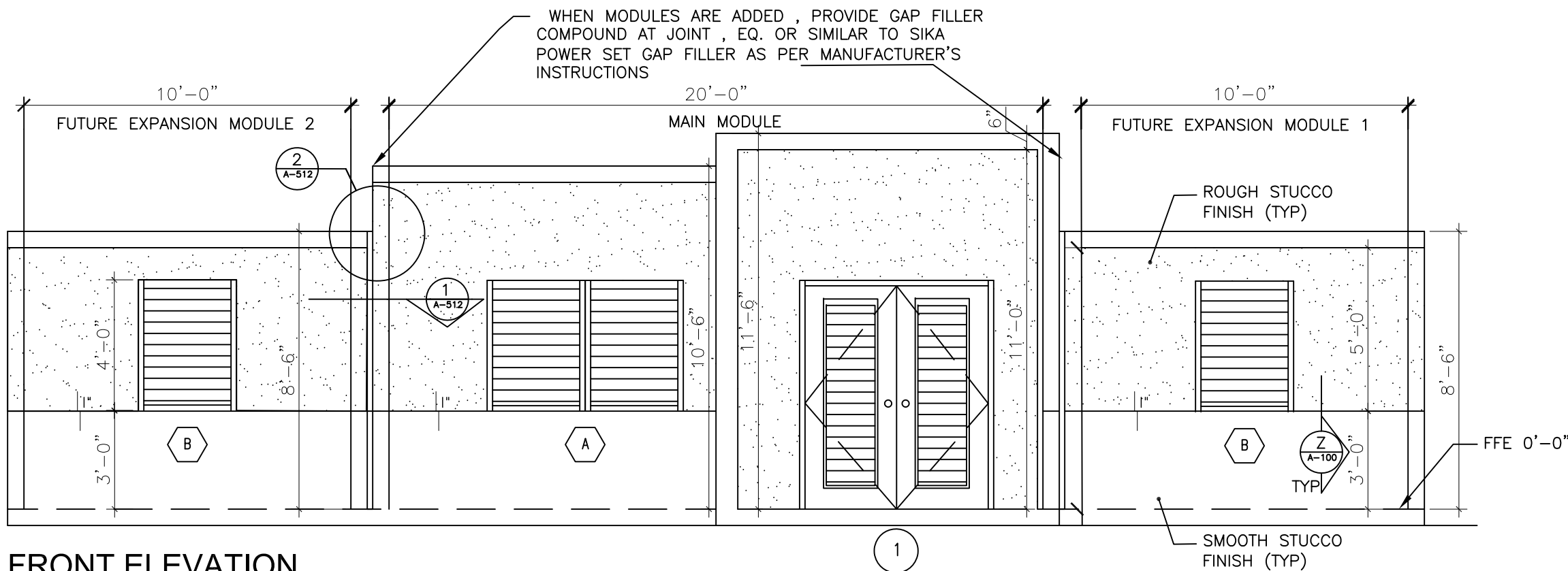
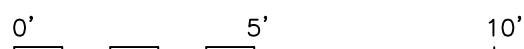
MAIN STRUCTURE



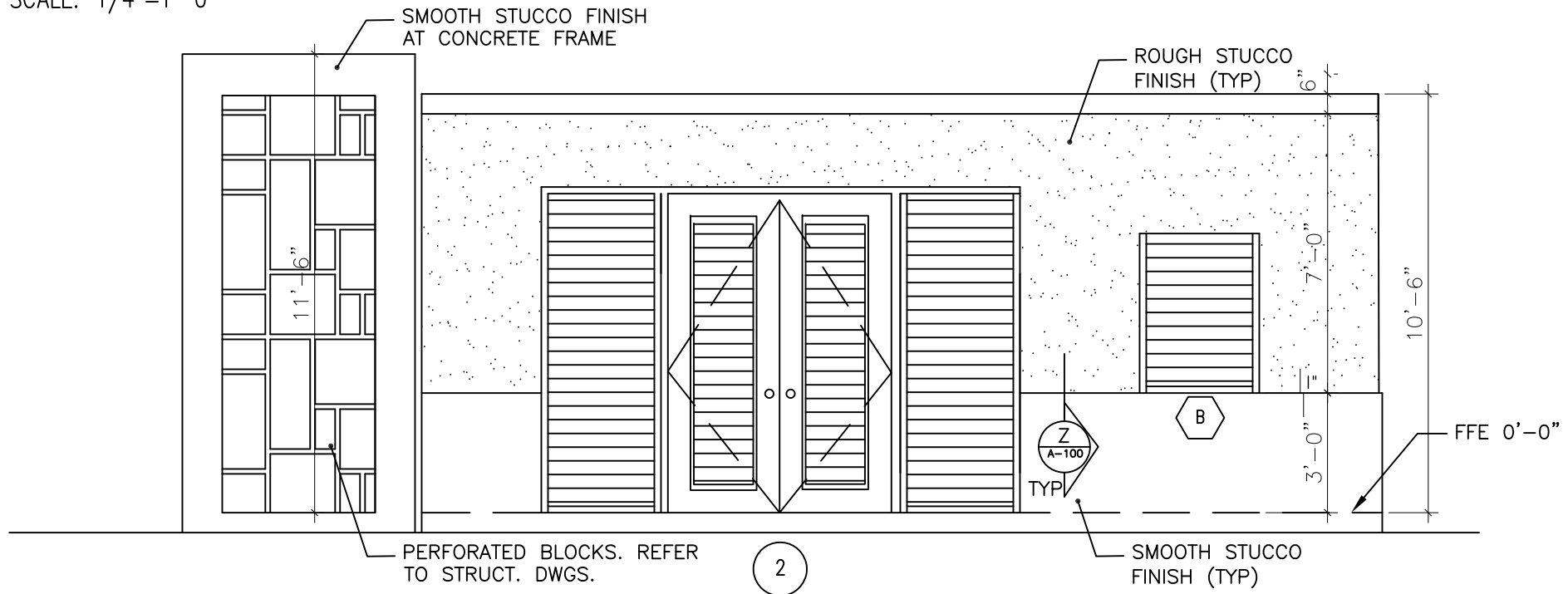
ADDITION OPTION



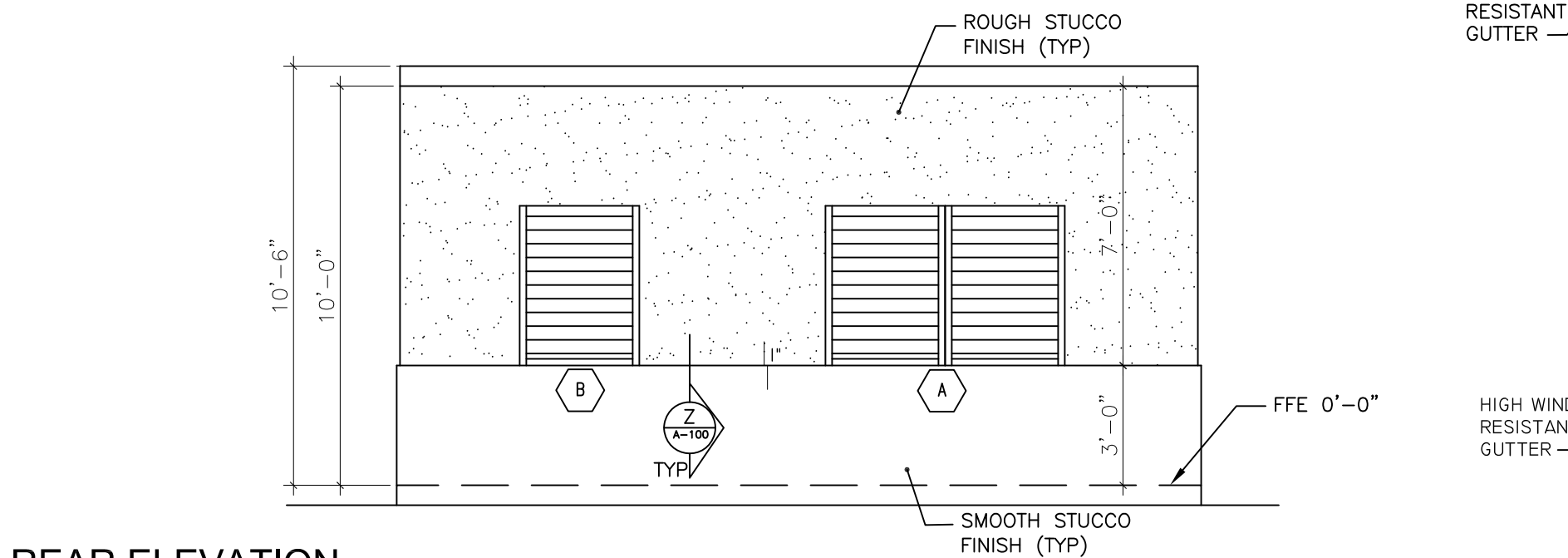
- LEGEND:
- CONCRETE
  - REINFORCED MASONRY WALLS
  - STRUCTURAL WOOD WALL
  - SOLID GROUTED MASONRY WALLS (SAFE ROOM. SEE STRUCTURAL PLANS)
- NOTE: FOR STRUCTURE DESIGN, FOOTINGS AND WALLS DESCRIPTION SEE STRUCTURAL PLANS



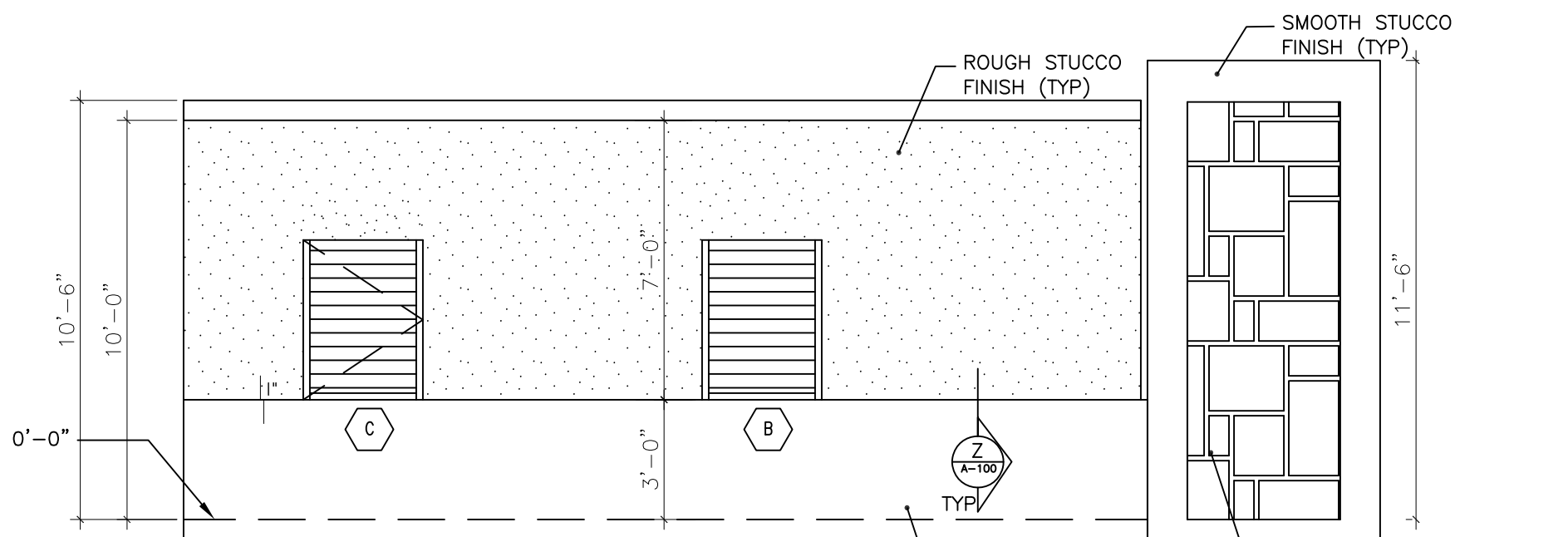
FRONT ELEVATION  
SCALE: 1/4"=1'-0"



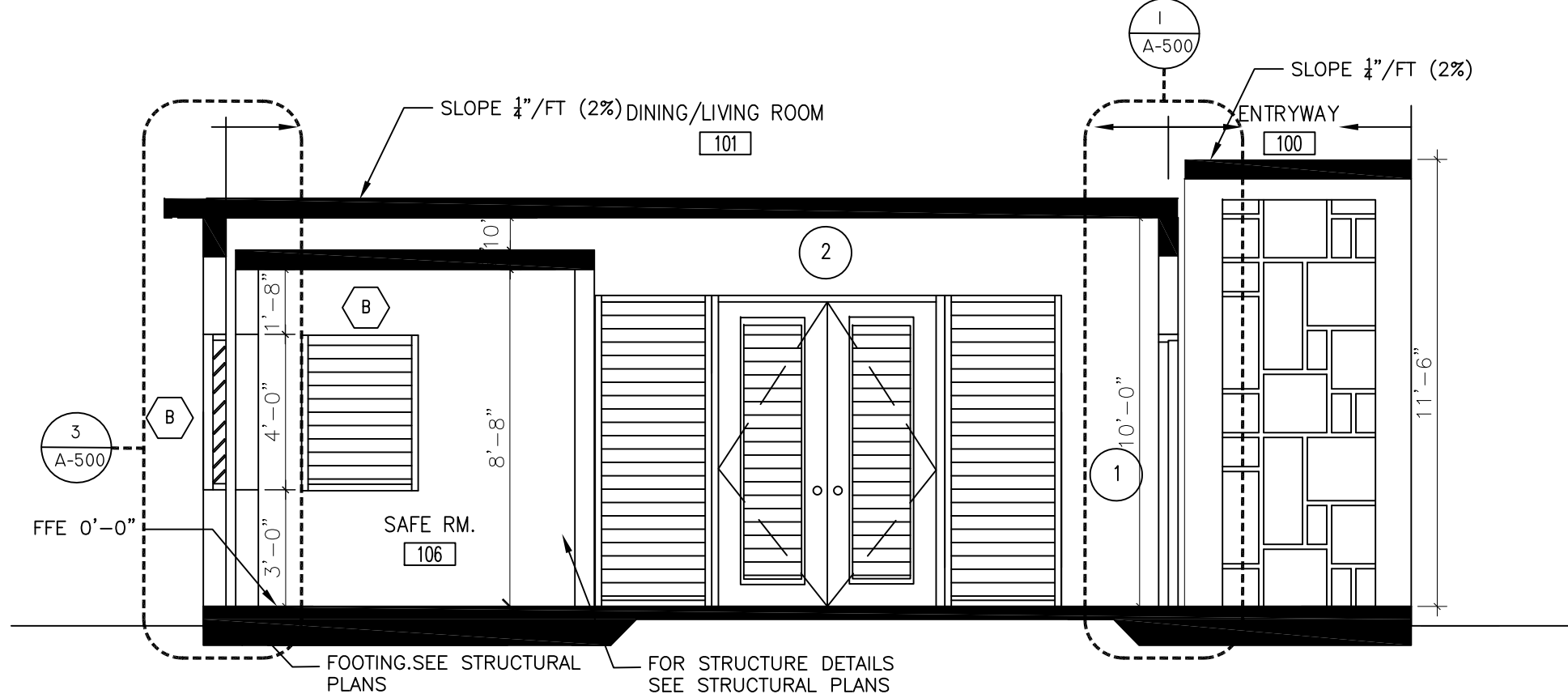
RIGHT SIDE ELEVATION (WITHOUT MODULE 1)  
SCALE: 1/4"=1'-0"



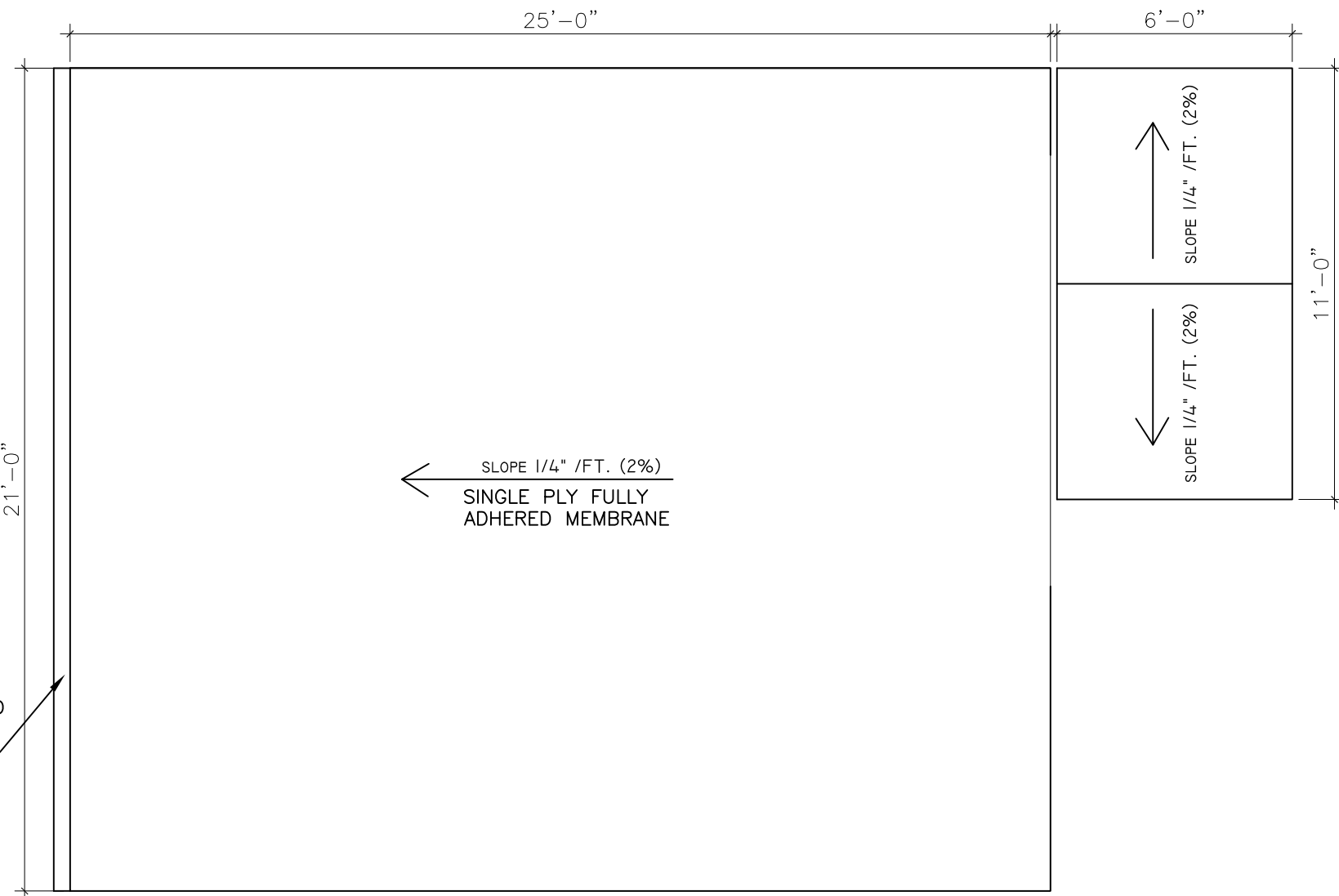
REAR ELEVATION  
SCALE: 1/4"=1'-0"



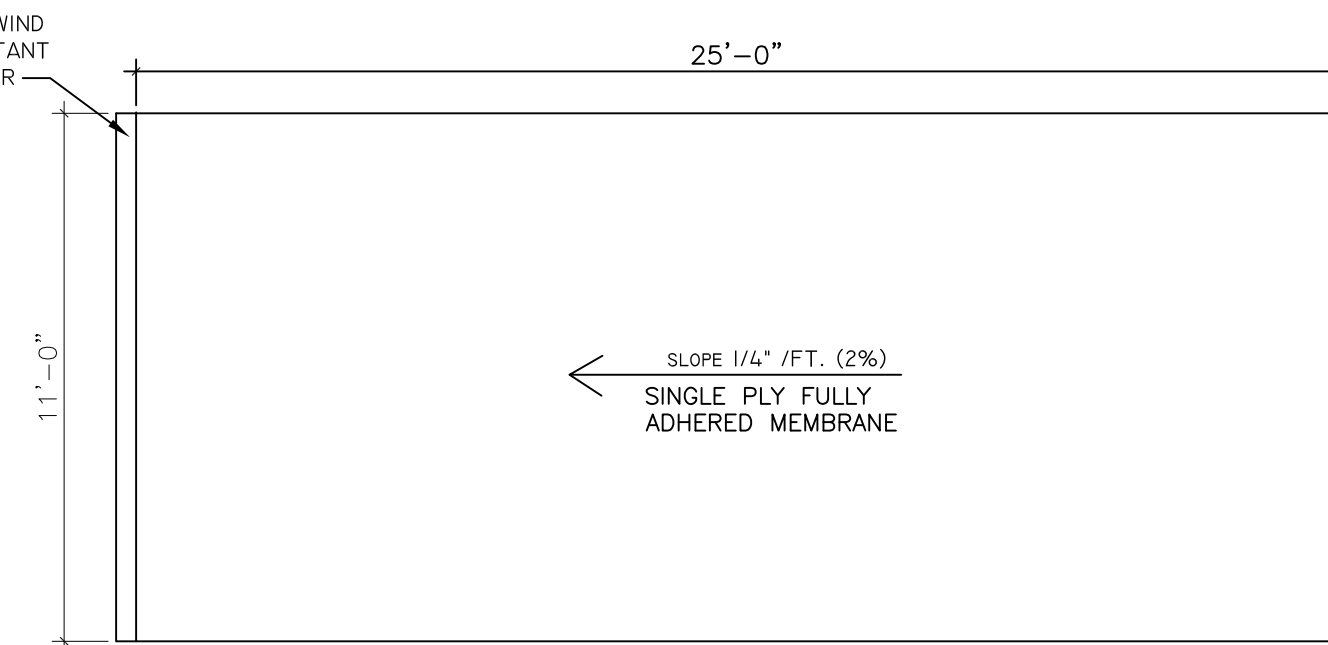
LEFT SIDE ELEVATION (WITHOUT MODULE 2)  
SCALE: 1/4"=1'-0"



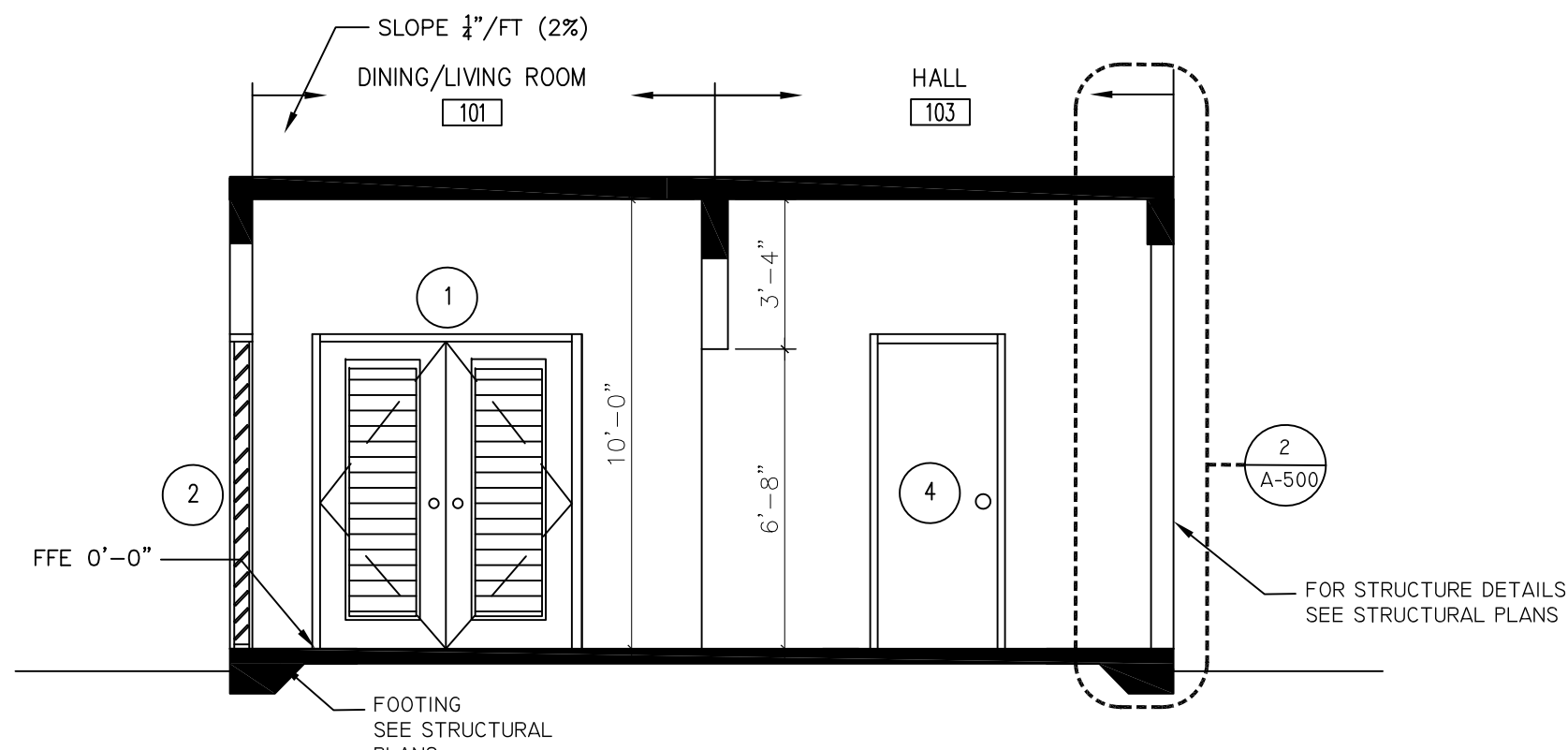
SECTION A-A  
SCALE: 1/4"=1'-0"



MAIN MODULE ROOF PLAN  
SCALE: 1/4"=1'-0"



EXPANSION MODULES ROOF PLAN  
SCALE: 1/4"=1'-0"



SECTION B-B  
SCALE: 1/4"=1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGPe-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

## PROTOTYPE 1\_FLOOR PLANS & ELEVATIONS

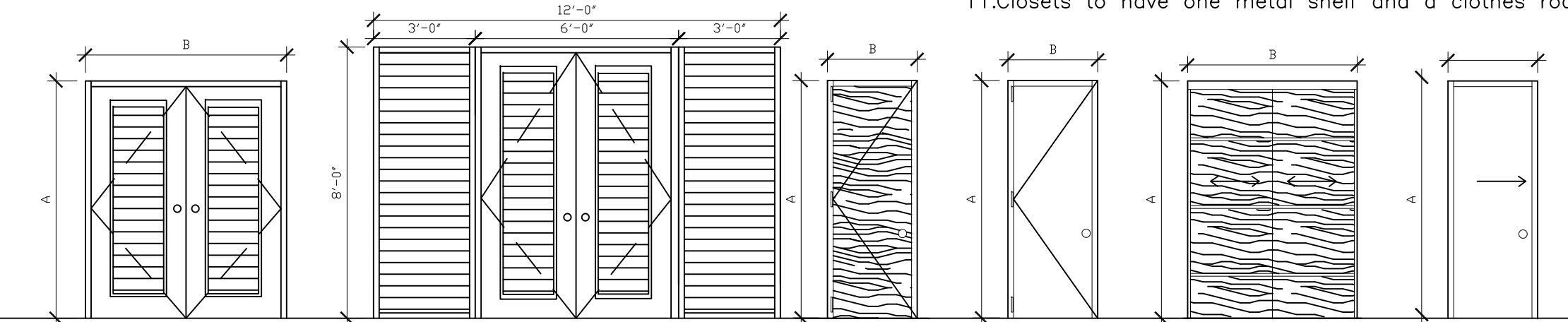
SHEET INFORMATION:

JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	<b>A-100</b>
QC Review:	Phase:



FINISH SCHEDULE MAIN MODULE					
NO.	NAME	FLOOR	BASE	CEILING	WALL
100	BALCONY	F1		C1	W1
101	LIVING/DINING ROOM	F1		C1	W1
102	BEDROOM	F1		C1	W1
103	HALL	F1		C1	W1
104	BATHROOM	F1, F2		C1	W1,W2
105	KITCHEN	F1		C1	W1
106	SAFE ROOM	F1		C1	W1

FINISH SCHEDULE MODULES 1&2					
NO.	NAME	FLOOR	BASE	CEILING	WALL
M1-1	LIVING ROOM	F1		C1	W1
M1-2	BEDROOM	F1		C1	W1
M2-1	HALLWAY	F1		C1	W1
M2-2	BEDROOM	F1		C1	W1
M2-3	BATHROOM	F1, F2		C1	W1,W2



DOOR ELEVATIONS

DOOR SCHEDULE PROTOTYPE 1										
MAIN BLDG	MOD. 1	MOD. 2	QTY.	NO.	TYPE	DIMENSIONS (D.O.)		MATERIAL	DESCRIPTION	REMARKS
QTY.	QTY.	QTY.	QTY.	NO.	TYPE	A	B			
1			①	I		7'-0"	6'-0"	ALUMINUM	JALOUSIE WINDOW DOOR	HARDWARE BY MANUFACTURER (ENTRANCE) COLOR: GRAY, FRAME: ALUM.
1			②	II		7'-0"	12'-0"	ALUMINUM	JALOUSIE WINDOW DOOR & JALOUSIE WINDOW	STOREFRONT, DOOR 6' X 8' H. HARDWARE BY MANUFACTURER (ENTRANCE).
1			③	IV		7'-0"	3'-4"	HOLLOW METAL	FIXED	SAFETY ROOM DOOR HARDWARE BY MANUFACTURER (COLOR GRAY)
2	1	3	④	III		7'-0"	3'-0"	WOOD & WOOD FRAME	FLUSH DOOR SEMI-SOLID	HARDWARE: PRIVACY WOOD: CEDAR, PAINT GRAY
1	1		⑤	V		8'-0"	8'-9 1/4"	WOOD	FLUSH SLIDING BYPASS CL. DOOR	HARDWARE: JOHNSON HARDWARE 200SD COLOR: GRAY PAINT; LOCATION: ROOM M1-2 & ROOM 102
		2	⑥	V		8'-0"	7'-8 3/8"	WOOD	FLUSH SLIDING BYPASS CL. DOOR	HARDWARE: JOHNSON HARDWARE 200SD COLOR: GRAY PAINT
		1	⑦	V		8'-0"	5'-2 5/8"	WOOD	FLUSH SLIDING BYPASS CL. DOOR	HARDWARE: JOHNSON HARDWARE 200SD COLOR: GRAY PAINT
		1	⑧	V		8'-0"	3'-0"	ALUMINUM	FLUSH DOOR	SECURITY ENTRANCE DOOR HARDWARE BY MANUFACTURER (COLOR GRAY)
		1	⑨	VI		7'-0"	3'-0"	WOOD & WOOD FRAME	POCKET DOOR SEMI-SOLID	HARDWARE: PRIVACY WOOD: CEDAR, PAINT GRAY

1. Install doors as per the FMA/AMMA 200 and 400 guidelines.

## FINISHES KEYNOTES

### FLOOR FINISHES:

F1 – Polished concrete with satin sealer

F2 – Shower floor and 4" high shower curb to be mosaic ceramic tile, 2x2, color white, grout silver color.

### BASE:

No base to be installed

### CEILING:

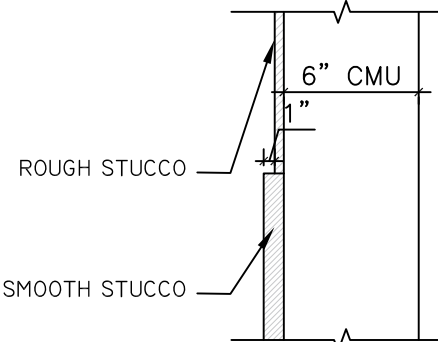
C1 – Concrete, smooth plaster painted white

### WALLS:

W1 – Concrete, smooth plaster painted white

W2 – Ceramic tile wainscot, 4"x4", color white

with silver grout at shower walls (3), to 72" high

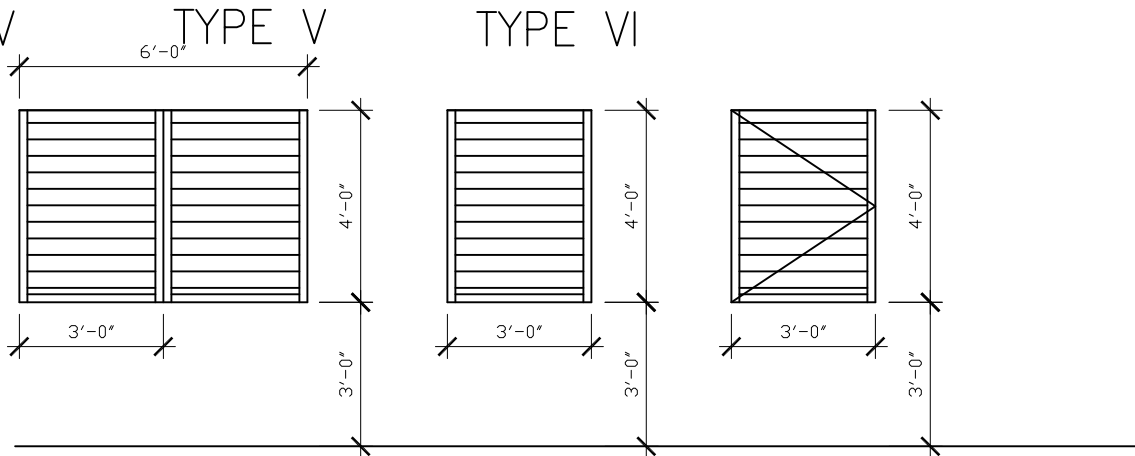


WALL DETAIL - Z

N.T.S.

## FINISHES NOTES

- All floor finishes must be level and smooth
- Contractor must consult with the Owner for any material changes from the specified in the contract documents.
- When required by Owner, Contractor must submit one sample of the finishes to the Owner for approval. Sample must conform with the specifications in the contract documents and colors selected by the Architect and/or Owner.
- Whenever a color is not selected or indicated in the contract documents, it must be consulted with the Owner for selection.
- Interior Walls paints shall be equal or similar to Behr Premium Plus Ultra (paint and primer) in eggshell finish, white, unless otherwise indicated by the Owner. Personal Colors to be selected by the Owner.
- Ceiling paint to be equal or similar to Behr Premium Plus Ultra Stain Blocking Ceiling Paint in white, unless otherwise indicated by the Owner.
- Exterior paint to be equal or similar to Behr Premium Plus Ultra Exterior Flat Enamel, color white unless otherwise indicated by the Owner. Personal Colors to be selected by Owner.
- Bathrooms wall and floor finishes to be selected and provided by the contractor, unless otherwise indicated by the Owner.
- Kitchen finishes to be selected by the Owner. Kitchen design and construction shop drawings to be provided by Others to the Owner. Contractor must coordinate with Kitchen supplier. Kitchen supplier must verify all the dimensions prior to the start of the kitchen cabinetry construction. Contractor shall be responsible for any discrepancies in the dimensions not verified by the supplier.
- Contractor must verify on field all the finishes quantities and areas before the material is purchased. Contractor must provide the exact quantities to the Owner so he can get quotes on the material finishes if required.
- Closets to have one metal shelf and a clothes rod installed on its interior.



WINDOW ELEVATIONS

MAIN BLDG		MOD. 1	MOD. 2	WINDOW SCHEDULE PROTOTYPE 1						
QTY.	QTY.	QTY.	NO.	TYPE	DIMENSIONS		MATERIAL	A.F.F. (C)	REMARKS	
2			A	I	4'-0"	6'-0"	ALUMINUM JALOUSIE	3'-0"	COLOR: GRAY JALOUSIE: 4", ADD ALUM. SCREEN	
3	3	1	B	II	4'-0"	3'-0"	ALUMINUM JALOUSIE	3'-0"	COLOR: GRAY JALOUSIE: 4", ADD ALUM. SCREEN	
1	1	2	C	III	4'-0"	3'-0"	ALUMINUM JALOUSIE	3'-0"	COLOR: GRAY JALOUSIE: 4", ADD ALUM. SCREEN	

- Window waterproofing: Provide 100% Silicone caulking around the interior and exterior perimeter of each window, eq. or similar to Sikaflex 211. Install as per the FMA/AMMA 200 and 400 guidelines.
- For safe room window requirements, see structural drawings.

## BATHROOM SCHEDULE

### BATHROOM EQUIPMENT:

Water Closet: Cadet 3 FloWise Tall Height 2-Piece 1.28 GPF Single Flush High Efficiency Elongated Toilet in White with Slow Close Seat by American Standard

Lavatory sink: Elmbrook 24 in. Pedestal Sink in White with 4 in. Centerset Faucet Holes by Kohler

Lavatory faucet: Elmbrook 4 in. Centerset 2-Handle Bathroom Faucet in Polished Chrome by Kohler

Lavatory mirror: 20 in. x 26 in. Recessed or Surface-Mount Bathroom Medicine Cabinet with Beveled Mirror in Silver by Pegasus

Accessories: Serano 5-Piece Bathroom Accessory Set in Chrome by Kingston Brass

Shower: Centa 47 in. 1 Jet Shower Panel with Hand Shower in Stainless Steel by Mediterraneo

Shower drain: PVC Shower Drain with Chrome Barrel and Square 4-3/16 in. Chrome Strainer by Oatey

Shower curtain rod: Expanse Wall Mount Shower Rod in Brushed Stainless by Kohler

### BATHROOM NOTES:

- Bathroom equipment and accessories to be equal or similar to the specified above. Variations to be approved by Owner.
- Bathroom equipment and accessories supplier: Equal or similar to The Home Depot
- Bathroom walls to be painted white (eggshell finish).
- For bathroom wainscot and shower tiles see finish schedule.
- For water cistern (potable) and rain water cistern details, see mechanical plans.

## KITCHEN SCHEDULE

### KITCHEN EQUIPMENT:

Sink: Handcrafted All-in-One Drop-In Stainless Steel 25 in. x 22 in. x 9 in. Single Bowl Kitchen Sink with Tray and Drain by Akdy

Sink Faucet: Fairbury Single-Handle Pull-Down Sprayer Kitchen Faucet in Stainless Steel by American Standard

Cabinets: Wood cabinets, laminated by others. For Owner approval.

Cooking range: N.I.C.

Refrigerator: N.I.C.

Kitchen Hood: RL6200 Series 30 in. Ductless Under Cabinet Range Hood with Light in Stainless Steel by NuTone

### KITCHEN NOTES:

- Kitchen equipment and accessories to be equal or similar to the specified above. Variations to be approved by the Owner.
- Kitchen equipment and accessories supplier: equal or similar to The Home Depot
- Kitchen walls to be painted white (eggshell finish).
- Kitchen backsplash tiles: Ceramic tiles 6x6, color gray unless otherwise indicated by the Owner.

## SAFE ROOM NOTES

SAFE ROOM SIZE SHOWN IN THIS PLAN SET IS BASED UPON A 7 PERSON OCCUPANCY. PER FEMA P-320 REQUIREMENTS 7 S.F. OF SPACE IS REQUIRED PER OCCUPANT. FOR VARYING OCCUPANCY REQUIREMENTS CONFIRM SAFE ROOM SIZE REQUIREMENTS WITH FEMA P-320, FEMA 361, AND ICC 500.

SEE FEMA P-361 AND ICC-500 FOR ADDITIONAL SAFE ROOM REQUIREMENTS SUCH AS FIRST AID KITS, OPERATION, AND MAINTENANCE REQUIREMENTS, ONCE THE SAFE ROOM IS CONSTRUCTED IT SHOULD BE REGISTERED WITH LOCAL FIRST RESPONDERS (E.G., POLICE, FIRE, RESCUE ORGANIZATIONS).

NOT ALL SAFE ROOM OPENINGS ARE SHOWN IN THESE DRAWINGS. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING, AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS, AND SUBCONTRACTORS PRIOR TO CONSTRUCTION. OPENINGS MAY REQUIRE ADDITIONAL REINFORCING OR SUPPORTS AS SHOWN ON TYPICAL DETAILS. OPENINGS NEED TO BE PROTECTED PER ICC 500.

COMPLETE SAFE ROOM INSPECTION REQUIREMENTS SHALL BE AS DIRECTED BY THE LOCAL BUILDING DEPARTMENT.

SAFE ROOM VENTILATION IS TO BE PROVIDED. VERIFY SIZE REQUIREMENTS BASED ON SAFE ROOM SIZE, OCCUPANCY, AND ICC 500 SPECIFICATIONS. CONSULT LOCAL BUILDING OFFICIAL AND REFER TO ICC 500-14 FOR VENTILATION OPENING PROTECTION.

THE SELECTED DOOR AND WINDOW PROTECTION SHALL MEET THE DESIGN CRITERIA OF 2015 FEMA P-361 AND 2014 ICC-500. ALL DOORS AND WINDOW PROTECTIONS SHALL BE A TESTED ASSEMBLY AND INSTALLED PER MANUFACTURER RECOMMENDATIONS.

- ① OWNER HAS THE OPTION TO ELIMINATE SAFE ROOM WINDOW IF THIS ROOM WILL NEVER BE USED AS A BEDROOM.

## GENERAL NOTES

- ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL BUILDING CODES AND/OR REGULATIONS.
- ALL WORK SHALL BE DONE IN A MANNER CONSISTENT WITH THE HIGHEST STANDARDS OF THE RESPECTIVE TRADES.
- THE CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH THE EXISTING CONDITIONS BEFORE BIDDING.
- THE CONTRACTOR SHALL VERIFY ALL FIELD DIMENSIONS BEFORE PROCEEDING WITH THE WORK AND COMPLIANCE WITH ZONING REGULATIONS.
- THE CONTRACTOR SHALL ABIDE BY ALL REQUIREMENTS OF THE OWNER WITH RESPECT TO CONSTRUCTION SCHEDULING, COORDINATION, TEMPORARY CONSTRUCTION, UTILITIES, ETC.
- THE CONTRACTOR SHALL NOT SCALE THESE CONSTRUCTION DOCUMENTS. IN THE EVENT THAT THE CONTRACTOR DOES SCALE THESE DOCUMENTS, IT SHALL BE AT THEIR OWN RISK.
- ALL MATERIALS, PRODUCTS, AND UNITS, SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.
- INSTALLATION OF ALL MATERIALS AND/OR UNITS TO BE SELECTED BY, SUPPLIED BY, AND/OR INSTALLED BY THE OWNER SHALL BE SCHEDULED AND COORDINATED BY THE CONTRACTOR TO MAINTAIN THE CONSTRUCTION SCHEDULE. PRIOR TO THE COMMENCEMENT OF THE WORK, THE CONTRACTOR SHALL NOTIFY THE OWNER OF ALL QUANTITIES OF OWNER SUPPLIED MATERIALS AND/OR UNITS NOT SPECIFICALLY CALLED OUT IN THESE CONSTRUCTION DOCUMENTS. THE CONTRACTOR SHALL NOTIFY THE OWNER OF REQUIRED DELIVERY DATES OF OWNER SUPPLIED MATERIALS AND UNITS.
- ALL FINISH PAINT SHALL BE APPLIED OVER A COMPATIBLE FACTORY OR FIELD APPLIED PRIMER.
- THE CONTRACTOR SHALL PROTECT ALL EXISTING AND ADJACENT AREAS AT ALL TIMES DURING CONSTRUCTION. ANY AREA DAMAGED OR AFFECTED BY CONSTRUCTION SHALL BE PATCHED, REPAIRED, OR REPLACED AS REQUIRED TO MATCH EXISTING OR ADJACENT AREAS AT THE CONTRACTOR'S EXPENSE.
- THE CONTRACTOR SHALL YIELD TO THE OWNER AND THEIR VISITORS AT ALL TIMES.
- THE CONTRACTOR SHALL NOT DISRUPT THE BUILDING OR OPERATIONS WITHOUT PRIOR SCHEDULING AND APPROVAL FROM THE OWNER.
- NOT USED
- IF A CONFLICT OCCURS ON THESE CONSTRUCTION DOCUMENTS AND/OR THE SPECIFICATIONS, THE CONTRACTOR SHALL BID THE HIGHER QUALITY AND/OR QUANTITY.
- AIR CONDITIONING NOT INCLUDED. HOUSE OWNER SHALL DECIDE IF REQUIRED AND INSTALLATION WILL BE DONE BY OTHERS AFTER HOUSE IS BUILT.
- ALL WORK THAT IS EITHER IMPLIED OR REASONABLY INFERRED BY THE CONTRACT DOCUMENTS, DRAWINGS, AND SPECIFICATIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL DRAWINGS ARE DIRECTED TO THE ATTENTION OF THE CONTRACTOR, AND THE INCLUSION OF ANY WORK BY MENTION, NOTE, DETAIL, OR IMPLICATION, HOWEVER BRIEF, MEANS THAT THE CONTRACTOR SHALL PROVIDE AND INSTALL THE SAME.
- ALL WORK PERFORMED SHALL INCLUDE ALL APPURTENANCES AND APPARATUS NORMALLY DEEMED TO BE PART OF A COMPLETE PACKAGE WITHIN THE DEFINITIONS OF NORMAL INDUSTRY STANDARDS.
- ALL DIMENSIONS ARE CLEAR (FINISH TO FINISH). ALL FINAL DIMENSIONS AND LAYOUT SHALL BE VERIFIED WITH AND APPROVED BY THE OWNER AS REQUIRED BEFORE PROCEEDING WITH THE WORK.
- ROOF WATERPROOFING TO BE LIQUID APPLIED MEMBRANE (LAM) SYSTEM ON CONCRETE ROOFS, EQ. OR SIMILAR TO SIKALASTIC PRODUCTS (560, 612 OR 614). APPLICATION TO BE AS PER MANUFACTURER'S INSTRUCTIONS. WARRANTY BY MANUFACTURER.
- ONE BEDROOM WINDOW SHOULD BE CASEMENT TYPE JALOUSIE TO SWING IN THE DIRECTION OF EGRESS PER CODE
- NOT USED
- THE CONTRACTOR ASSUMES RESPONSIBILITY FOR CONSTRUCTION MEANS, METHODS, MATERIALS, TECHNIQUES, PROCEDURES, SEQUENCES, OR SCHEDULING IN CONNECTION WITH THIS WORK.
- NOT USED
- THE CONTRACTOR SHALL REMOVE ALL RUBBISH AND WASTE MATERIAL PERIODICALLY AND KEEP THE JOB SITE BROOM CLEAN AT ALL TIMES. ALL WASTE MATERIAL SHALL BE DISPOSED OF PROPERLY.
- ALL MECHANICAL, ELECTRICAL, PLUMBING FIXTURES AND EQUIPMENT SHOWN IN THE ARCHITECTURAL CONSTRUCTION DOCUMENTS, ARE SHOWN FOR LOCATION PURPOSES ONLY. ALL SPECIFICATIONS, ETC. SHALL BE PROVIDED UNDER SEPARATE COVER.

ONE STORY  
CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (DGP+DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

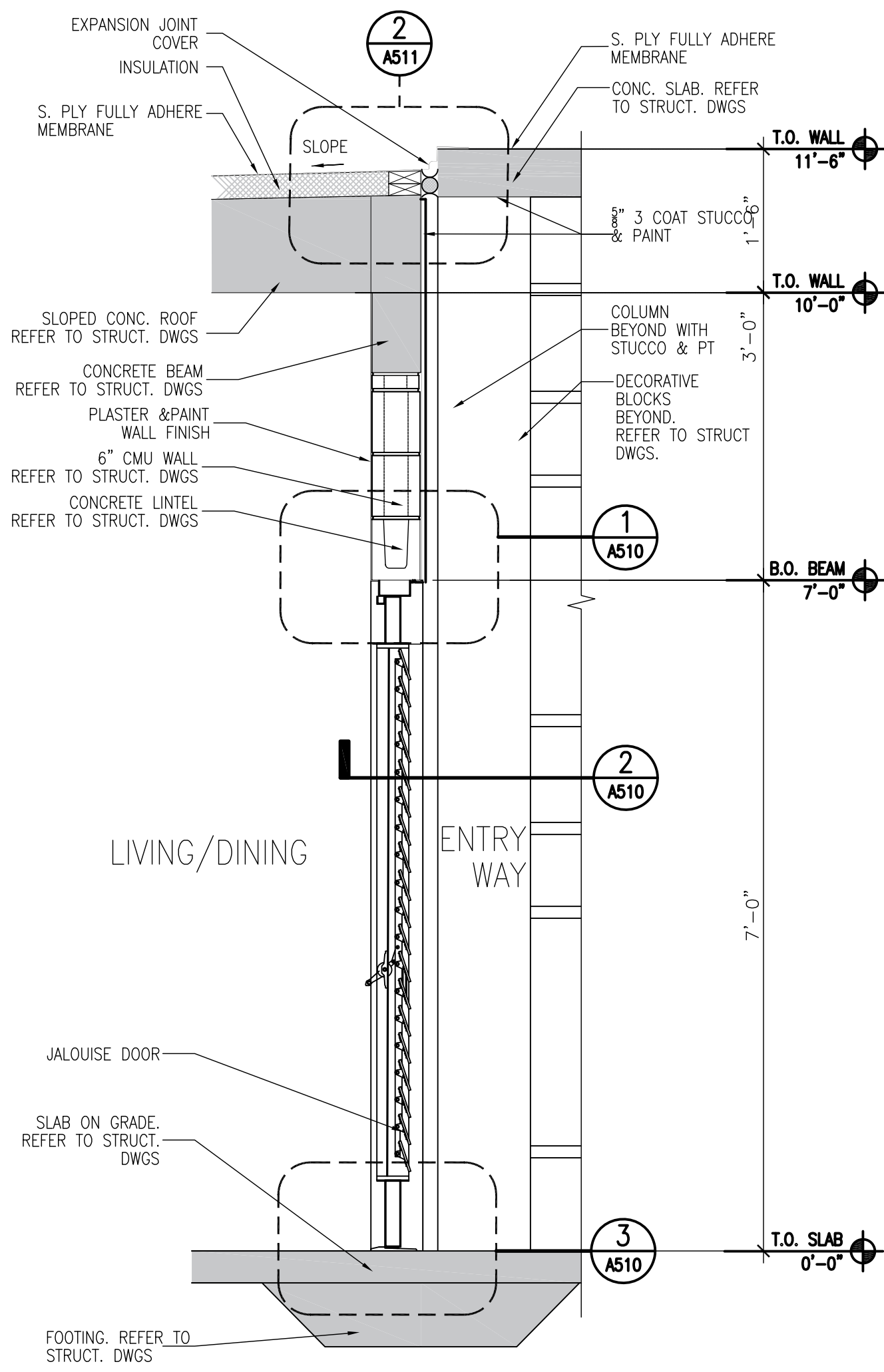
PROFESSIONAL SEALS:

SHEET TITLE:

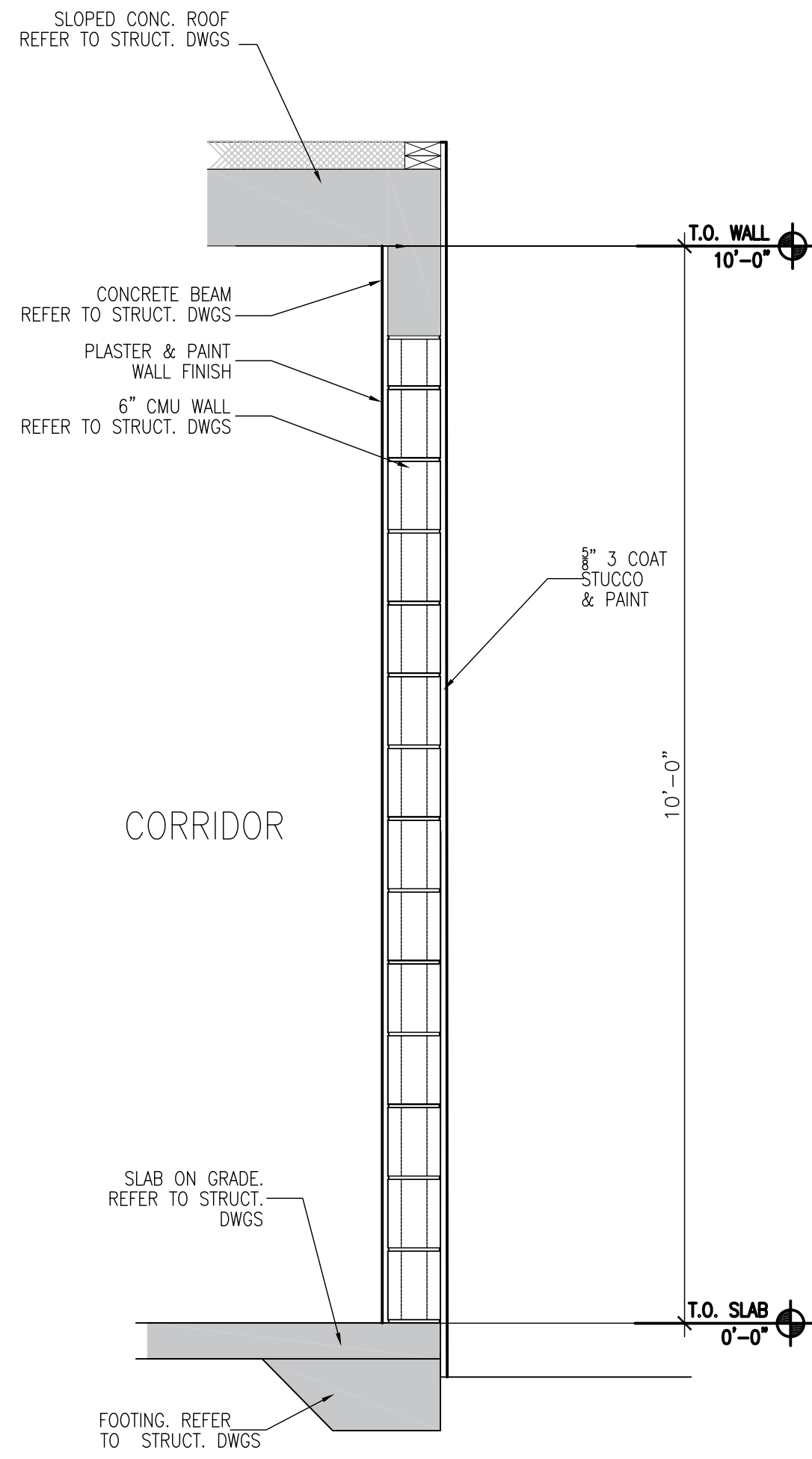
## PROTOTYPE 1\_DOORS, WINDOWS AND FINISHES

SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	A-101
QC Review:	
Phase:	

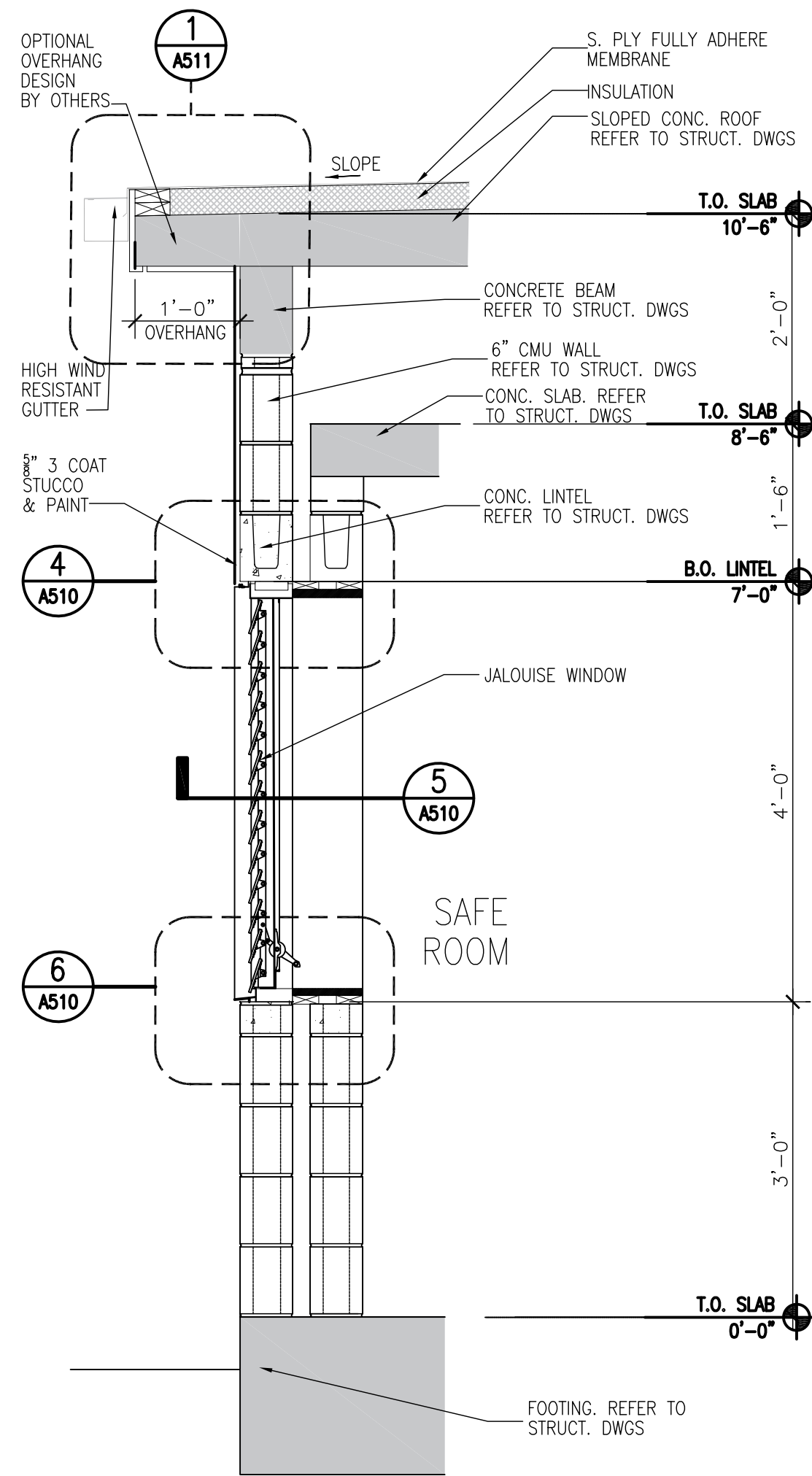




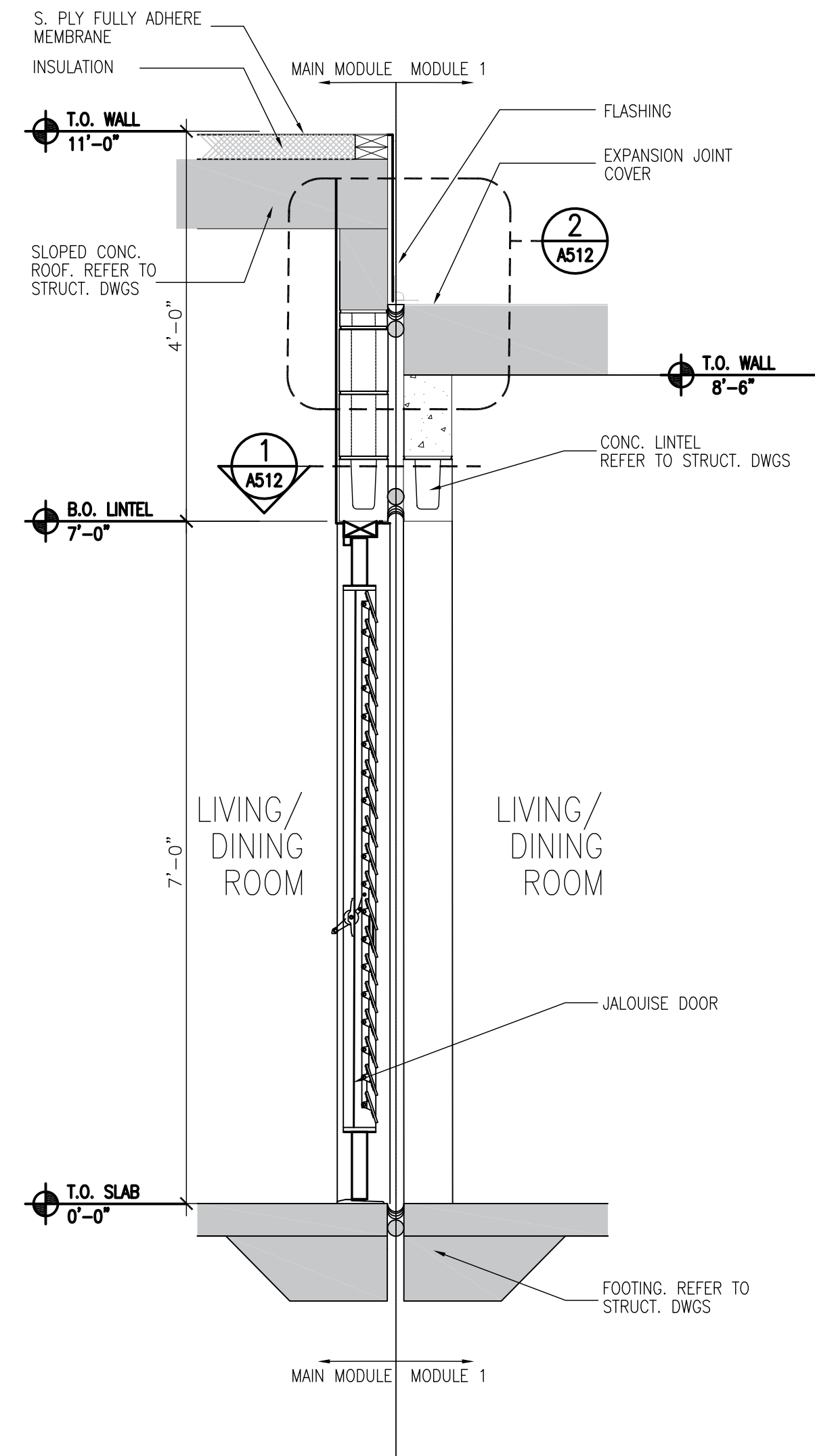
1 WALL SECTION  
SCALE: 3/4" = 1'-0"



2 WALL SECTION  
SCALE: 3/4" = 1'-0"



3 WALL SECTION  
SCALE: 3/4" = 1'-0"



4 WALL SECTION  
SCALE: 3/4" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (DGP+DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

## ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

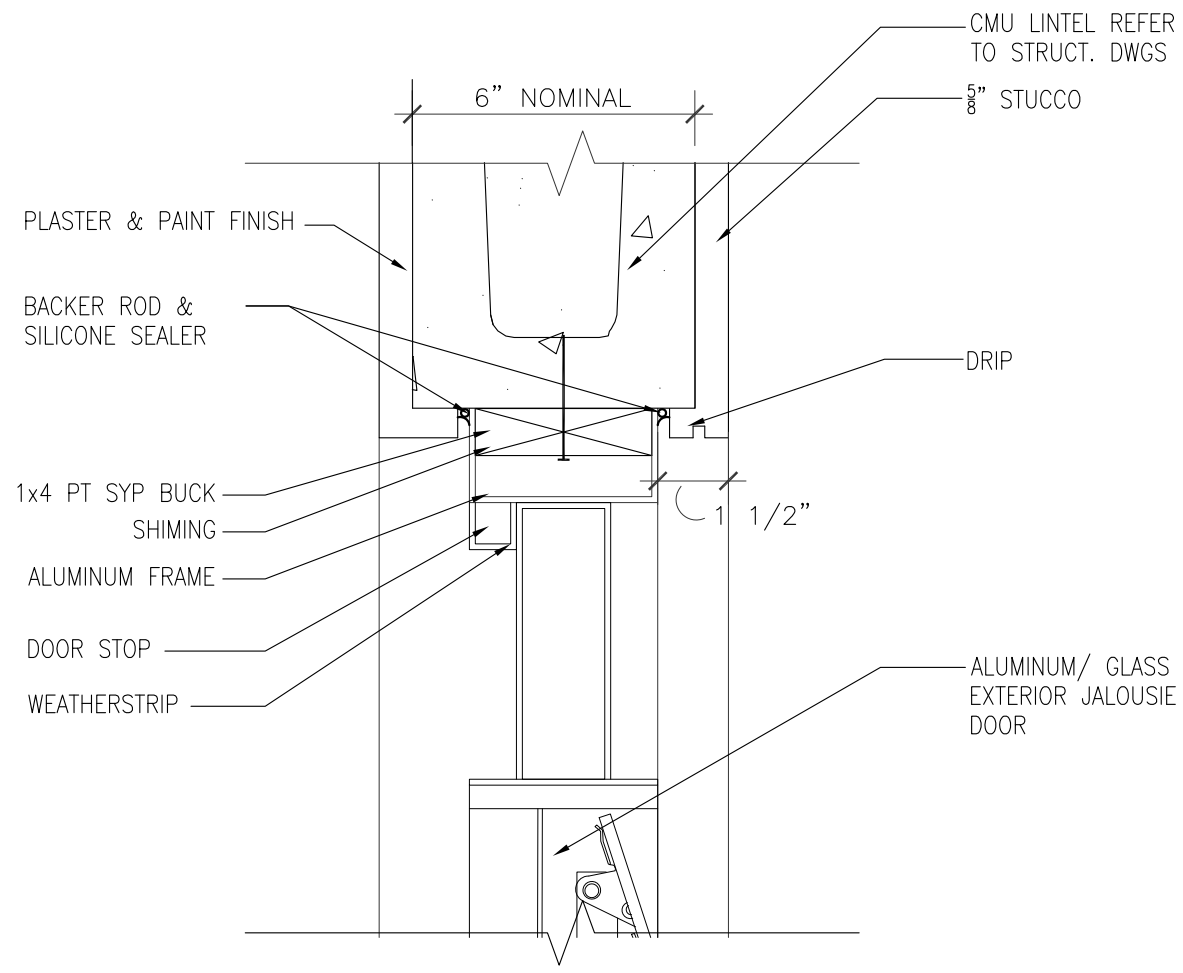
SHEET TITLE:

## PROTOTYPE#1 WALL SECTIONS

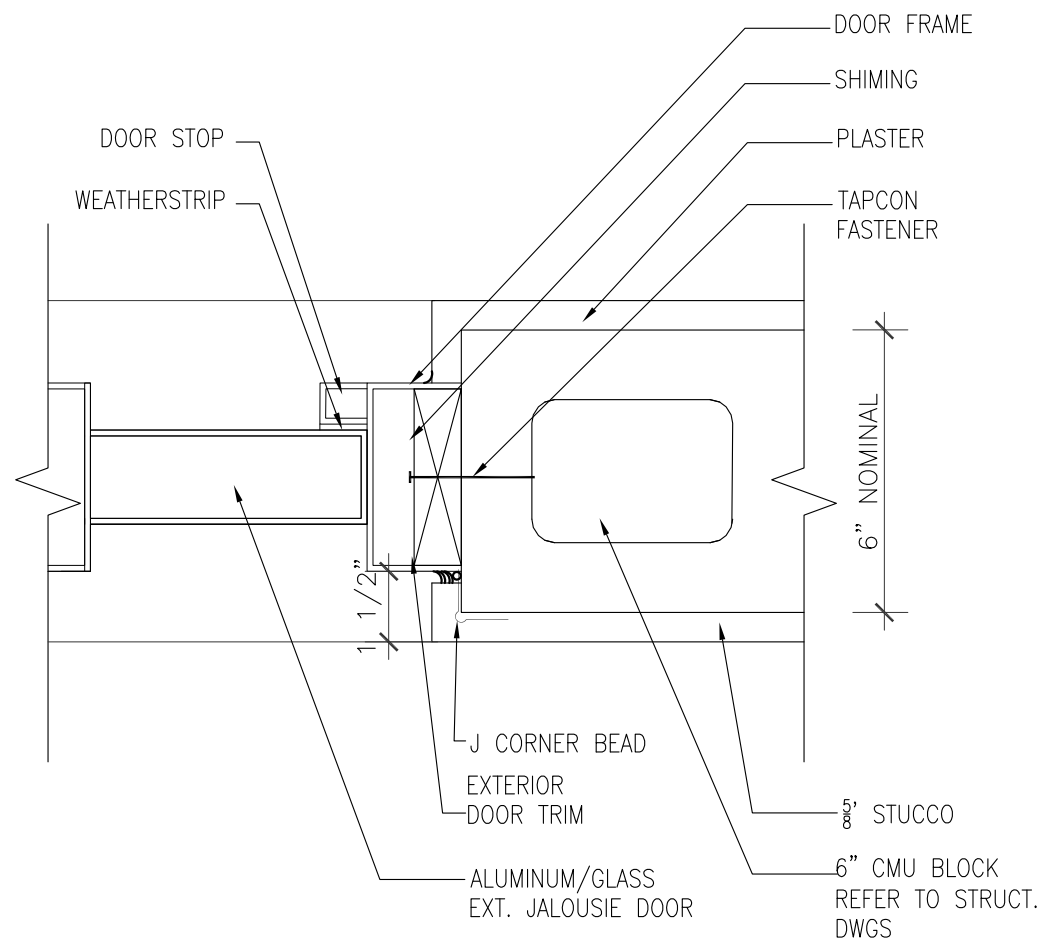
SHEET INFORMATION:

JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	A-500
QC Review:	
Phase:	

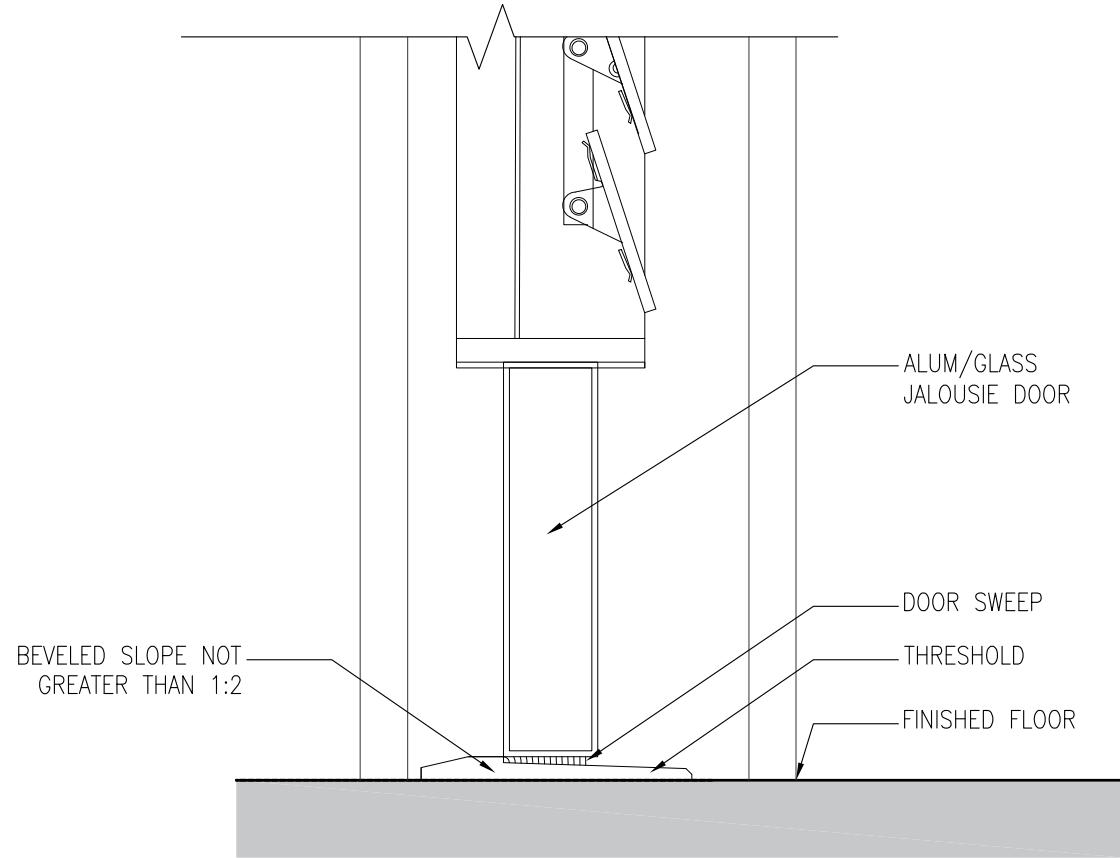




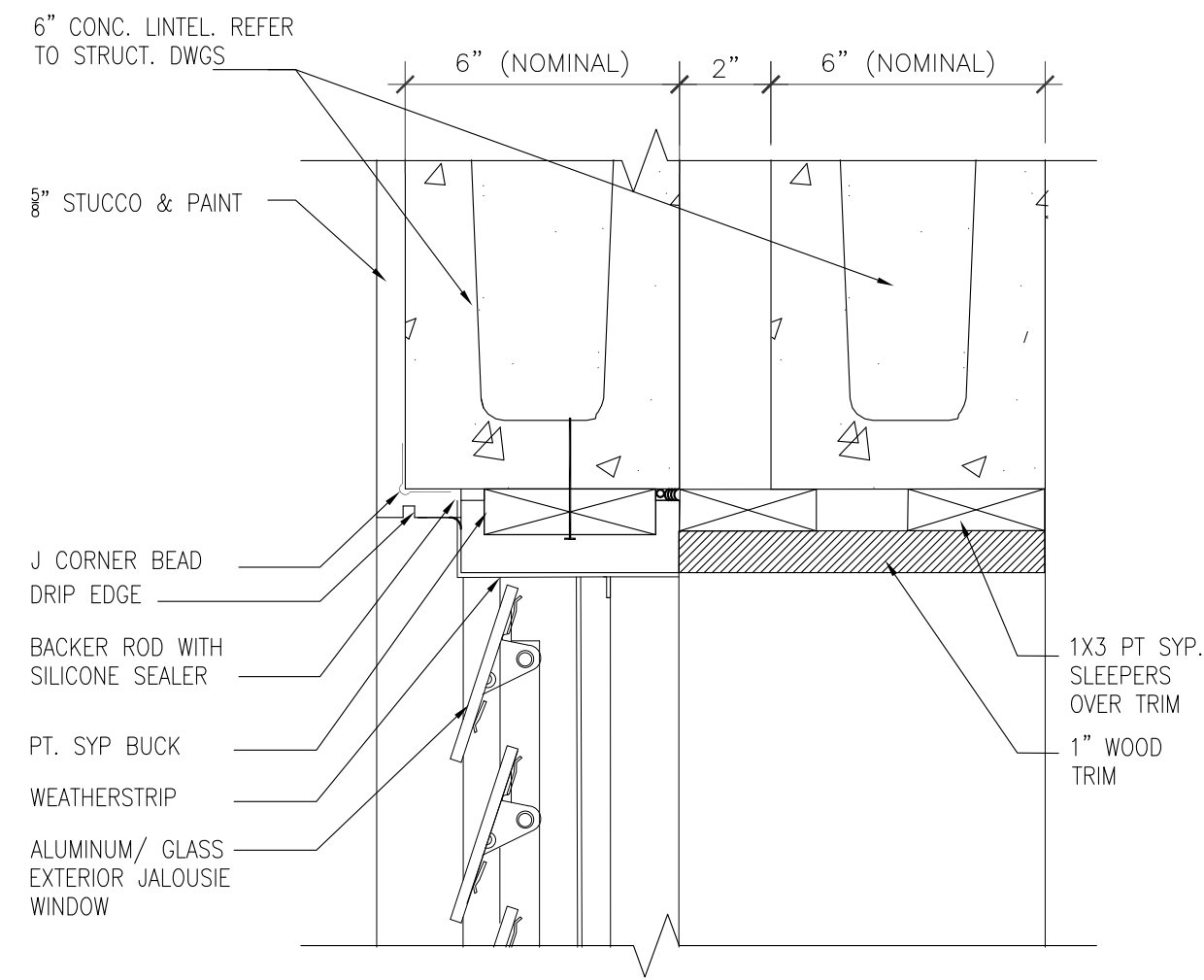
1 SECTION DETAIL-DOOR HEADER- CONC. WALL  
SCALE: 3" = 1'-0"



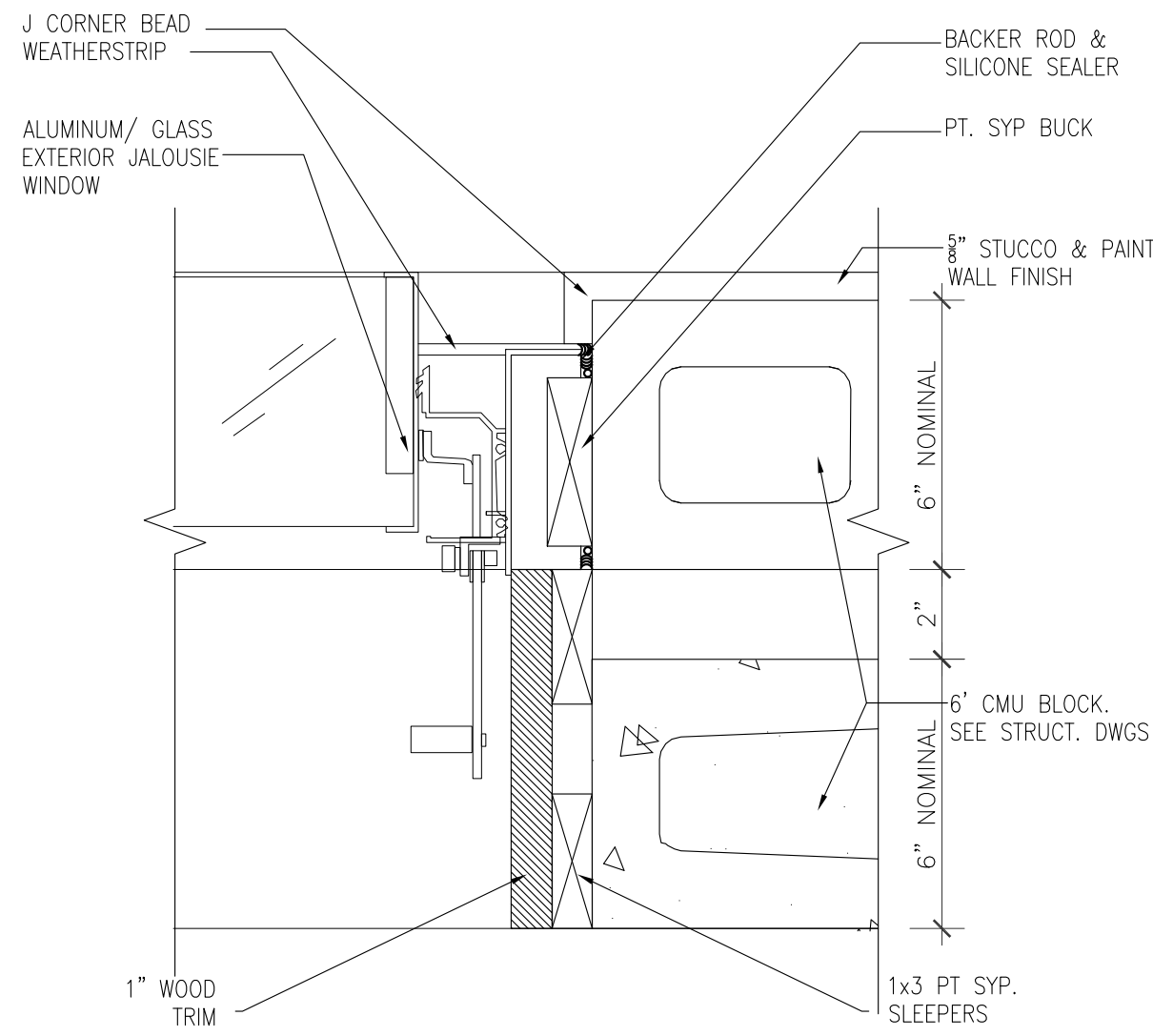
2 SECTION DETAIL-DOOR JAMB- CONC WALL  
SCALE: 3" = 1'-0"



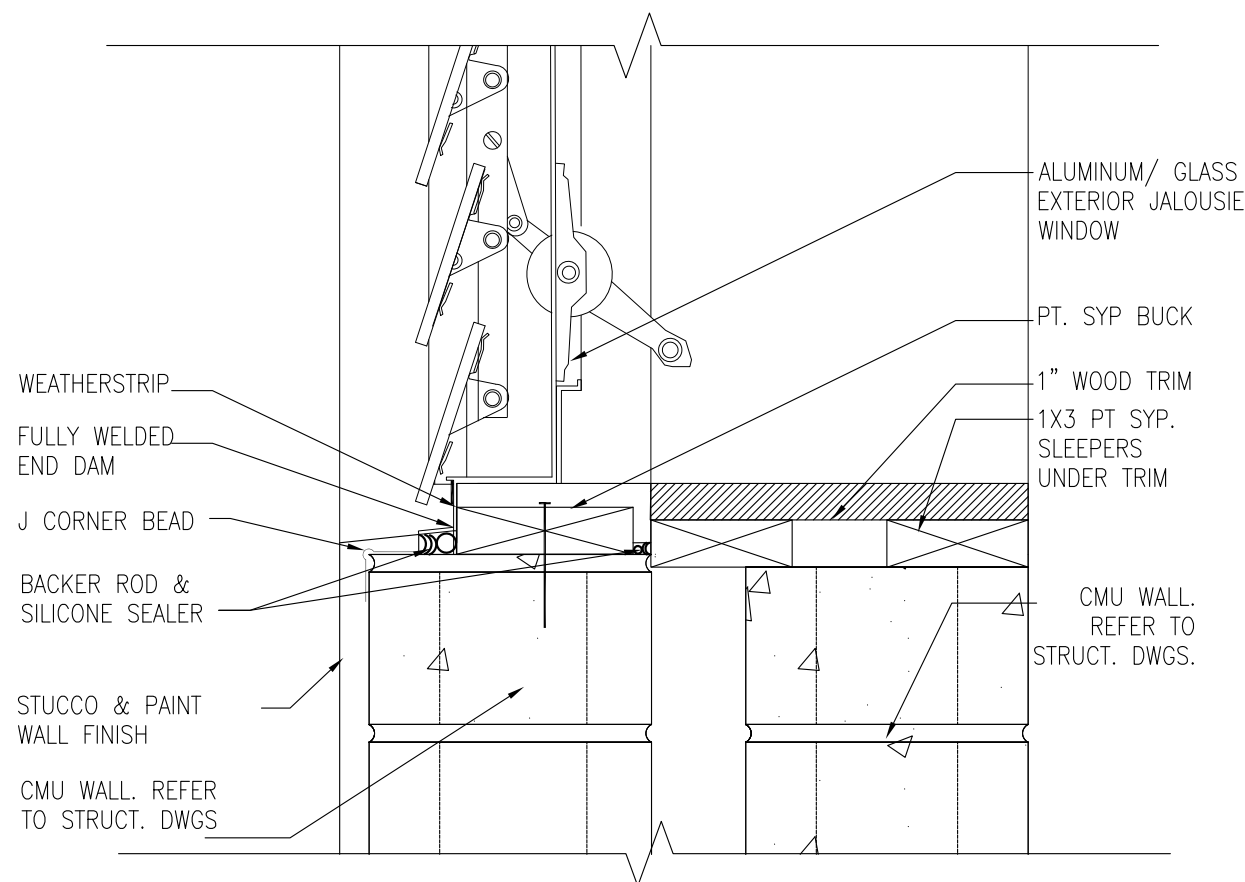
3 SECTION DETAIL-DOOR THRESHOLD -CONC. FLOOR  
SCALE: 3" = 1'-0"



4 SECTION DETAIL-WINDOW HEADER-CONC. WALL  
SCALE: 3" = 1'-0"



5 SECTION DETAIL-WINDOW JAMB-CONC. WALL  
SCALE: 3" = 1'-0"



6 SECTION DETAIL-WINDOW SILL CONC. WALL  
SCALE: 3" = 1'-0"

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OPM-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

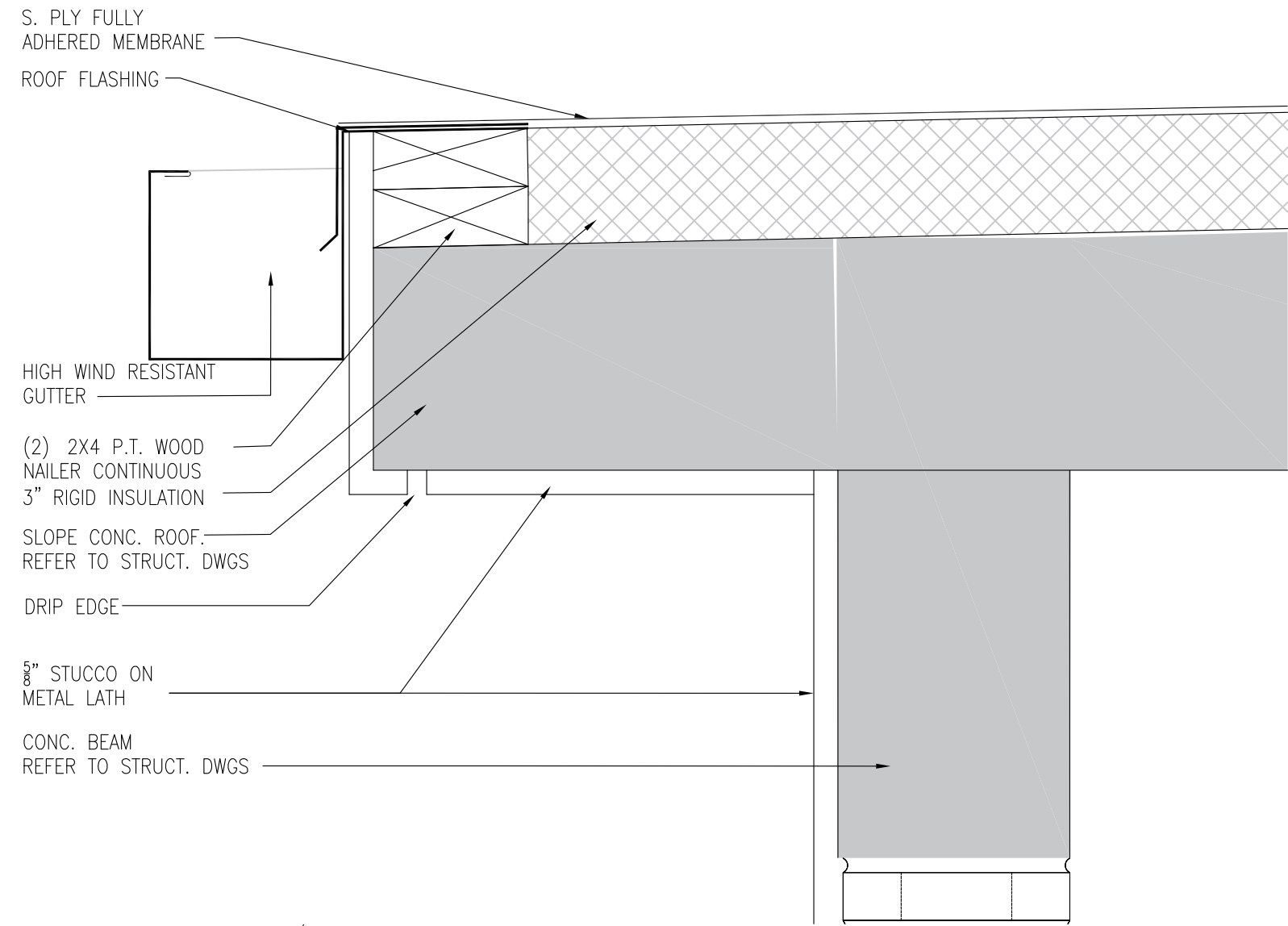
ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

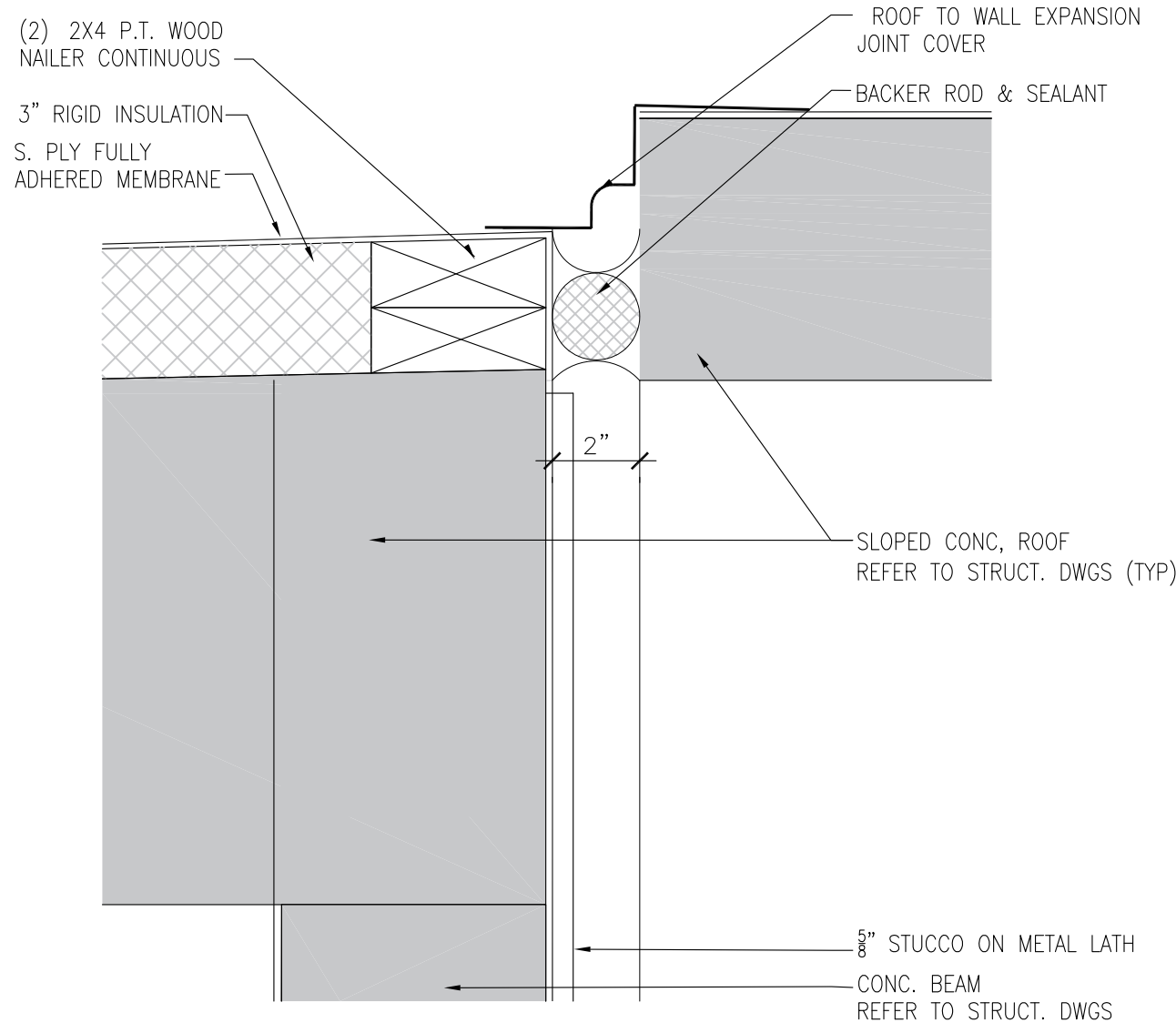
SHEET TITLE:  
**PROTOTYPE #1-DETAILS  
DOORS AND WINDOWS**

SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	<b>A-510</b>
QC Review:	
Phase:	





1 SECTION DETAIL-ROOF OVERHANG/ GUTTER  
SCALE: 3" = 1'-0"



2 SECTION DETAIL-MAIN HOUSE AND ENTRY WAY JOINT  
SCALE: 3" = 1'-0"

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OPM-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

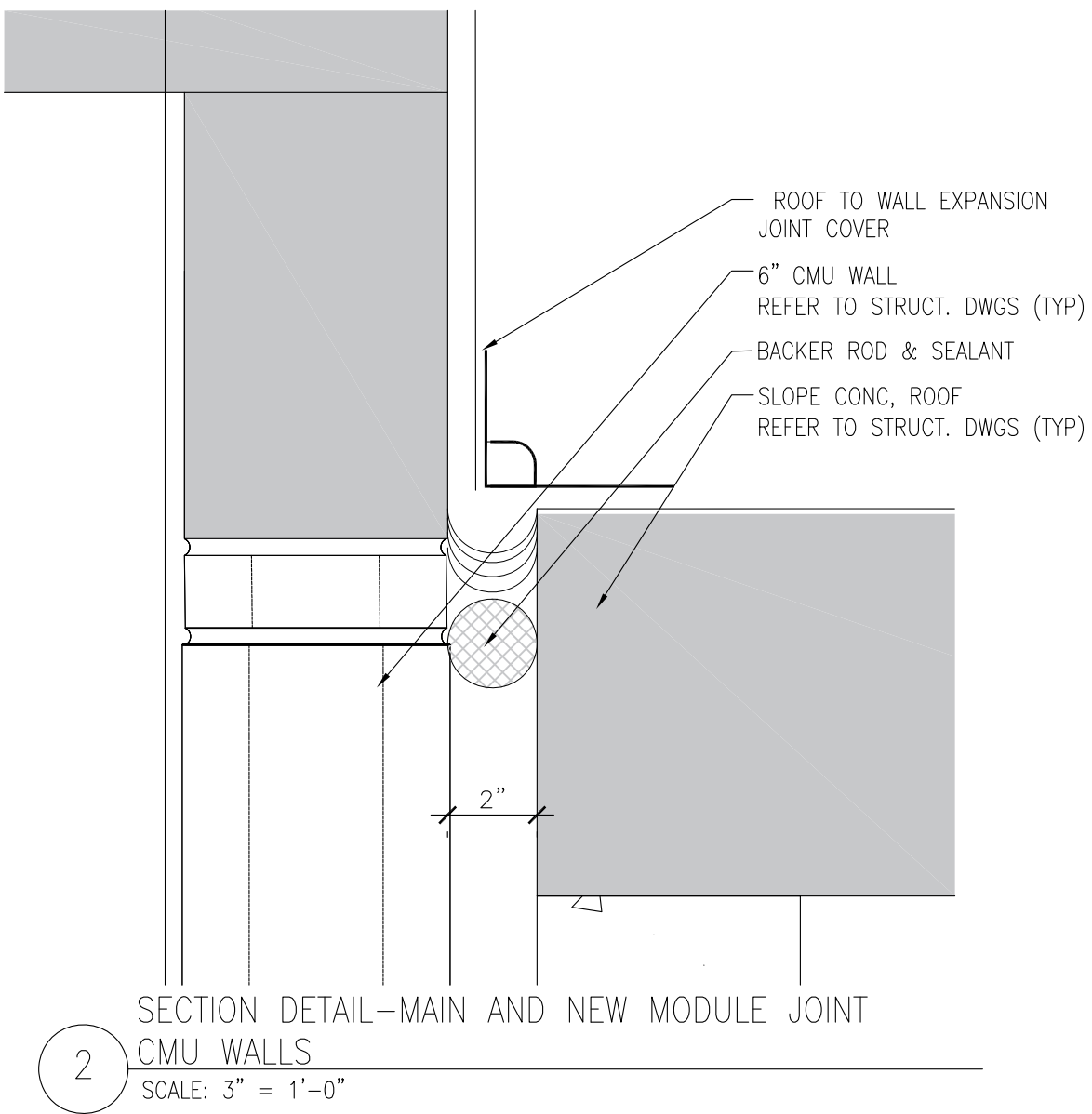
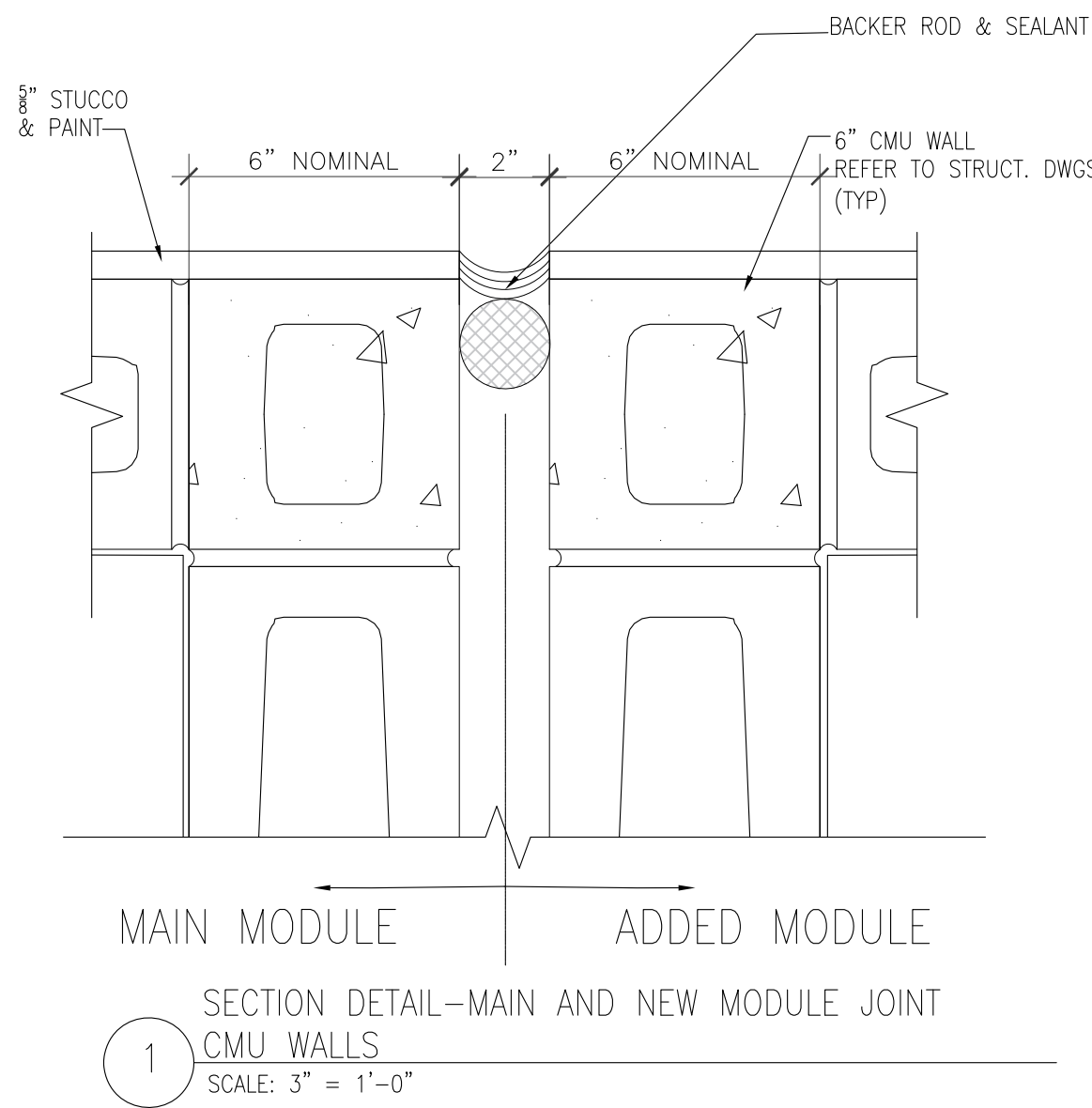
ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:  
**PROTOTYPE #1  
ROOFING DETAILS**

SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	<b>A-511</b>
QC Review:	
Phase:	





# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OPM-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

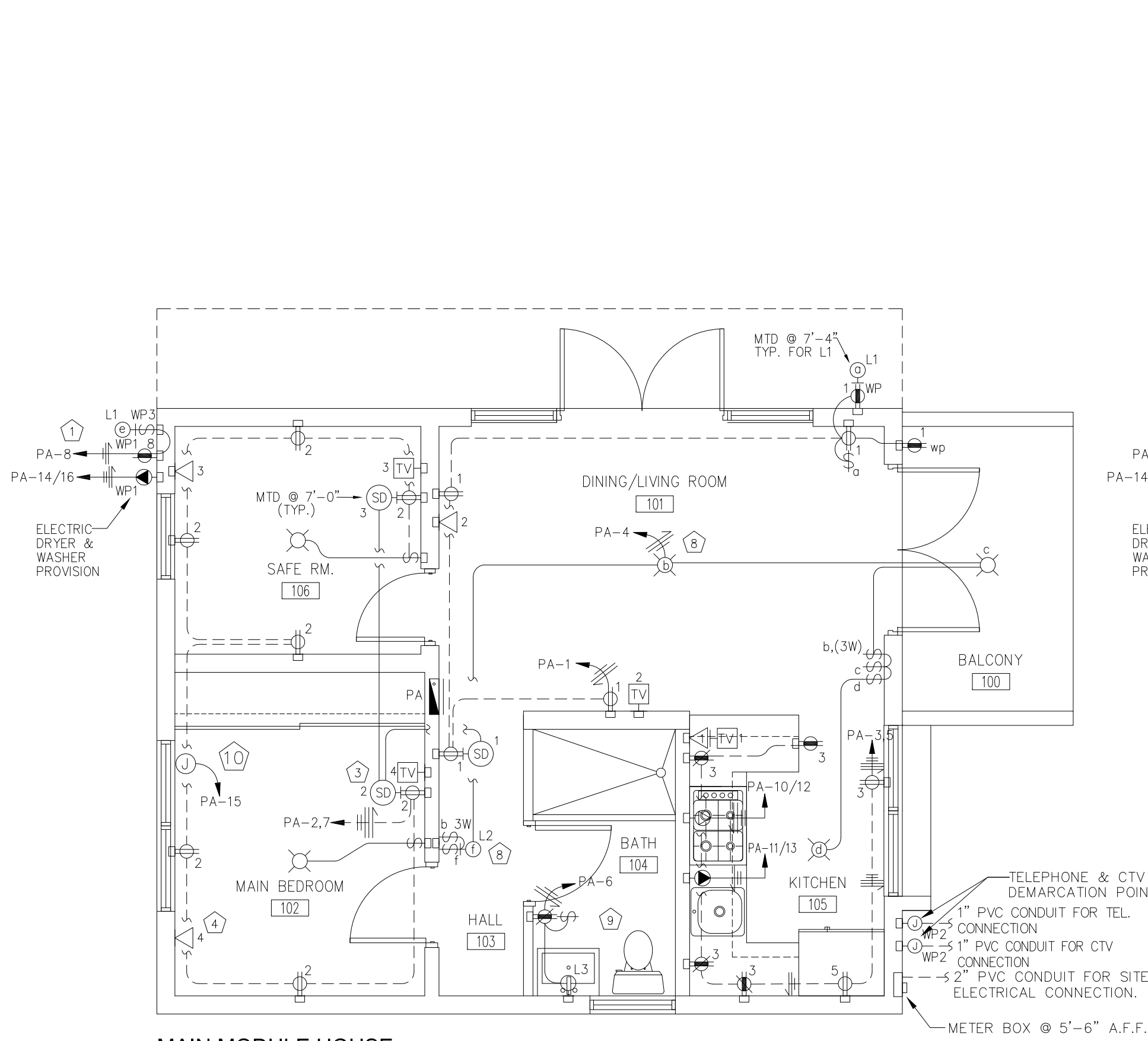
ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

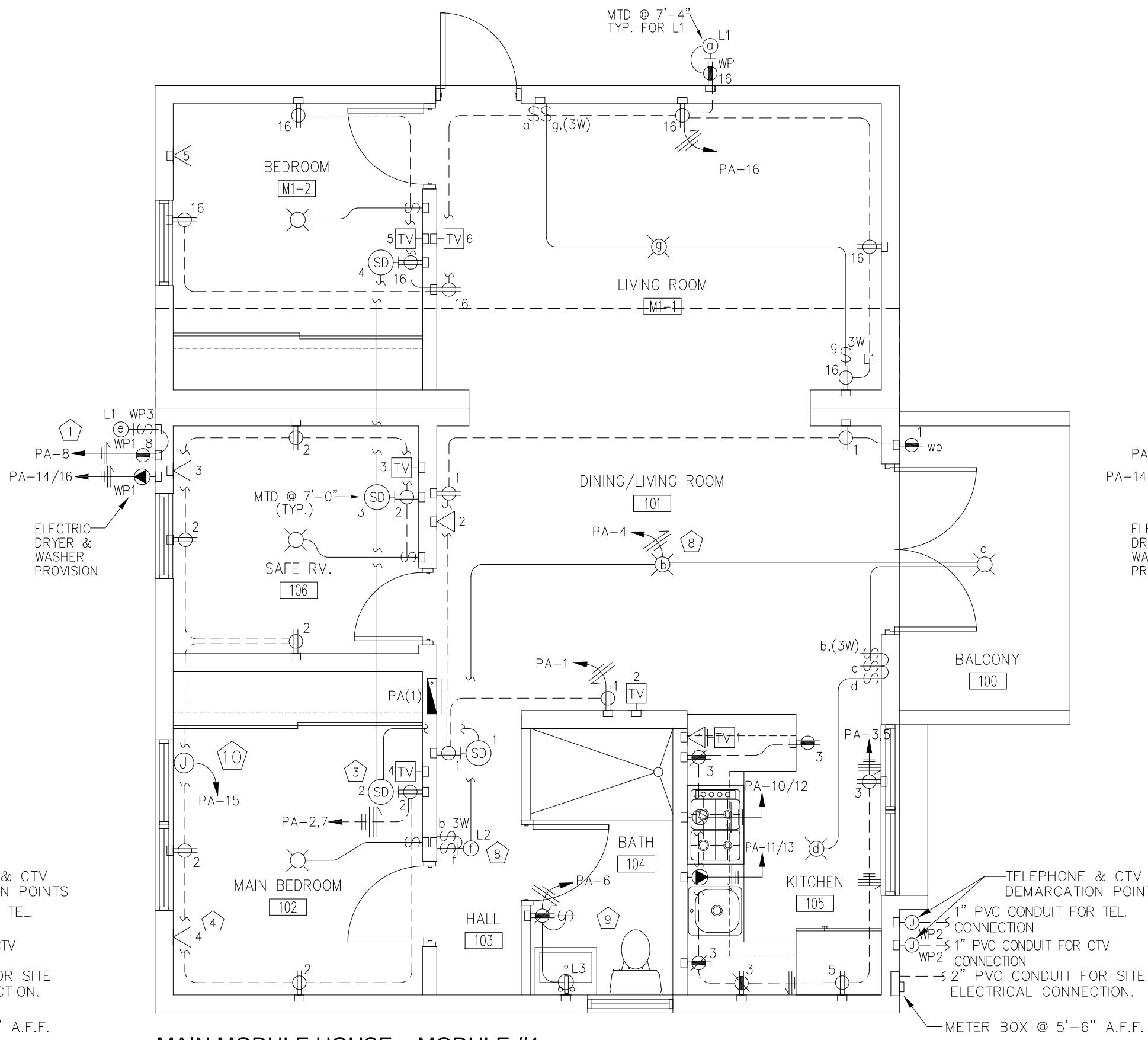
SHEET TITLE:  
**PROTOTYPE #1  
MODULES JOINT DETAILS**

SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/20
Drawn By:	Sheet Number:
Checked By:	<b>A-512</b>
QC Review:	
Phase:	

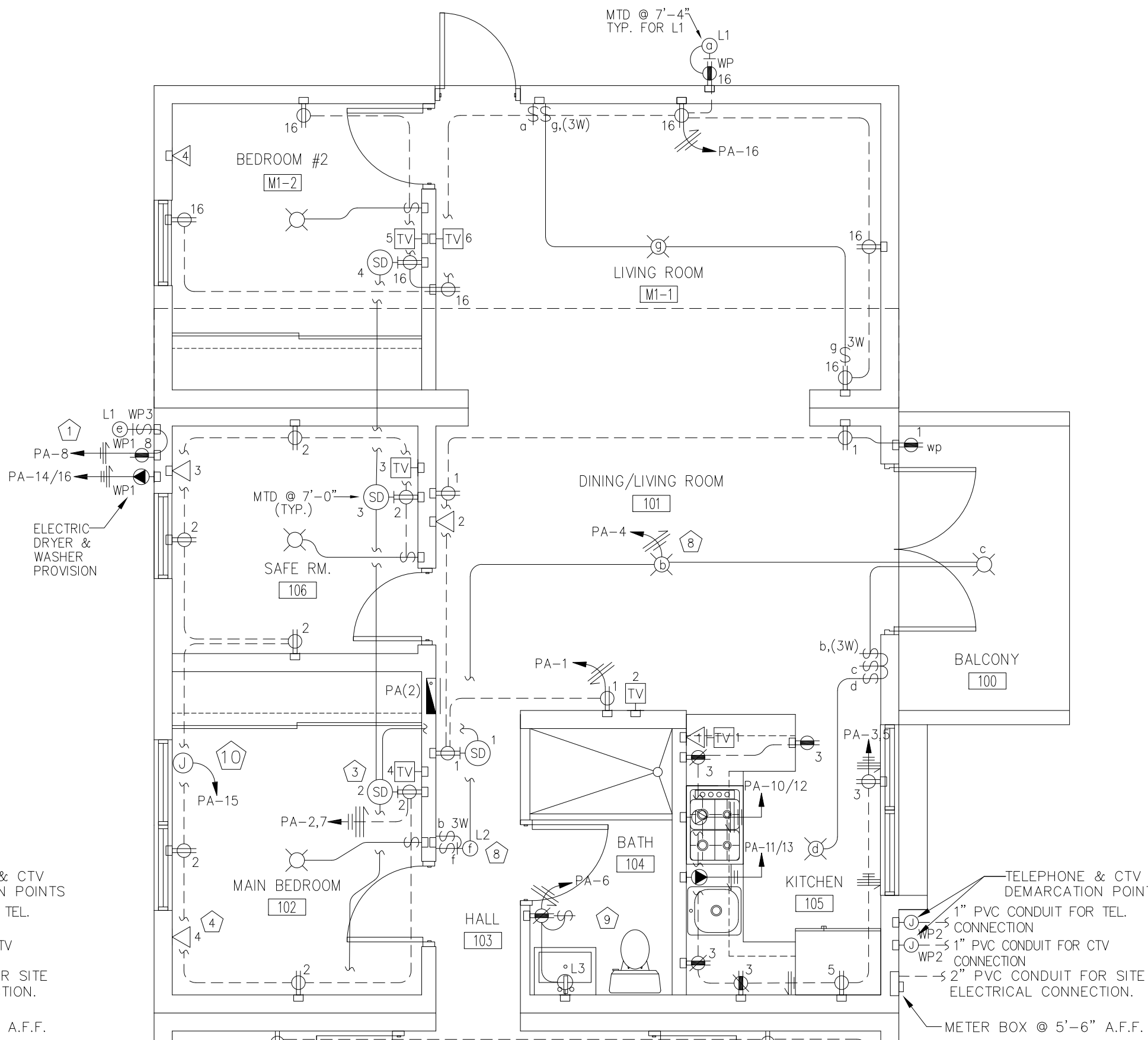




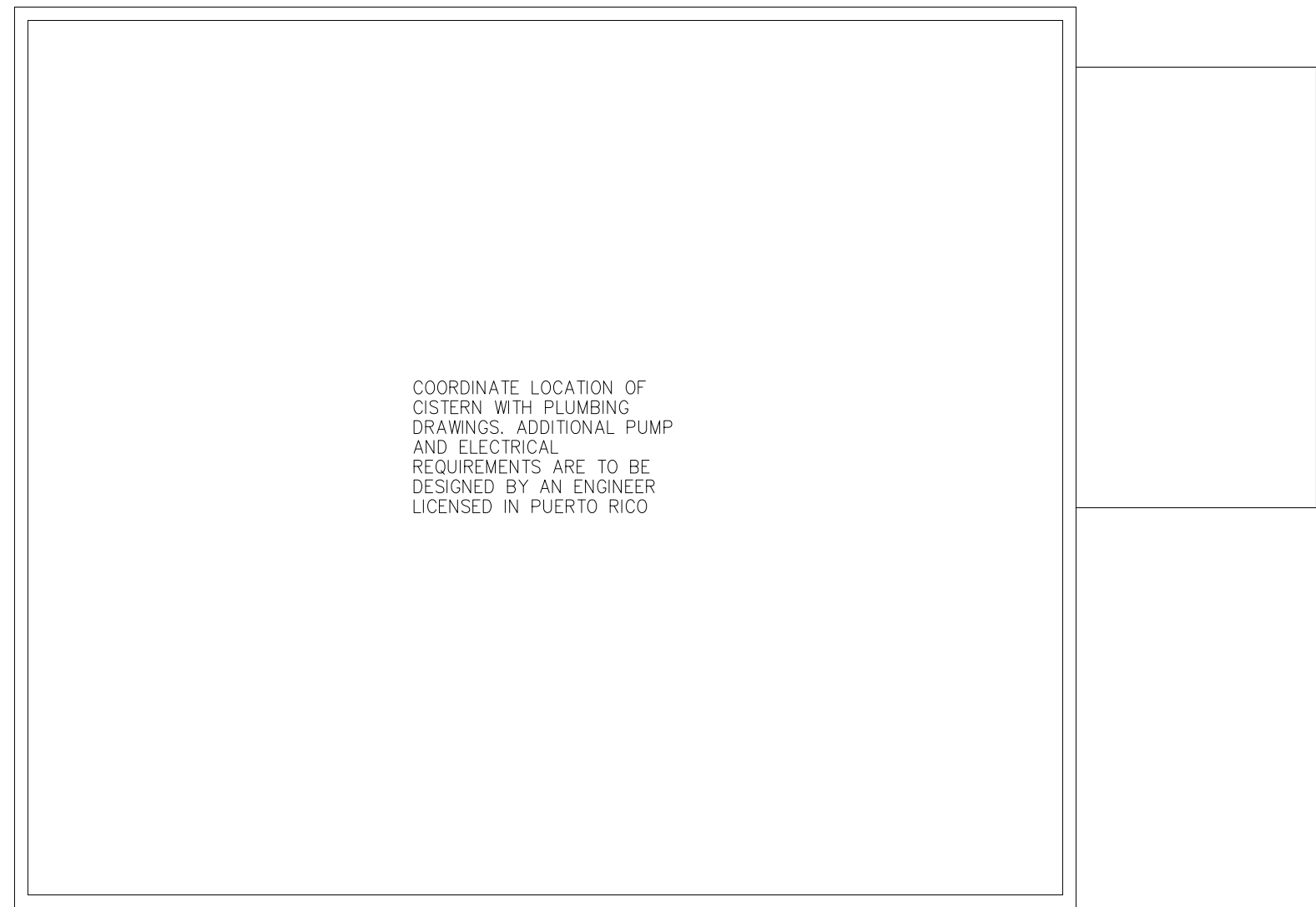
MAIN MODULE HOUSE  
SCALE: 1/4"=1'-0"



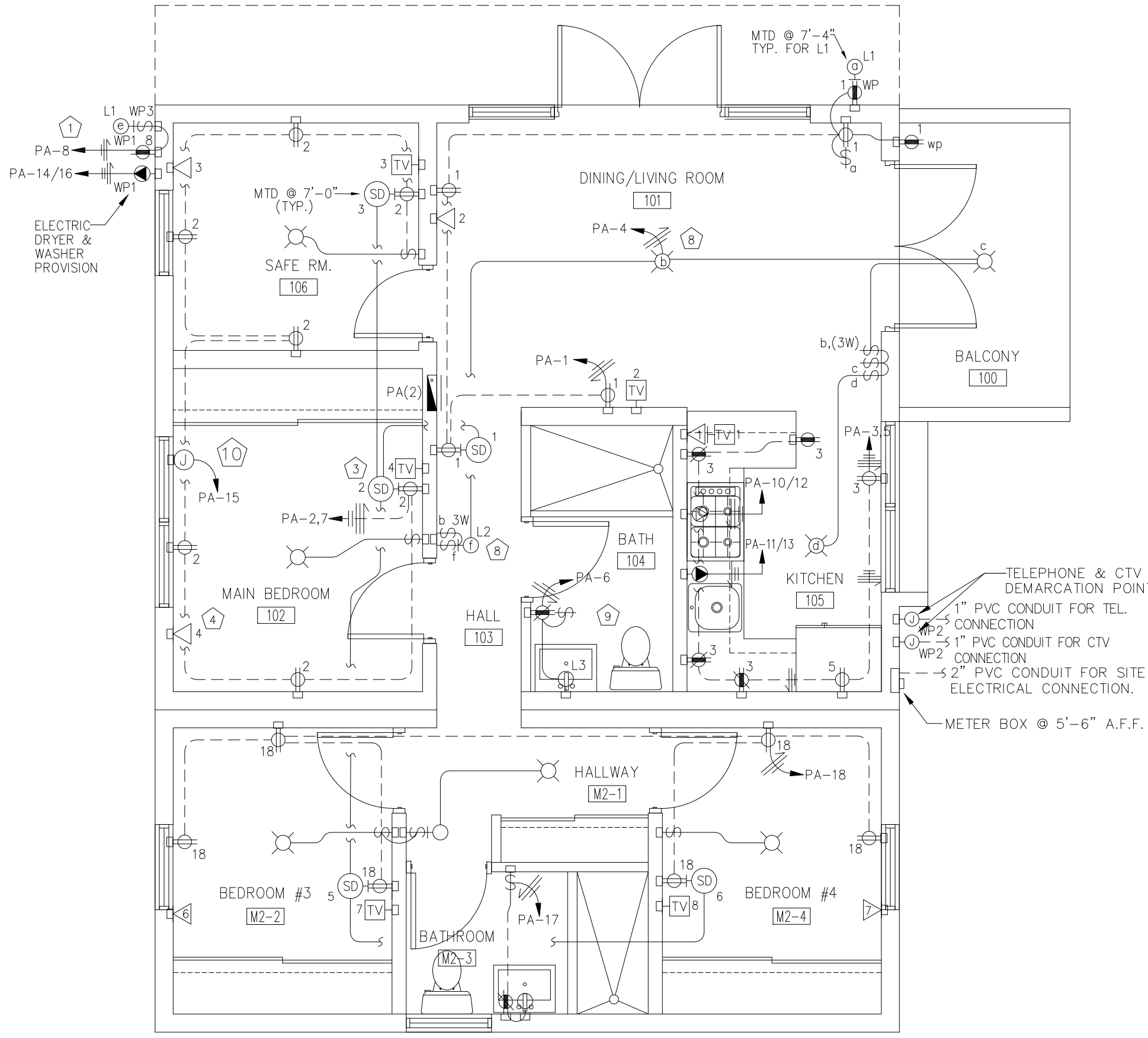
MAIN MODULE HOUSE + MODULE #1  
SCALE: 1/4"=1'-0"



MAIN MODULE HOUSE + MODULES #1 & #2  
SCALE: 1/4"=1'-0"



MAIN MODULE HOUSE ROOF PLAN  
SCALE: 1/4"=1'-0"



MAIN MODULE HOUSE + MODULE #2  
SCALE: 1/4"=1'-0"

- NOTES:
- 1 WASHER AND DRYER AREA RECEPTACLES LOCATED @ 48" A.F.F. (COORDINATE FINAL LOCATION WITH FIELD ENGINEER.)
  - 2 NOT USED
  - 3 ALL SMOKE DETECTORS MUST BE CONNECTED BETWEEN EACH OTHER FOR PARALLEL ACTIVATION.
  - 4 COORDINATE WITH ARCHITECT OR FIELD ENGINEER THE FINAL LOCATION FOR ALL TELEPHONE AND CTV OUTLETS (TYPICAL).
  - 5 VANITY LIGHTS OUTLETS. COORDINATE FINAL HEIGHT WITH ARCHITECT.
  - 6 COORDINATE WITH ARCHITECT OR FIELD ENGINEER THE FINAL HEIGHT FOR LIGHTING FIXTURE.
  - 7 NOT USED
  - 8 ALL INDOOR & OUTDOOR LIGHTING FIXTURES ARE TO BE PORCELAIN LAMP HOLDERS WITH 26 WATTS FLUORESCENT BULBS OR LED EQUIVALENTS.
  - 9 INTERLOCK FAN WITH BATHROOM LIGHTING SWITCH. COORDINATED WITH MECHANICAL DWGS. WHEN APPLICABLE.
  - 10 4"x4" JUNCTION BOX FOR A/C UNIT DEDICATED RECEPTACLE. INSTALL EMPTY CONDUIT UP TO PANEL BOARD PA. RECEPTACLE, WIRING AND BREAKER (N.I.C.).

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (DOP-PDDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

No.	Date	Description

ISSUE LOG  
PROFESSIONAL SEALS:

SHEET TITLE:  
**PROTOTYPE #1 SCHEMATIC -  
ONE STORY, CONCRETE &  
FLAT CONCRETE ROOF**

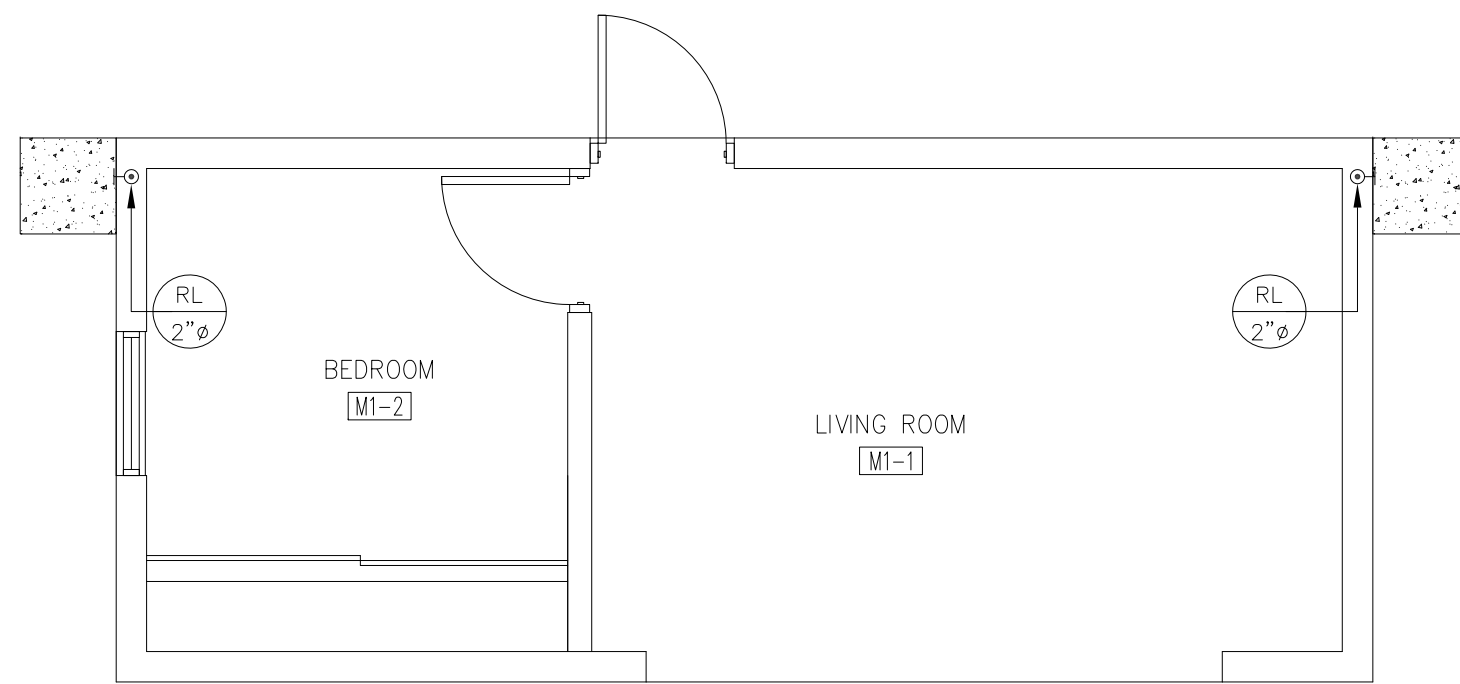
SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/2020
Drawn By:	Sheet Number:
Checked By:	<b>E-100</b>
QC Review:	
Phase:	

NOT FOR CONSTRUCTION





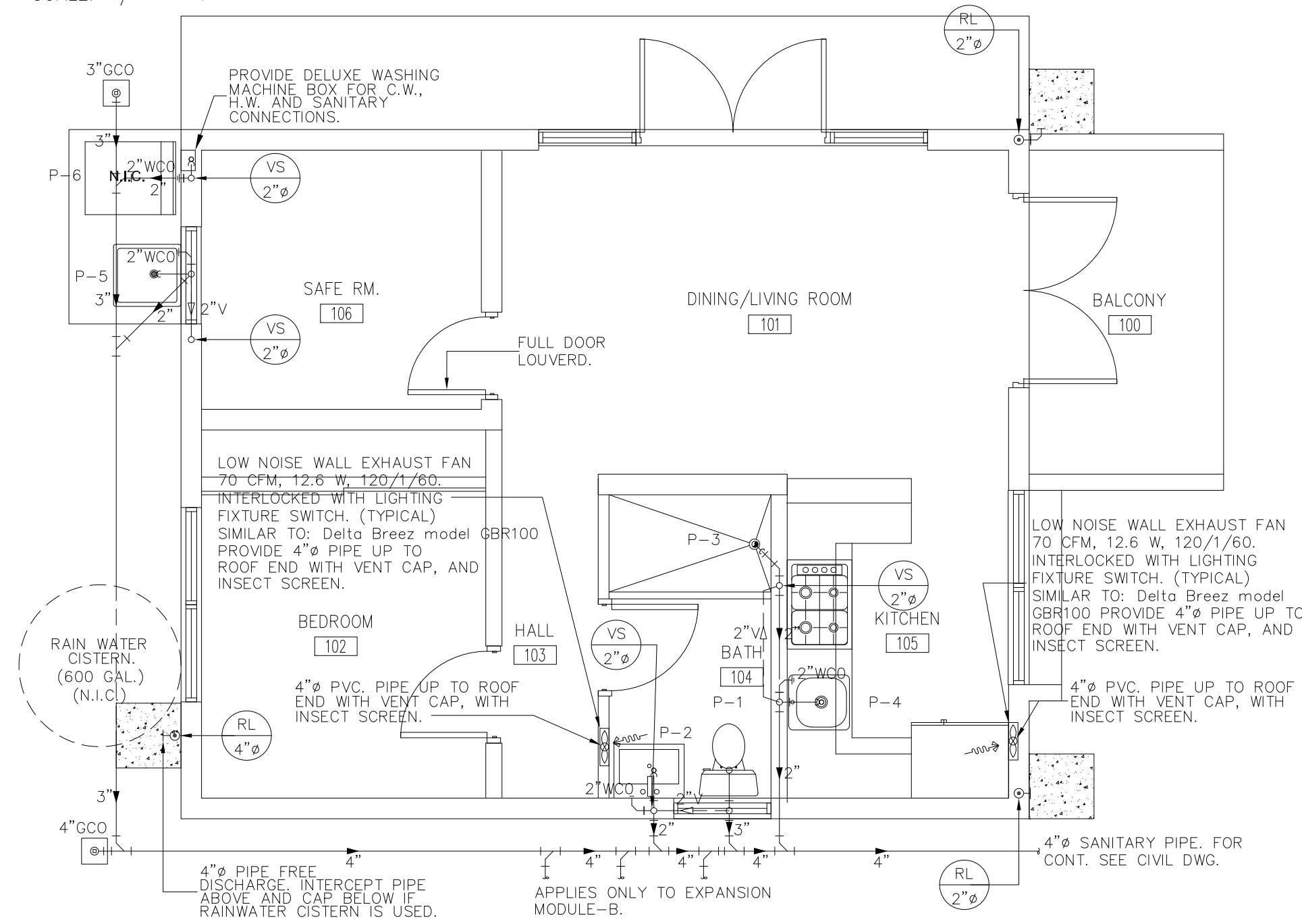




## EXPANSION MODULE - A

### FLOOR PLAN- SANITARY LAYOUT

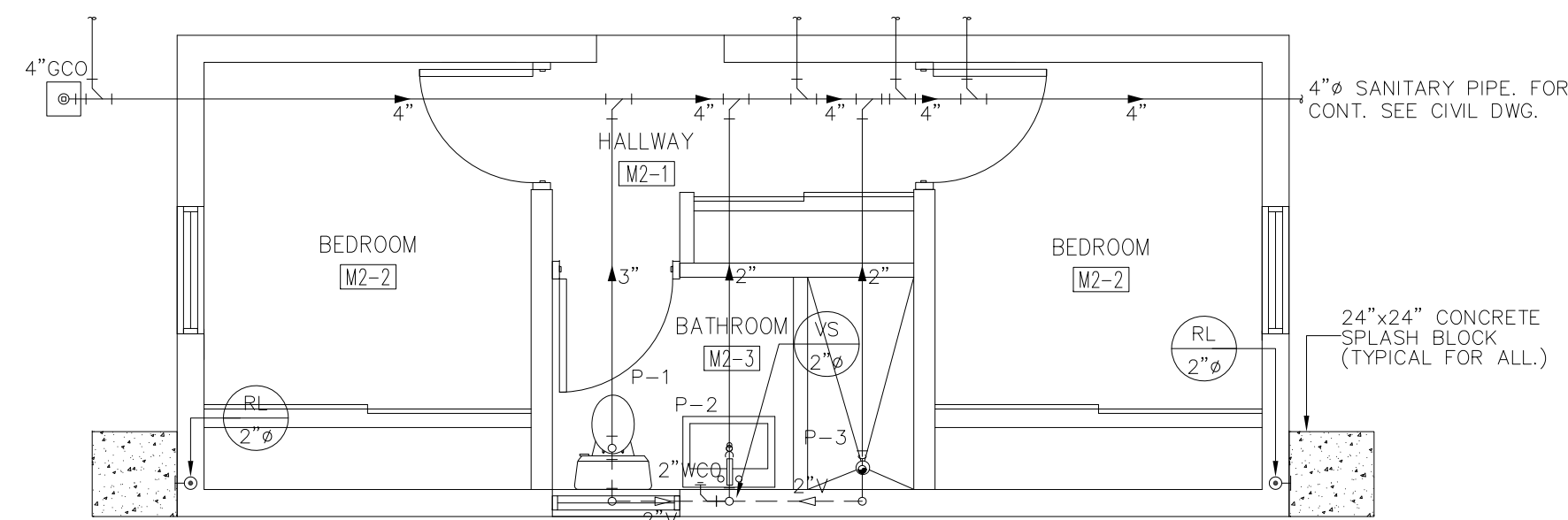
SCALE: 1/4"=1'-0"



## MAIN MODULE HOUSE #1

### FLOOR PLAN- SANITARY LAYOUT

SCALE: 1/4"=1'-0"












## EXPANSION MODULE - B

### FLOOR PLAN- SANITARY LAYOUT

SCALE: 1/4"=1'-0"

PLUMBING LEGEND:

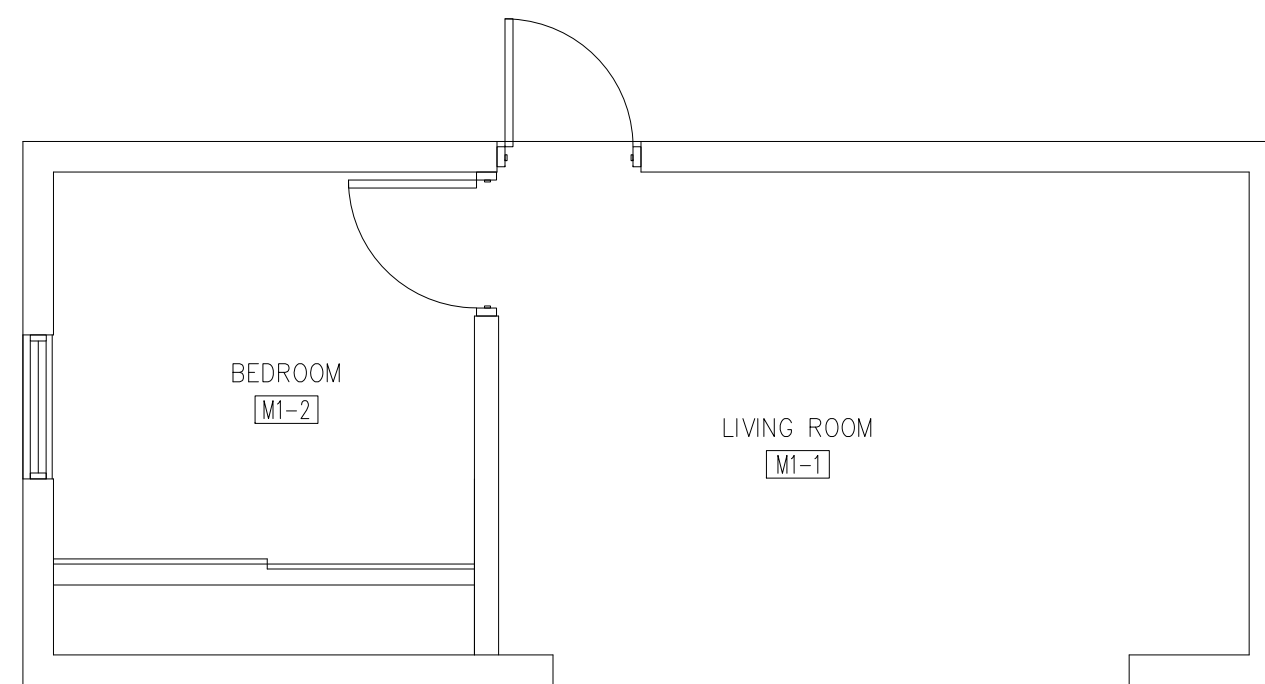
----	COLD POTABLE WATER LINE
----	HOT POTABLE WATER LINE
----	SANITARY SEWER LINE
-----	SANITARY VENTILATION LINE
	INDICATES COLD WATER RISER DESIGNATION AND SIZE
	INDICATES HOT WATER SUPPLY RISER DESIGNATION AND SIZE
	INDICATES HOT WATER RETURN RISER DESIGNATION AND SIZE
	INDICATES SANITARY STACK DESIGNATION AND SIZE
	INDICATES WASTE STACK DESIGNATION AND SIZE
	INDICATES RAIN LEADER STACK DESIGNATION AND SIZE
	INDICATES SANITARY VENTILATION STACK DESIGNATION AND SIZE
	INDICATES PLUMBING FIXTURE DESIGNATION SEE SCHEDULE
	POINT OF CONNECTION

## PLUMBING ABBREVIATIONS:

C.W.	COLD WATER
HWS	HOT WATER SUPPLY
HWR	HOT WATER RETURN
(TYP.)	TYPICAL
VS	VENT STACK
WCO	WALL CLEAN OUT
FCO	FLOOR CLEAN OUT
GCO	GROUND CLEAN OUT
W.H.	WATER HEATER
FD	FLOOR DRAIN
V	VENTILATION
H.B.	HOSE BIBB
(E)	EXISTING
CC	CEILING CASSETTE
FCU	FAN COIL UNIT

NOTE:

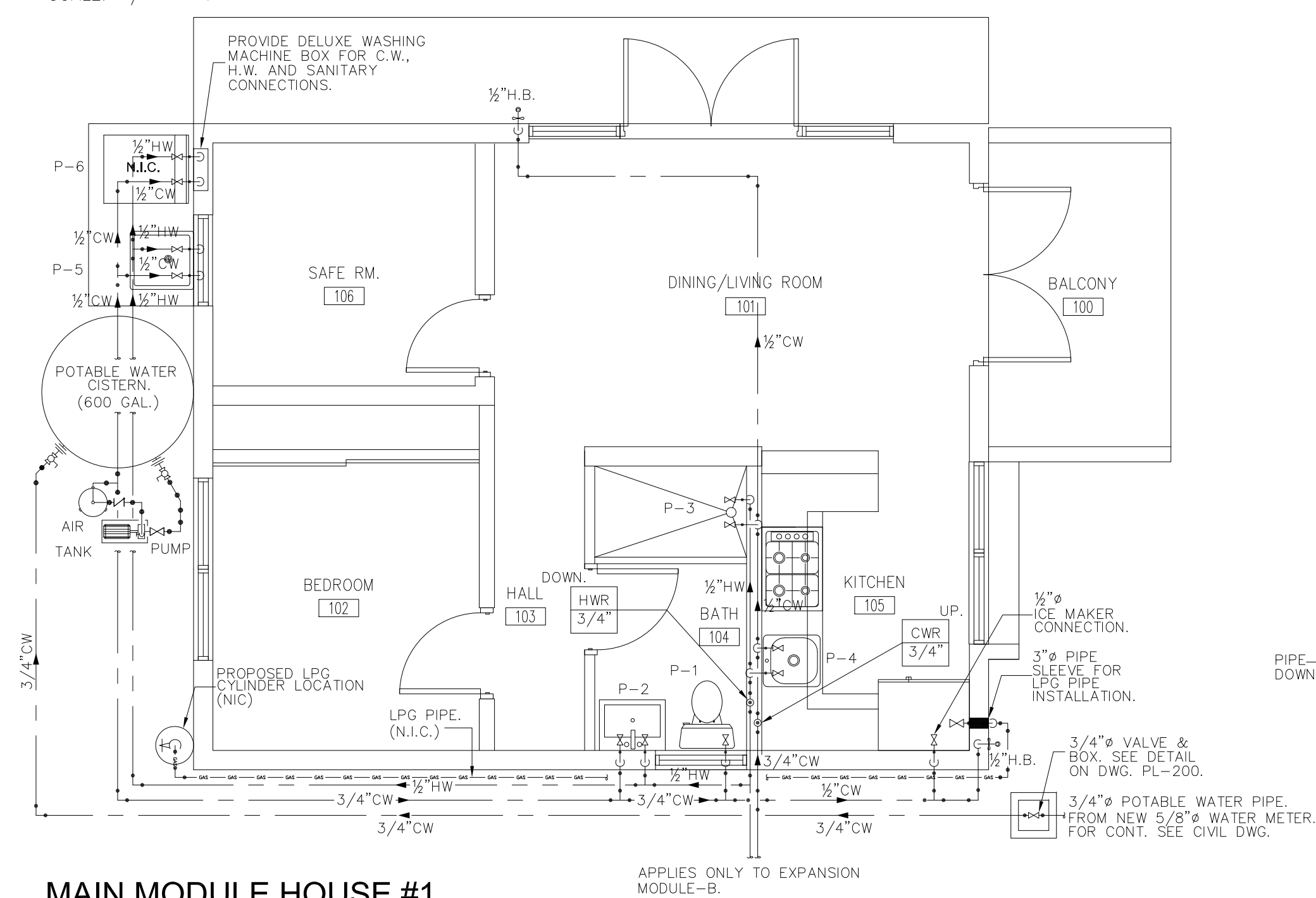
- 1) NON-POTABLE WATER SYSTEM IS NOT IN CONTRACT. CISTERN LOCATION DEPICTED ON DRAWINGS SHOULD BE EVALUATED AND MODIFIED ACCORDING TO ACTUAL SITE CONDITIONS.
- 2) LPG SYSTEM IS NOT IN CONTRACT. INSTALLATION SHALL COMPLY WITH APPLICABLE CODES, REGULATIONS, STANDARDS AND "COMISION DE SERVICIO PUBLICO"
- 3) SOLAR WATER HEATING SYSTEM IS NOT IN CONTRACT. COLLECTORS SHOULD BE INSTALLED WITH THE APPROPRIATE ANGLE AND FACING SOUTH.



## EXPANSION MODULE - A

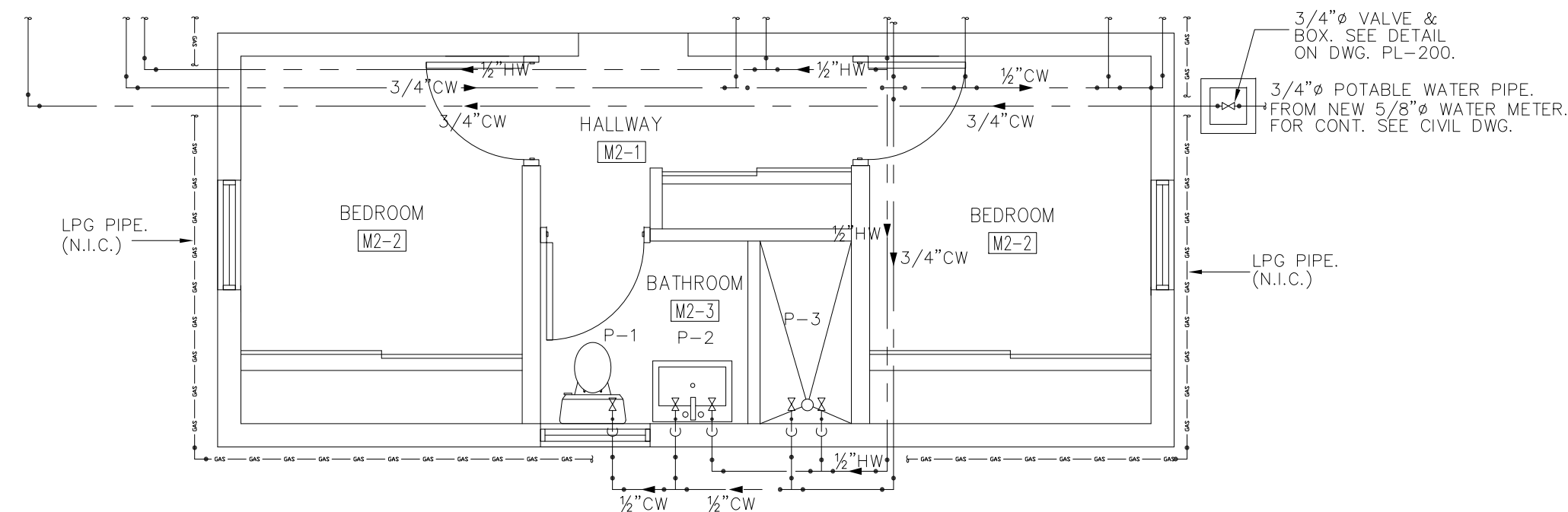
### FLOOR PLAN- POTABLE WATER LAYOUT

SCALE: 1/4"=1'-0'



## MAIN MODULE HOUSE #1 FLOOR PLAN- POTABLE WATER LAYOUT

SCALE:  $1/4"=1'-0"$



EXPANSION MODULE - B  
FLOOR PLAN- POTABLE WATER LAYOUT

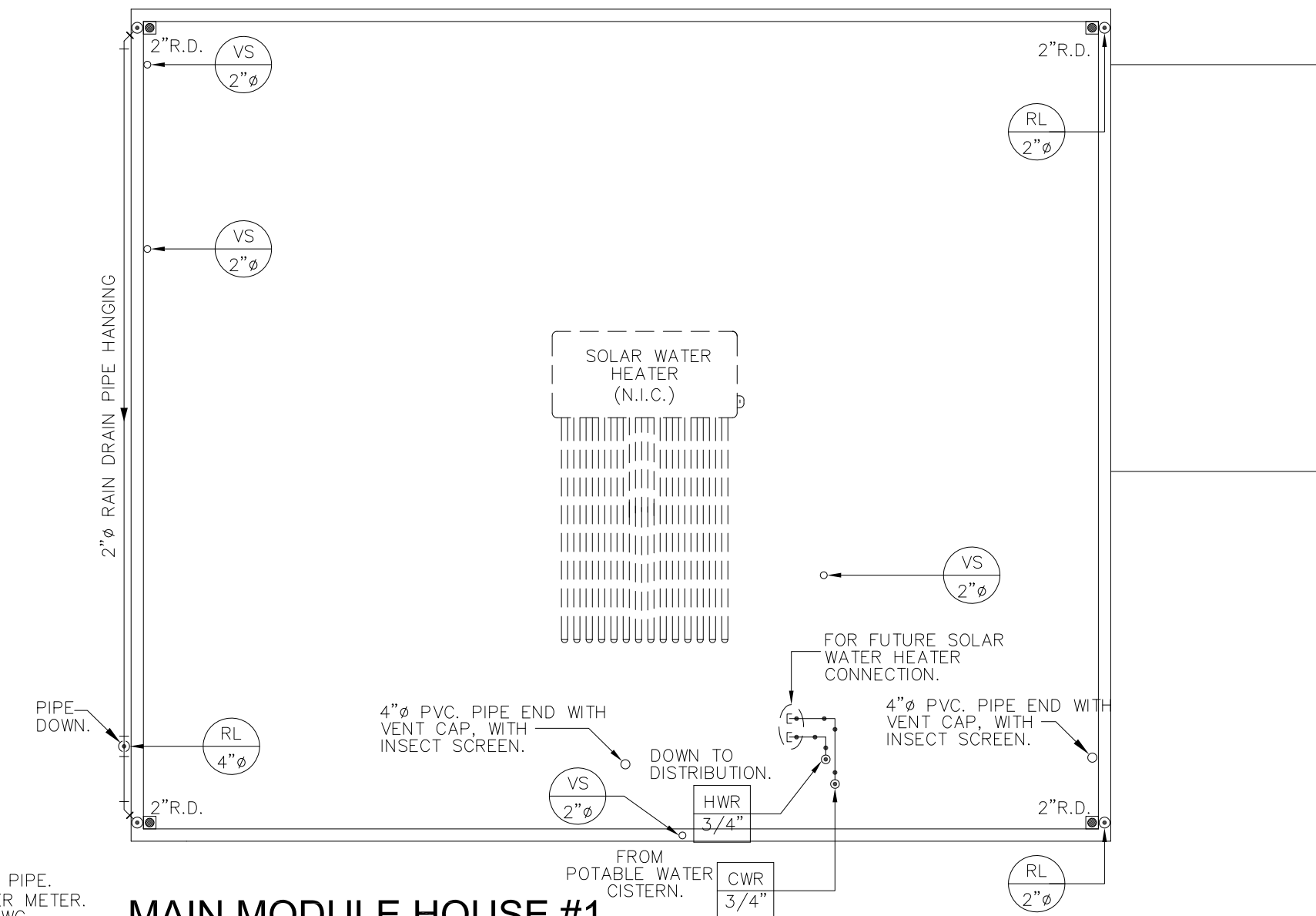
SCALE: 1/4"=1'-0"



## EXPANSION MODULE - A

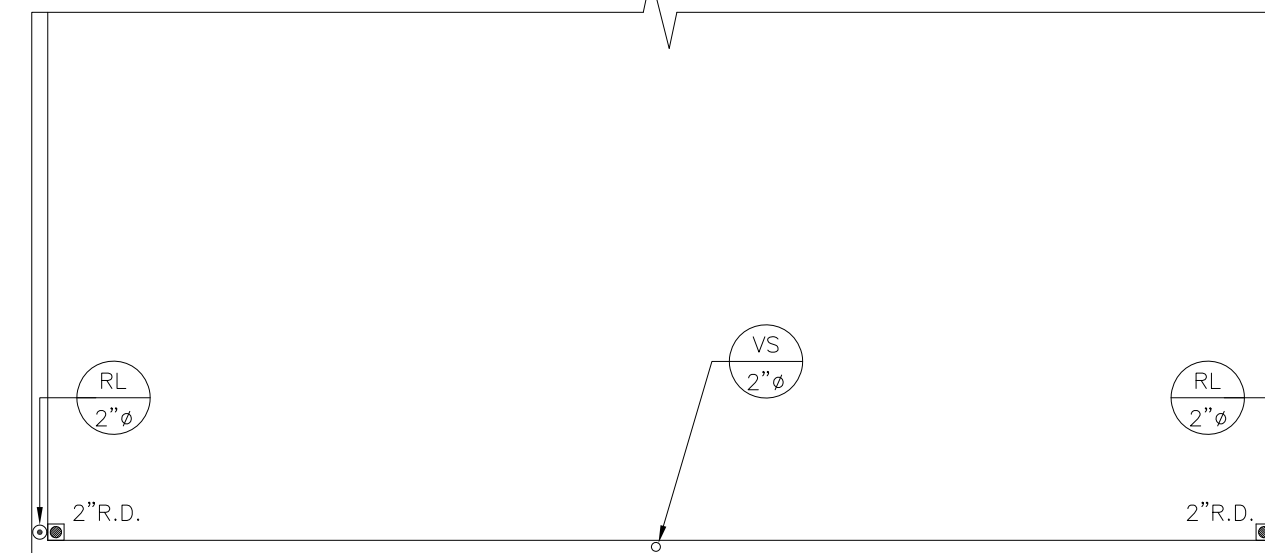
### ROOF PLAN- PLUMBING LAYOUT

SCALE:  $1/4"=1'-0"$



MAIN MODULE HOUSE #1  
ROOF PLAN- PLUMBING LAYOUT

SCALE:  $1/4"=1'-0"$



## EXPANSION MODULE - B

### ROOF PLAN- PLUMBING LAYOUT

SCALE:  $1/4"=1'-0"$

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OPG-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPERATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

[illegible]

## ISSUE LOG

---

PROFESSIONAL SEALS:

SHEET TITLE:

## PROTOTYPE #1 FLOOR PLAN- PLUMBING LAYOUT

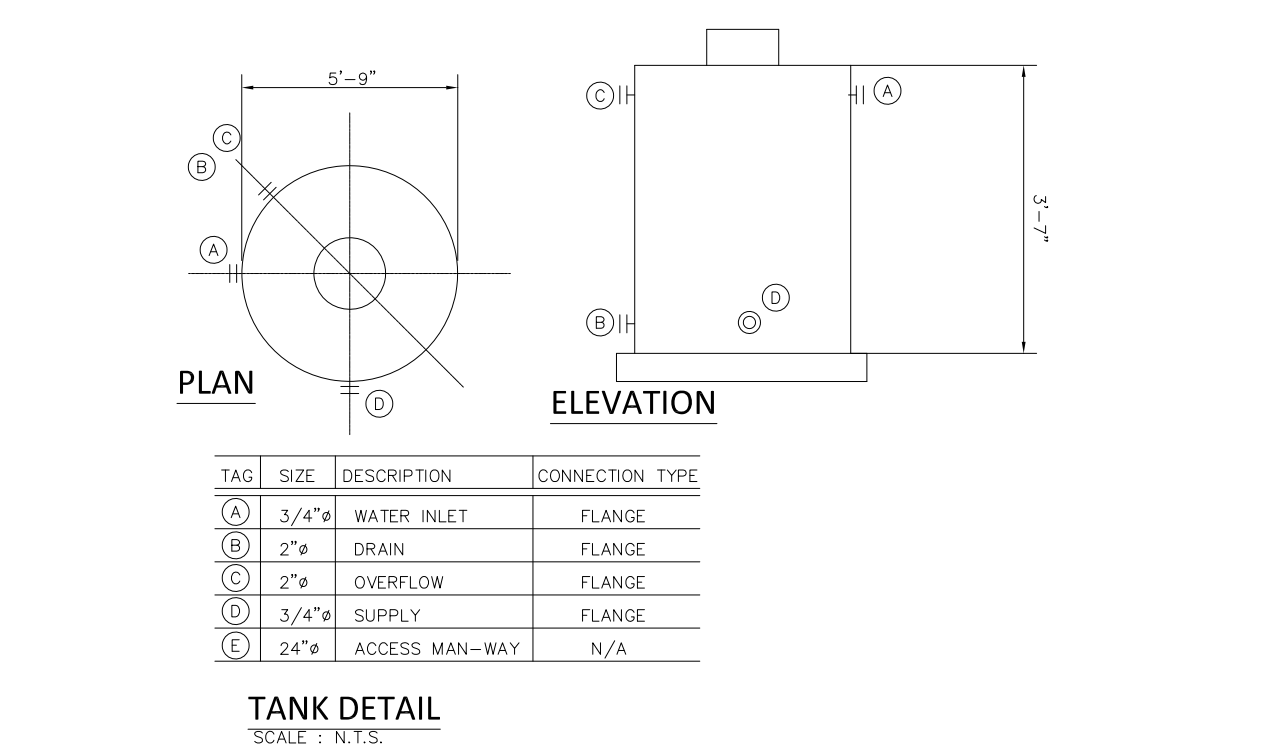
**SHEET INFORMATION:**

JOB No.	Date Issued: 05/08/2020
Drawn By:	Sheet Number:  <div style="font-size: 2em; font-weight: bold; text-align: center;">PL-100</div>
Checked By:	
QC Review:	
Phase:	

NOT FOR CONSTRUCTION



DESIGNATION	DESCRIPTIONS	LOCATIONS	UNIT WASTE OR SOL.	VENT SIZE	WATER SUPPLY		FIXTURES		REMARKS
					COLD	HOT	COLD	HOT	
P-1	WATER CLOSET (TANK)	TOILETS	3"	2"	½"	–	½"	–	SEE ARCHITECTURAL DWG'S.
P-2	LAVATORY	TOILETS	1½"	1½"	½"	–	½"	–	SEE ARCHITECTURAL DWG'S.
P-3	SHOWER	TOILETS	2"	1½"	3/4"	–	3/4"	–	SEE ARCHITECTURAL DWG'S.
P-4	KITCHEN SINK	KITCHEN	1½"	1½"	½"	–	½"	–	SEE ARCHITECTURAL DWG'S.
F.C.O.	FLOOR CLEANOUT	AS SHOWN ON DWGS.	–	–	–	–	–	–	RECESSED HEAD BRONZE CLEANOUT PLUG
W.C.O.	WALL CLEANOUT	AS SHOWN ON DWGS.	–	–	–	–	–	–	RECESSED HEAD BRONZE CLEANOUT PLUG



- NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEC), PERMITS MANAGEMENT OFFICE (OGp-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPERATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.**

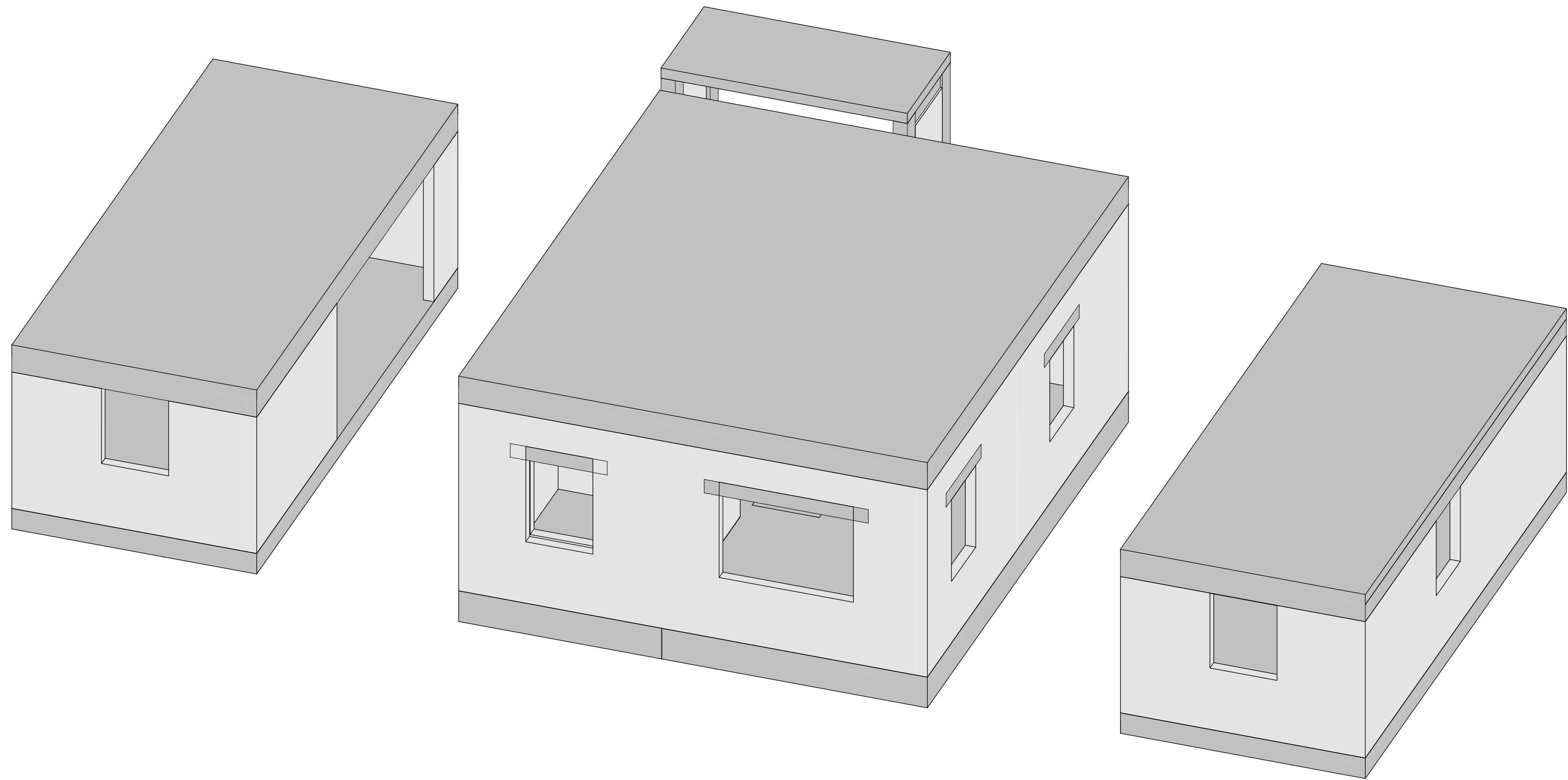
SHEET TITLE:

**PLUMBING DETAILS,  
SCHEDULES & NOTES**

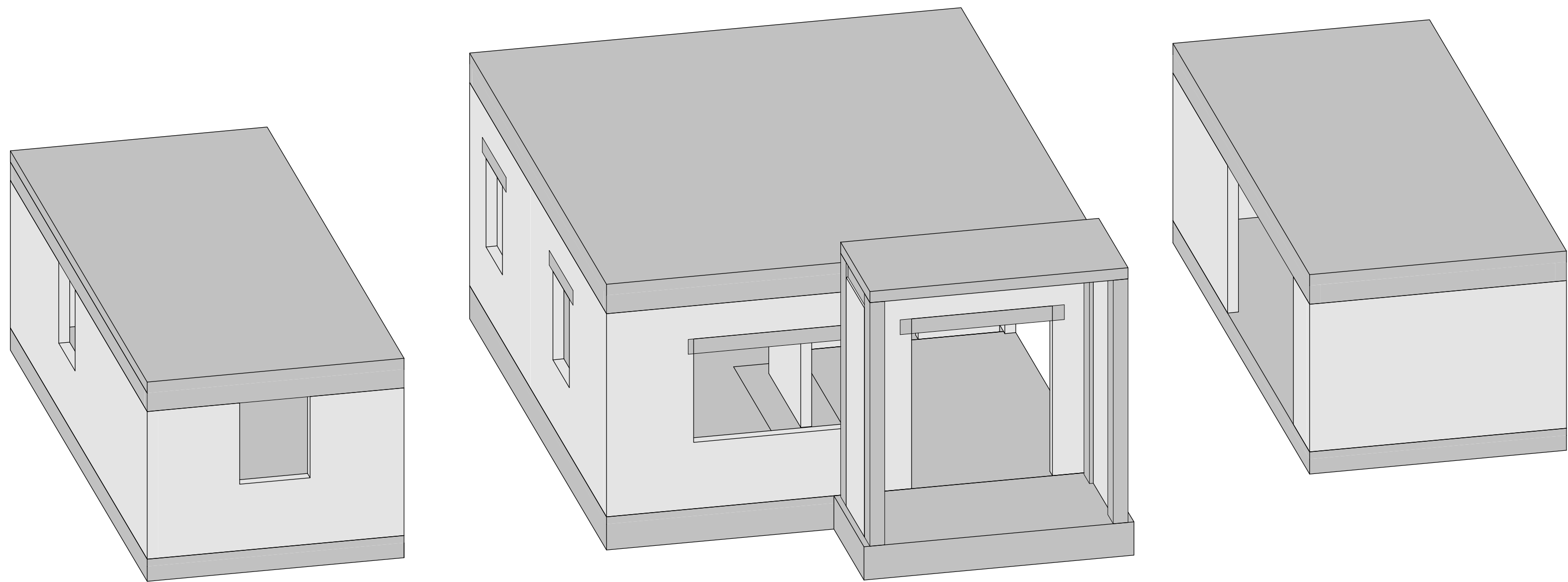
JOB No.	Date Issued: 05/08/2020
Drawn By:	Sheet Number:
Checked By:	<b>PL-200</b>
QC Review:	
Phase:	

NOT FOR CONSTRUCTION





1 PRIMARY STRUCTURE WITH MODULE EXPANSIONS



2 PRIMARY STRUCTURE WITH MODULE EXPANSIONS OPPOSITE VIEW

DRAWING INDEX	
SHEET NUMBER	SHEET NAME
S-001	TITLE SHEET
S-002A	GENERAL NOTES
S-002B	GENERAL NOTES
S-003	WIND DIAGRAMS FLAT ROOF
S-004	SAFE ROOM WIND DIAGRAMS
S-005	FOUNDATION PLAN
S-006	WALL FRAMING PLAN
S-007	FLAT ROOF FRAMING PLAN
S-008	ELEVATIONS
S-009	SECTIONS
S-010	TYPICAL DETAILS
S-011	TYPICAL DETAILS
S-012	SLAB TYP. DETAILS

PREFACE:

THIS PRESCRIPTIVE HOME DRAWING SET PRESENTS RECOMMENDATIONS FOR THE CONSTRUCTION OF A ONE STORY HOME. THIS GUIDANCE DISPLAYS INFORMATION FOR A PARTICULAR SIZED HOME. THE DESIGN INFORMATION PROVIDED HEREIN INCORPORATES SEISMIC AND WIND CRITERIA BASED UPON THE LATEST PUERTO RICO BUILDING CODE WHICH REFERENCES THE 2018 INTERNATIONAL RESIDENTIAL CODE (2018 IRC), 2018 INTERNATIONAL BUILDING CODE (2018 IBC), AND THE AMERICAN SOCIETY OF CIVIL ENGINEERS ASCE/SEI 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES.

ALL RECOMMENDED DESIGN WORK, INCLUDING THOSE PARTS COVERED BY THIS DOCUMENT, SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL SUCH AS A REGISTERED PROFESSIONAL ENGINEER OR A LICENSED ARCHITECT IN PUERTO RICO. WHEN THESE GUIDANCE DRAWINGS ARE USED FOR A PROJECT, THEY SHOULD BE MODIFIED AS NEEDED IN ORDER TO COMPLY WITH ALL OF THE APPLICABLE CODE REQUIREMENTS FOR A GIVEN PROJECT SITE, THEN SIGNED AND SEALED IN ACCORDANCE WITH PUERTO RICO LAWS, BUILDING CODE, AND DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC).

THE FOLLOWING BOUNDARY CONDITIONS SHALL BE MET IN ORDER TO USE THIS DRAWING SET. THIS DRAWING SET IS NOT VALID IF THE PROJECT PARAMETERS ARE OUTSIDE OF THESE BOUNDARY CONDITIONS.

- SINGLE STORY BUILDINGS WITH THE MAXIMUM MEAN ROOF HEIGHT AS SHOWN IN THE DRAWING SET.
- GABLE ROOF AS SHOWN IN THE DRAWING SET
- BUILDING WIDTH AND LENGTH AS SHOWN IN THE DRAWING SET.
- DETERMINE SITE SPECIFIC EXPOSURE CATEGORY FIRST AND THEN DETERMINE THE SITE SPECIFIC WIND SPEED AS SHOWN IN THE ATC ONLINE HAZARDS TOOL FOR THE PUERTO RICO BUILDING CODE 2018. CONFIRM THAT THE EXPOSURE AND DESIGN WIND SPEED DO NOT EXCEED THAT SHOWN IN THE DESIGN DATA WITHIN THE DRAWING SET.

ALL CONSTRUCTION MUST COMPLY WITH THE PUERTO RICO BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC). SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OFPe-DDEC).

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION.

NOT FOR CONSTRUCTION

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY CMU  
HOME CONCRETE  
ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGPe-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

TITLE SHEET

SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	S-001	
QC Review:		
Phase:		



GENERAL STRUCTURAL NOTES

1.0 GENERAL

- 1.01 DRAWINGS SHOW TYPICAL AND CERTAIN SPECIFIC CONDITIONS ONLY. FOR DETAILS NOT SPECIFICALLY SHOWN, PROVIDE DETAILS SIMILAR TO THOSE SHOWN.
- 1.02 VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS BEFORE STARTING WORK. NOTIFY ENGINEER OF RECORD OF ANY DISCREPANCY.
- 1.03 STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE ONCE IN SERVICE. NO CONSIDERATION FOR STABILITY AND SHORING IS ASSUMED BY THE ENGINEER DURING THE BUILDING PROCESS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THE STABILITY AND SAFETY OF THE STRUCTURE AND ITS COMPONENTS BY DETERMINING AND IMPLEMENTING ERECTION PROCEDURES AND SEQUENCE OF CONSTRUCTION. THIS INCLUDES TEMPORARY BRACING AND SHORING AS WELL AS SOIL STABILIZATION AND PROTECTIVE MEASURES FOR ADJACENT EXISTING CONSTRUCTION.
- 1.04 COORDINATE STRUCTURAL CONTRACT DOCUMENTS WITH ARCHITECTURAL, MECHANICAL, ELECTRICAL, PLUMBING AND CIVIL. NOTIFY ENGINEER OF RECORD OF ANY CONFLICT AND/OR OMISSION. CONTRACTOR SHALL MAKE NO DEVIATION FROM DESIGN DRAWINGS WITHOUT WRITTEN APPROVAL OF THE ENGINEER OF RECORD. FOR ADDITIONAL OPENINGS NOT SHOWN ON THE STRUCTURAL DRAWINGS, SEE ARCHITECTURAL, MECHANICAL AND PLUMBING DRAWINGS.
- 1.05 FOR DIMENSIONS NOT SHOWN, SEE ARCHITECTURAL DRAWINGS.
- 1.06 REVIEW OF SUBMITTALS AND/OR SHOP DRAWINGS BY THE ENGINEER OF RECORD DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO REVIEW AND CHECK SHOP DRAWINGS BEFORE SUBMITTAL TO THE ENGINEER OF RECORD. THE CONTRACTOR REMAINS SOLELY RESPONSIBLE FOR ERRORS AND OMISSIONS ASSOCIATED WITH THE PREPARATION OF SHOP DRAWINGS AS THEY PERTAIN TO MEMBER SIZES, DETAILS AND DIMENSIONS SPECIFIED IN THE CONTRACT DOCUMENTS. CONTRACTOR IS ALSO RESPONSIBLE FOR MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES OF CONSTRUCTION AND JOBSITE SAFETY.
- 1.07 ANY BRAND SPECIFIC MATERIALS MAY BE SUBSTITUTED W/ AN EQUIVALENT PRODUCT BY AN ALTERNATE MANUF. IF APPROVED BY THE ENGINEER OF RECORD. UNLESS AN OPTION IS USED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE DETAILS.
- 1.08 NO STRUCTURAL MEMBER OR COMPONENT SHALL BE CUT, NOTCHED OR OTHERWISE ALTERED UNLESS APPROVED IN WRITING BY THE ENGINEER OF RECORD OR DETAILED IN THIS PLAN SET. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY AND ALL COSTS INCURRED BY THE ENGINEER OF RECORD FOR REVIEW OF SUCH DEVIATIONS AND IMPLEMENTATION OF APPROPRIATE SOLUTIONS.
- 1.09 PRIOR TO COMMENCING WORK, THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING AND COORDINATING WITH THE SUB-CONTRACTORS WORK INDICATED ON STRUCTURAL DRAWINGS WITH ARCHITECTURE, SITE WORK, DELEGATED COMPONENTS, AND THE WORK OF OTHER ENGINEERING DISCIPLINES.
- 1.10 THE ENGINEER OF RECORD SHALL NOT BE CONSTRUED AS HAVING CONTROL, CHARGE, AND RESPONSIBILITY FOR THE ACTS AND OMISSIONS AND FOR FAILURE OF THE CONTRACTOR, SUB-CONTRACTOR, AND OTHER PERSONS PERFORMING THE WORK TO CARRY OUT SUCH WORK IN ACCORDANCE WITH THE STRUCTURAL DRAWINGS AND COLLECTIVE CONTRACT DOCUMENTS.
- 1.11 PERIODIC SITE OBSERVATION BY THE ENGINEER OF RECORD AND HIS / HER REPRESENTATIVES IS SOLELY FOR THE PURPOSE OF DETERMINING IF THE WORK OF THE CONTRACTOR IS PROCEEDING IN GENERAL ACCORDANCE WITH THE STRUCTURAL DRAWINGS AND SPECIFICATIONS. THIS LIMITED SITE OBSERVATION SHALL NOT BE CONSTRUED AS AN INSPECTION, EXHAUSTIVE, OR CONTINUOUS OBSERVATION TO VERIFY THE QUALITY AND QUANTITY OF THE WORK.
- 1.12 COMPLETE INSPECTION REQUIREMENTS SHALL BE AS DIRECTED BY THE LOCAL BUILDING DEPARTMENT.
- 1.13 THE USE OF REPRODUCTIONS OF THESE STRUCTURAL DRAWINGS AND SPECIFICATIONS BY ANY CONTRACTOR, SUBCONTRACTOR, ERECTOR, FABRICATOR OR MATERIAL SUPPLIER IN LIEU OF THE PREPARATION OF SHOP DRAWINGS IS PROHIBITED UNLESS PRIOR WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER OF RECORD.
- 1.14 IN THE EVENT THERE IS CONFLICTING INFORMATION BETWEEN THE DRAWINGS, SPECIFICATIONS AND LOCAL CODE APPLICATIONS OR ANY OTHER CONTROLLING AUTHORITY, THE MOST STRINGENT CONDITION SHALL APPLY.

2.0 SOIL PREPARATION AND FOUNDATION

- 2.01 THE DESIGN OF FOUNDATIONS IS BASED ON AN ALLOWABLE SOIL BEARING PRESSURE OF 1,500 PSF.
- 2.02 A QUALIFIED GEOTECHNICAL ENGINEER SHALL VERIFY CONDITION AND/OR ADEQUACY OF ALL SUBGRADES, FILLS AND BACKFILLS BEFORE PLACEMENT OF FOUNDATIONS, FOOTINGS, SLABS, WALLS, FILLS, BACKFILLS, ETC. AND SHALL ANTICIPATE SOIL EROSION WHEN DETERMINING EXCAVATION DEPTH.
- 2.03 SOIL, DEWATERING, AND SITE PREPARATION SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT.
- 2.04 SOIL SUPPORTED FOUNDATIONS:  
A. REINFORCING SHALL BE SUPPORTED FROM ABOVE OR WITH 3" SLAB BOSTER WITH PLATE (SBP) AT 4'-0" O.C. MAXIMUM FOR ALL FOUNDATION REINFORCING.
- 2.05 REMOVE FREE WATER FROM EXCAVATIONS BEFORE PLACING CONCRETE.
- 2.06 REMOVE EXISTING TOP SOIL, FILL, PAVEMENT OR FOUNDATIONS FROM THE BUILDING AREA.
- 2.07 BACKFILL BELOW STRUCTURAL ELEMENTS TO BE A GRANULAR MATERIAL HAVING MAXIMUM SIZE OF 3" AND LESS THAN 12% PASSING SIZE. FILL TO BE PLACED IN LIFTS OF ONE-FOOT OR LESS COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR (ASTM.D1557).
- 2.08 DO NOT BACKFILL FOUNDATION WALLS UNTIL THE RESTRAINING SLABS OR ADEQUATE BRACING ARE IN PLACE. ALL BACKFILL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATION.
- 2.09 EXTERIOR SLABS SHALL SLOPE AWAY FROM THE STRUCTURE A MINIMUM OF 1/4" PER FOOT UNLESS NOTED OTHERWISE.
- 2.10 SLABS ON FILL TO BE PLACED OVER A 10-MIL POLYETHYLENE FILM VAPOR BARRIER INSTALLED ON COMPACTED SOIL. CONCRETE TO BE PLACED IN A CHECKERBOARD PATTERN, LIMITED TO 400 SQ. FT. OR 2'0" IN ANY DIRECTION. AS AN ALTERNATIVE, SLABS MAY BE POURED CONTINUOUSLY, HOWEVER, THEY MUST BE SAWN AS SOON AS THE SLAB WILL SUPPORT THE WEIGHT OF THE SAW AND OPERATOR AND THE SAW BLADE WILL PRODUCE CLEAN CUTS WITHOUT DISLOGGING AGGREGATE (7 HOURS MAX). SAW CUT TO BE A MINIMUM OF 1/4 OF THE SLAB DEPTH AND 1/8 INCH WIDTH.
- 2.11 PROVIDE SOIL POISONING UNDER BUILDINGS FOR TERMITE PROTECTION.
- 2.12 HOUSES BUILT ON THE SIDES OF STEEP SLOPES REQUIRE SPECIAL DESIGN GUIDANCE. THESE HOMES ARE OFTEN SET ON EXPOSED POSTS OR COLUMNS. WALLS, POSTS, AND COLUMNS SHALL BE PROPERLY BRACED TO PREVENT COLLAPSE DURING AN EARTHQUAKE. FOUNDATIONS SHALL BE PROPERLY EMBEDDED IN CONSIDERATION OF ALL DESIGN FORCES AND POTENTIAL IMPACTS OF EROSION. CONSULT A PUERTO RICO LICENSED PROFESSIONAL ARCHITECT OR ENGINEER FOR DESIGN GUIDANCE IN SUPPORTING A HOME ON A STEEP SLOPE. IT IS RECOMMENDED TO PROVIDE ADDITIONAL ANCHORAGE FOR EACH FLOOR SYSTEM TO THE UPHILL FOUNDATION AND SUPPLEMENTAL ANCHORAGE, STRAPPING, AND BRACING OF CRIPPLE WALLS.
- 2.13 A REGISTERED GEOTECHNICAL ENGINEER SHALL PERFORM A SLOPE STABILITY ANALYSIS ON STEEP SLOPES AND ADDITIONAL STABILIZING DESIGN OF KNEEWALLS OR WIDER GRADE BEAMS MAY BE REQUIRED IN THE DESIGN.

3.0 REINFORCING CONCRETE

- 3.01 PRIOR TO CASTING FOUNDATIONS, PREPARE THE SITE IN ACCORDANCE WITH PLANS, SPECIFICATIONS AND REQUIRED COMPACTION.
- 3.02 ALL CONCRETE WORK SHALL CONFORM TO ACI 301-10, SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS. DESIGN IS BASED ON ACI 318-14, BUILDING CODE REQUIREMENTS FOR REINF. CONCRETE.
- 3.03 UNLESS NOTED OTHERWISE, ALL CONCRETE SHALL BE NORMAL WEIGHT AND HAVE THE FOLLOWING MINIMUM 28-DAY COMPRESSIVE STRENGTHS:  
fo  
FOUNDATIONS 3,000 PSI  
SLABS ON-GRADE 3,000 PSI  
WALLS 3,000 PSI
- 3.04 USE OF CALCIUM CHLORIDE, CHLORIDE IONS OR OTHER SALTS IN CONCRETE IS NOT PERMITTED.
- 3.05 CHAMFER OR ROUND ALL EXPOSED CORNERS MINIMUM 3/4".
- 3.06 DETAIL CONCRETE REINFORCEMENT AND ACCESSORIES IN ACCORDANCE WITH ACI 315-18, DETAILING MANUAL.
- 3.07 REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE.
- 3.08 WELDED WIRE FABRIC (MESH) SHALL CONFORM TO ASTM A185 AND SHALL BE PROVIDED IN FLAT SHEETS. LAP EDGES 3 CROSS WIRES MINIMUM.
- 3.09 PROVIDE CONTINUOUS REINFORCEMENT WHEREVER POSSIBLE. SPLICE ONLY AS SHOWN OR APPROVED. STAGGER SPLICES WHERE POSSIBLE; USE FULL TENSION SPLICE (CLASS "B") FOR CONTINUOUS REINF. AND MATCHING DOWELS U.N.O. LAP SPLICES SHALL BE 57 BAR DIAMETERS FOR BARS SMALLER THAN #7 AND 72 BAR DIAMETERS FOR #7 & LARGER.

- 3.10 REINFORCING STEEL SHALL HAVE THE FOLLOWING CONCRETE COVER UNLESS NOTED OTHERWISE:  
A. CONCRETE CAST AGAINST EARTH (NOT FORMED) 3"  
B. FORMED CONCRETE EXPOSED TO THE EARTH OR WEATHER  
#6 THROUGH #18 BARS ..... 2"  
#5 BARS AND SMALLER ..... 1 1/2"  
C. CONCRETE NOT EXPOSED TO EARTH OR WEATHER  
SUSPENDED SLABS AND WALLS  
#14 THROUGH #18 BARS ..... 1 1/2"  
#11 BARS AND SMALLER ..... 1"  
BEAMS (STIRRUPS) AND COLUMNS (TIES) ..... 1 1/2"
- 3.11 DO NOT PLACE PIPES OR DUCTS EXCEEDING ONE-THIRD THE SLAB OR WALL THICKNESS WITHIN THE SLAB OR WALL UNLESS SPECIFICALLY SHOWN AND DETAILED ON STRUCTURAL DRAWINGS. ANY PIPES SHALL BE BETWEEN THE OUTER HORIZONTAL AND VERTICAL LAYERS OF REINF.
- 3.12 DO NOT WELD OR TACK WELD REINFORCING STEEL UNLESS APPROVED OR DIRECTED BY THE ENGINEER OF RECORD.
- 3.13 REINFORCE SLAB-ON-GRADE AT ALL PENETRATIONS AND AT RE-ENTRANT CORNERS. PLACE THREE #3x3'-0 AROUND FLOOR DRAINS. PLACE #4x4'-0" (MIN.) AT RE-ENTRANT CORNERS. HOLD REINFORCING 1" CLEAR FROM TOP OF CONCRETE.
- 3.14 WALLS AND OTHER INTERSECTING ELEMENTS SHALL HAVE CORNER BARS TO PROVIDE CONTINUITY. USE CONCRETE STEEL REINFORCING INSTITUTE (CRSI) STANDARDS OR AS SHOWN ON THE DRAWINGS.
- 3.15 FINISH INTERIOR SLAB ON GRADES WITH A TROWEL FINISH.

4.0 SAWN LUMBER

- 4.01 DESIGN STANDARDS:  
  
AMERICAN WOOD COUNCIL, "NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION" (ANSI/AWC NDS-2018) WITH "NDS SUPPLEMENT", 2018 EDITION.  
  
AMERICAN SOFTWOOD LUMBER STANDARD VOLUNTARY PRODUCT STANDARD PS20-15.  
  
APA E30- THE ENGINEERED WOOD ASSOCIATION, "ENGINEERED WOOD CONSTRUCTION GUIDE", AND D510 "PANEL DESIGN SPECIFICATION", LATEST EDITIONS.
- 4.02 ALL WOOD FRAMING MEMBERS INCLUDING BUT NOT LIMITED TO WALL STUDS AND JOISTS, ARE INTENDED TO ACT AS A SYSTEM AS DETAILED IN THE STRUCTURAL DRAWINGS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE SAFETY AND STABILITY OF THE WOOD FRAMING SYSTEMS (I.E. TEMPORARY BRACING IF REQUIRED) DURING CONSTRUCTION.
- 4.03 ALL SAWN LUMBER SHALL CONFORM TO THE AMERICAN SOFTWOOD LUMBER STANDARD, PS20-15. LUMBER SIZES SHOWN ARE NOMINAL UNLESS NOTED OTHERWISE. LUMBER SHALL BE OF THE SPECIES AND GRADE SHOWN BELOW, UNLESS NOTED OTHERWISE:
- | MEMBER           | GRADE                     | SPACING    |
|------------------|---------------------------|------------|
| WALL STUDS       | SOUTHERN YELLOW PINE No.2 | REF. PLANS |
| RAFTERS/JOISTS   | SOUTHERN YELLOW PINE No.2 | REF. PLANS |
| POST/COLUMNS     | SOUTHERN YELLOW PINE No.2 | REF. PLANS |
| SILL PLATE       | SOUTHERN YELLOW PINE No.2 |            |
| DOUBLE TOP PLATE | SOUTHERN YELLOW PINE No.2 |            |
- 4.04 ALL ATTACHMENTS OF WOOD FRAMING SHALL NOT BE LESS THAN THAT DESCRIBED IN TABLE "FASTENING SCHEDULE" ON SHEET S-004.
- 4.05 STORAGE OF ALL LUMBER AND TIMBER ON SITE SHALL BE KEPT OFF OF THE GROUND, UNDER COVER, AND PROTECTED FROM DAMAGE.
- 4.06 ALL LUMBER IN CONTACT WITH THE GROUND OR CONCRETE SHALL BE PRESSURE TREATED.
- 4.07 ALL FASTENERS FOR PRESERVATIVE-TREATED AND FIRE-RETARDENT-TREATED WOODS AND ALL OTHER WOODS SHALL BE OF HOT-DIPPED ZINC COATED GALVANIZED STEEL OR STAINLESS STEEL. ALL FASTENERS SHALL FOLLOW CURRENT MANUFACTURER'S GUIDELINES BASED ON WEATHER EXPOSURE. STAINLESS STEEL OR HOT-DIPPED GALVANIZED FASTENERS SHALL BE USED TO MATCH THE CONNECTOR TYPE. AT A MINIMUM ALL FASTENERS SHALL BE HOT-DIPPED GALVANIZED MEETING ASTM A153. WHEN FASTENERS ARE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS, FASTENERS SHALL BE STAINLESS STEEL. FOR HOMES LOCATED WITHIN 1 MILE OF THE OCEAN, FASTENERS SHALL BE HOT-TIPPED GALVANIZED G185 OR BE IN ACCORDANCE WITH FEMA TECHNICAL BULLETIN 8.
- 4.08 ALL METAL HARDWARE AND FRAMING ACCESSORIES SHALL BE MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, MITEK USP, OR APPROVED. ALL ITEMS SHALL BE INSTALLED PER THE MANUFACTURER'S INSTALLATION REQUIREMENTS. ALL CONNECTORS SHALL BE MINIMUM HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A653, ASTM A123, OR HIGHER STANDARDS. STAINLESS STEEL CONNECTORS MAY ALSO BE USED IN LIEU OF HOT-DIP GALVANIZED CONNECTORS. ALL NAIL/BOLT HOLES SHALL BE FILLED WITH THE RECOMMENDED FASTENER UNLESS NOTED OTHERWISE.
- 4.09 ALL WALLS SHALL HAVE DOUBLE TOP PLATES AND SHALL BE SPLICED PER THE TYPICAL TOP PLATE SPLICE DETAIL ON S-014, UNLESS NOTED OTHERWISE. TOP PLATES AT WALL INTERSECTIONS SHALL BE LAPPED AND NAILED WITH (3) 16d NAILS.
- 4.10 WHERE ROOF MEMBERS OR ROOF TRUSSES ARE CONNECTED TO EXTERIOR WALLS OR WALLS W/ PLYWOOD SHEATHING, THE SPECIFIED HURRICANE CLIP SHALL BE PLACED ON THE SIDE OF THE WALL WITH SHEATHING.
- 4.11 HOLES FOR BOLTS SHALL BE DRILLED WITH A BIT OF THE SAME NOMINAL DIAMETER AS THE BOLT + 1/16". LEAD HOLES FOR LAG SCREWS SHALL BE DRILLED PER NDS.
- 4.12 ALL BOLTS, CARRIAGE BOLTS, LAG SCREWS, EXPANSION BOLTS, AND EPOXY BOLTS SHALL BE INSTALLED WITH STANDARD CUT WASHERS AND NUTS THAT BEAR DIRECTLY ON THE WOOD. ALL NUTS SHALL BE TIGHTENED AT THE TIME OF INSTALLATION AND RE-TIGHTENED IF NECESSARY. DUE TO WOOD SHRINKAGE, PRIOR TO CLOSE-IN OR AT THE COMPLETION OF THE PROJECT, BOLTS AND LAG SCREWS SHALL CONFORM TO ANSI/ASME STANDARD B18.2.1. WOOD SCREWS SHALL CONFORM TO B18.6.1. ALL BOLTS SHALL CONFORM TO ASTM A307 GRADE A UNLESS NOTED OTHERWISE. ALL SHALL BE GALVANIZED.

THE MINIMUM STRENGTHS FOR LAG SCREWS AND WOOD SCREWS SHALL BE AS FOLLOWS:

WOOD SCREW DIAMETER-INCHES	MIN. BENDING YIELD STRENGTH (PSI)
0.138 (#6)	100,000
0.151 (#7)	90,000
0.164 (#8)	90,000
0.177 (#9)	90,000
0.190 (#10)	80,000
0.216 (#12)	80,000
0.246 (#14)	70,000
WOOD SCREW DIAMETER-INCHES	MIN. BENDING YIELD STRENGTH (PSI)
1/4"	70,000
5/16"	60,000
3/8" AND GREATER	45,000

- 4.13 WOOD STUDS IN EXTERIOR WALLS AND BEARING PARTITIONS MAY BE CUT OR NOTCHED TO A DEPTH NOT EXCEEDING ¼ OF ITS WIDTH, PROVIDED NOT MORE THAN TWO SUCCESSIVE STUDS ARE NOTCHED OR CUT. BUNDLED STUDS UNDER POINTS OF CONCENTRATED LOADS SHALL NOT BE CUT OR NOTCHED. CUTTING AND NOTCHING OF STUDS TO A DEPTH NOT GREATER THAN 40% OF THE WIDTH OF THE STUD IS PERMITTED IN NON-BEARING PARTITIONS SUPPORTING NO LOADS OTHER THAN THE WEIGHT OF THE PARTITION.
- 4.14 A HOLE MAY BE BORED IN A WOOD STUD UP TO A DIAMETER OF 33% OF THE STUD WIDTH. BORED HOLES NOT GREATER THAN 60% OF THE WIDTH OF THE STUD ARE PERMITTED IN NON-BEARING PARTITIONS OR IN ANY WALL WHERE EACH BORED STUD IS DOUBLED, PROVIDED NOT MORE THAN TWO SUCCESSIVE DOUBLED STUDS ARE BORED. IN NO CASE, SHALL THE EDGE OF THE BORED HOLE BE NEARER THAN 5/8" TO THE EDGE OF THE STUD, BORED HOLES SHALL NOT BE LOCATED AT THE SAME SECTION OF THE STUD AS A CUT OR NOTCH.
- 4.15 END NOTCHES NOT EXCEEDING ¼ THE DEPTH ARE PERMITTED FOR 2X FLOOR JOISTS OR RAFTERS. TAPER CUT FROM THE REDUCED DEPTH OF THE MEMBER TO THE FULL DEPTH AT A MINIMUM SLOPE OF (1) HORIZ./ (1) VERT. DO NOT SQUARE CUT AN END NOTCH.
- 4.16 INTERIOR NOTCHES NOT EXCEEDING 1/6 THE DEPTH OF A 2X FLOOR JOIST OR RAFTER SHALL BE PERMITTED ONLY IN THE OUTER THIRD OF ANY SPAN. NOTCHES ARE NOT PERMITTED IN THE MIDDLE THIRD OF ANY SPAN NOR IN ANY LINTEL MEMBERS.
- 4.17 THE LENGTH OF NOTCHES IN FLOOR JOISTS SHALL NOT EXCEED 1/3 THE JOIST DEPTH.
- 4.18 HOLES BORED IN FLOOR JOISTS OR RAFTERS SHALL NOT BE WITHIN 2 INCHES OF THE TOP OR BOTTOM AND THE DIAMETER OF ANY SUCH HOLE SHALL NOT EXCEED 1/3 THE DEPTH OF THE MEMBER. HOLES SHALL NOT OCCUR WITHIN 12" OF THE EDGE OF ANY BEARING SUPPORT OR CONNECTION.

- 4.19 WHEN NAILS ARE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS, NAILS SHALL BE STAINLESS STEEL (TYPE 316). NAILS THAT ARE NOT EXPOSED TO THE ELEMENTS BUT IN CONTACT WITH PRESERVATIVE TREATMENT LUMBER SHALL BE MINIMUM HOT-DIP GALVANIZED MEETING ASTM A153. ALL NAILS FOR STRUCTURAL WORK SHALL BE COMMON WIRE NAILS UNLESS NOTED OR DETAILED OTHERWISE MEETING ASTM F1667. HOLES SHALL BE PRE-DRILLED WHERE NECESSARY TO PREVENT SPLITTING. NAILS SHALL HAVE THE MINIMUM PROPERTIES SPECIFIED IN THE TABLE BELOW:

NAIL TYPE	SHANK DIAMETER-INCHES	MIN. PENETRATION-INCHES	MIN. BENDING YIELD STRENGTH (PSI)
6d	0.113	1.25	100,000
8d box	0.113	1.38	100,000
8d	0.131	1.38	100,000
10d box	0.128	1.50	100,000
10d	0.148	1.50	90,000
12d box	0.128	1.48	100,000
12d	0.148	1.48	90,000
16d box	0.135	1.63	100,000
16d	0.162	1.63	90,000
20d	0.192	1.92	80,000

5.0 WOOD STRUCTURAL PANELS

- 5.01 STRUCTURAL WOOD PANELS SHALL CONFORM TO THE REQUIREMENTS OF ONE OF THE FOLLOWING STANDARDS AND PUBLICATIONS:  
A. U.S. PRODUCT STANDARD PS1-95 FOR CONSTRUCTION AND INDUSTRIAL PLYWOOD.  
B. U.S. PRODUCT STANDARD PS2-92 PERFORMANCE STANDARD FOR WOOD BASED STRUCTURAL USE PANELS.  
C. APA PRP-108 PERFORMANCE STANDARDS.
- 5.02 ROOF AND WALL PANELS SHALL BE APA RATED, EXPOSURE 1, OSB WITH A MIN. 48/24 SPAN RATING UNLESS NOTED OTHERWISE ON THE DRAWINGS. SHEATHING SHALL BE EXTERIOR GRADE WHERE EITHER SIDE OF SHEATHING IS PERMANENTLY EXPOSED TO WEATHER. SHEATHING SHALL RUN CONTINUOUS OVER AT LEAST THREE SPANS.
- 5.03 ALL ROOF SHEATHING SHALL BE INSTALLED WITH THE FACE GRAIN PERPENDICULAR TO THE SUPPORTS. ROOF SHEATHING SHALL BE NAILED AND GLUED TO WOOD FRAMING IN ACCORDANCE WITH THE PUERTO RICO CODE AND AMERICAN PLYWOOD ASSOCIATION (APA) SPECIFICATION AFG-01, ADHESIVES FOR FIELD GLUING PLYWOOD TO WOOD FRAMING.
- 5.04 ALL SHEATHING PANELS SHALL BE INSTALLED WITH END JOINTS STAGGERED UNLESS NOTED OTHERWISE.
- 5.05 STAINLESS STEEL (TYPE 316) NAILS SHALL BE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS. ALL NAILS THAT ARE NOT EXPOSED TO THE ELEMENTS BUT IN CONTACT WITH PRESERVATIVE TREATMENT LUMBER SHALL BE MINIMUM HOT-DIPPED GALVANIZED MEETING ASTM A153.
- 5.06 3x BLOCKING SHALL BE PROVIDED AT PLYWOOD SHEATHED INTERIOR AND EXTERIOR WALLS. BLOCKING SHALL BE INSTALLED AT ALL WALL AND ROOF PANEL EDGES PERPENDICULAR TO FRAMING MEMBERS AND AS SHOWN ON PLAN.

6.0 PRE-FABRICATED WOOD TRUSSES

- 6.01 DESIGN STANDARDS:  
  
TRUSS PLATE INSTITUTE, "NATIONAL DESIGN STANDARD FOR METAL-PLATE CONNECTED WOOD TRUSS CONSTRUCTION" (ANSI/TPI 1-2014)
- 6.02 MINIMUM DESIGN LOADS:  
ROOF TRUSSES  
  
TOP CHORD      LIVE LOAD:                      20 PSF  
                         SUPERIMPOSED DEAD LOAD:      5 PSF  
  
BOTTOM CHORD      LIVE LOAD:                      20 PSF  
                         SUPERIMPOSED DEAD LOAD:      5 PSF  
  
DEFLECTION:      LIVE LOAD:                      L/240 MAX.  
                         TOTAL LOAD:                      L/180 MAX.
- WOOD TRUSSES SHALL BE DESIGNED TO RESIST DOWNWARD AND UPLIFT WIND PRESSURE NORMAL TO THE TOP CHORD. SEE DESIGN DATA DRAWING FOR WIND LOAD CRITERIA. ROOF TRUSS AT GABLE END TO BE DESIGNED FOR LATERAL WIND PRESSURE. SEE PLANS FOR GABLE END BRACING DETAILS.
- 6.03 FABRICATION AND PLACEMENT REQUIREMENTS:  
ALL CONNECTIONS BETWEEN TRUSSES AND/OR TRUSSES AND CONVENTIONAL FRAMING SHALL BE DESIGNED AND DETAILED BY THE TRUSS FABRICATOR. TRUSSES SHALL BE ASSEMBLED, HANDLED, STORED, AND ERECTED IN ACCORDANCE WITH STANDARDS OF THE TRUSS PLATE INSTITUTE. BOTTOM CHORD BRACING AND BRIDGING SHALL BE LOCATED AND DESIGNED BY THE TRUSS FABRICATOR AND INSTALLED BY THE TRUSS ERECTOR IN CONFORMANCE WITH THE "BUILDING COMPONENT SAFETY INFORMATION, BCSI 2013 GUIDELINE" PUBLISHED BY THE TRUSS PLATE INSTITUTE.
- 6.04 SHOP DRAWINGS:  
SHOP DRAWINGS SEALED BY AN ENGINEER REGISTERED IN PUERTO RICO SHALL BE SUBMITTED FOR REVIEW, DESCRIBING ALL DIMENSIONS, SIZES AND GRADE OF LUMBER, DESIGN LOADS, FORCES, REACTIONS, AND CONNECTIONS FOR ALL MEMBERS OF EACH TRUSS AND TRUSS CONNECTIONS.
- 6.05 THE TRUSS MANUFACTURER SHALL DESIGN THE TRUSSES AND GIRDER TRUSSES FOR THE LOADS INDICATED ON THE STRUCTURAL DRAWINGS. SPECIAL LOAD CONSIDERATIONS, SUCH AS OVERFRAMING, ETC. SHALL BE ACCOUNTED FOR IN THE DESIGN.
- 6.06 THE TRUSS MANUFACTURER SHALL ACCEPT FULL RESPONSIBILITY FOR THE DESIGN. THE TRUSS ENGINEER SHALL PREPARE DESIGN CALCULATIONS AND DRAWINGS, WHICH SHALL BE SEALED, SIGNED, AND DATED BY THE RESPONSIBLE PROFESSIONAL ENGINEER REGISTERED IN PUERTO RICO.
- 6.07 THE DESIGN SHALL INCLUDE INTERNAL CONNECTIONS AND CONNECTIONS BETWEEN TRUSSES. CONNECTIONS TO OTHER STRUCTURAL MEMBERS AND ARCHITECTURAL SYSTEMS SHALL BE INCLUDED. TYPICAL DETAILS OF CONNECTIONS SHALL BE SHOWN.
- 6.08 THE MEMBER SIZE AND PROPERTIES FOR EACH MEMBER USED SHALL BE SHOWN, CLEARLY INDICATING WHERE EACH MEMBER IS BEING USED.
- 6.09 PARTICULAR ATTENTION SHALL BE GIVEN TO HEEL HEIGHTS AND TOP CHORD SLOPES TO ENSURE THAT THE FASCIA DETAILS ARE CONSISTENT, ALIGNED, AND IN ACCORDANCE WITH THE ARCHITECTURAL DRAWINGS.
- 6.10 THE MAXIMUM SPACING OF THE TRUSSES SHALL BE 24 INCHES FOR ROOF TRUSSES. THE SELECTED SPACING MUST BE COORDINATED WITH THE TRUSS ENGINEER, THE MECHANICAL ENGINEER, THE FABRICATOR, THE DECKING, HVAC AND ELECTRICAL SUBCONTRACTORS, ERECTORS, DRYWALLER, AND ANY OTHER RELATED SUBCONTRACTORS. THE SPACING SHALL BE DENOTED IN SHOP DRAWINGS FOR EACH TRADE.
- 6.11 A SAMPLE SUBMITTAL OF THE TYPICAL TRUSS AND TRUSS GIRDER TYPES SHALL BE SUBMITTED FOR PRELIMINARY REVIEW PRIOR TO COMPLETION OF DESIGN CALCULATIONS AND DRAWINGS.
- 6.12 COMPLETE ERECTION PLANS AND DETAILS SHALL BE SUBMITTED TO EACH TRADE FOR REVIEW.
- 6.13 THE TRUSS ENGINEER SHALL BE RESPONSIBLE FOR ANY FIELD COORDINATION ISSUES WHICH MAY ARISE REGARDING THE TRUSSES, OPENINGS IN TRUSSES, AND CONNECTIONS OF TRUSSES.
- 6.14 TRUSS ENGINEER SHALL VERIFY THAT DETAILS OF CONNECTIONS SHOWN ARE APPROPRIATE FOR THE TRUSS DESIGN. IF NOT, THE PROPOSED REVISIONS TO DETAILS SHALL BE SUBMITTED.
- 6.15 SHIM PLATES SHALL BE INSTALLED AS REQUIRED TO PROVIDE A POSITIVE BEARING SURFACE BETWEEN THE TRUSSES AND WALLS. EACH TRUSS SHALL BEAR ON EACH WALL WITH WHICH IT INTERSECTS AS SHOWN ON THE PLAN AND IN THE LOADING DIAGRAMS. UNLESS SPECIFICALLY NOTED, THERE SHALL NOT BE ANY SPACE BETWEEN THE TRUSSES AND THE STRUCTURAL WALLS.
- 6.16 LOADS SHOWN ABOVE ARE SUPERIMPOSED LOADS AND DO NOT INCLUDE THE TRUSS SELF-WEIGHT. TRUSS MANUFACTURER SHALL CONSIDER THE TRUSS SELF-WEIGHT IN THE TRUSS DESIGN.
- 6.17 TRUSS TOP CHORD SHALL BE A MINIMUM 3x MEMBER.

ALL CONSTRUCTION MUST COMPLY WITH THE PUERTO RICO BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND RESOURCES. SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE.

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION.

NOT FOR CONSTRUCTION

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY CMU  
HOME CONCRETE  
ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGP-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

GENERAL NOTES

SHEET INFORMATION:		
JOB No.	Date Issued: 05/08/2020	
Drawn By:	Sheet Number:	
Checked By:	S-002A	
QC Review:		
Phase:		



7.0 MASONRY

- 7.01 CONCRETE MASONRY DESIGN AND CONSTRUCTION SHALL CONFORM TO TMS 402/602-16 BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES.
- 7.02 PROVIDE NORMAL WEIGHT, HOLLOW, LOAD-BEARING CONCRETE MASONRY UNITS (CMU) CONFORMING TO ASTM C90, GRADE N, TYPE II.
- 7.03 PROVIDE MASONRY CONSTRUCTION WITH MINIMUM COMPRESSIVE STRENGTH, f'm = 1,900 PSI.
- 7.04 PROVIDE TYPE "S" MORTAR IN ACCORDANCE WITH ASTM C270.
- 7.05 VERTICAL REINFORCING SHALL BE HELD IN POSITION WITH BAR POSITIONERS AT TOP OF THE GROUT POUR AT SPACINGS AS SHOWN ON THE PLANS.
- 7.06 PROVIDE HORIZONTAL JOINT REINFORCEMENT COMPLYING WITH ASTM A82, NO. 9 GAUGE OR HEAVIER, LADDER TYPE, ZINC COATED, PLACED 16" ON CENTER, UNLESS NOTED OTHERWISE. LADDER RUNGS SHALL BE POSITIONED TO COMPLETELY CLEAR CELL OPENINGS. LAP JOINT REINF. 1 FULL CROSS WIRE SPACING PLUS 2" (18" MIN FOR CROSS WIRE SPACING OF 16" ON CENTER), BUT NOT LESS THAN 12".
- 7.07 PROVIDE RUNNING BONDS WITH VERTICAL JOINTS LOCATED AT CENTER OF MASONRY UNITS IN THE ALTERNATE COURSE BELOW.
- 7.08 PROVIDE FOUNDATION DOWELS WITH HOOKS SIZED AND SPACED TO MATCH CMU VERTICAL REINFORCING. DOWELS SHALL LAP WALL VERTICALS SEE FASTENING SCHEDULES FOR MASONRY LAP SPlice REQUIREMENTS.
- 7.09 REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE.
- 7.10 PROVIDE FINE GROUT FOR REINFORCED MASONRY IN ACCORDANCE WITH ASTM C476 WITH MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 2,000 PSI. GROUT SHALL BE OF FLUID CONSISTENCY, WHICH MEANS AS FLUID AS POSSIBLE FOR POURING WITHOUT SEGREGATION OF THE CONSTITUENT PARTS. GROUT SLUMP SHALL BE 8 TO 10 INCHES. WATER CEMENT RATIO SHALL BE REDUCED AND WATER REDUCERS USED AS REQUIRED TO MAINTAIN SLUMP WHEN PLACED IN LOW ABSORPTION CMU. FILL ALL CELLS BELOW GRADE WITH GROUT. ALL GROUT SHALL BE CONSOLIDATED AT THE TIME OF POURING BY VIBRATING AND THEN RECONSOLIDATED AGAIN BY PUDDLING LATER, BEFORE PLASTICITY IS LOST. TYPICALLY WITHIN 10 TO 15 MINUTES. WHEN GROUTING S STOPPED FOR ONE HOUR OR LONGER, CONSTRUCTION JOINTS SHALL BE FORMED BY STOPPING THE POUR OF GROUT 1 1/2" BELOW THE TOP OF THE UPPERMOST UNIT.
- 7.11 ALL VERTICAL REINFORCING SHALL HAVE A STANDARD HOOK WHEN TERMINATING INTO A BOND BEAM.
- 7.12 ALL VERTICAL REINFORCING SHALL BE LOCATED IN GROUTED CELLS.

8.0 MISCELLANEOUS

- 8.01 SUBSTITUTION OF EXPANSION ANCHORS FOR ADHESIVE ANCHORS OR EMBEDDED ANCHORS SHOWN ON THE DRAWINGS WILL NOT BE PERMITTED UNLESS APPROVED BY THE ENGINEER OF RECORD IN ADVANCE.
- 8.02 THE CONTRACTOR SHALL PROVIDE THE FOLLOWING SERVICES AS PART OF THE CONSTRUCTION SCOPE OF WORK:  
A. VERIFICATION OF ALL DIMENSIONS, ELEVATIONS, OPENING SIZES, MECHANICAL EQUIPMENT WEIGHTS PRIOR TO STARTING WORK.  
B. REMOVE ALL ABANDONED FOUNDATIONS, UTILITIES, PIPELINES, ETC. THAT INTERFERE WITH NEW CONSTRUCTION.  
C. REVIEW AND APPROVE ALL SHOP DRAWINGS PRIOR TO SUBMITTAL, NOTING CHANGES MADE WHICH DO NOT COMPLY WITH DESIGN DRAWINGS.  
D. PROVIDE TEMPORARY BRACING AND SHORING TO PREVENT EXCESSIVE DEFLECTIONS AND DAMAGE DURING CONSTRUCTION. DESIGN OF TEMPORARY BRACING AND SHORING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.  
E. SUPPORT OF CEILING SYSTEMS, FOLDING PARTITIONS, TOILET PARTITIONS, COUNTERS, MISCELLANEOUS EQUIPMENT, AND WINDOW SYSTEMS AS DEFINED IN THE ARCHITECTURAL PLANS.

9.0 SPECIAL INSPECTIONS

- 9.01 PER THE REQUIREMENTS OF CHAPTER 17, SECTION 1704.1 OF THE REFERENCED BUILDING CODE, SPECIAL INSPECTION IS REQUIRED FOR THE PROPOSED BUILDING CONSTRUCTION. SPECIAL INSPECTION INVOLVES THE VERIFICATION OF COMPLIANCE OF MATERIALS, INSTALLATION, FABRICATION, ERECTION AND OR PLACEMENT OF COMPONENTS WITH THE OFFICIAL SET OF CONSTRUCTION DOCUMENTS AND REFERENCED STANDARDS. SPECIAL INSPECTION IS PART OF THE PERMIT APPLICATION PROCESS FUNDED BY THE OWNER OR OWNER'S AGENT.
- 9.02 A STATEMENT OF SPECIAL INSPECTION LISTING THE REQUIREMENTS ALONG WITH A SCHEDULE OF TESTING, SUBMITTAL REVIEWS, AND FIELD OBSERVATION REQUIREMENTS HAS BEEN PREPARED AND DISPLAYED ON THIS DRAWING SET. THIS STATEMENT INCLUDES A COMPLETE LIST OF MATERIAL AND ACTIVITY REQUIRING INSPECTION. IT IS THE RESPONSIBILITY OF ALL PARTIES TO BECOME FAMILIAR WITH THIS REQUIREMENT AND UNDERSTAND THE GUIDELINES AND REQUIREMENTS OF EACH PARTY INVOLVED WITH THE CONSTRUCTION. THE SPECIAL INSPECTOR COORDINATOR SHALL COORDINATE WITH THE OWNER, CONTRACTOR, AND THE DESIGN PROFESSIONALS AND SCHEDULE THE INSPECTIONS ACCORDINGLY.
- 10.01 SAFE ROOM WALLS TO BE FULLY CONSTRUCTED AND INSPECTED PRIOR TO COMMENCING CONSTRUCTION ON EXTERIOR WALLS.
- 10.02 EXTERIOR AND INTERIOR SIDES OF SAFE ROOM WALLS MUST HAVE TOOLED JOINTS.
- 10.03 MECHANICAL AND ELECTRICAL PENETRATIONS SHOULD BE KEPT TO A MINIMUM. ANY OPENINGS LARGER THAN 3 1/2" SQUARE OR 2" IN DIAMETER SHALL BE PROTECTED BY BAFFLES, COWLINGS, OR OTHER MEANS. THESE COVERINGS SHOULD MEET PRESSURE TESTING AND IMPACT CRITERIA AS SPECIFICED IN THESE PLANS.
- 10.04 THE SELECTED SAFE ROOM DOOR SHALL MEET THE DESIGN CRITERIA OF 2015 FEMA P-361 AND 2014 ICC-500. DOOR SHALL BE A TESTED ASSEMBLY AND IN INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
- 10.05 IF AN IMPACT RESISTANT GLAZING IS SELECTED FOR THE SAFE ROOM WINDOW(S) THE SELECTED WINDOW(S) SHALL MEET THE DESIGN CRITERIA OF 2015 FEMA P-361 AND 2014 ICC-500. WINDOW SHALL BE A TESTED ASSEMBLY AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
- 10.06 IF A WINDOW PROTECTION ASSEMBLY IS SELECTED FOR THE SAFE ROOM, IT SHALL MEET THE DESIGN CRITERIA OF 2015 FEMA P-361 AND 2014 ICC-500. WINDOW PROTECTION ASSEMBLY SHALL BE A TESTED ASSEMBLY AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

COMMON ABBREVIATIONS

ARCH.	ARCHITECT	IN.	INCHES
B/	BOTTOM OF	INFO.	INFORMATION
BRG.	BEARING	INT.	INTERIOR
BOTT.	BOTTOM	JNT.	JOINT
C/C	CENTER-TO-CENTER	K	KIPS
C/P.	CAST IN PLACE	KSI	KIPS PER SQUARE INCH
C.J.	CONTROL JOINT	LAT.	LATERAL
CLR.	CLEAR	LBS.	POUNDS
COL.	COLUMN	LLH	LONG LEG HORIZONTAL
CONC.	CONCRETE	LLV	LONG LEG VERTICAL
CONN.	CONNECTION	L.W.	LONG WAYS
CONT.	CONTINUOUS	MANUF.	MANUFACTURER
COORD.	COORDINATE	MAX.	MAXIMUM
CMU	CONCRETE MASONRY UNIT	MECH.	MECHANICAL
DM.	DIMENSION	MIN.	MINIMUM
DTL.	DETAIL	N.T.S.	NOT TO SCALE
DIA.	DIAMETER	NO.	NUMBER (BAR)
DIST.	DISTANCE	O.C.	ON CENTER
DWGS.	DRAWINGS	OPNG.	OPENING
EA.	EACH	PL.	PLATE
EL.	ELEVATION	PREFAB.	PREFABRICATED
E.F.	EACH FACE	PROJ.	PROJECTION
EMBED.	EMBEDMENT	PSF	POUNDS PER SQUARE FOOT
ENG.	ENGINEER	PSI	POUNDS PER SQUARE INCH
E.O.R.	ENGINEER OF RECORD	P.T.	PRESSURE TREATED
EQ.	EQUAL	QTY.	QUANTITY
E.S.	EACH SIDE	REF.	REFERENCE
E.W.	EACH WAY	REINF.	REINFORCED OR REINFORCING
EXP.	EXPANSION	SCH.	SCHEDULE
EXT.	EXTERIOR	S.F.	STEPPED FOOTING
FABR.	FABRICATOR	SPA.	SPACING
F.F.	FINISHED FLOOR	SIM.	SIMILAR
FFE	FINISHED FLOOR ELEVATION	SQU.	SQUARE
FT.	FEET	SQ. FT.	SQUARE FEET
FDN.	FOUNDATION	STL.	STEEL
GA.	GAUGE	STRUC.	STRUCTURAL
GALV.	GALVANIZED	S.W.	SHORT WAYS
HGT.	HEIGHT	SYP	SOUTHERN YELLOW PINE
HKD.	HOOKEED	T/	TOP OF
HORIZ.	HORIZONTAL	TDD.	TRUSS DESIGN DRAWINGS
HR.	HOUR	TYP.	TYPICAL
H.S.	HEADED STUD	UNO.	UNLESS NOTED OTHERWISE
		VERT.	VERTICAL
		VCJ	VERTICAL CONTROL JOINT
		VMCJ	VERTICAL MASONRY CONTROL JOINT
		W/	WITH
		W/O	WITHOUT
		WWF	WELDED WIRE FABRIC

DESIGN CRITERIA FOR PRIMARY STRUCTURE AND MODULES

DESIGN CRITERIA – CODES AND SPECIFICATIONS

1. 2018 PUERTO RICO BUILDING CODE.
2. ACI 318-14-BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.
3. ACI 301-10–SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.
4. ASCE/SEI 7-16–MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.
6. TMS 402/602-16 BUILDING CODE REQUIREMENTS AND SPECIFICATIONS FOR MASONRY STRUCTURES.
7. NDS 2018-NATIONAL DESIGN ASSOCIATION SPECIFICATION FOR WOOD CONSTRUCTION.
8. ANSI/TPI 1-2014-NATIONAL DESIGN STANDARD FOR METAL-PLATE CONNECTED WOOD TRUSS CONSTRUCTION.

DESIGN LOADS

DEAD LOAD

THE WEIGHT OF ALL PERMANENT CONSTRUCTION INCLUDING BUT NOT LIMITED TO: WALLS, FLOORS, CEILINGS, ROOF CLADDING.

ROOF..... SELF WEIGHT

LIVE LOAD

ROOF..... 20 PSF  
FIRST FLOOR..... 40 PSF

WIND LOAD

BASIC WIND SPEED (ULTIMATE)..... 190 MPH IF EXPOSURE D  
BASIC WIND SPEED (NOMINAL)..... 147 MPH IF EXPSOURE D  
BASIC WIND SPEED (ULTIMATE)..... 210 MPH IF EXPOSURE C  
BASIC WIND SPEED (NOMINAL)..... 163 MPH IF EXPOSURE C  
BASIC WIND SPEED (ULTIMATE)..... 255 MPH IF EXPOSURE B  
BASIC WIND SPEED (NOMINAL)..... 194 MPH IF EXPSOURE B  
ULTIMATE BASIC DESIGN WIND SPEEDS CORRESPOND TO PUERTO RICO SPECIAL WIND HAZARD MAP ADOPTED IN THE 2018 PUERTO RICO BUILDING CODE

RISK CATEGORY..... II

ENCLOSURE CLASSIFICATION..... PARTIALLY OPEN  
INTERNAL PRESSURE COEFFICIENTS..... +/- 0.18

SEISMIC LOAD

SEISMIC IMPORTANCE FACTOR..... 1.0  
Ss..... 1.35  
S1..... 0.53  
SITE CLASS..... D (STIFF SOIL)  
Sds..... 0.90  
Sd1..... 0.36  
SEISMIC DESIGN CATEGORY..... D

SEISMIC FORCE RESISTING SYSTEM

BEARING WALL SYSTEM (PRIMARY STRUCTURE 1ST STORY):  
LIGHT-FRAME (WOOD) WALLS SHEATHED WITH WOOD STRUCTURAL PANELS  
RATED FOR SHEAR RESISTANCE  
ANALYSIS METHOD..... EQUIVALENT LATERAL FORCE  
R..... 6.5  
Cs..... 0.14  
DESIGN BASE SHEAR..... 4.72 KIPS  
OVERSTRENGTH FACTOR..... 3

BEARING WALL SYSTEM (MODULE STRUCTURES):  
LIGHT-FRAME (WOOD) WALLS SHEATHED WITH WOOD STRUCTURAL PANELS  
RATED FOR SHEAR RESISTANCE  
ANALYSIS METHOD..... EQUIVALENT LATERAL FORCE  
R..... 6.5  
Cs..... 0.14  
DESIGN BASE SHEAR..... 2.3 KIPS  
OVERSTRENGTH FACTOR..... 3

DESIGN CRITERIA FOR SAFE ROOM

DESIGN CRITERIA – SAFE ROOM

1. 2018 INTERNATIONAL RESIDENTIAL CODE
2. 2018 INTERNATIONAL BUILDING CODE
3. FEMA P-361 THIRD EDITION
4. ICC 500-2014

DESIGN LOADS

DEAD LOAD

THE WEIGHT OF ALL PERMANENT CONSTRUCTION INCLUDING BUT NOT LIMITED TO: WALLS, FLOORS, CEILINGS, ROOF CLADDING.

ROOF..... SELF WEIGHT  
COLLATERAL LOAD..... 5 PSF

LIVE LOAD

ROOF..... 150 PSF

WIND LOAD

BASIC WIND SPEED (ULTIMATE)..... 250 MPH  
BASIC WIND SPEED (NOMINAL)..... 194 MPH  
RISK CATEGORY..... II  
EXPOSURE CATEGORY..... D  
ENCLOSURE CLASSIFICATION..... PARTIALLY ENCLOSED  
INTERNAL PRESSURE COEFFICIENTS..... +/- 0.55

SEISMIC LOAD

SEISMIC IMPORTANCE FACTOR..... 1.0  
Ss..... 1.35  
S1..... 0.53  
SITE CLASS..... D (STIFF SOIL)  
Sds..... 0.9  
Sd1..... 0.36  
SEISMIC DESIGN CATEGORY..... D

SEISMIC FORCE RESISTING SYSTEM

BEARING WALL SYSTEM:  
SPECIAL REINFORCED MASONRY SHEAR WALL  
R..... 5  
Cs..... 0.181  
DESIGN BASE SHEAR..... 9.48 KIPS  
OVERSTRENGTH FACTOR..... 2 1/2

FLOOD CRITERIA

A. THE SAFE ROOM SHALL BE LOCATED OUTSIDE OF THE FOLLOWING HIGH-RISK FLOOD HAZARD AREAS:

1. FLOOD HAZARD AREAS SUBJECT TO HIGH VELOCITY WAVE ACTION (V ZONES) AND COASTAL A ZONES.
2. FLOODWAYS
3. ANY AREAS SUBJECT TO STORM SURGE INUNDATION ASSOCIATED WITH ANY MODELED HURRICANE CATEGORY, INCLUDING COASTAL WAVE EFFECTS.

B. THE LOWEST FLOOD USED FOR THE OCCUPIED RESIDENTIAL SAFE ROOM SHALL BE ELEVATED TO THE HIGHER OF THE ELEVATIONS DETERMINED BY:

1. THE FLOOD ELEVATION, INCLUDING COASTAL WAVE EFFECTS, HAVING A 0.2 PERCENT ANNUAL CHANCE OF BEING EQUALED OR EXCEEDED IN ANY GIVEN YEAR; OR
2. THE FLOOD ELEVATION CORRESPONDING TO THE HIGHEST RECORDED FLOOD ELEVATION IF A FLOOD HAZARD STUDY HAS NOT BEEN CONDUCTED FOR THE AREA; OR
3. THE MINIMUM ELEVATION OF THE LOWEST FLOOR REQUIRED BY THE AUTHORITY HAVING JURISDICTION FOR THE LOCATION WHERE THE SAFE ROOM IS INSTALLED.
4. THE FLOOD ELEVATION HAVING A 1 PERCENT ANNUAL CHANCE OF BEING EQUALED OR EXCEEDED IN ANY GIVEN YEAR.

SAFE ROOM DOOR, WINDOW AND/OR AND WINDOW PROTECTION ASSEMBLY

A. MISSILE IMPACT CRITERIA

1. VERTICAL SURFACES..... 15 POUND 2 x 4 AT 100 MPH
2. HORIZONTAL SURFACES..... 15 POUND 2 x 4 AT 67 MPH

DESIGN CRITERIA – CODES AND SPECIFICATIONS

1. 2018 PUERTO RICO BUILDING CODE.
2. ACI 318-14-BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.
3. ACI 301-10–SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.
4. ASCE/SEI 7-16–MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.
6. TMS 402/602-16 BUILDING CODE REQUIREMENTS AND SPECIFICATIONS FOR MASONRY STRUCTURES.
7. NDS 2018-NATIONAL DESIGN ASSOCIATION SPECIFICATION FOR WOOD CONSTRUCTION.
8. ANSI/TPI 1-2014-NATIONAL DESIGN STANDARD FOR METAL-PLATE CONNECTED WOOD TRUSS CONSTRUCTION.

STATEMENT OF SPECIAL INSPECTIONS		
SPECIAL INSPECTION TYPE	CONTINUOUS	PERIODIC
1. CONCRETE VERIFICATION/INSPECTION		
a. Inspect reinforcement and verify placement		X
b. Inspect anchors cast in concrete		X
c. Inspect anchors post installed in concrete	X	
d. Verify use of required design mix		X
e. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	X	
f. Inspect concrete for proper application techniques	X	
g. Verify in-situ concrete strength prior to removal of forms		X
h. Inspect formwork for shape, location, and dimensions of the concrete member being formed		X
2. SOILS VERIFICATION/INSPECTION		
a. Verify materials below shallow foundations are adequate to achieve the design-bearing capacity.		X
b. Verify excavations are extended to proper depth and have reached proper material		X
c. Perform classification and testing of compacted fill materials.		X
d. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X	
e. Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly.		X
3. STRUCTURAL WOOD		
a. Verify nailing, bolting, anchoring, and other fastening elements		X
4. MASONRY		
a. Prior to construction verify proportions of site prepared mortar		X
b. Prior to construction verify grade, type, and size of reinforcement, anchor bolts, and connectors		X
c. Prior to grouting verify grout spacing, and locations of anchors, reinforcement, and connectors		X
d. During construction verify compliance with the approved submittals		X
e. During construction verify location of structural members including: anchors, reinforcement, and other connectors		X
f. Verify preparation of masonry during code or hot weather		X
g. Observe preparation of grout specimens, mortar specimen, and/or prisms		X

ALL CONSTRUCTION MUST COMPLY WITH THE PUERTO RICO BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND RESOURCES. SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE.

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION.

NOT FOR CONSTRUCTION

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGP+DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

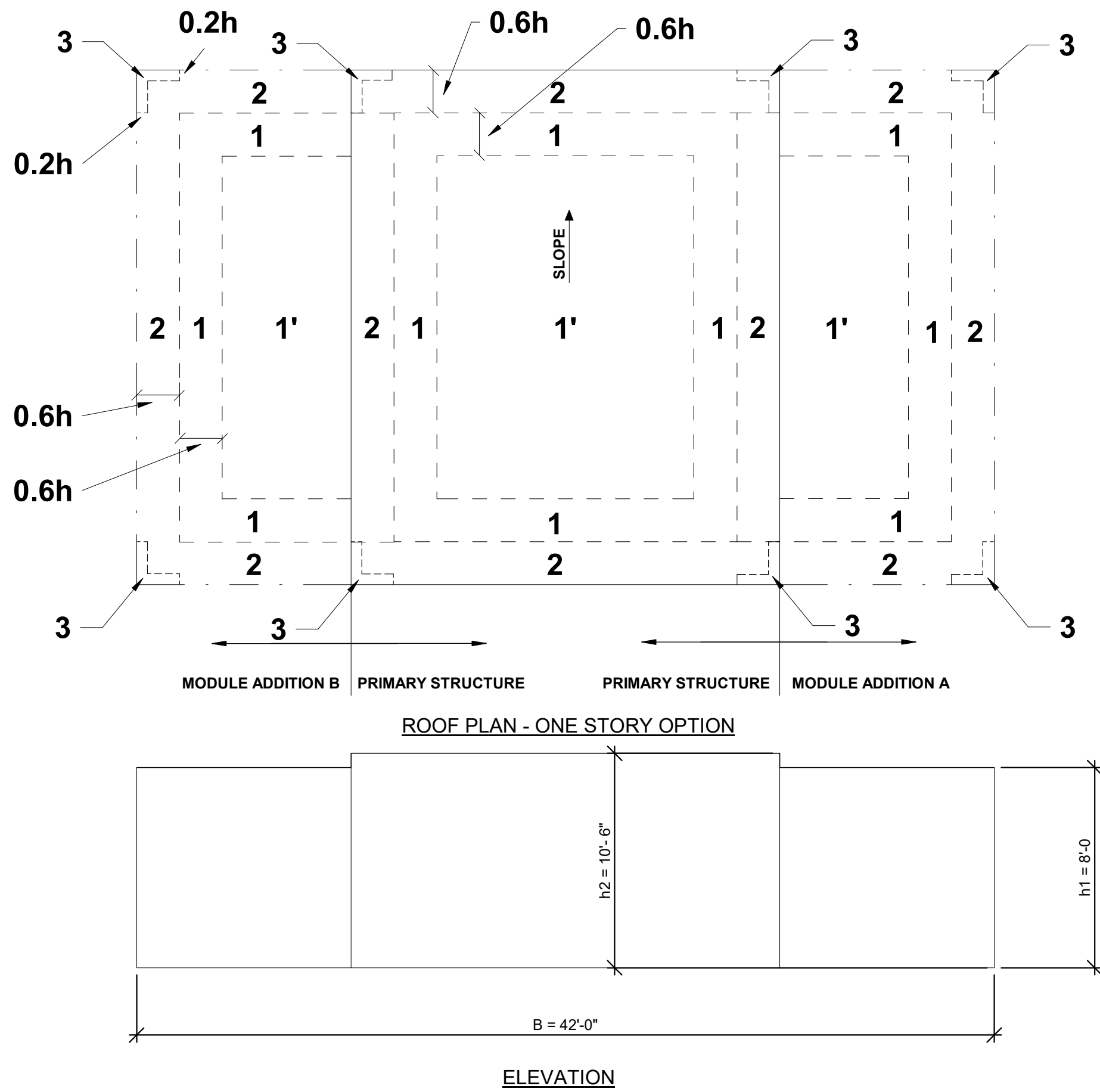
GENERAL NOTES

SHEET INFORMATION:	
JOB No.	Date Issued: 05/08/2020
Drawn By:	Sheet Number:
Checked By:	S-002B
QC Review:	
Phase:	



COMPONENTS AND CLADDING ULTIMATE DESIGN PRESSURE SCHEDULE				
GABLE ROOF, $\theta \leq 7^\circ$ WALLS $h \leq 60'$			EXPOSURE CATEGORY, TOPOGRAPHIC FACTOR EXP. D, $K_{zt} = 1.0$	
COMPONENT	ZONE	EFFECTIVE WIND AREA (SF)	SURFACE PRESSURE (PSF)	
			POSITIVE	NEGATIVE
ROOF ELEMENTS	1	10	38.8	-152.1
		50	33.2	-127.8
		100	30.8	-119.7
	1'	10	38.8	-87.4
		50	33.2	-87.4
		100	30.8	-87.4
	2	10	38.8	-200.7
		50	33.2	-168.3
		100	30.8	-168.3
	3	10	38.8	-273.5
		50	33.2	-247.6
		100	30.8	-213.6
EXTERIOR WALL ELEMENTS	4	10	95.5	-103.6
		50	87.4	-95.5
		100	79.3	-87.4
	5	10	95.5	-127.8
		50	87.4	-110.0
		100	79.3	-103.6

NOTES:  
1. DESIGN WIND PRESSURES SHALL BE USED IN THE DESIGN OF ALL COMPONENTS AND CLADDING ELEMENTS COMPRISING THE BUILDING ENVELOPE.  
2. REFER TO THE WIND PRESSURE DIAGRAM FOR ZONE LOCATIONS AND EXTENTS.  
3. POSITIVE PRESSURES ACT TOWARD COMPONENT SURFACES AND NEGATIVE PRESSURES ACT AWAY FROM COMPONENT SURFACES.  
4. LINEAR INTERPOLATION BETWEEN EFFECTIVE WIND AREAS MAY BE USED TO OBTAIN THE REQUIRED COMPONENT AND CLADDING DESIGN PRESSURE.  
5. OVERHANG SOFFIT PRESSURE EQUALS ADJACENT WALL PRESSURE.



1

ROOF DIAGRAM-C & C PRESSURES - ONE STORY OPTION

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY CMU  
HOME CONCRETE  
ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEEC), PERMITS MANAGEMENT OFFICE (OGPe-DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DEEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

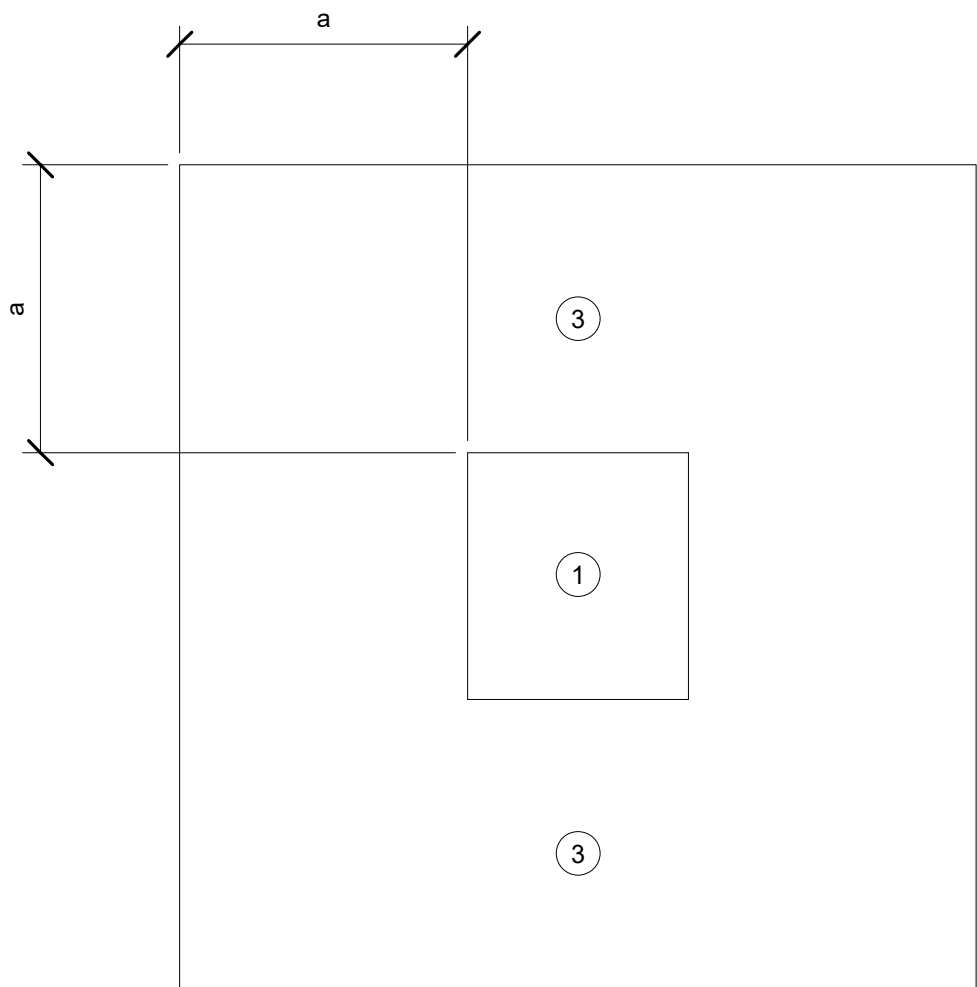
SHEET TITLE:

WIND DIAGRAMS FLAT  
ROOF

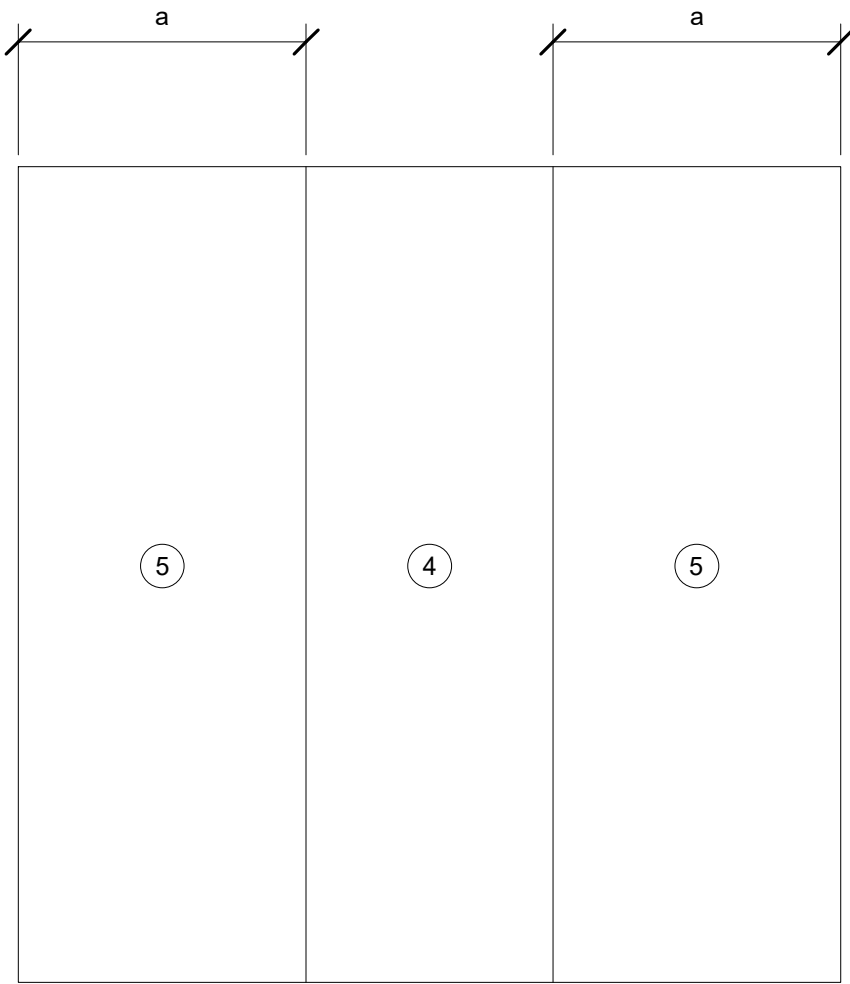
SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	S-003	
QC Review:		
Phase:		

NOT FOR CONSTRUCTION





1 SAFE ROOM C&C DIAGRAM ROOF PLAN  
SCALE: 1/2" = 1'-0"



2 SAFE ROOM C&C ELEVATION  
SCALE: 1/2" = 1'-0"

ULTIMATE C&C WIND PRESSURE (ASCE 7-16)										
BUILDING	a (FT)	Vult (MPH)	Vasd (MPH)	GCpi	Area (SF)	ZONE ① (PSF)	ZONE ② (PSF)	ZONE ③ (PSF)	ZONE ④ (PSF)	ZONE ⑤ (PSF)
SAFE ROOM	3.0	250	193.6	+/- 0.55	<10	+119.1 -315.3	+119.1 -399.3	+119.1 -525.4	+203.2 -203.2	+203.2 -329.3
					20	+114.9 -297.9	+114.9 -377	+114.9 -480.7	+196.5 -209.1	+196.5 -240.2
					50	+109.3 -274.9	+109.3 -347.4	+109.3 -421.7	+187.6 -200.2	+187.6 -222.5
					100	+105.1 -257.5	+105.1 -325.1	+105.1 -377	+180.9 -193.5	+180.9 -209.1
					500+	+105.1 -217.2	+105.1 -273.2	+105.1 -273.2	+165.3 -177.9	+165.3 -177.9

ULTIMATE C&C WIND PRESSURE PLAN NOTES:

- PRESSURES INDICATED ARE ULTIMATE COMPONENTS AND CLADDING PRESSURES, CONVERTED FROM NOMINAL PRESSURES USING A 0.6 MULTIPLIER FACTOR.
- a - INDICATES END ZONE WIDTH IN FT.
- THIS BUILDING PROTOTYPE IS ASSUMED TO HAVE A Kz1 FACTOR OF 1.
- Vult AND Vasd INDICATE ULTIMATE AND NOMINAL DESIGN WIND SPEED IN MPH RESPECTIVELY.
- GROSS PRESSURES SHALL BE LINEARLY INTERPOLATED FOR (A) NOT SHOWN IN TABLE.
- GROSS PRESSURES ARE FOR JOISTS, WINDOWS, DOORS, VENEER, LIGHT GAGE METAL FRAMING, METAL DECK ATTACHMENTS, ROOFING, ROOFING ACCESSORIES AND OTHER BUILDING COMPONENTS AND CLADDING.
- POSITIVE PRESSURES INDICATE PRESSURES ACTING TOWARD A PROJECTED SURFACE. NEGATIVE PRESSURES INDICATE PRESSURES ACTING AWAY FROM A PROJECTED SURFACE.
- ROOF ZONES INCLUDING END CONDITIONS ARE DENOTED AS ① THRU ③
- WALL ZONES INCLUDING END CONDITIONS ARE DENOTED AS ④ AND ⑤
- OVERHANG ZONES ②H AND ③H APPLY ONLY TO ROOF OVERHANGS WHERE THE COMPONENT OR CLADDING RECEIVES PRESSURE SIMULTANEOUSLY ON BOTH SIDES (UPWARD SUCTION ON TOP AND UPWARD PRESSURE ON BOTTOM, SUCH AS AT OPEN SOFFITS), AND IS CONTINUOUS WITH FIELD OF ROOF.
- NET DESIGN ROOF PRESSURES SHALL BE CALCULATED USING THE SELFWEIGHT (DEAD LOAD) OF THE MATERIALS. THE MAXIMUM REDUCTION OF GROSS WIND UPLIFT PRESSURES SHALL BE LIMITED TO THE SELF WEIGHT OF THE ROOF SYSTEM PLUS 5 PSF MAXIMUM FOR SUPERIMPOSED DEAD LOADS.

WINDOWS/DOORS PERFORMANCE REQUIREMENTS:

PROVIDE WINDOW, DOOR AND FRAME SYSTEMS AS SHOWN ON THE ARCHITECTURAL DRAWINGS WHICH COMPLY WITH THE DESIGN PRESSURES LISTED HEREIN.

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DDEC), PERMITS MANAGEMENT OFFICE (OGPe-DDEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DDEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

## SAFE ROOM WIND DIAGRAMS

SHEET INFORMATION:

JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	S-004	
QC Review:		
Phase:		

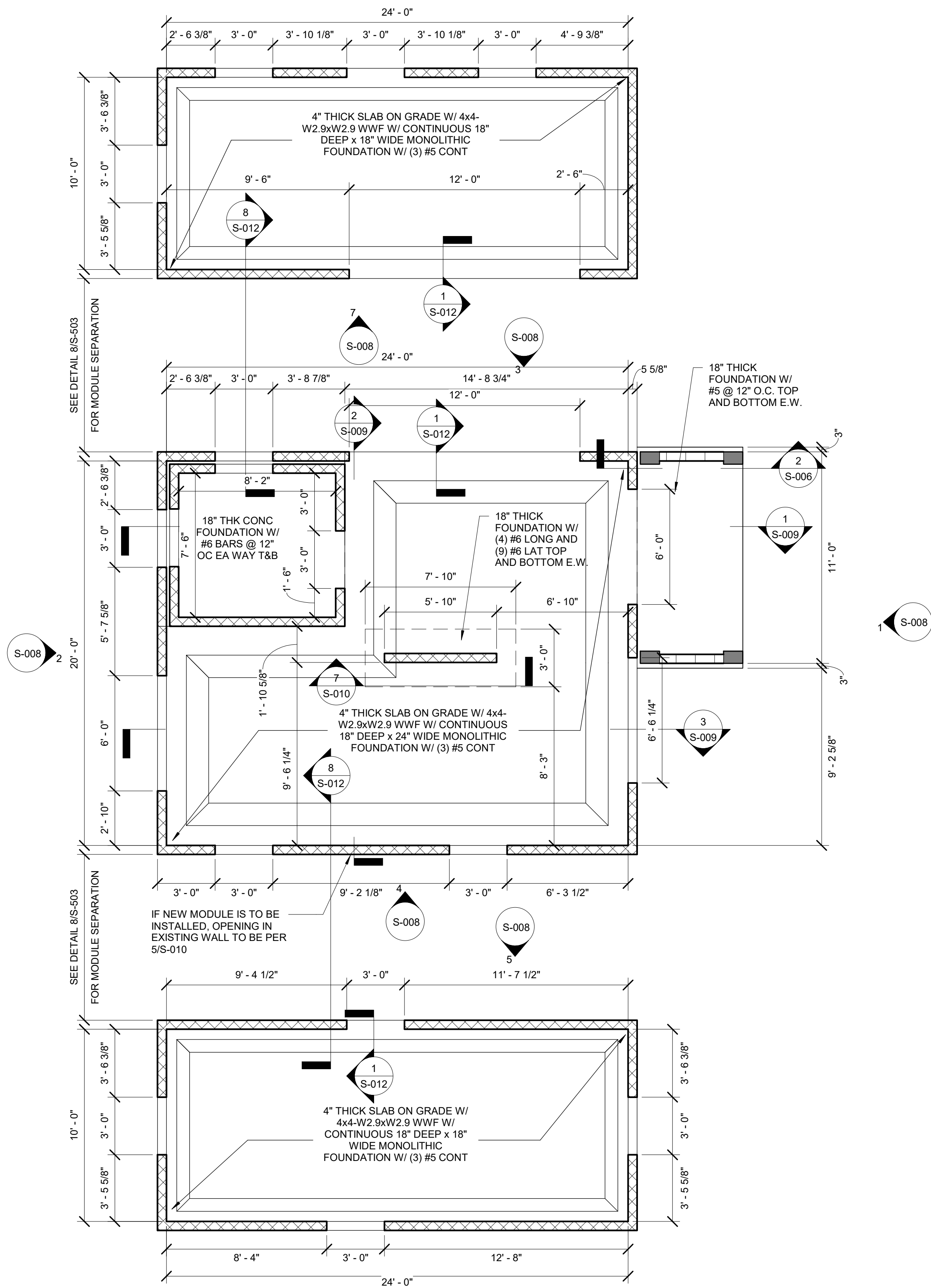
NOT FOR CONSTRUCTION



FUTURE MODULE

MAIN STRUCTURE

FUTURE MODULE



1 FOUNDATION PLAN  
SCALE: 1/4" = 1'-0"

FOUNDATION PLAN NOTES

1. REFER TO GENERAL STRUCTURAL NOTES AND PROJECT SPECIFICATIONS FOR DEFINITION OF SYMBOLS, ABBREVIATIONS, AND OTHER INFORMATION AND CRITERIA NOT SHOWN ON PLAN.
2. FOUNDATION SIZES INDICATED ARE BASED ON THE SUBSURFACE RECOMMENDATIONS PROVIDED BY THE GEOTECHNICAL ENGINEER FOR THE PROJECT. REFER TO STRUCTURAL GENERAL NOTES FOR ADDITIONAL INFORMATION.
3. VERIFY DIMENSIONS, ELEVATIONS, DEPRESSIONS, DRAIN LOCATIONS, FINISHES AND LIMITS THEREOF, AND INFORMATION NOT EXPLICITLY INDICATED ON STRUCTURAL DRAWINGS WITH THE DRAWINGS OF OTHER DISCIPLINES PRIOR TO CONSTRUCTION.
4. COLUMN CENTERLINES SHALL COINCIDE WITH FOUNDATION CENTERLINES UNLESS NOTED OTHERWISE ON PLAN, SECTIONS, AND DETAILS.
5. ALL REINFORCING IN FOUNDATION AND SLAB CORNERS, INTERSECTIONS, TEES, AND CHANGES IN DIRECTION SHALL BE CONTINUOUS AND CORNER REINFORCING SHALL BE PROVIDED AND LAPPED.
6. CONCRETE SLAB ON GRADE CONTROL JOINTS SHALL NOT EXCEED A MAXIMUM SPACING OF 10'-0" O.C. EACH WAY. SEE TYPICAL DETAIL FOR ADDITIONAL INFORMATION.

CONSULTANT:

CLIENT:

PROJECT NAME:

ONE STORY CMU  
HOME CONCRETE  
ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEEC), PERMITS MANAGEMENT OFFICE (OGP+DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DEEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

FOUNDATION PLAN

SHEET INFORMATION:

JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	S-005
Checked By:		
QC Review:		
Phase:		

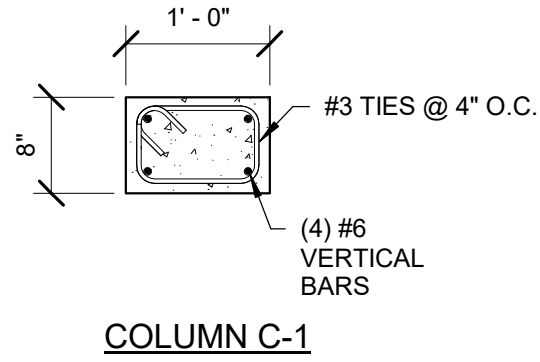
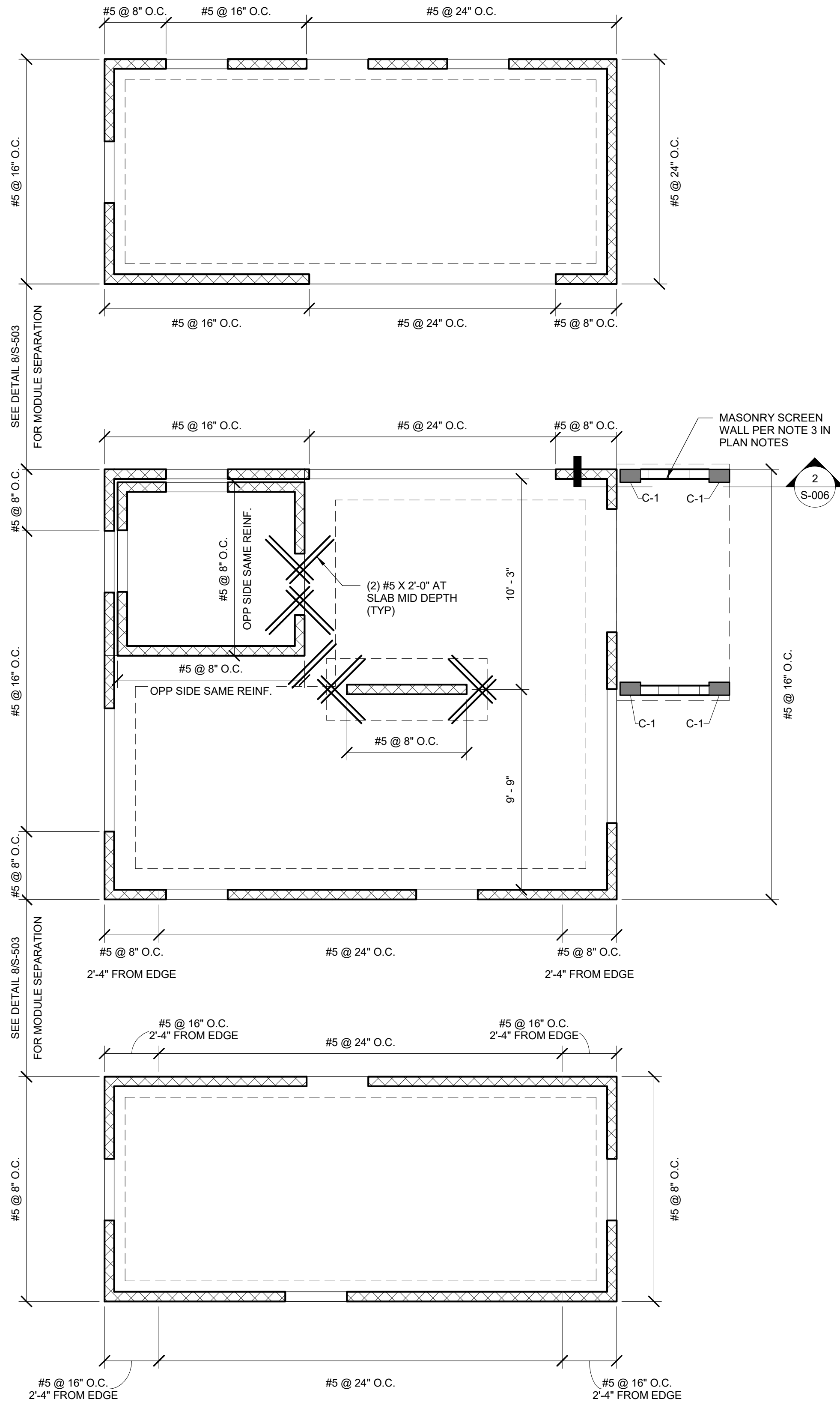
NOT FOR CONSTRUCTION



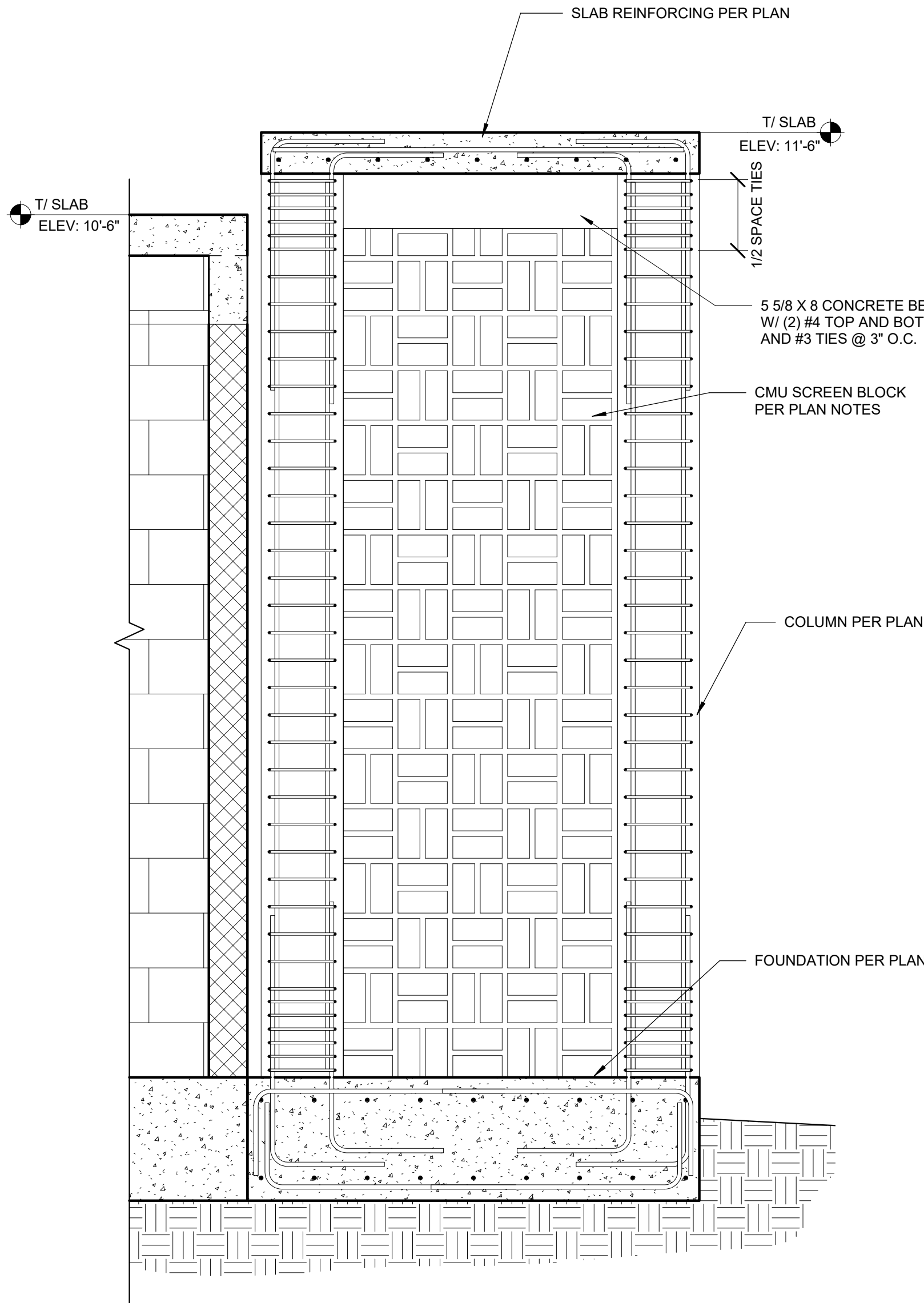
FUTURE MODULE

MAIN STRUCTURE

FUTURE MODULE



SLAB PLAN NOTES	
1.	ALL MASONRY WALLS TO BE NOMINAL 6" WIDE BLOCK U.N.O.
2.	FOR ADDITIONAL FOUNDATION INFORMATION SEE FOUNDATION PLAN SHEET
3.	SCREEN BLOCK TO HAVE MINIMUM 30% OPEN AREA AND A MINIMUM OF 2000 PSI NET AREA COMPRESSIVE STRENGTH. PROVIDE 9 GA TRUSS TYPE JOINT REINFORCEMENT AT EVERY COURSE AND EXTEND INTO COLUMNS 4" MINIMUM.
4.	ALL MASONRY TO BE FULLY GROUTED



1 SLAB PLAN  
SCALE: 1/4" = 1'-0"

2 ENTRY FRAMING  
SCALE: 3/4" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEEC), PERMITS MANAGEMENT OFFICE (OGP+DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DEEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

## WALL FRAMING PLAN

SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	S-006
Checked By:		
QC Review:		
Phase:		

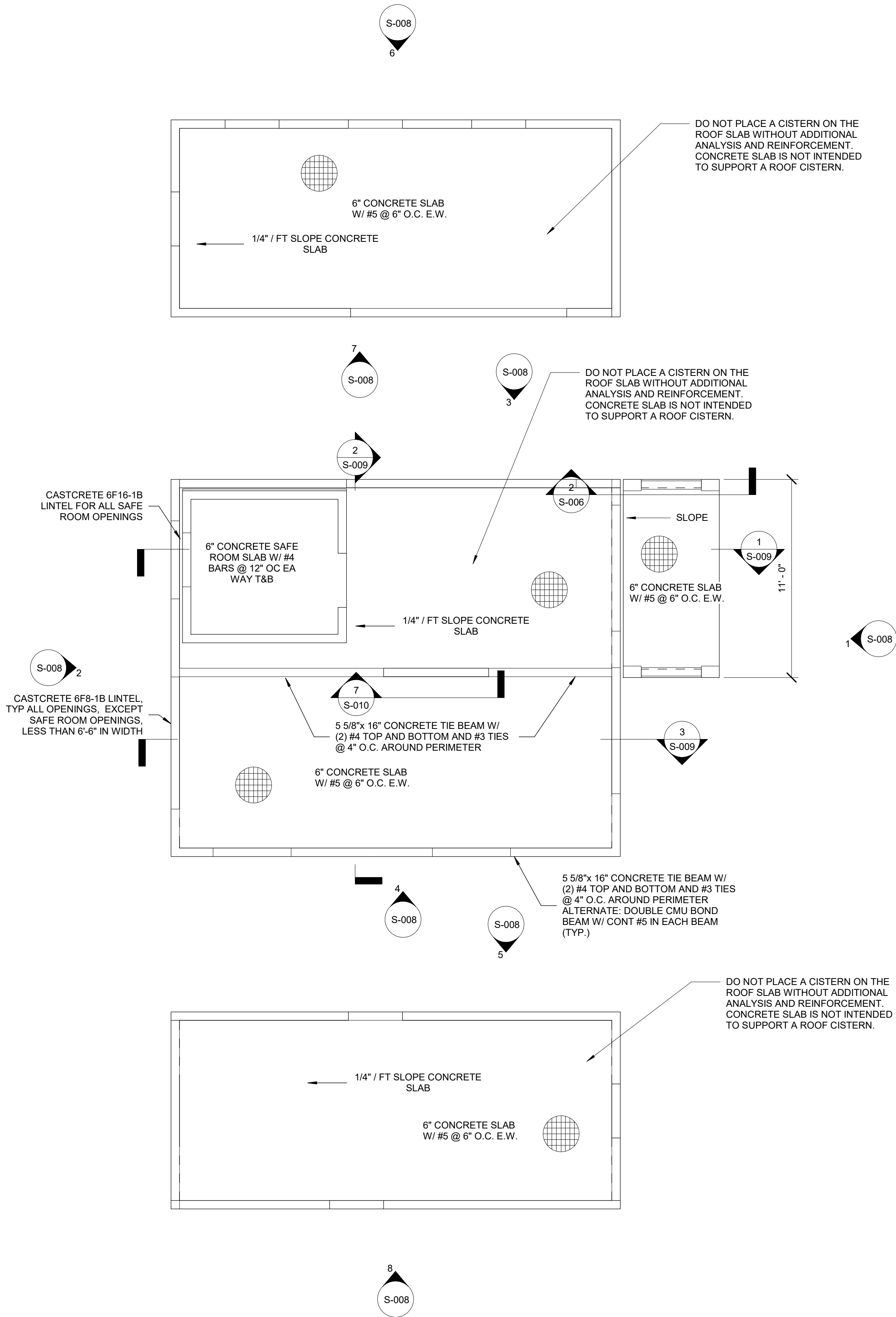
NOT FOR CONSTRUCTION



FUTURE MODULE

MAIN STRUCTURE

FUTURE MODULE



- ROOF FRAMING PLAN NOTES**
1. ROOF CONSTRUCTION "ROOFING" COORDINATE WITH ARCHITECTURAL DRAWINGS.
  2. VERIFY ROOF SLOPE WITH ARCHITECTURAL DRAWINGS PRIOR TO FABRICATION AND CONSTRUCTION.
  3. ROOF FASTENER DECKING PATTERN, SEE DETAIL.
  4. SEE GENERAL NOTES FOR ADDITIONAL BOND BEAMS AT 4'-0".
  5. STAGGER MODULE ROOF TRUSSES TO AVOID CONFLICT WITH PRIMARY ROOF TRUSSES

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (ODEC), PERMITS MANAGEMENT OFFICE (OGPe-DEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY ODEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

## FLAT ROOF FRAMING PLAN

SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	<b>S-007</b>	
QC Review:		
Phase:		

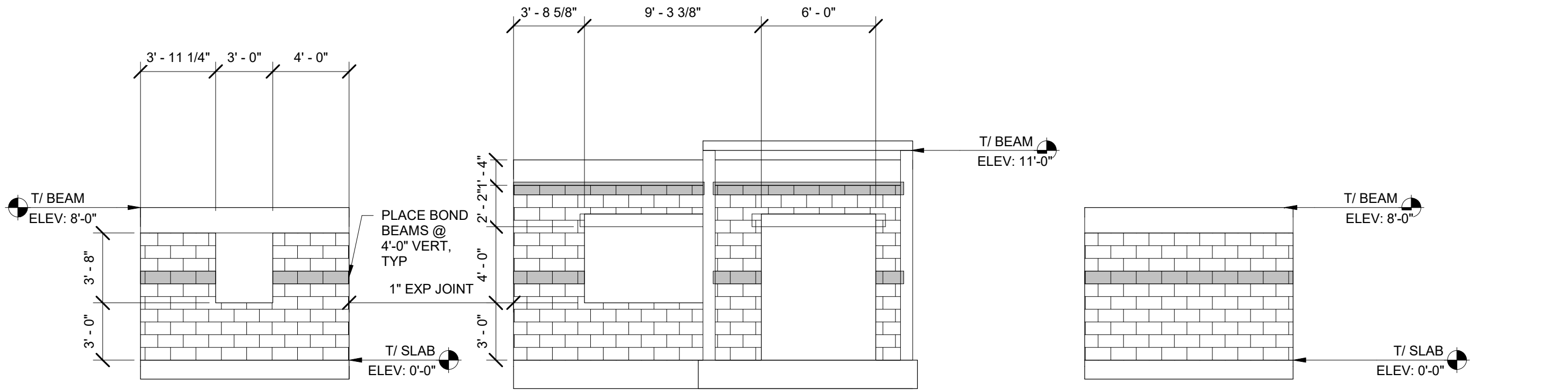
1

## CONCRETE ROOF FRAMING PLAN

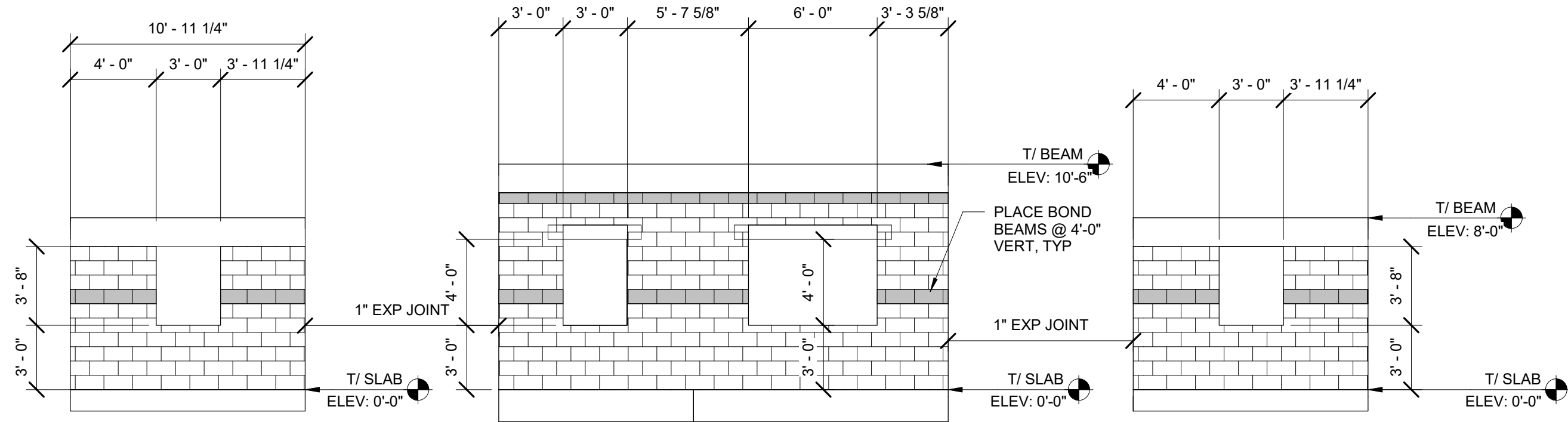
SCALE: 1/4" = 1'-0"

NOT FOR CONSTRUCTION

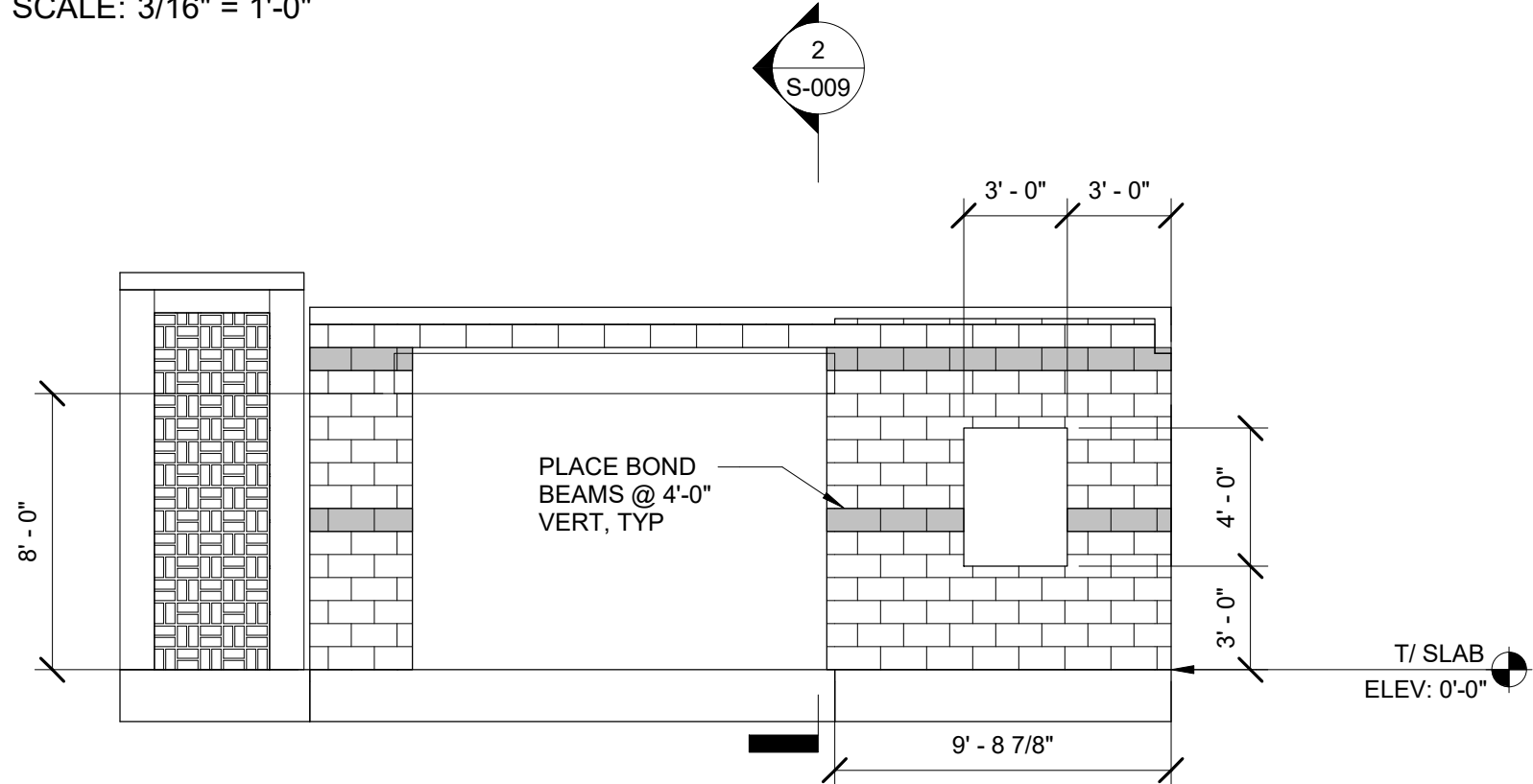




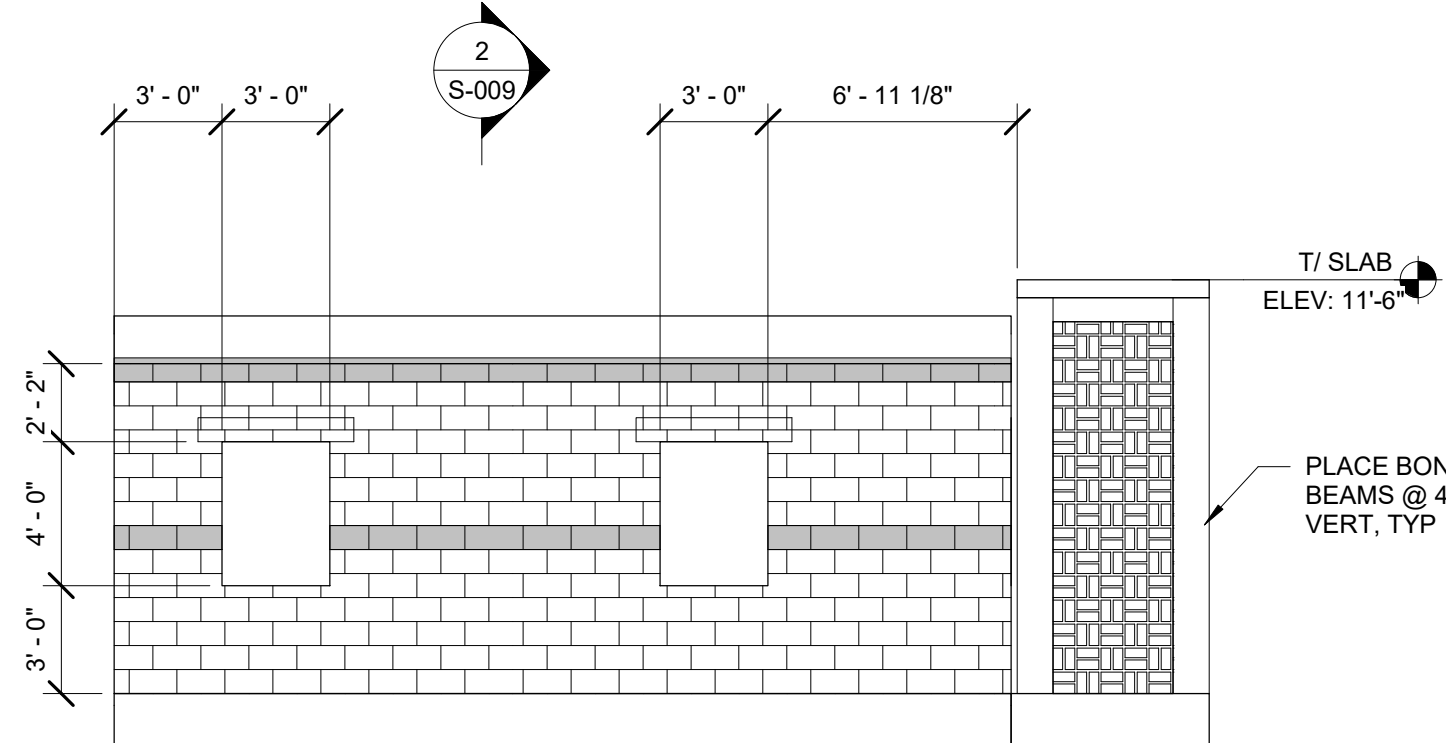
**1 FRONT ELEVATION OF STRUCTURE AND FUTURE MODULE 1 & 2**  
SCALE: 3/16" = 1'-0"



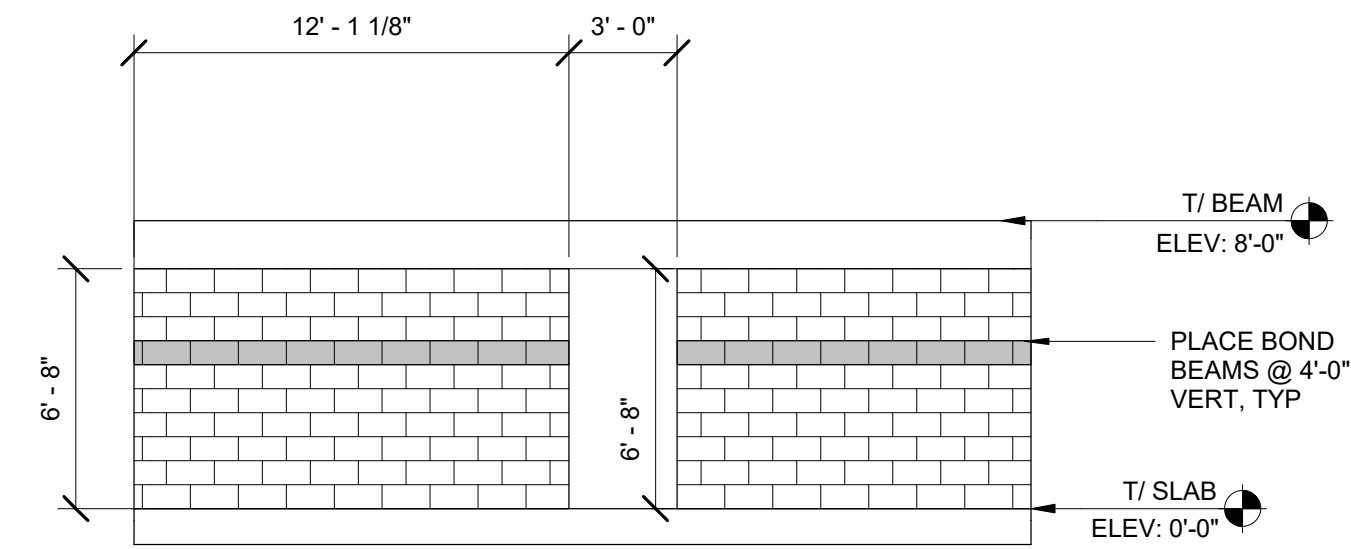
**2 REAR STRUCTURE AND FUTURE MODULE 1 & 2 ELEVATIONS**  
SCALE: 3/16" = 1'-0"



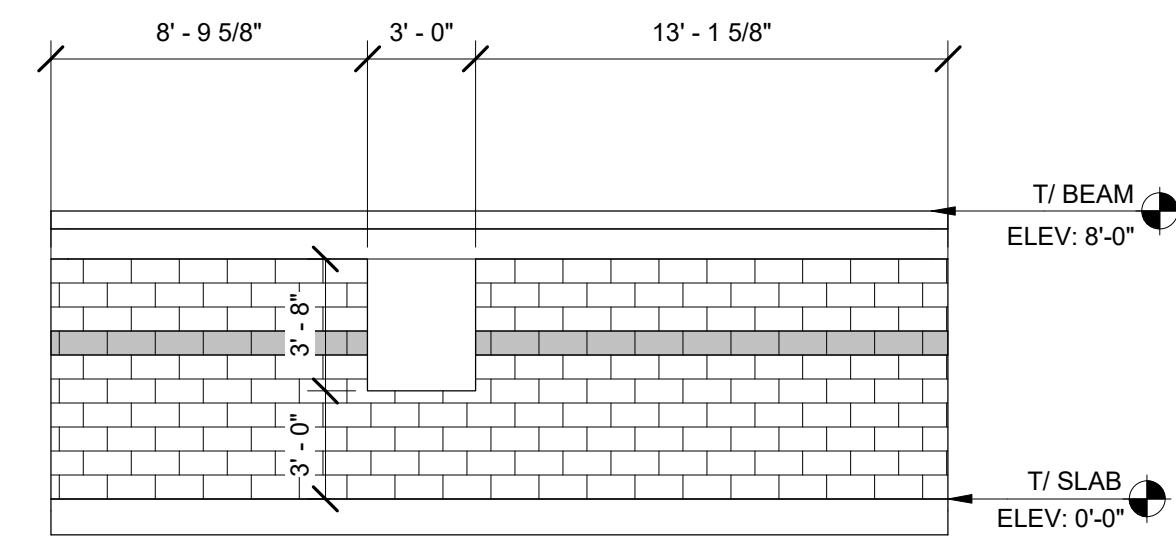
**3 RIGHT STRUCTURE ELEVATION**  
SCALE: 3/16" = 1'-0"



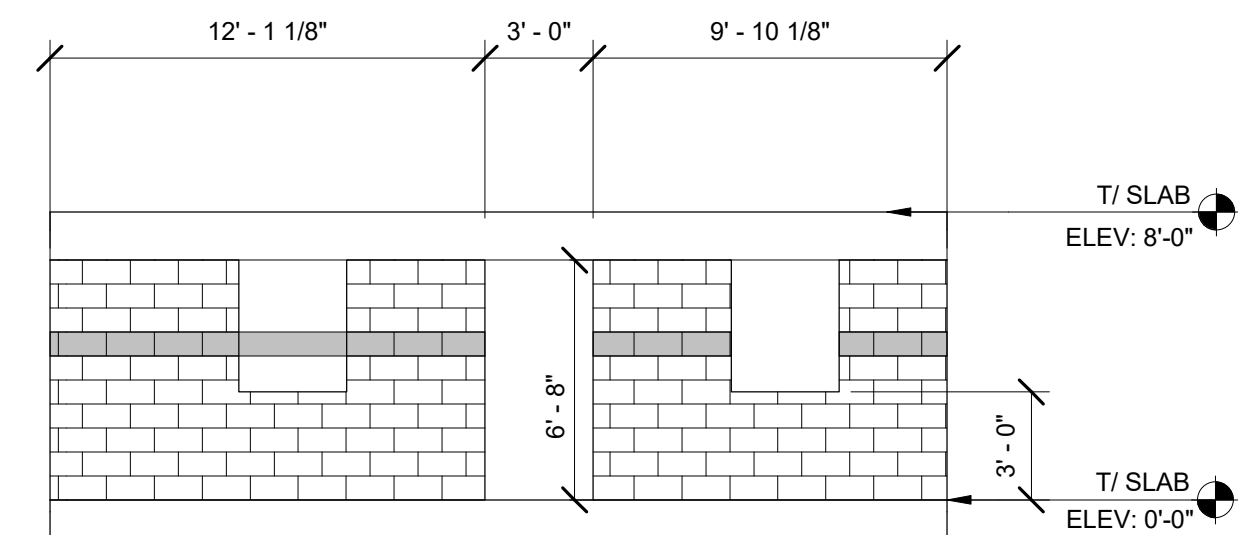
**4 LEFT STRUCTURE ELEVATION**  
SCALE: 3/16" = 1'-0"



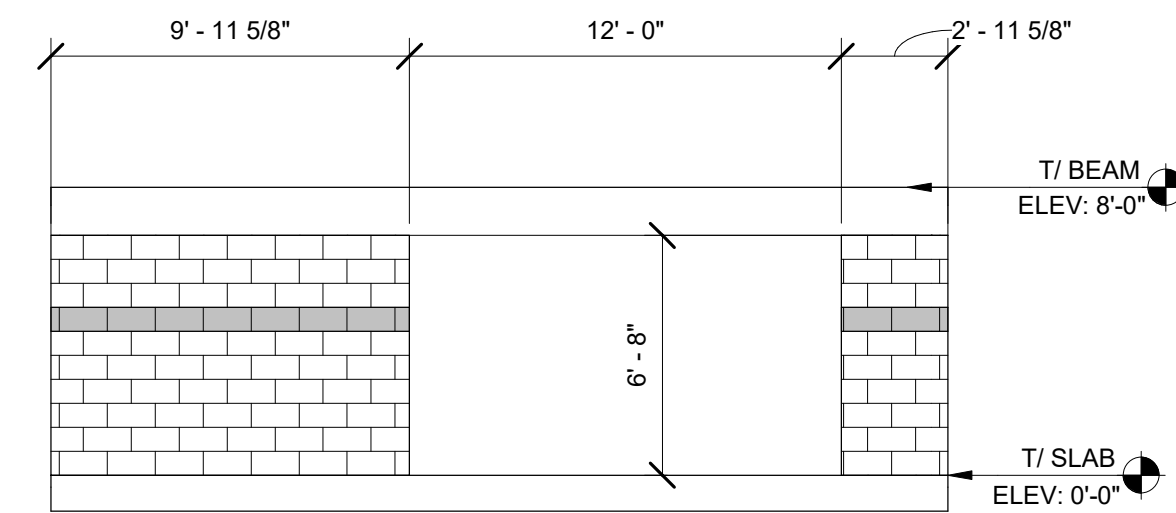
**5 FUTURE MODULE 1 RIGHT ELEVATION**  
SCALE: 3/16" = 1'-0"



**8 FUTURE MODULE 1 LEFT ELEVATION**  
SCALE: 3/16" = 1'-0"



**6 FUTURE MODULE 2 RIGHT ELEVATION**  
SCALE: 3/16" = 1'-0"



**7 FUTURE MODULE 2 LEFT ELEVATION**  
SCALE: 3/16" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEEC), PERMITS MANAGEMENT OFFICE (OGPe-DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DEEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

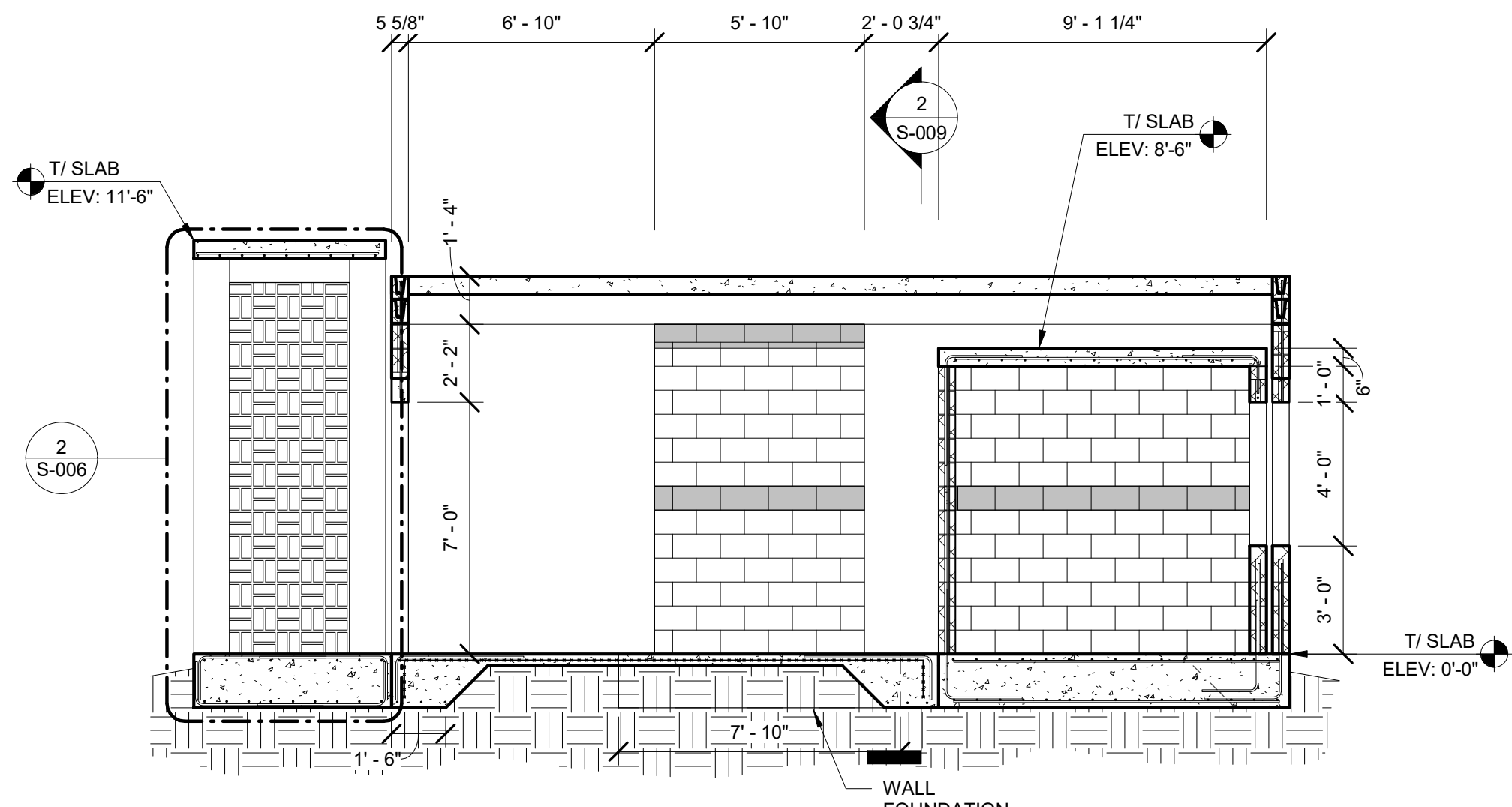
SHEET TITLE:

ELEVATIONS

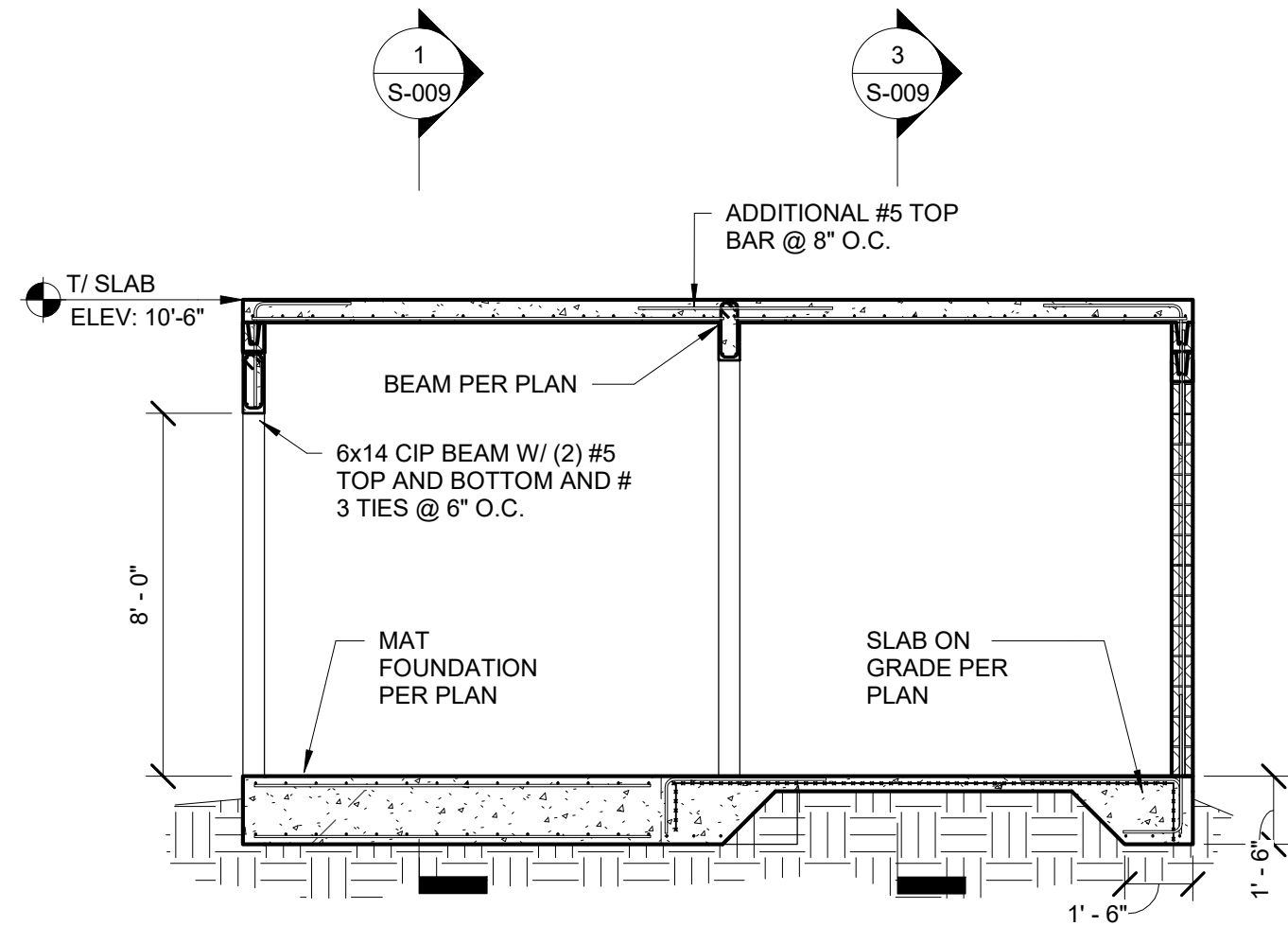
SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	<b>S-008</b>	
QC Review:		
Phase:		

NOT FOR CONSTRUCTION

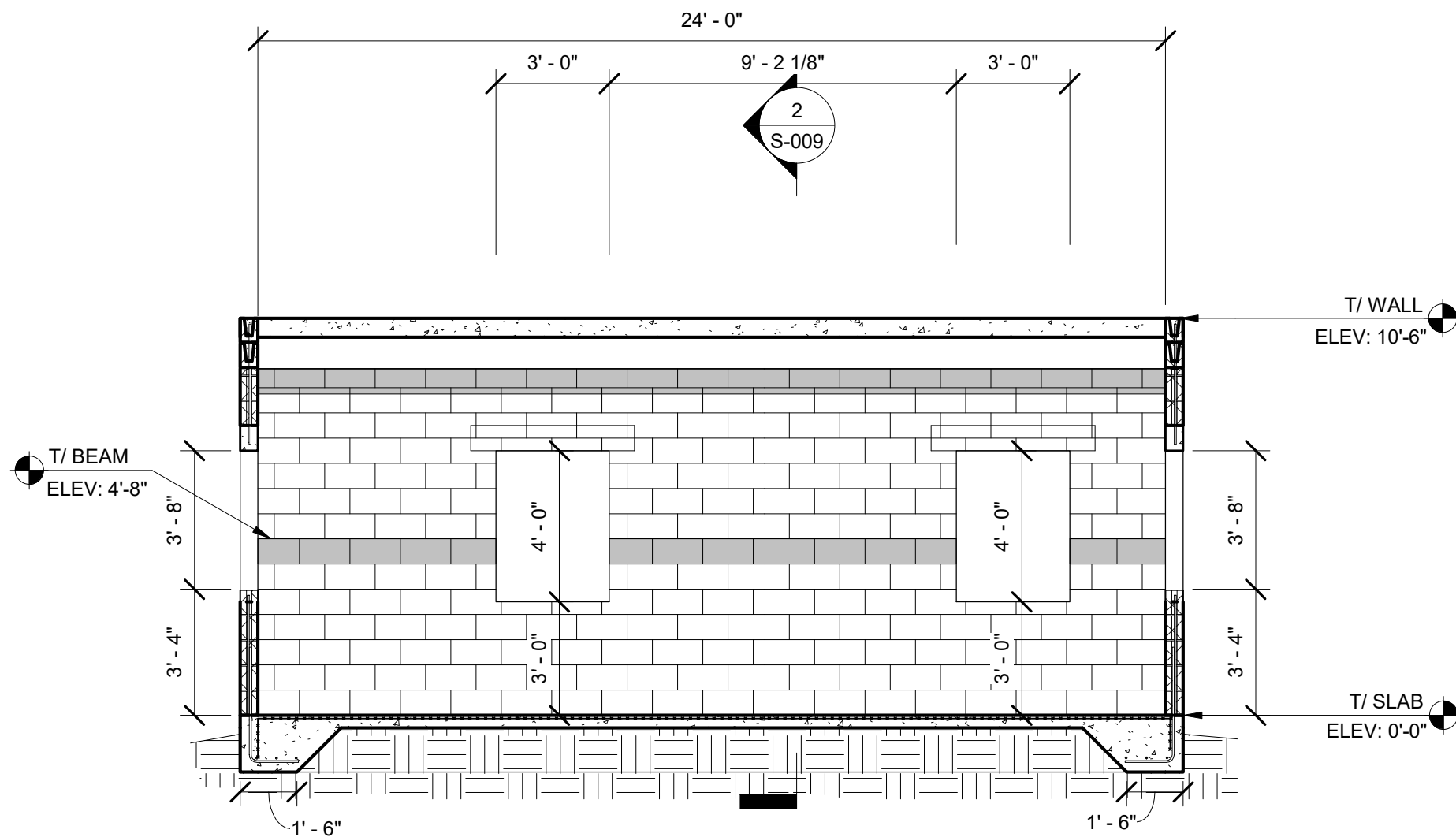




1 INTERIOR SECTION 1  
SCALE: 1/4" = 1'-0"



2 INTERIOR SECTION 2  
SCALE: 1/4" = 1'-0"



3 INTERIOR SECTION 3  
SCALE: 1/4" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DEEC), PERMITS MANAGEMENT OFFICE (OGPe-DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DEEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG		
No.	Date	Description

PROFESSIONAL SEALS:

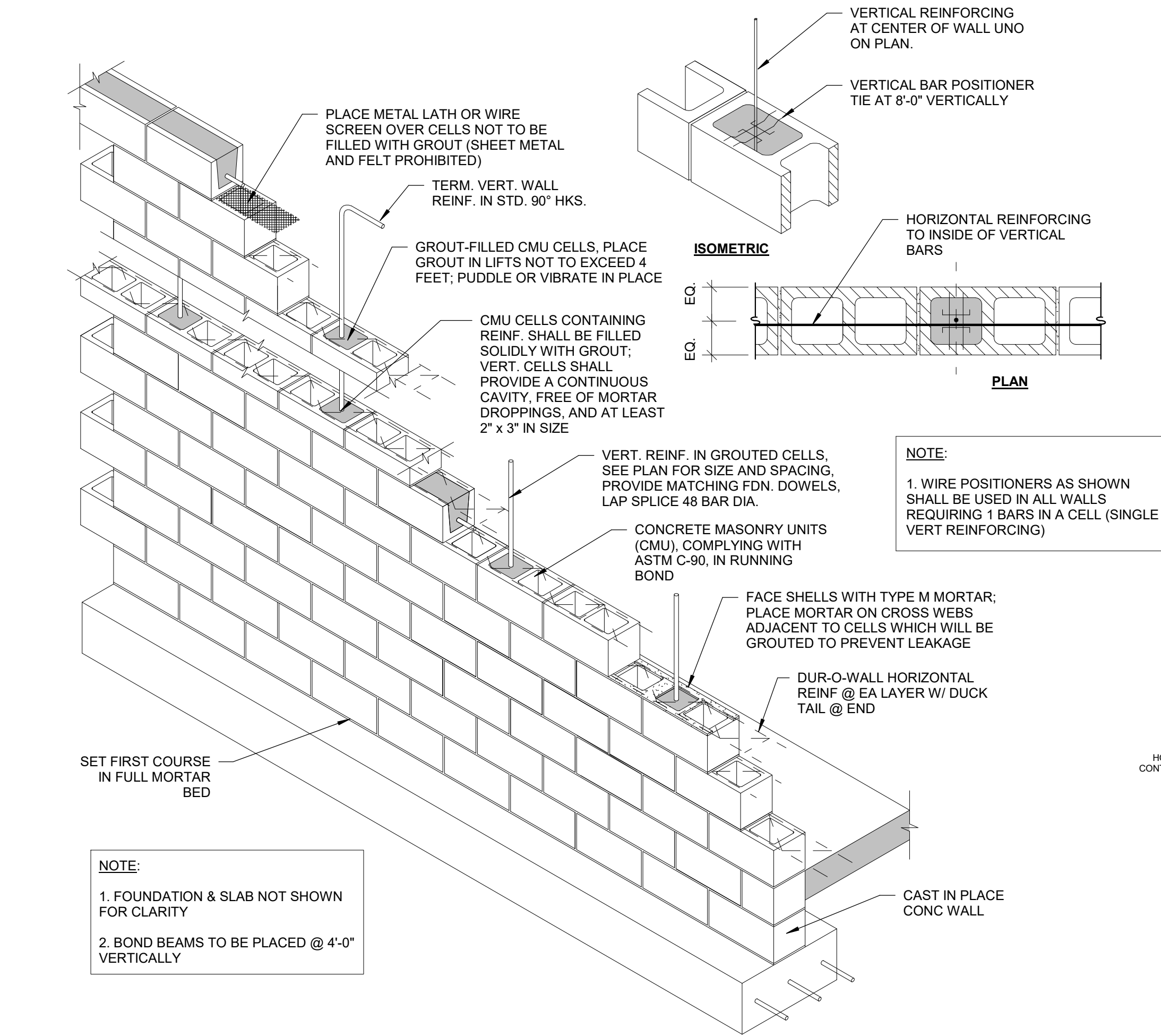
SHEET TITLE:

## SECTIONS

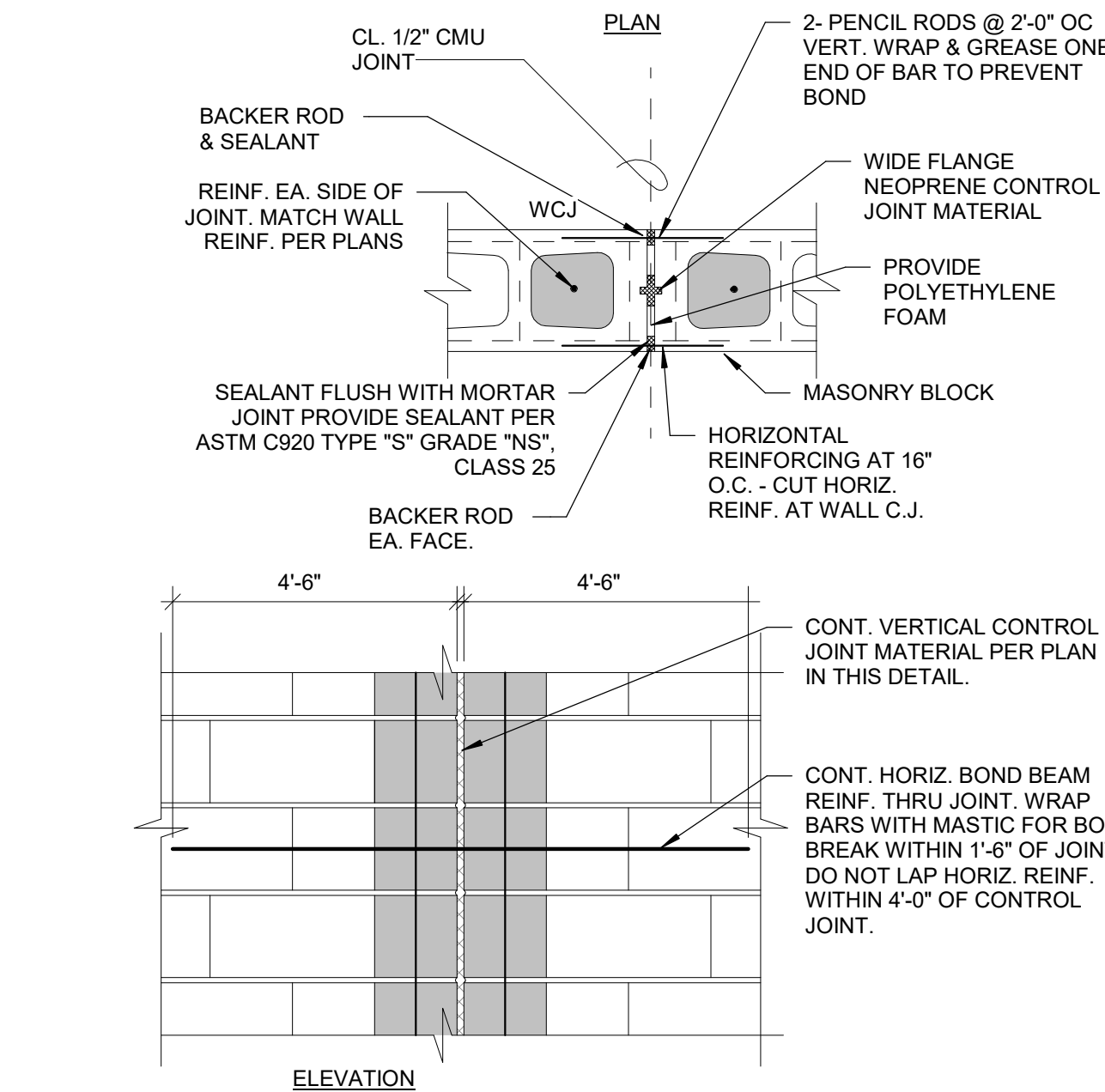
SHEET INFORMATION:		
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	
Checked By:	S-009	
QC Review:		
Phase:		

NOT FOR CONSTRUCTION

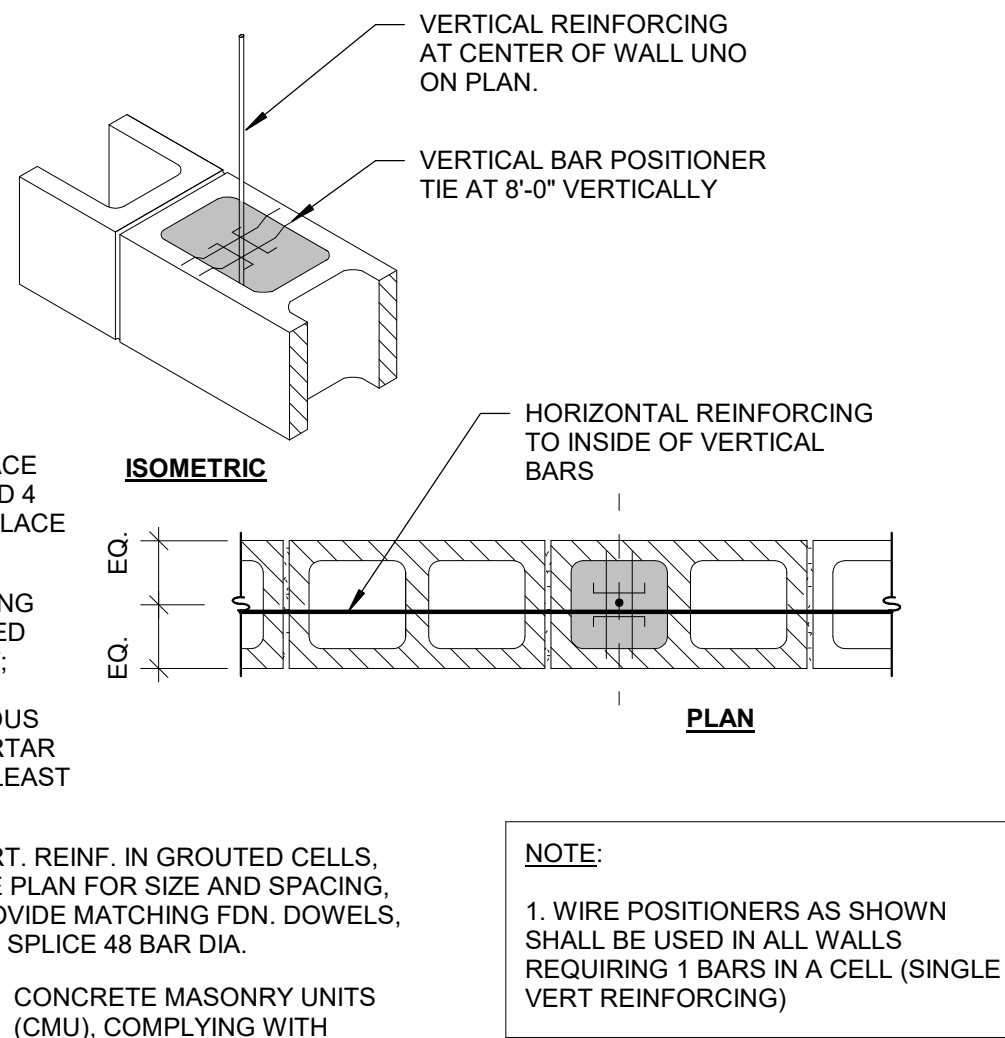




1 TYP. REINF. MASONRY WALL CONSTRUCTION  
3/4" = 1'-0"



6 MASONRY CONTROL JOINT (MCJ)  
3/4" = 1'-0"



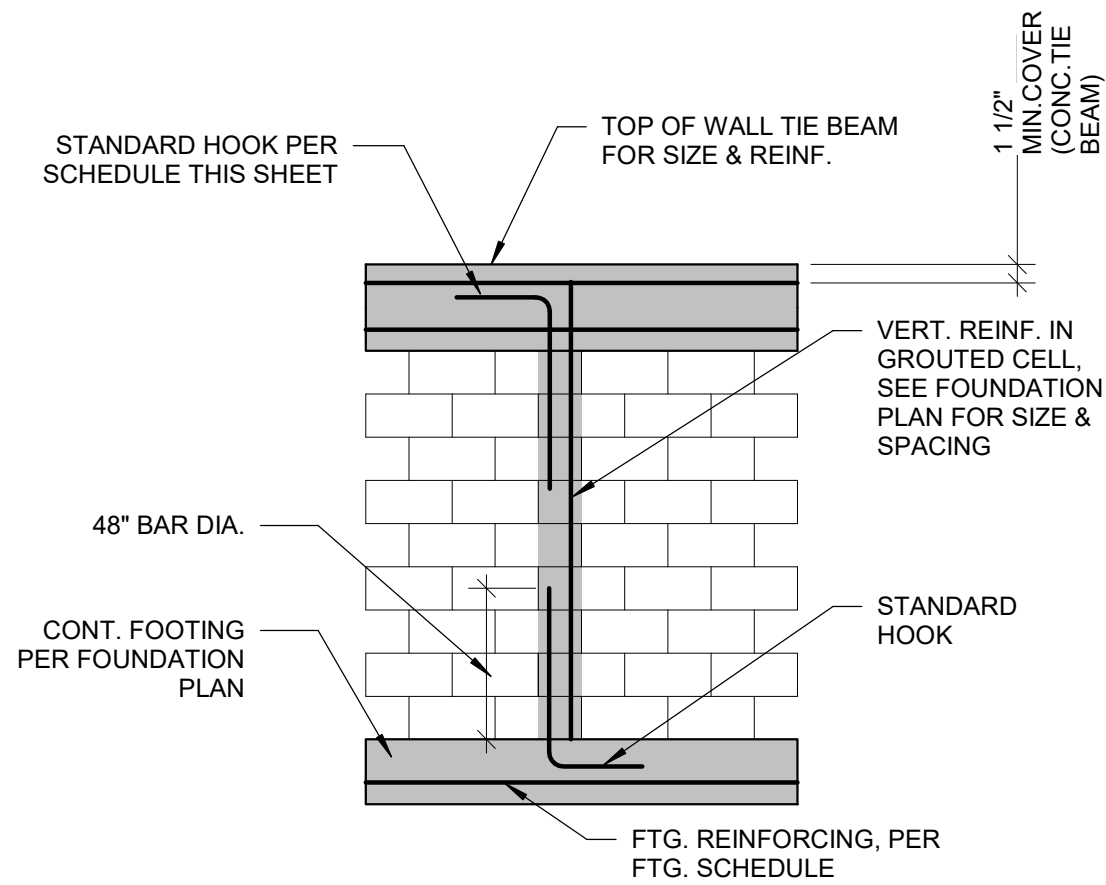
2 TEE WALL INTERSECTION  
3/4" = 1'-0"

CMU LINTEL/JAMB SCHEDULE					
MAX OPENING SPAN	CMU WIDTH	① HORIZONTAL BOT. REINF.	② HORIZONTAL TOP REINF.	③ SHEAR REINF.	④ MIN. ADJACENT REINF. JAMB CELLS (1 VERT.) PER CELL
OPNG. ≤ 4'-0"	6"	(1) #5 BOT.	N/A	N/A	8" (1) #5
4'-0" < OPNG. ≤ 6'-0"	6"	(1) #5 BOT.	N/A	N/A	16" (2) #5
6'-0" < OPNG. ≤ 8'-0"	6"	(1) #5 BOT.	(1) #5 TOP	SINGLE LEG #5 AT 7" C/C	16" (2) #6

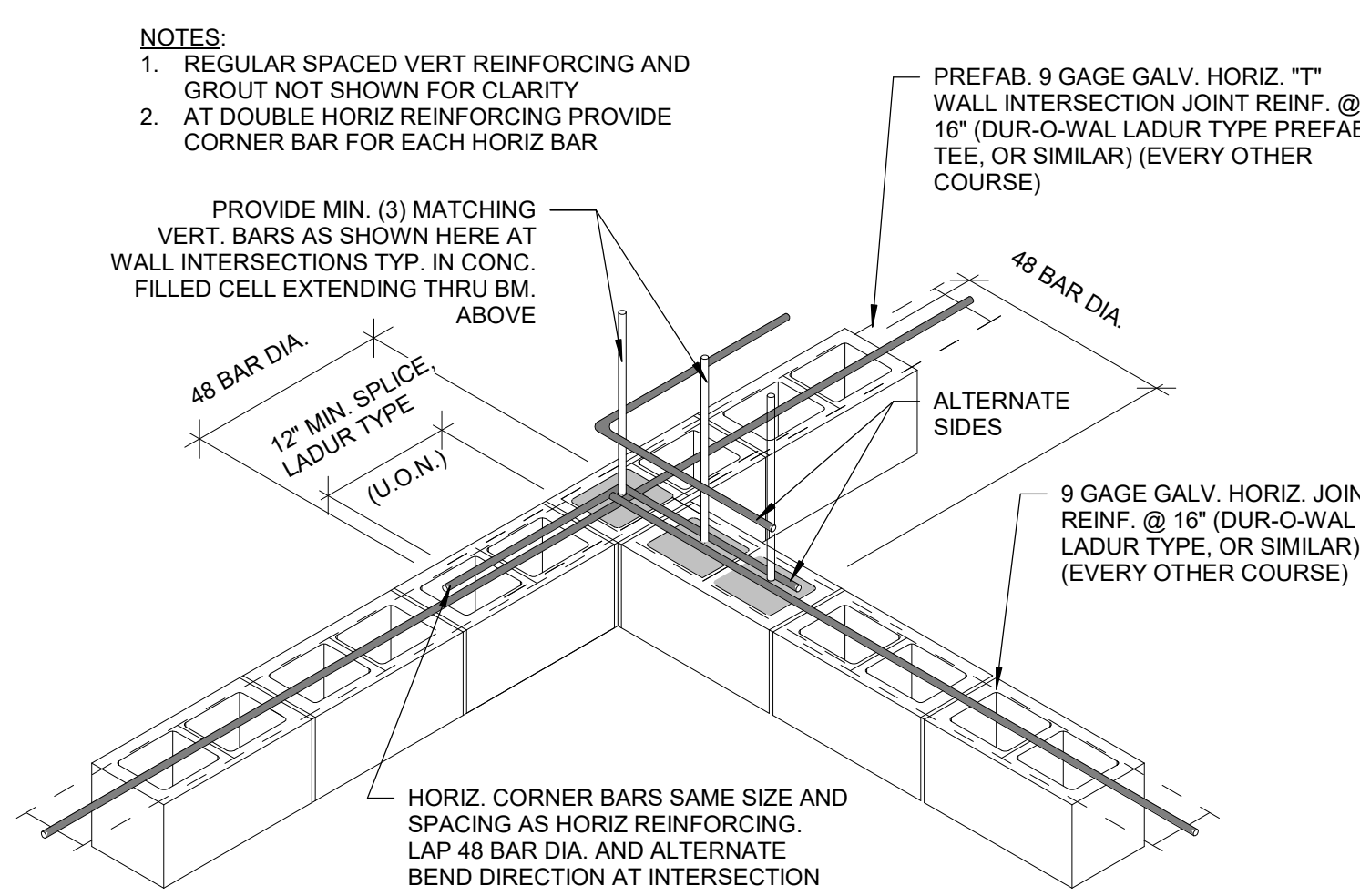
NOTES:

- #6 VERT. SHALL START ABOVE FOOTING WITH A MINIMUM LAP LENGTH OF 50".
- ALL CMU LINTEL BEAMS ABOVE BOTTOM COURSE SHALL BE CONSTRUCTED OF OPEN BOTTOM LINTEL UNITS, OR STRETCHER COURSES WITH 1/2" WEB CUT OUT.
- COORDINATE W/ SECTIONS, DETAILS, & GENERAL NOTES.
- PROVIDE THE SAME REINFORCEMENT AND PLACEMENT FOR CONCRETE WALL OPENINGS.

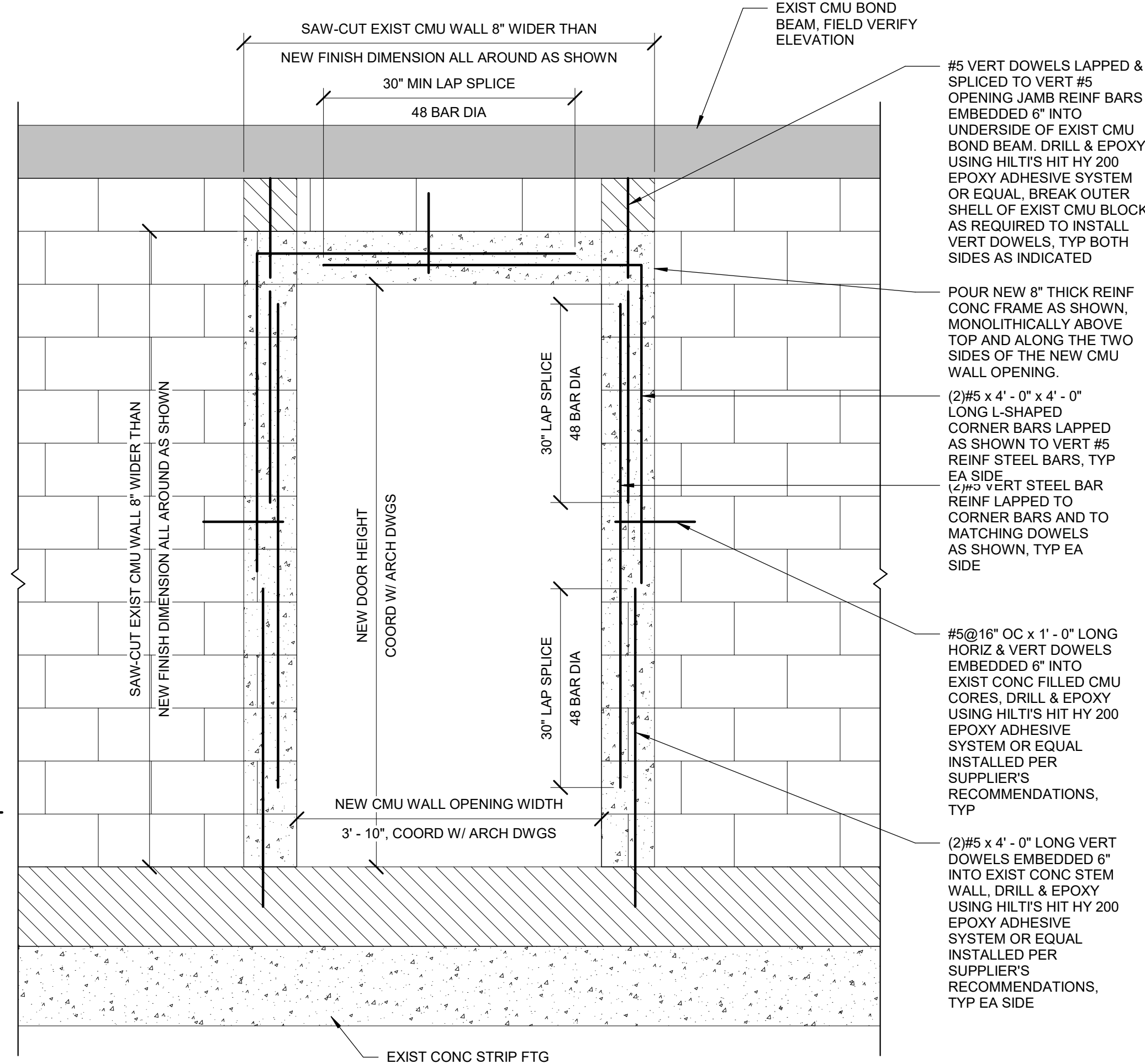
4 CMU LINTEL/JAMB SCHEDULE  
SCALE: 3/4" = 1'-0"



7 TYP. ONE STORY MASONRY WALL  
3/4" = 1'-0"



3 TYP. REINF. CORNER DETAIL  
3/4" = 1'-0"



5 TYP. OPENING IN EXISTING WALL DETAIL  
SCALE: 3/4" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (ODEC), PERMITS MANAGEMENT OFFICE (OPe-DEEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY ODEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

TYPICAL DETAILS

SHEET INFORMATION:

JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	S-010
Checked By:		
QC Review:		
Phase:		

NOT FOR CONSTRUCTION



BAR SIZE	BEND DIAMETER, d <sub>b</sub> (IN)	MINIMUM INSIDE DIAMETER OF BEND (IN)	180 DEGREE HOOK 4d <sub>b</sub> EXTENSION (IN)	STIRRUPS & TIES, 6d <sub>b</sub> EXTENSION (IN)	90 DEGREE HOOK, 12d <sub>b</sub> EXTENSION (IN)	EQUIVALENT EMBEDMENT LENGTH, l <sub>e</sub> , 13d <sub>b</sub> (IN)
# 3	12	-	12	-	12	-
# 4	20	-	15	-	15	-
# 5	32	-	23	-	23	-
# 6	54	29	43	27	43	27
# 7	NP	-	60	32	60	32
# 8	NP	-	72	50	72	50
# 9	NP	-	NP	-	NP	-

TABLE A - REINFORCEMENT TENSION LAPS, EMBEDMENT AND HOOK LENGTHS						NOTES FOR USE WITH TABLE A
f <sub>w</sub> = 60000psi      f <sub>c</sub> = 4000psi						
BAR SIZE	CLASS "A" LAP		CLASS "B" LAP		HOOKS	
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS		
#3	19	15	24	19	6	
#4	25	19	32	25	8	
#5	31	24	40	31	10	
#6	37	29	48	37	12	
#7	54	42	70	54	14	

1. LENGTH SHOWN CONFORM TO NON-SEISMIC PROVISIONS OF ACI 318 FOR UNCOATED BARS ENCLOSED BY PROPERLY SPACED TIES OR STIRRUPS.

2. CLASS "A" LAPS APPLY WHEN BAR LAPS ARE STAGGERED TO LAP HALF THE BARS AT ONE LOCATION OR WHEN BARS ARE LAPPED AT THE LOCATION OF MINIMUM STRESS IN THE BARS.

3. CLASS "B" LAPS APPLY WHEN ALL BARS ARE LAPPED AT A LOCATION OF MAXIMUM STRESS IN THE BARS.

4. TOP BARS SHALL BE DEFINED AS ANY HORIZONTAL BARS PLACED SUCH THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE BARS IN ANY SINGLE POUR.

5. LAP AND EMBEDMENT LENGTHS HAVE THE SAME VALUE.

6. CLEAR SPACING OF REINFORCING SHALL NOT BE LESS THAN 1" OR 1 BAR DIAMETER. IF THE CLEAR SPACING IS LESS THAN SPECIFIED, MULTIPLY THE ABOVE LENGTHS BY 1.5.

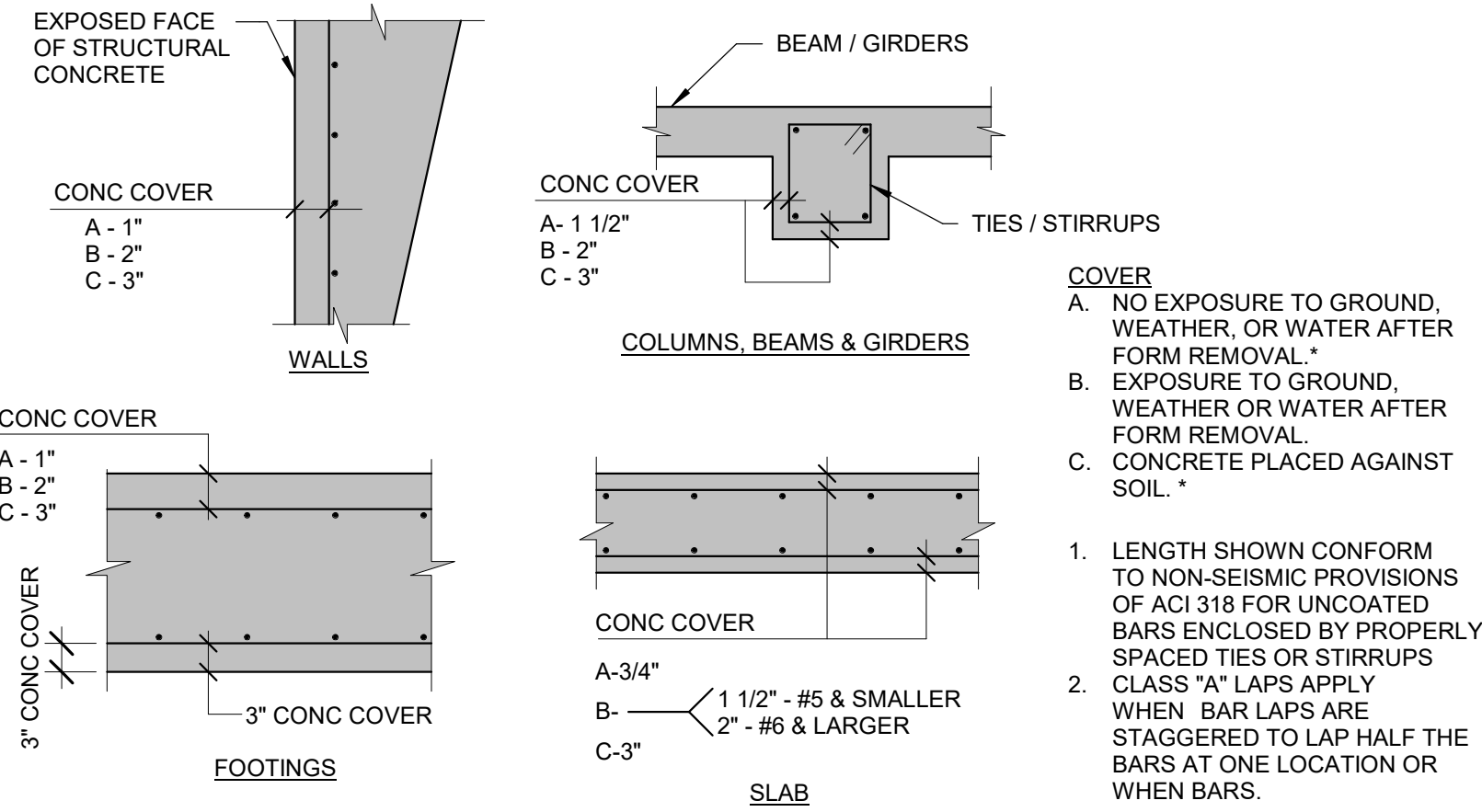
7. CLEAR COVER FOR REINFORCING SHALL NOT BE LESS THAN 1 BAR DIAMETER OR AS SPECIFIED IN SECTION 7.7 OF ACI 318. IF THE CLEAR COVER IS LESS THAN SPECIFIED, MULTIPLY THE ABOVE LENGTHS BY 1.5.

8. MULTIPLY THE ABOVE LENGTHS BY 1.3 FOR CONCRETE WITH LIGHTWEIGHT AGGREGATE.

9. MULTIPLY THE ABOVE LENGTHS BY 1.5 FOR EPOXY COATED REINFORCING.

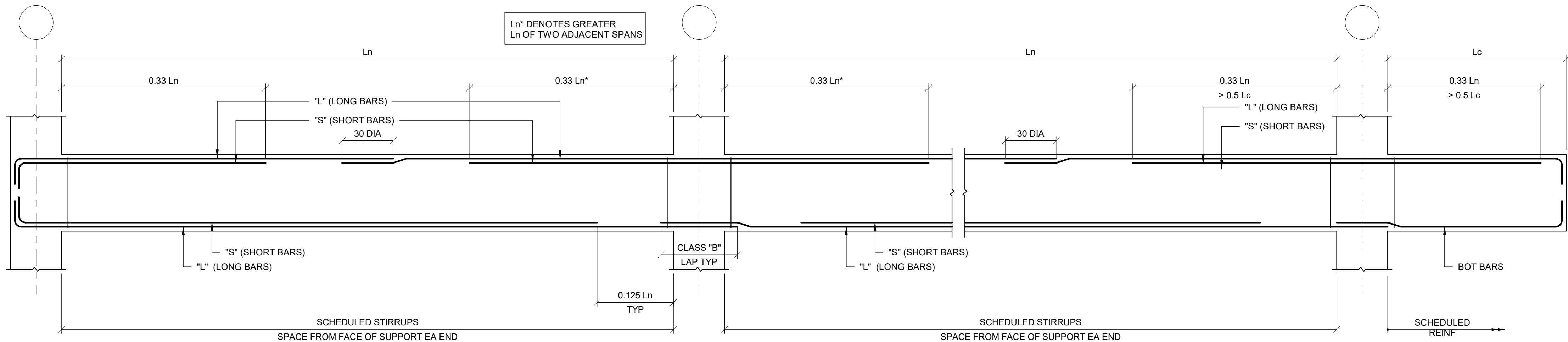
10. FOR CONCRETE STRENGTHS OTHER THAN 4000 PSI, MULTIPLY ABOVE LENGTHS BY 4000 / f<sub>c</sub>.

11. UNLESS NOTED OTHERWISE ALL FOOTING REINFCING BARS SHALL LAP AROUND CORNERS.

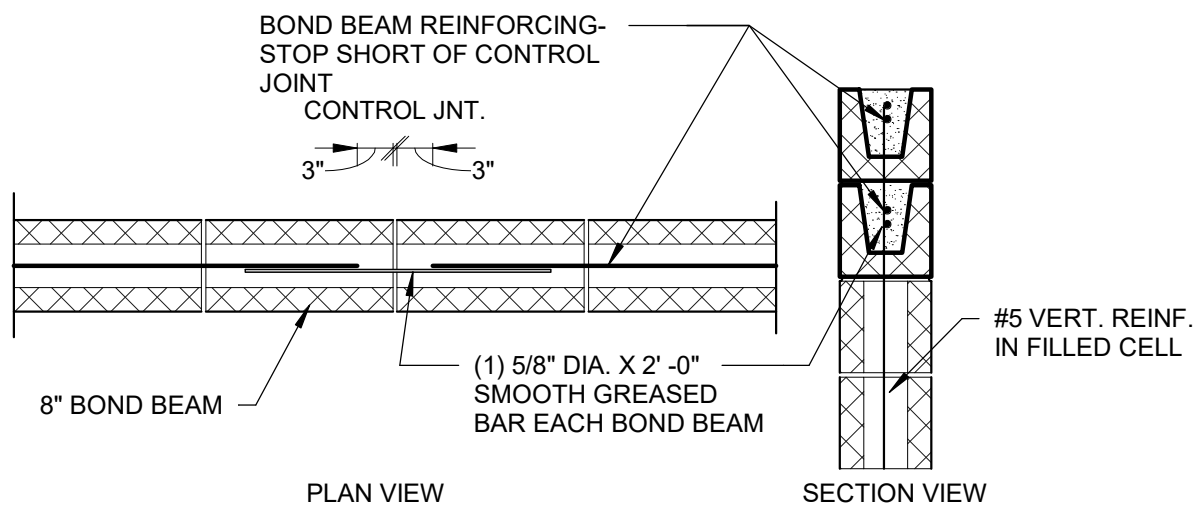
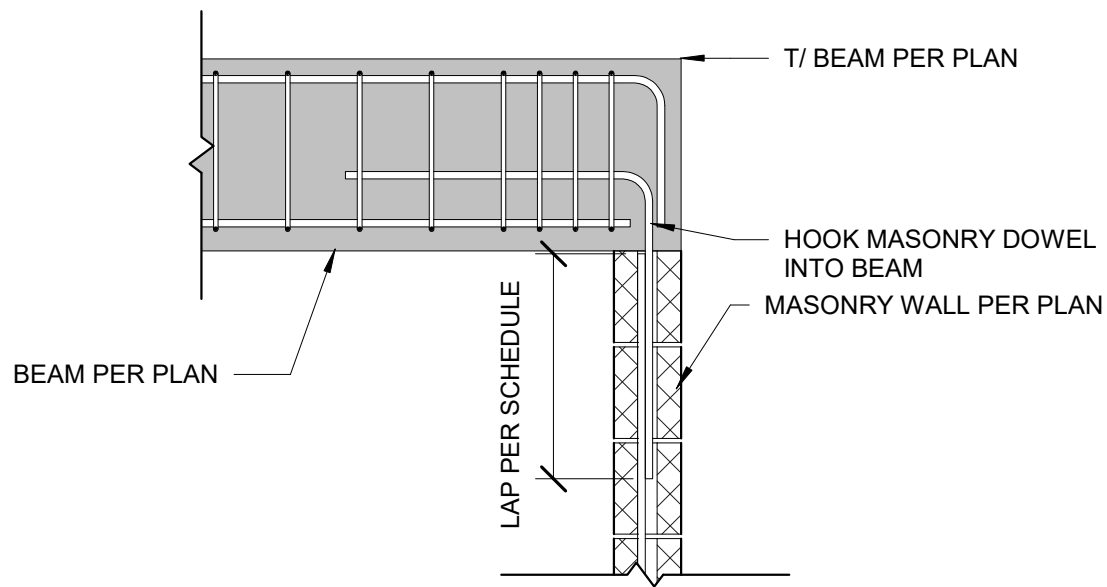


## STANDARD HOOK DIMENSIONS AND EQUIVALENT EMBEDMENT LENGTHS

## LAP SPLICE SCHEDULE



## TYPICAL BEAM DIAGRAM



LONGITUDINAL BAR SIZE	MINIMUM LAP SPLICE LENGTH, IN, FOR 1,900 PSI STRENGTH MASONRY WITH CENTER REINFORCEMENT:
	6 IN CMU
	UNCONFINED
# 3	24
# 4	33
# 5	40
# 6	48
# 7	NP
# 8	NP
# 9	NP

## BEAM BEARING IN MASONRY

## CONROL JOINT AT BOND BEAM

## MASONRY LAP SPLICE SCHEDULE

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (ODEC), PERMITS MANAGEMENT OFFICE (OGPe-ODEC) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY ODEC, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

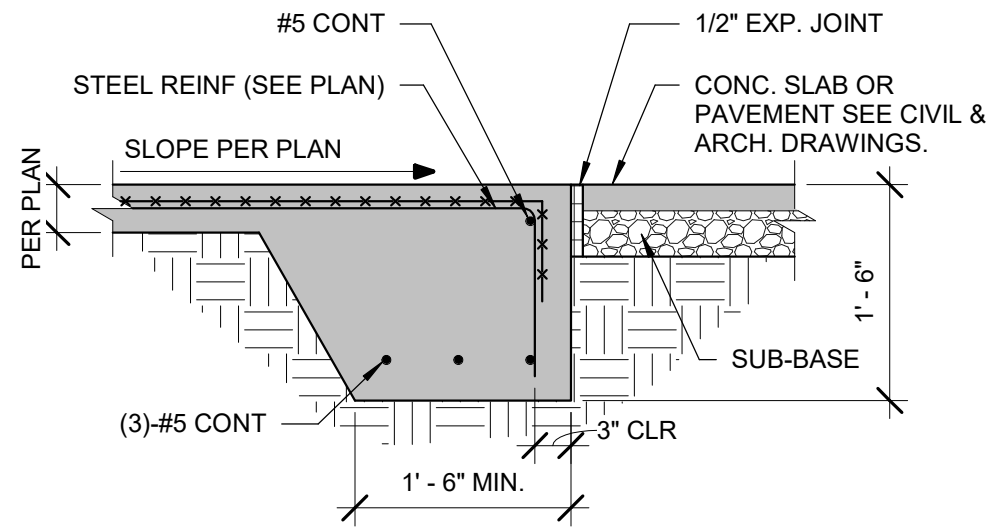
## TYPICAL DETAILS

SHEET INFORMATION:

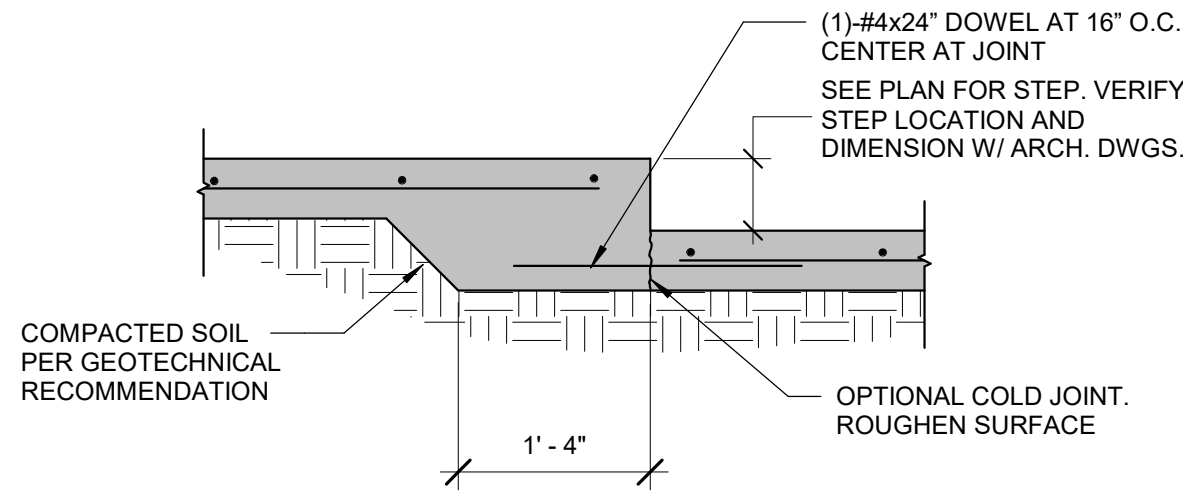
JOB No.	Date Issued:	05/08/2020
Drawn By:	Sheet Number:	S-011
Checked By:	QC Review:	
Phase:		

NOT FOR CONSTRUCTION

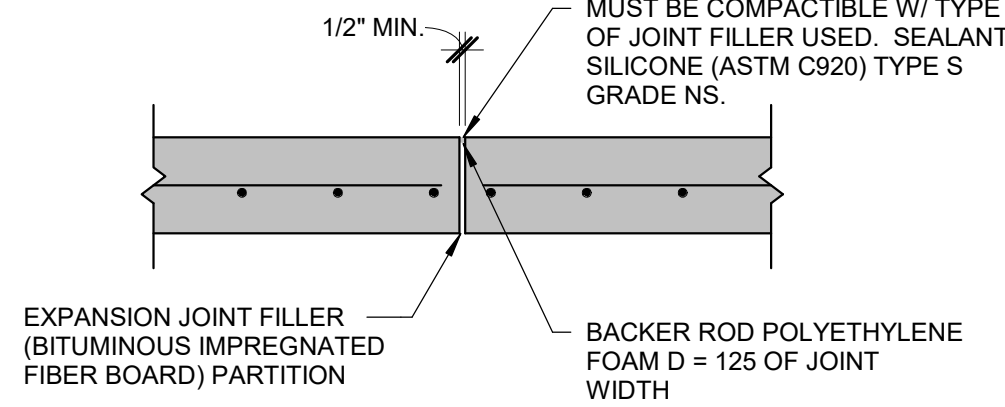




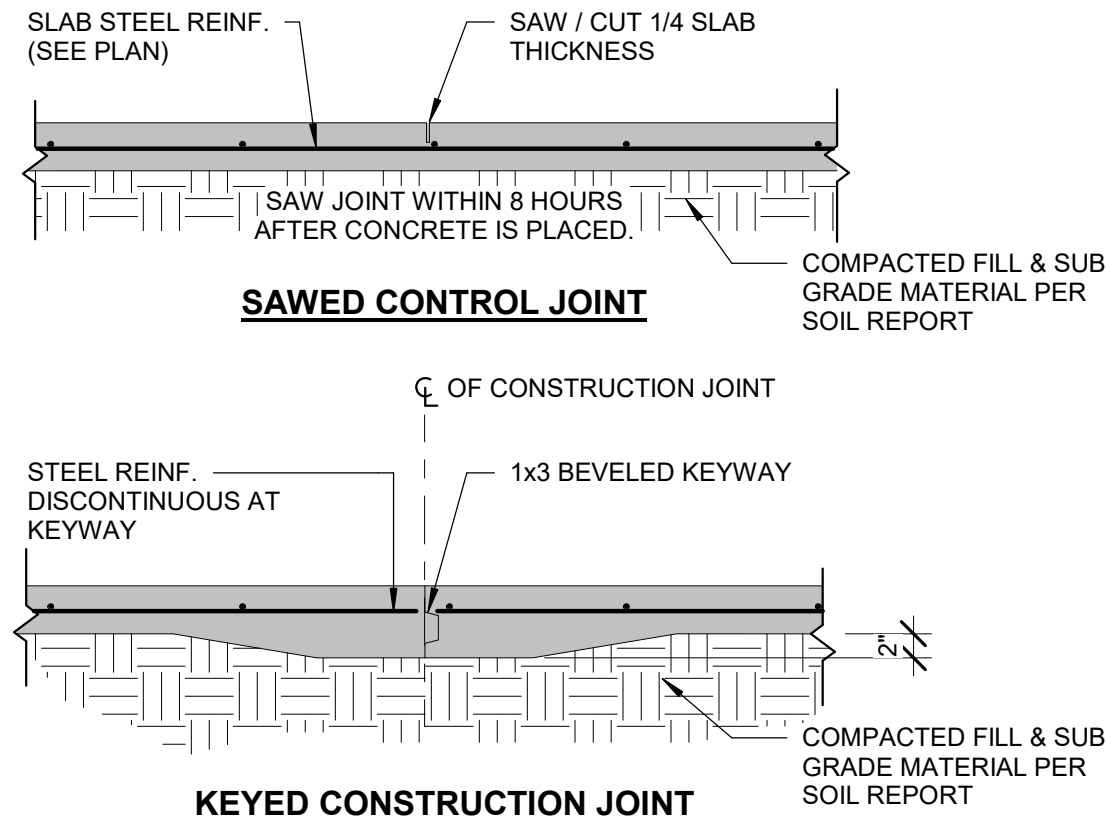
1 SLAB EDGE DETAIL  
3/4" = 1'-0"



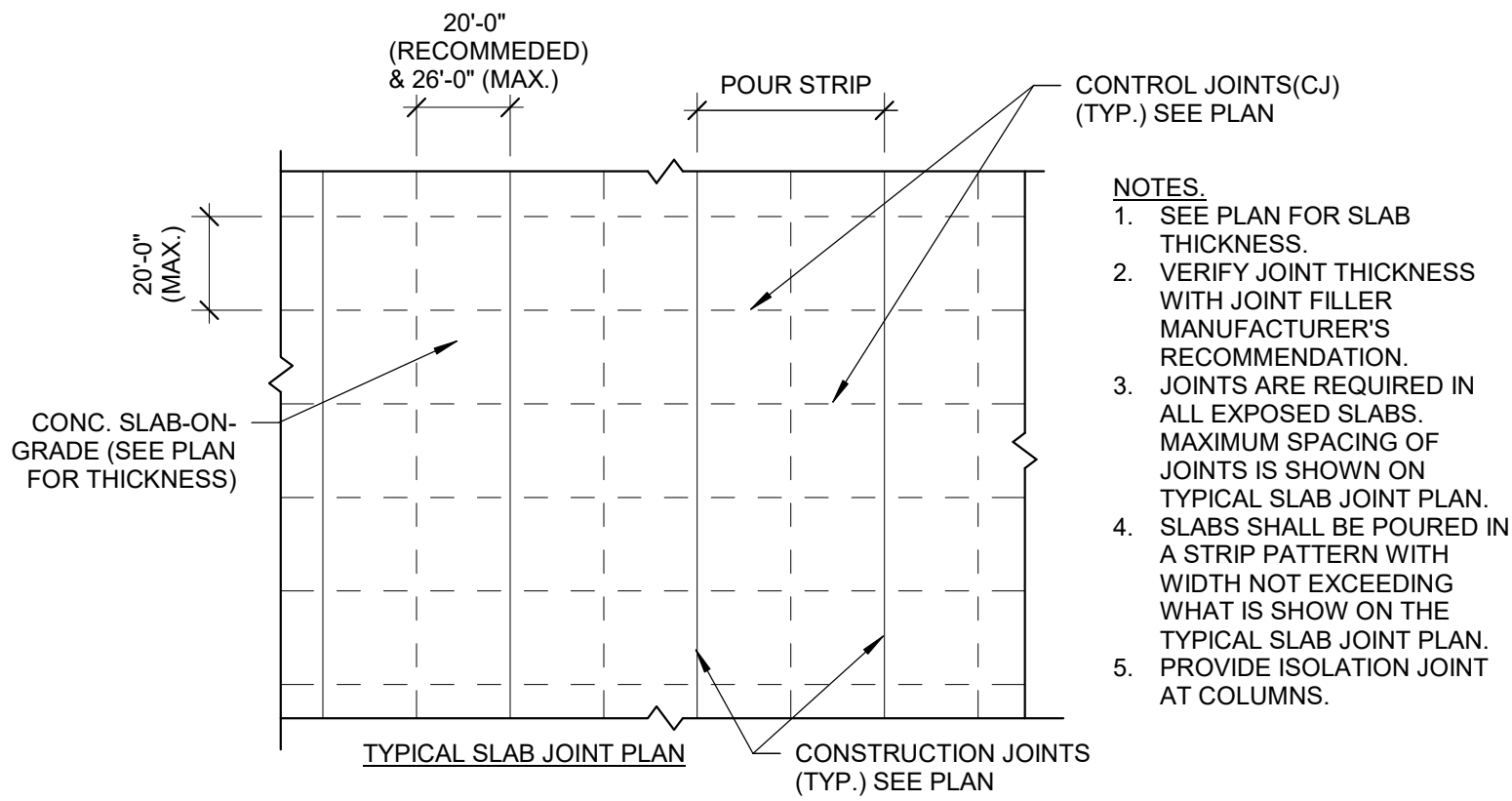
2 TYP. SMALL STEP IN SLAB (IF REQ'D)  
3/4" = 1'-0"



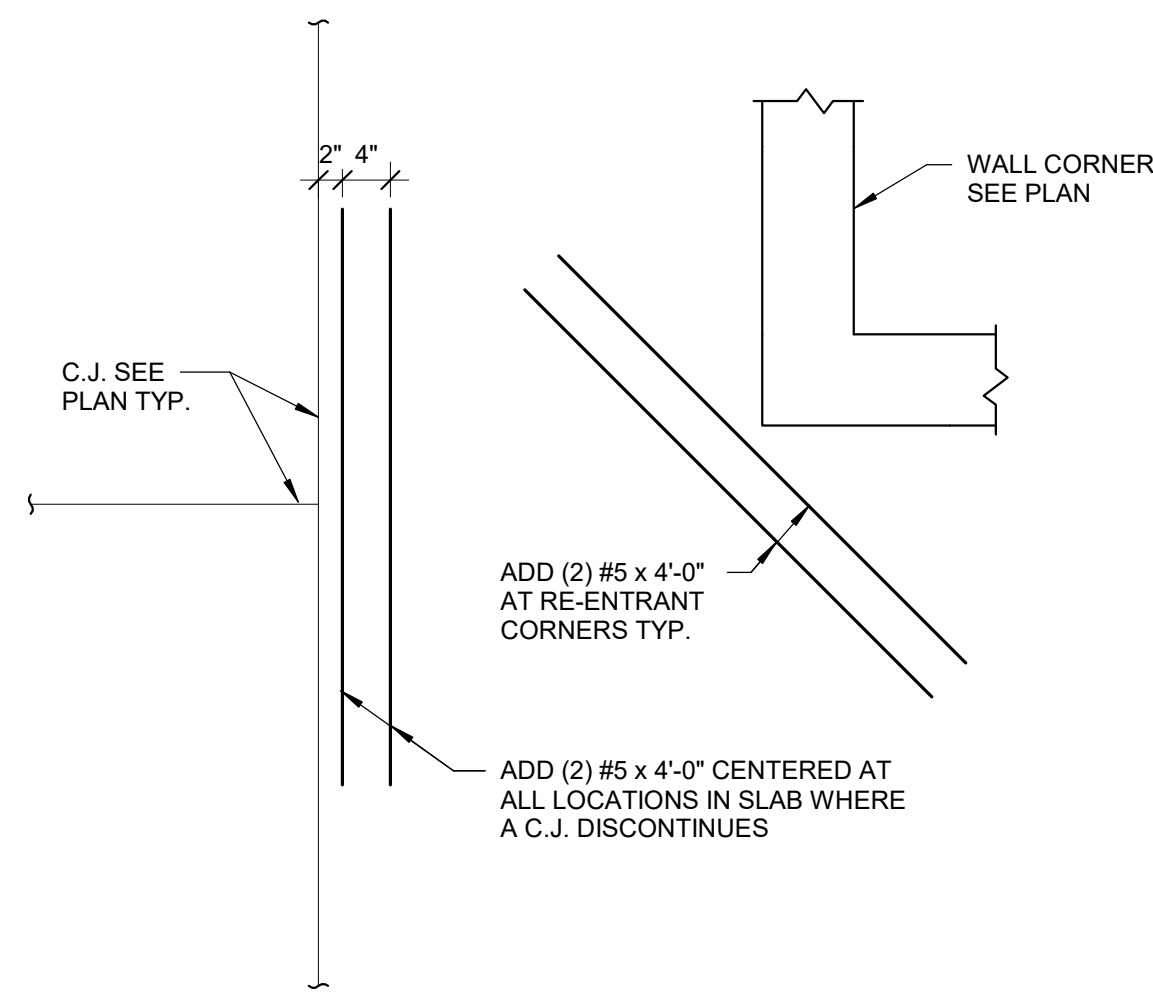
3 TYP. ISOLATION JOINT DETAIL  
3/4" = 1'-0"



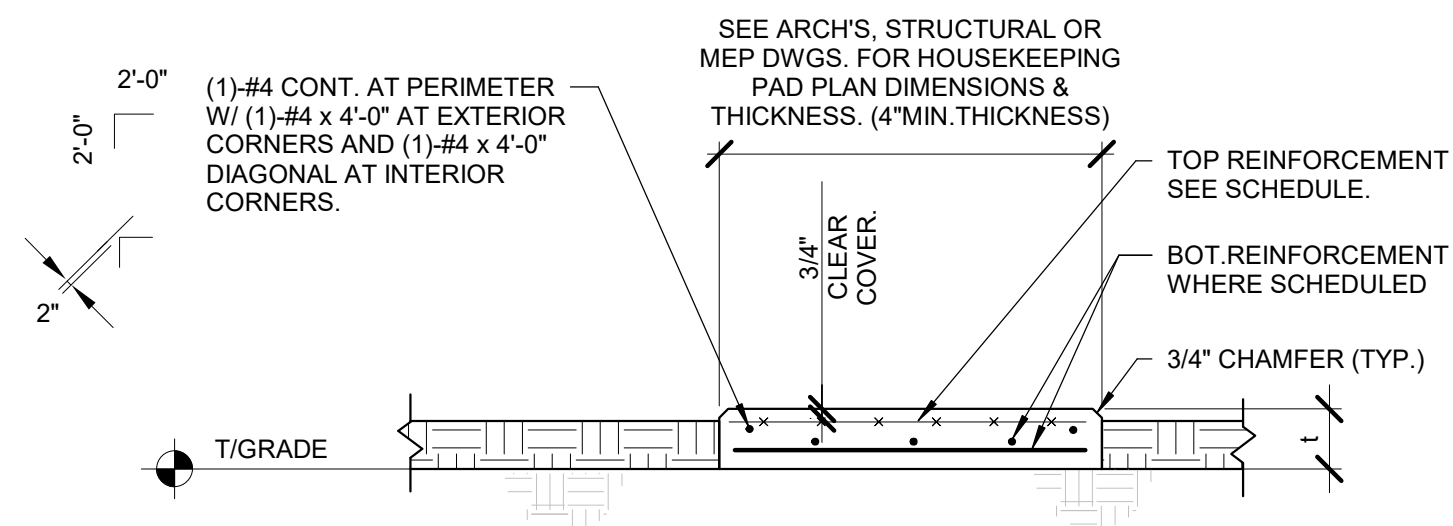
4 SLAB CONTROL AND CONSTRUCTION JOINT DETAILS  
3/4" = 1'-0"



5 SLAB ON GRADE JOINT NOTES  
3/4" = 1'-0"



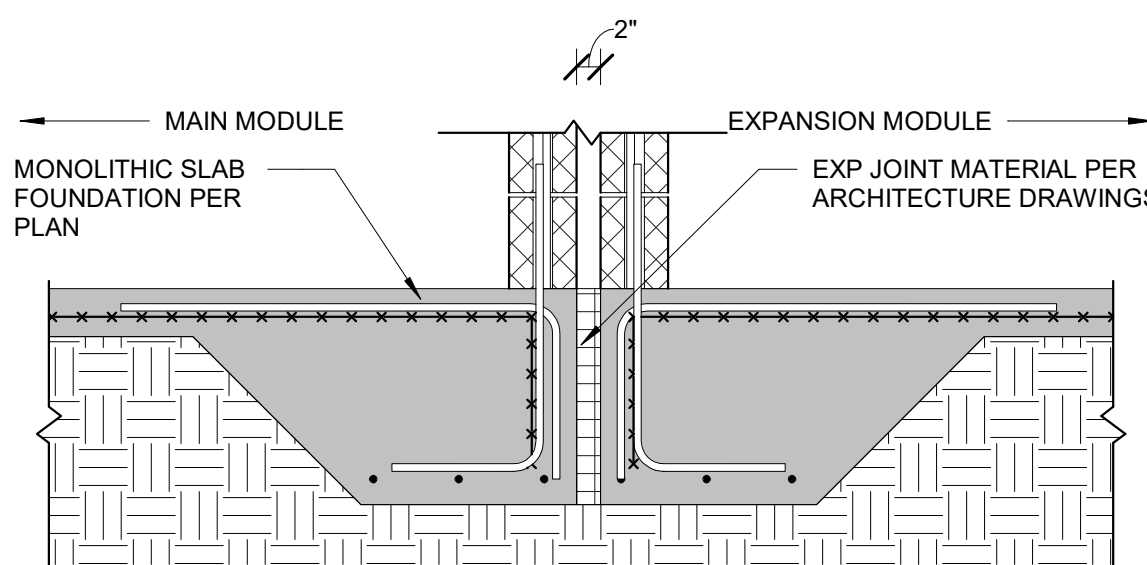
6 TYP. S.O.G. CRACK CONTROL  
3/4" = 1'-0"



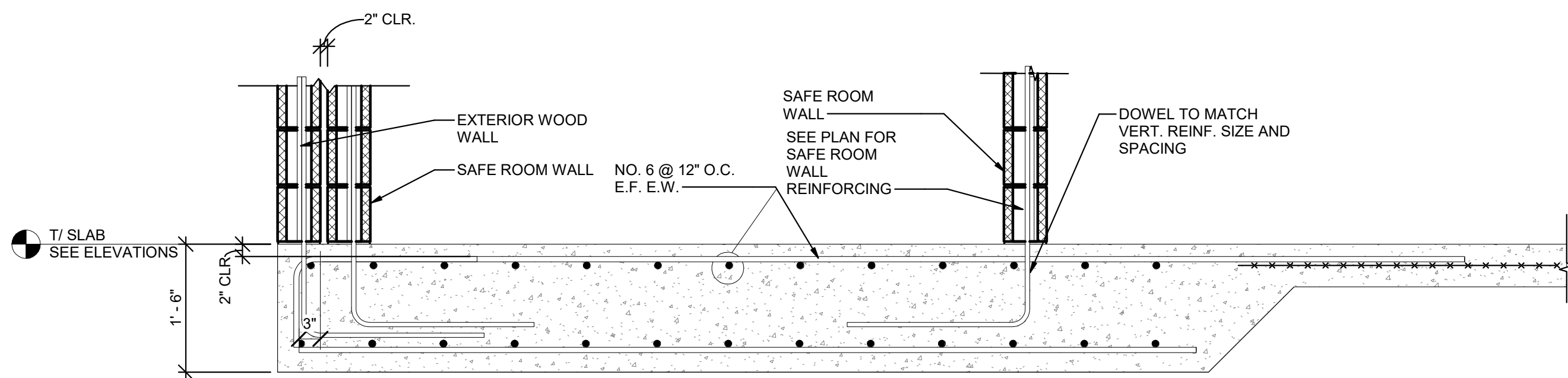
NOTE: GENERAL CONTRACTOR TO COORDINATE WITH MECHANICAL DRAWINGS AND SPECS. TO DETERMINE REQUIREMENTS FOR HOUSEKEEPING PADS OVER STRUCTURAL SLAB AND PROVIDE WHERE REQUIRED WHETHER SHOWN ON STRUCTURAL DRAWINGS OR NOT. COORDINATE DIMENSIONS AND OTHER SPECIAL REQUIREMENTS WITH EQUIPMENT MANUFACTURERS AS REQUIRED.

7 TYP. HOUSEKEEPING PAD - EXTERIOR  
3/4" = 1'-0"

HOUSEKEEPING PAD REINFORCING SCHEDULE		
PAD THICKNESS	TOP REINF.	BOTTOM REINF.
t ≤ 4"	6"x 6", W2.9 x W2.9	NONE
4" < t ≤ 6"	4"x 4", W4.0 x W4.0	NONE
6" < t ≤ 8"	4"x 4", W5.5 x W5.5	NONE
8" < t ≤ 12"	#4@12"E	#3@18"E
12" < t ≤ 16"	#4@12"E	#4@12"E



8 EXP JOINT AT MODULES  
SCALE: 3/4" = 1'-0"



9 SECTION AT SAFE ROOM FOUNDATION  
SCALE: 3/4" = 1'-0"

CONSULTANT:

CLIENT:

PROJECT NAME:

# ONE STORY CMU HOME CONCRETE ROOF

NOTE: PRIOR TO CONSTRUCTION CONTACT PUERTO RICO DEPARTMENT OF ECONOMIC DEVELOPMENT AND COMMERCE (DECE), PERMITS MANAGEMENT OFFICE (OGP-DECE) FOR BUILDING REQUIREMENTS IN PUERTO RICO. THIS INFORMATION HAS BEEN DEVELOPED FOR THE USE OF PUERTO RICO RESIDENTS AND IS BELIEVED TO MEET THE PUERTO RICO BUILDING CODE. ALL DRAWINGS MUST BE SEPARATELY APPROVED BY DECE, PERMITS MANAGEMENT OFFICE UPON SUBMISSION OF A BUILDING PERMIT APPLICATION.

ISSUE LOG

No.	Date	Description

PROFESSIONAL SEALS:

SHEET TITLE:

SLAB TYP. DETAILS

SHEET INFORMATION:

JOB No.	Date Issued: 05/08/2020
Drawn By:	Sheet Number:
Checked By:	S-012
QC Review:	
Phase:	

NOT FOR CONSTRUCTION



FEMA - PUERTO RICO PRESCRIPTIVE DESIGN HOUSE  
WIND DESIGN CRITERIA



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

**JOB TITLE** PR CMU Prescriptive Design**JOB NO.****SHEET NO.****CALCULATED BY** EEB**DATE** 8/29/19**CHECKED BY** MJR**DATE**[www.struware.com](http://www.struware.com)**Code Search****Code:** ASCE 7 - 16**Occupancy:**

Occupancy Group = R Residential

**Risk Category & Importance Factors:**

Risk Category = II

Wind factor = 1.00

Snow factor = 1.00

Seismic factor = 1.00

**Type of Construction:**

Fire Rating:

Roof = 0.0 hr

Floor = 0.0 hr

**Building Geometry:**Roof angle ( $\theta$ ) 4.00 / 12 18.4 deg

Building length (L) 32.2 ft

Least width (B) 11.0 ft

Mean Roof Ht (h) 22.4 ft

Parapet ht above grd 0.0 ft

Minimum parapet ht 0.0 ft



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.	SHEET NO.
CALCULATED BY EEB	DATE 8/29/19
CHECKED BY MJR	DATE

**Wind Loads :**

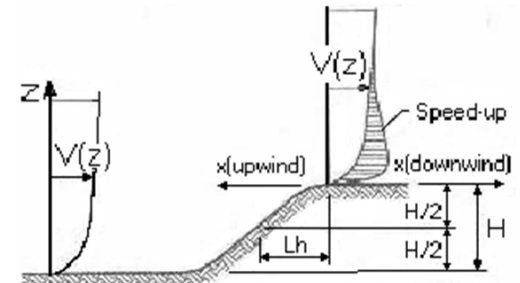
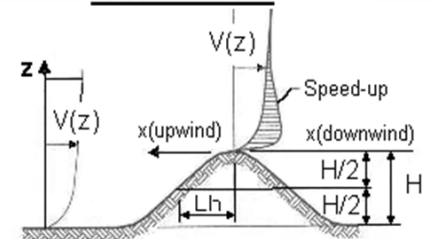
ASCE 7- 16

Ultimate Wind Speed	190 mph
Nominal Wind Speed	147.2 mph
Risk Category	II
Exposure Category	D
Enclosure Classif.	Enclosed Building
Internal pressure	+/-0.18
Directionality (Kd)	0.85
Kh case 1	1.105
Kh case 2	1.105
Type of roof	Gable

Topographic Factor (Kzt)

Topography	2D Ridge
Hill Height (H)	15.0 ft
Half Hill Length (Lh)	15.0 ft
Actual H/Lh =	0.00
Use H/Lh =	0.00
Modified Lh =	15.0 ft
From top of crest: x =	0.0 ft
Bldg up/down wind?	downwind
H/Lh = 0.00	K <sub>1</sub> = 0.000
x/Lh = 0.00	K <sub>2</sub> = 1.000
z/Lh = 1.49	K <sub>3</sub> = 0.011
At Mean Roof Ht:	
	K <sub>zt</sub> = (1+K <sub>1</sub> K <sub>2</sub> K <sub>3</sub> ) <sup>2</sup> = 1.00

H/Lh < 0.2  
∴ K<sub>zt</sub> = 1.0

**ESCARPMENT****2D RIDGE or 3D AXISYMMETRICAL HILL****Gust Effect Factor**

h =	22.4 ft
B =	11.0 ft
/z (0.6h) =	13.4 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).  
If building h/B > 4 then may be flexible and should be investigated.  
h/B = 2.04

**G = 0.85** Using rigid structure formula

**Rigid Structure**

$\bar{e}$ =	0.13
$l$ =	650 ft
$Z_{min}$ =	7 ft
$c$ =	0.13
$g_Q, g_v$ =	3.4
$L_z$ =	581.0 ft
$Q$ =	0.95
$I_z$ =	0.15
$G$ =	0.90 use G = 0.85

**Flexible or Dynamically Sensitive Structure**

$34 \pi c y (\eta_1)$ =	0.0 Hz		
Damping ratio ( $\beta$ ) =	0		
$/b$ =	0.80		
$/\alpha$ =	0.11		
$V_z$ =	201.8		
$N_1$ =	0.00		
$R_n$ =	0.000		
$R_h$ =	28.282	$\eta$ =	0.000
$R_B$ =	28.282	$\eta$ =	0.000
$R_L$ =	28.282	$\eta$ =	0.000
$g_R$ =	0.000		
$R$ =	0.000		
$G_f$ =	0.000		
		h =	22.4 ft

**Enclosure Classification**



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO. \_\_\_\_\_ SHEET NO. \_\_\_\_\_  
CALCULATED BY EEB DATE 8/29/19  
CHECKED BY MJR DATE \_\_\_\_\_

**Wind Loads - MWFRS all h (Except for Open Buildings)**

Kh (case 2) = 1.10 h = 22.4 ft GCpi = +/-0.18  
Base pressure (qh) = **86.8 psf** ridge ht = 23.3 ft G = 0.85  
Roof Angle (θ) = 18.4 deg L = 32.2 ft qi = qh  
Roof tributary area - (h/2)\*L: 360 sf B = 11.0 ft  
(h/2)\*B: 123 sf

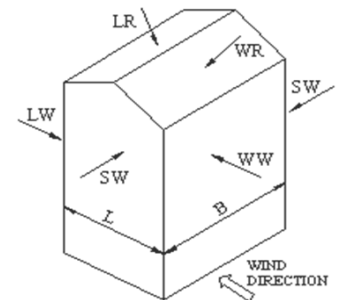
**Ultimate Wind Surface Pressures (psf)**

Surface	Wind Normal to Ridge				Wind Parallel to Ridge			
	B/L = 0.34	h/L = 2.04			L/B = 2.93	h/L = 0.70		
	Cp	qhGCp	w/+qiGCpi	w/-qiGCpi	Dist.*	Cp	qhGCp	w/+qiGCpi w/-qiGCpi
Windward Wall (WW)	0.80	59.0	see table below			0.80	59.0	see table below
Leeward Wall (LW)	-0.50	-36.9	-52.5	-21.3		-0.25	-18.7	-34.3 -3.1
Side Wall (SW)	-0.70	-51.6	-67.2	-36.0		-0.70	-51.6	-67.2 -36.0
Leeward Roof (LR)	-0.60	-44.3	-59.9	-28.6	Included in windward roof			
Neg Windward Roof pressure	-0.79	-58.6	-74.2	-42.9	0 to h/2*	-1.05	-77.1	-92.7 -61.5
Pos/min Windward Roof press.	-0.18	-13.3	-28.9	2.3	h/2 to h*	-0.82	-60.6	-76.2 -45.0
					h to 2h*	-0.58	-42.7	-58.3 -27.0
					Min press.	-0.18	-13.3	-28.9 2.3

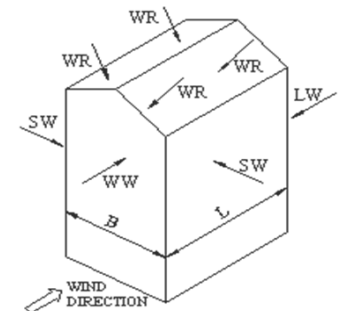
\*Horizontal distance from windward edge

**Windward Wall Pressures at "z" (psf)**

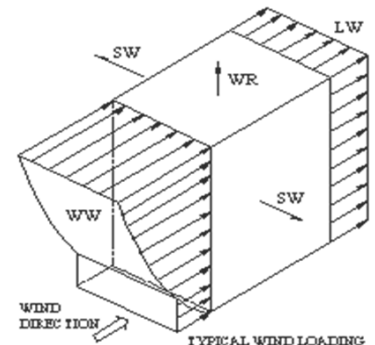
z	Kz	Kzt	Windward Wall			Combined WW + LW	
			qzGCp	w/+qiGCpi	w/-qiGCpi	Normal to Ridge	Parallel to Ridge
0 to 15'	1.03	1.00	55.0	39.4	70.7	91.9	73.7
20.0 ft	1.08	1.00	57.9	42.2	73.5	94.7	76.6
h = 22.4 ft	1.10	1.00	59.0	43.4	74.6	95.9	77.7
ridge = 23.3 ft	1.11	1.00	59.4	43.8	75.0	96.3	78.1



WIND NORMAL TO RIDGE



WIND PARALLEL TO RIDGE



TYPICAL WIND LOADING

**NOTE:**

See figure in ASCE7 for the application of full and partial loading of the above wind pressures. There are 4 different loading cases.

**Parapet**

z	Kz	Kzt	qp (psf)
0.0 ft	1.03	1.00	0.0

Windward parapet: 0.0 psf (GCpn = +1.5)  
Leeward parapet: 0.0 psf (GCpn = -1.0)

Windward roof overhangs ( add to windward roof pressure ) : 59.0 psf (upward)



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.

SHEET NO.

CALCULATED BY EEB

DATE 8/29/19

CHECKED BY MJR

DATE

## Ultimate Wind Pressures

### Wind Loads - Components & Cladding : $h \leq 60'$

Kh (case 1) = 1.10 h = 22.4 ft  
Base pressure (qh) = **86.8 psf** a = 3.0 ft  
Minimum parapet ht = 0.0 ft GCpi = +/-0.18  
Roof Angle ( $\theta$ ) = 18.4 deg qi = qh = 86.8 psf  
Type of roof = Gable

#### Roof

Area	Surface Pressure (psf)							
	2 sf	10 sf	20 sf	50 sf	75 sf	100 sf	200 sf	250 sf
Negative Zone 1 & 2e	-189.2	-189.2	-189.2	-115.1	-82.3	-59.0	-59.0	-59.0
Negative Zone 2n, 2r & 3e	-275.9	-275.9	-238.6	-189.2	-167.3	-151.8	-114.4	-102.4
Negative Zone 3r	-328	-328	-281	-218.8	-191.3	-171.8	-171.8	-171.8
Positive All Zones	45.1	30.8	24.7	16.6	16.0	16.0	16.0	16.0
Overhang Zone 1 & 2e	-201.3	-201.3	-201.3	-151.9	-130.1	-114.5	-114.5	-114.5
Overhang Zone 2n & 2r	-303.7	-288.1	-260.1	-223	-206.6	-195.0	-167.0	-157.9
Overhang Zone 3e	-355.8	-355.8	-307.2	-243	-214.5	-194.4	-145.8	-130.2
Overhang Zone 3r	-407.8	-407.8	-345.1	-262.3	-225.6	-199.6	-199.6	-199.6

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0

Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 15.6 psf)

User input	
75 sf	500 sf
-82.3	-59.0
-167.3	-102.4
-191.3	-171.8
16.0	16.0
-130.1	-114.5
-206.6	-157.9
-214.5	-130.2
-225.6	-199.6

#### Parapet

qp = 0.0 psf

Solid Parapet Pressure		Surface Pressure (psf)					
		10 sf	20 sf	50 sf	100 sf	250 sf	500 sf
CASE A:	Zone 2e :	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 2n, 2r & 3e :	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 3r :	0.0	0.0	0.0	0.0	0.0	0.0
CASE B :	Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0
	Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0

User input	
40 sf	
0.0	
0.0	
0.0	
0.0	
0.0	
0.0	

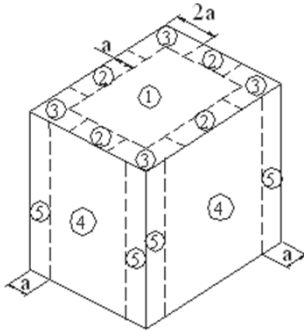
#### Walls

Area	GCp +/- GCpi				Surface Pressure at h			
	10 sf	100 sf	200 sf	500 sf	10 sf	100 sf	200 sf	500 sf
Negative Zone 4	-1.28	-1.10	-1.05	-0.98	-93.7	-95.7	-91.1	-85.0
Negative Zone 5	-1.58	-1.23	-1.12	-0.98	-171.8	-106.5	-97.2	-85.0
Positive Zone 4 & 5	1.18	1.00	0.95	0.88	93.7	87.1	82.5	76.4

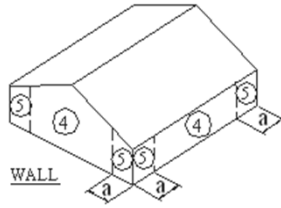
User input	
20 sf	50 sf
-106.5	-100.4
-127.9	-115.7
97.8	91.7



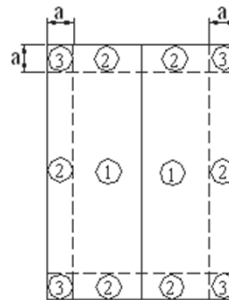
**Location of C&C Wind Pressure Zones - ASCE 7-10 & earlier**



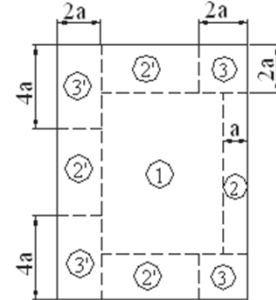
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



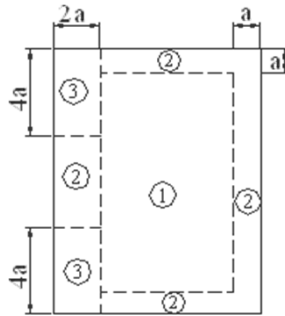
Walls  $h \leq 60'$   
& alt design  $h < 90'$



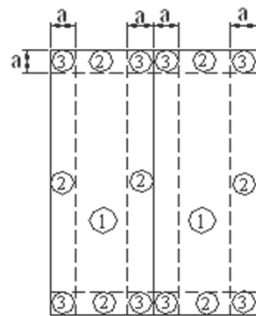
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



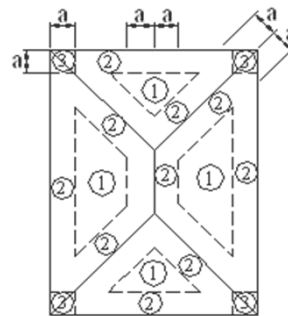
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



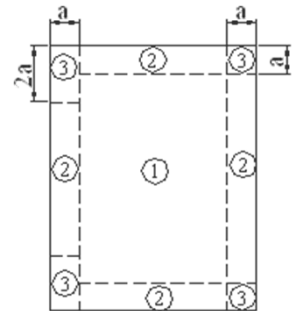
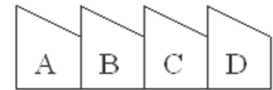
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



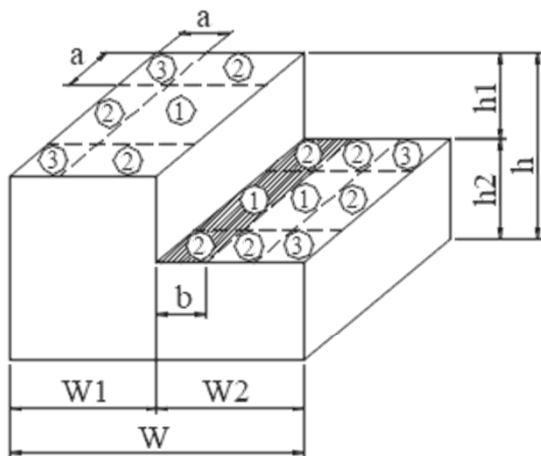
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



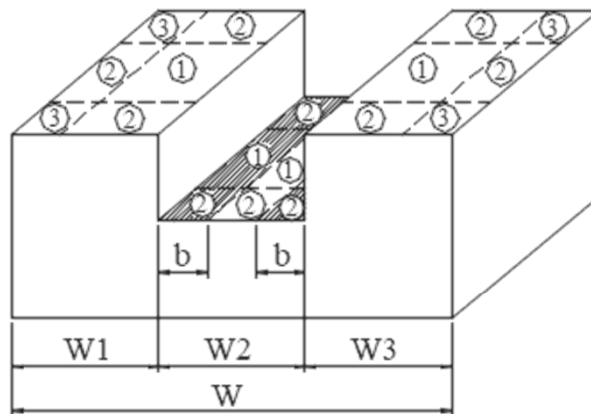
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

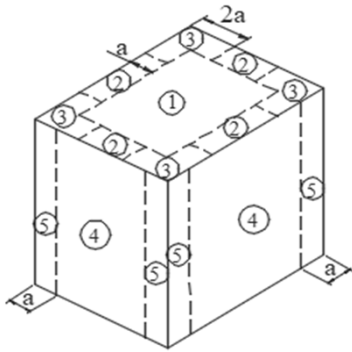


Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

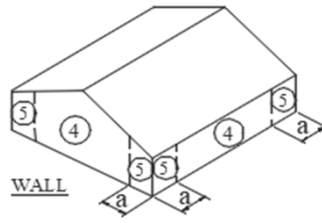




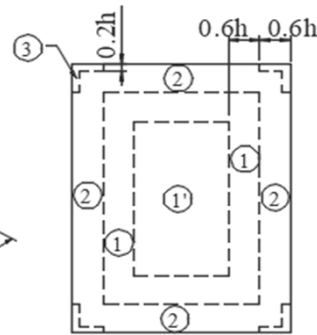
**Location of C&C Wind Pressure Zones - ASCE 7-16**



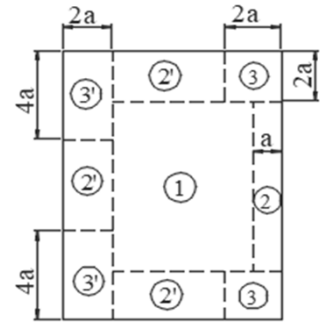
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



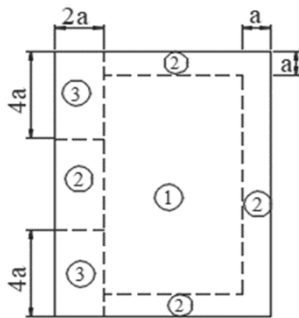
Walls  $h \leq 60'$   
& alt design  $h < 90'$



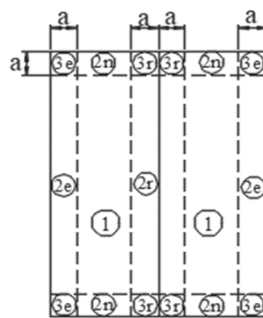
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



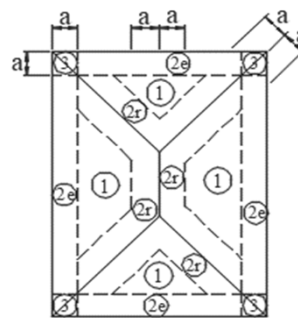
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



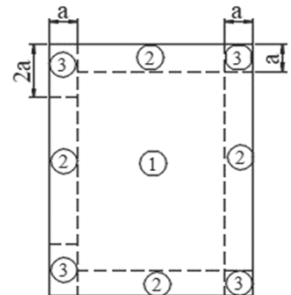
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



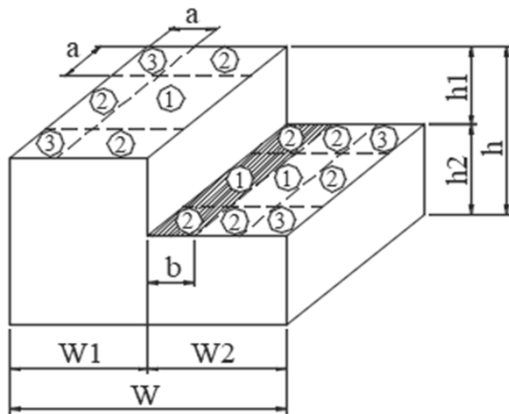
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



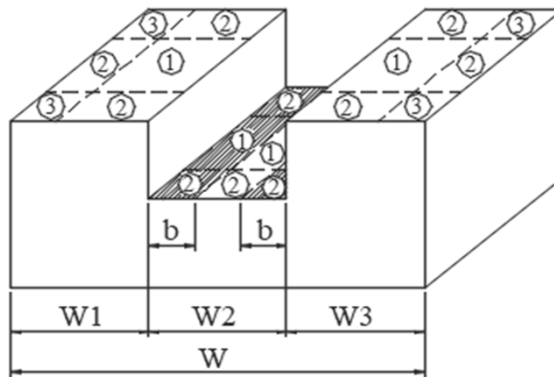
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$





**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

**JOB TITLE** PR CMU Prescriptive Design**JOB NO.****SHEET NO.****CALCULATED BY** EEB**DATE** 8/29/19**CHECKED BY** MJR**DATE**[www.struware.com](http://www.struware.com)**Code Search****Code:** ASCE 7 - 16**Occupancy:**

Occupancy Group = R Residential

**Risk Category & Importance Factors:**

Risk Category = II

Wind factor = 1.00

Snow factor = 1.00

Seismic factor = 1.00

**Type of Construction:**

Fire Rating:

Roof = 0.0 hr

Floor = 0.0 hr

**Building Geometry:**Roof angle ( $\theta$ ) 0.00 / 12 0.0 deg

Building length (L) 32.2 ft

Least width (B) 11.0 ft

Mean Roof Ht (h) 22.4 ft

Parapet ht above grd 0.0 ft

Minimum parapet ht 0.0 ft



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.	SHEET NO.
CALCULATED BY EEB	DATE 8/29/19
CHECKED BY MJR	DATE

**Wind Loads :**

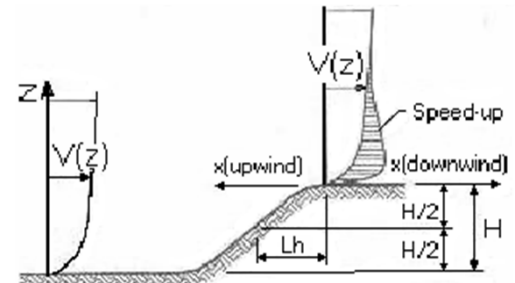
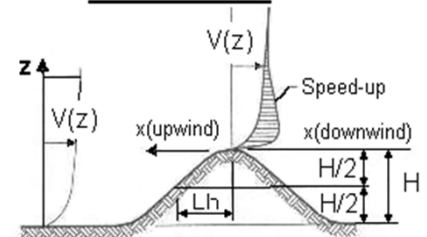
ASCE 7- 16

Ultimate Wind Speed	190 mph
Nominal Wind Speed	147.2 mph
Risk Category	II
Exposure Category	D
Enclosure Classif.	Enclosed Building
Internal pressure	+/-0.18
Directionality (Kd)	0.85
Kh case 1	1.105
Kh case 2	1.105
Type of roof	Monoslope

Topographic Factor (Kzt)

Topography	2D Ridge
Hill Height (H)	10.0 ft
Half Hill Length (Lh)	10.0 ft
Actual H/Lh =	0.00
Use H/Lh =	0.00
Modified Lh =	10.0 ft
From top of crest: x =	0.0 ft
Bldg up/down wind?	downwind
H/Lh= 0.00	K <sub>1</sub> = 0.000
x/Lh = 0.00	K <sub>2</sub> = 1.000
z/Lh = 2.24	K <sub>3</sub> = 0.001
At Mean Roof Ht:	
	Kzt = (1+K <sub>1</sub> K <sub>2</sub> K <sub>3</sub> ) <sup>2</sup> = 1.00

H < 15ft; exp D  
∴ Kzt=1.0

**ESCARPMENT****2D RIDGE or 3D AXISYMMETRICAL HILL****Gust Effect Factor**

h =	22.4 ft
B =	11.0 ft
/z (0.6h) =	13.4 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).  
If building h/B > 4 then may be flexible and should be investigated.  
h/B = 2.04

**G = 0.85** Using rigid structure formula

**Rigid Structure**

$\bar{e}$ =	0.13
$l$ =	650 ft
$Z_{min}$ =	7 ft
$c$ =	0.13
$g_Q, g_v$ =	3.4
$L_z$ =	581.0 ft
$Q$ =	0.95
$I_z$ =	0.15
$G$ =	0.90 use G = 0.85

**Flexible or Dynamically Sensitive Structure**

$34 \pi c_y (\eta_1)$ =	0.0 Hz		
Damping ratio ( $\beta$ ) =	0		
$/b$ =	0.80		
$/\alpha$ =	0.11		
$V_z$ =	201.8		
$N_1$ =	0.00		
$R_n$ =	0.000		
$R_n$ =	28.282	$\eta$ =	0.000
$R_B$ =	28.282	$\eta$ =	0.000
$R_L$ =	28.282	$\eta$ =	0.000
$g_R$ =	0.000		
$R$ =	0.000		
$G_f$ =	0.000		
		$h$ =	22.4 ft

**Enclosure Classification**



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO. \_\_\_\_\_ SHEET NO. \_\_\_\_\_  
CALCULATED BY EEB DATE 8/29/19  
CHECKED BY MJR DATE \_\_\_\_\_

**Wind Loads - MWFRS all h (Except for Open Buildings)**

Kh (case 2) = 1.10 h = 22.4 ft GCpi = +/-0.18  
Base pressure (qn) = **86.8 psf** ridge ht = 22.4 ft G = 0.85  
Roof Angle (θ) = 0.0 deg L = 32.2 ft qi = qh  
Roof tributary area - (h/2)\*L: 360 sf B = 11.0 ft  
(h/2)\*B: 123 sf

**Ultimate Wind Surface Pressures (psf)**

Surface	Wind Normal to Ridge				Wind Parallel to Ridge			
	B/L = 0.34	h/L = 2.04			L/B = 2.93	h/L = 0.70		
	Cp	qhGCp	w/+qhGCpi	w/-qhGCpi	Dist.*	Cp	qhGCp	w/+qhGCpi w/-qhGCpi
Windward Wall (WW)	0.80	59.0	see table below			0.80	59.0	see table below
Leeward Wall (LW)	-0.50	-36.9	-52.5	-21.3		-0.25	-18.7	-34.3 -3.1
Side Wall (SW)	-0.70	-51.6	-67.2	-36.0		-0.70	-51.6	-67.2 -36.0
Leeward Roof (LR)		**				Included in windward roof		
Neg Windward Roof: 0 to h/2*	-1.14	-84.4	-100.0	-68.8	0 to h/2*	-1.05	-77.1	-92.7 -61.5
> h/2*	-0.70	-51.6	-67.2	-36.0	h/2 to h*	-0.82	-60.6	-76.2 -45.0
					h to 2h*	-0.58	-42.7	-58.3 -27.0
Pos/min windward roof press.	-0.18	-13.3	-28.9	2.3	Min press.	-0.18	-13.3	-28.9 2.3

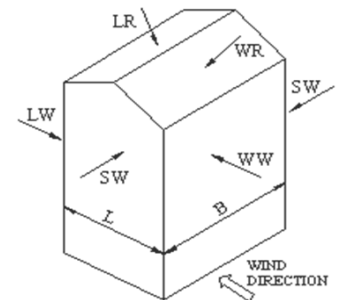
\*\*Roof angle < 10 degrees. Therefore, leeward roof is included in windward roof pressure zones.

\*Horizontal distance from windward edge

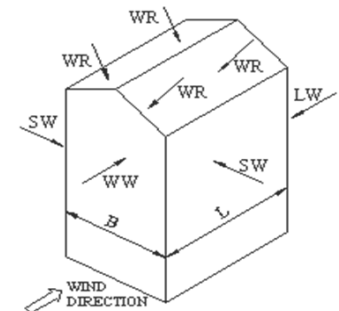
For monoslope roofs, entire roof surface is either windward or leeward surface.

**Windward Wall Pressures at "z" (psf)**

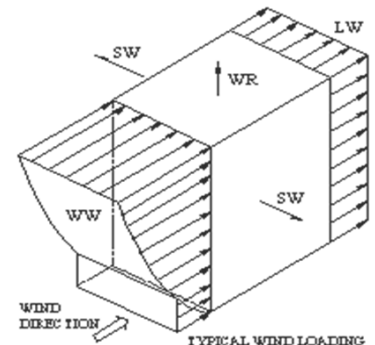
z	Kz	Kzt	Windward Wall			Combined WW + LW	
			qzGCp	w/+qhGCpi	w/-qhGCpi	Normal to Ridge	Parallel to Ridge
0 to 15'	1.03	1.00	55.0	39.4	70.7	91.9	73.7
20.0 ft	1.08	1.00	57.9	42.2	73.5	94.7	76.6
h= 22.4 ft	1.10	1.00	59.0	43.4	74.6	95.9	77.7



WIND NORMAL TO RIDGE



WIND PARALLEL TO RIDGE



TYPICAL WIND LOADING

**NOTE:**

See figure in ASCE7 for the application of full and partial loading of the above wind pressures. There are 4 different loading cases.

**Parapet**

z	Kz	Kzt	qp (psf)
0.0 ft	1.03	1.00	0.0

Windward parapet: 0.0 psf (GCpn = +1.5)  
Leeward parapet: 0.0 psf (GCpn = -1.0)

Windward roof overhangs ( add to windward roof pressure) : 59.0 psf (upward)



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO. \_\_\_\_\_ SHEET NO. \_\_\_\_\_  
CALCULATED BY EEB \_\_\_\_\_ DATE 8/29/19  
CHECKED BY MJR \_\_\_\_\_ DATE \_\_\_\_\_

**Ultimate Wind Pressures****Wind Loads - Components & Cladding :  $h \leq 60'$** 

Kh (case 1) = 1.10 h = 22.4 ft  
Base pressure (qh) = **86.8 psf** 0.6h = 13.4 ft  
Minimum parapet ht = 0.0 ft GCpi = +/-0.18  
Roof Angle ( $\theta$ ) = 0.0 deg qi = qh = 86.8 psf  
Type of roof = Monoslope

**Roof**

Area	Surface Pressure (psf)							
	10 sf	20 sf	50 sf	100 sf	200 sf	350 sf	500 sf	1000 sf
Negative Zone 1	-163.1	-152.4	-138.1	-127.4	-116.6	-107.9	-102.4	-102.4
Negative Zone 1'	-93.7	-93.7	-93.7	-93.7	-80.7	-70.1	-63.4	-50.3
Negative Zone 2	-215.2	-201.4	-183.1	-169.2	-155.4	-144.2	-137.1	-137.1
Negative Zone 3	-293.3	-265.6	-229	-201.4	-173.7	-151.3	-137.1	-137.1
Positive All Zones	41.7	39	35.6	33	33.0	33.0	33.0	33.0
Overhang Zone 1&1'	-147.5	-144.9	-141.5	-138.8	-116.4	-98.3	-86.8	-86.8
Overhang Zone 2	-199.6	-181.1	-156.7	-138.3	-119.8	-104.9	-95.5	-95.5
Overhang Zone 3	-277.7	-245.4	-202.7	-170.4	-138.1	-112.1	-95.5	-95.5

Overhang pressures in the table above assume an internal pressure coefficient (GCpi) of 0.0

Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 15.6 psf)

User input	
75 sf	500 sf
-131.9	-102.4
-93.7	-63.4
-175.0	-137.1
-212.8	-137.1
34.1	33.0
-139.9	-86.8
-145.9	-95.5
-183.8	-95.5

**Parapet**

qp = 0.0 psf

Solid Parapet Pressure	Surface Pressure (psf)					
	10 sf	20 sf	50 sf	100 sf	200 sf	500 sf
CASE A: Zone 2 :	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3 :	0.0	0.0	0.0	0.0	0.0	0.0
CASE B : Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0
Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0

User input
40 sf
0.0
0.0
0.0
0.0

**Walls**

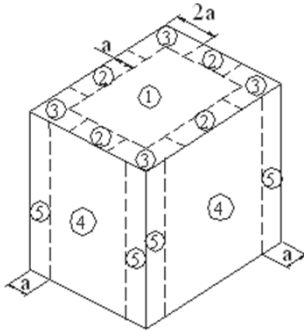
Area	GCp +/- GCpi				Surface Pressure at h			
	10 sf	100 sf	200 sf	500 sf	10 sf	100 sf	200 sf	500 sf
Negative Zone 4	-1.17	-1.01	-0.96	-0.90	-93.7	-87.7	-83.6	-78.1
Negative Zone 5	-1.44	-1.12	-1.03	-0.90	-171.8	-97.4	-89.1	-78.1
Positive Zone 4 & 5	1.08	0.92	0.87	0.81	93.7	79.9	75.8	70.3

Note: GCp reduced by 10% due to roof angle  $\leq 10$  deg.

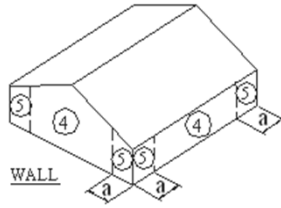
User input	
20 sf	50 sf
-97.4	-91.9
-116.7	-105.7
89.6	84.1



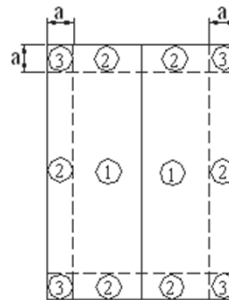
**Location of C&C Wind Pressure Zones - ASCE 7-10 & earlier**



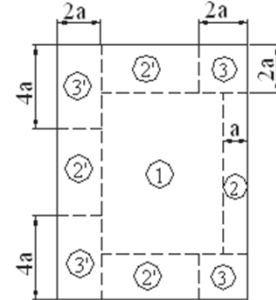
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



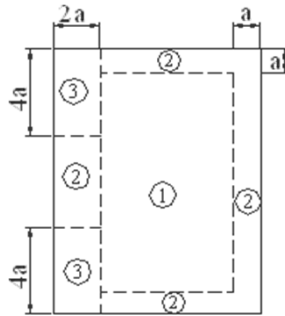
Walls  $h \leq 60'$   
& alt design  $h < 90'$



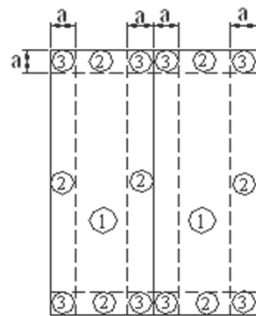
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



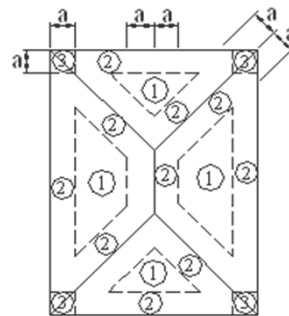
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



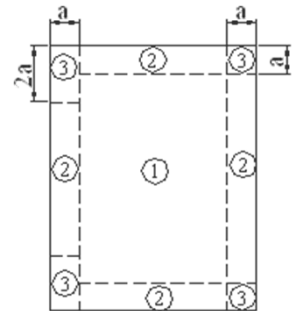
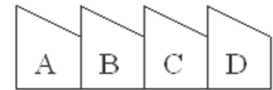
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



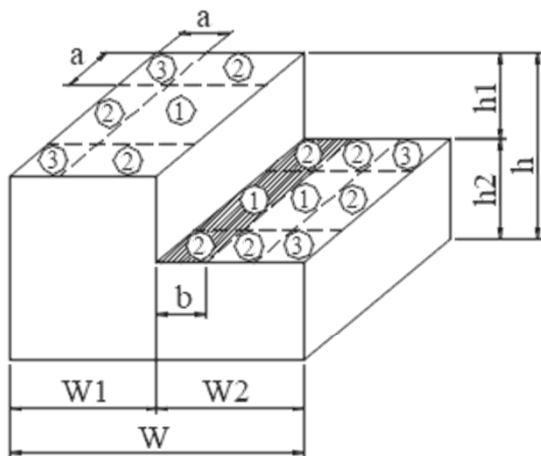
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



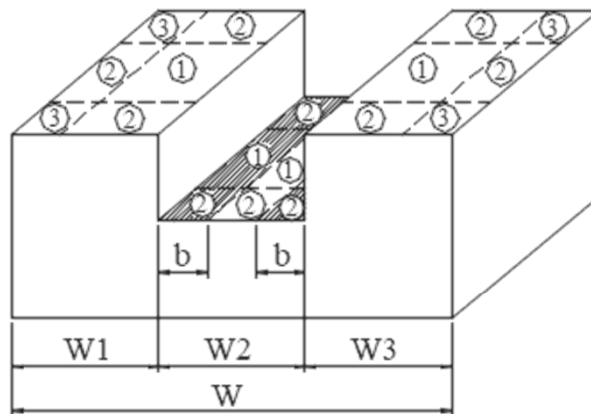
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

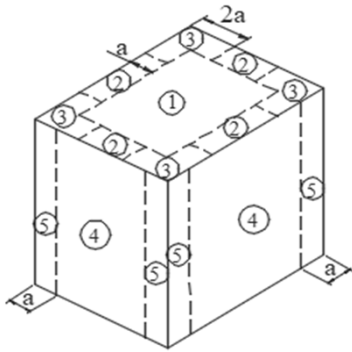


Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

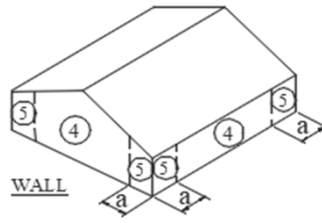




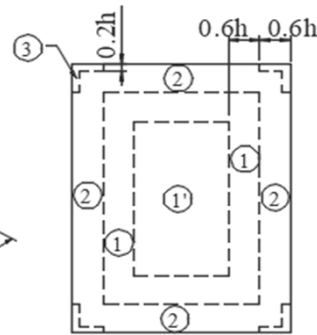
**Location of C&C Wind Pressure Zones - ASCE 7-16**



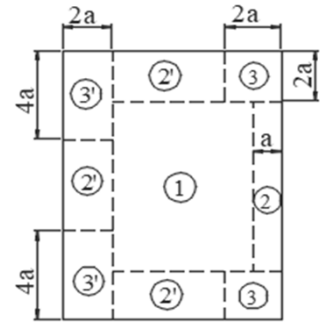
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



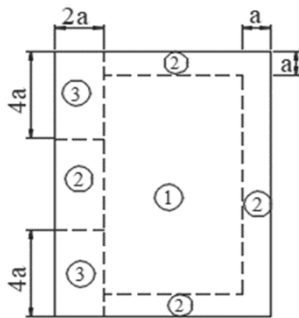
Walls  $h \leq 60'$   
& alt design  $h < 90'$



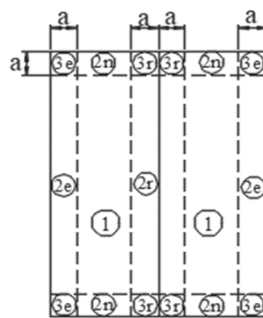
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



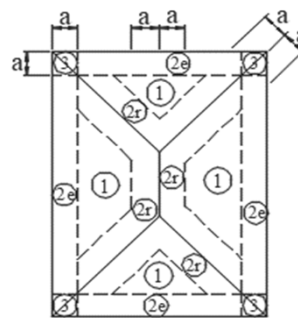
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



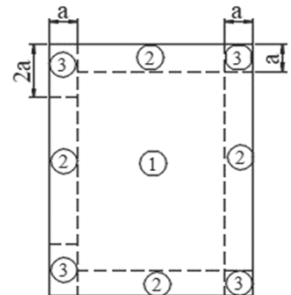
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



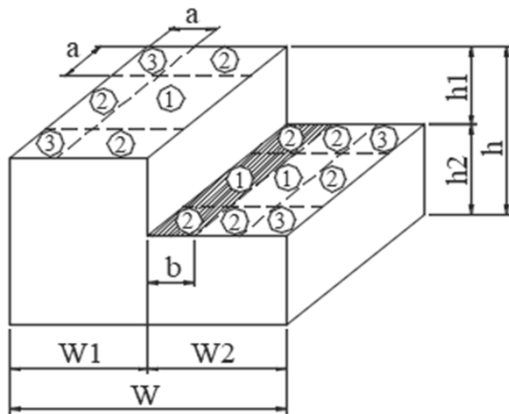
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



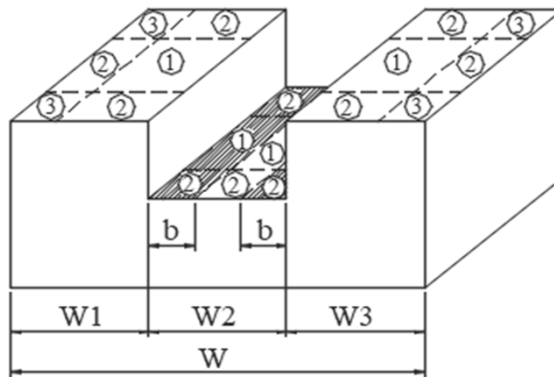
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$





**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.	SHEET NO.
CALCULATED BY EEB	DATE 1/6/20
CHECKED BY MJR	DATE

www.struware.com

## Code Search

**Code:** ASCE 7 - 16

**Occupancy:**

Occupancy Group = R Residential

**Risk Category & Importance Factors:**

Risk Category = II  
Wind factor = 1.00  
Snow factor = 1.00  
Seismic factor = 1.00

**Type of Construction:**

Fire Rating:  
Roof = 0.0 hr  
Floor = 0.0 hr

**Building Geometry:**

Roof angle ( $\theta$ ) 0.00 / 12 0.0 deg  
Building length (L) 8.0 ft  
Least width (B) 8.0 ft  
Mean Roof Ht (h) 10.5 ft  
Parapet ht above grd 0.0 ft  
Minimum parapet ht 0.0 ft



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.	SHEET NO.
CALCULATED BY EEB	DATE 1/6/20
CHECKED BY MJR	DATE

**Wind Loads :**

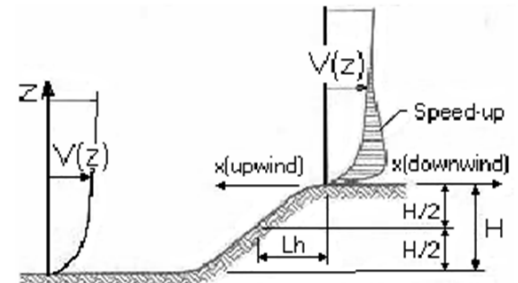
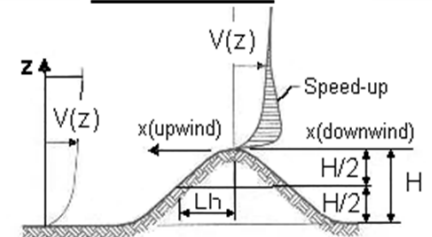
ASCE 7- 16

Ultimate Wind Speed	250 mph
Nominal Wind Speed	193.6 mph
Risk Category	II
Exposure Category	D
Enclosure Classif.	Partially Enclosed
Internal pressure	+/-0.55
Directionality (Kd)	0.85
Kh case 1	1.030
Kh case 2	1.030
Type of roof	Monoslope

Topographic Factor (Kzt)

Topography	Flat
Hill Height (H)	0.0 ft
Half Hill Length (Lh)	0.0 ft
Actual H/Lh =	0.00
Use H/Lh =	0.00
Modified Lh =	0.0 ft
From top of crest: x =	0.0 ft
Bldg up/down wind?	downwind
H/Lh = 0.00	K <sub>1</sub> = 0.000
x/Lh = 0.00	K <sub>2</sub> = 0.000
z/Lh = 0.00	K <sub>3</sub> = 1.000
At Mean Roof Ht:	
$K_{zt} = (1 + K_1 K_2 K_3)^2 = 1.00$	

H < 15ft; exp D  
∴ K<sub>zt</sub> = 1.0

**ESCARPMENT****2D RIDGE or 3D AXISYMMETRICAL HILL****Gust Effect Factor**

h =	10.5 ft
B =	8.0 ft
/z (0.6h) =	7.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).

If building h/B > 4 then may be flexible and should be investigated.

h/B = 1.31

**G = 0.85** Using rigid structure formula

**Rigid Structure**

$\bar{e}$ =	0.13
$l$ =	650 ft
$Z_{min}$ =	7 ft
$c$ =	0.13
$g_Q, g_v$ =	3.4
$L_z$ =	535.5 ft
$Q$ =	0.96
$I_z$ =	0.16
$G$ =	0.91 use G = 0.85

**Flexible or Dynamically Sensitive Structure**

$34 \pi c y (\eta_1)$ =	0.0 Hz		
Damping ratio ( $\beta$ ) =	0		
$/b$ =	0.80		
$/\alpha$ =	0.11		
$V_z$ =	246.9		
$N_1$ =	0.00		
$R_n$ =	0.000		
$R_n$ =	28.282	$\eta$ =	0.000
$R_B$ =	28.282	$\eta$ =	0.000
$R_L$ =	28.282	$\eta$ =	0.000
$g_R$ =	0.000		
$R$ =	0.000		
$G_f$ =	0.000		
		h =	10.5 ft

**Enclosure Classification**



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO. \_\_\_\_\_ SHEET NO. \_\_\_\_\_  
CALCULATED BY EEB DATE 1/6/20  
CHECKED BY MJR DATE \_\_\_\_\_

**Wind Loads - MWFRS all h (Except for Open Buildings)**

Kh (case 2) = 1.03 h = 10.5 ft GCpi = +/-0.55  
Base pressure (qn) = **140.1 psf** ridge ht = 10.5 ft G = 0.85  
Roof Angle (θ) = 0.0 deg L = 8.0 ft z for qi : 10.5 ft  
Roof tributary area - (h/2)\*L: 42 sf B = 8.0 ft qi = 140.1 psf for positive internal pressures  
(h/2)\*B: 42 sf

**Ultimate Wind Surface Pressures (psf)**

Surface	Wind Normal to Ridge				Wind Parallel to Ridge			
	B/L = 1.00	h/L = 1.31			L/B = 1.00	h/L = 1.31		
	Cp	qhGCp	w/+qiGCpi	w/-qiGCpi	Dist.*	Cp	qhGCp	w/+qiGCpi w/-qiGCpi
Windward Wall (WW)	0.80	95.3	see table below			0.80	95.3	see table below
Leeward Wall (LW)	-0.50	-59.5	-136.6	17.5		-0.50	-59.5	-136.6 17.5
Side Wall (SW)	-0.70	-83.4	-160.4	-6.3		-0.70	-83.4	-160.4 -6.3
Leeward Roof (LR)		**				Included in windward roof		
Neg Windward Roof: 0 to h/2*	-1.30	-154.8	-231.9	-77.8	0 to h/2*	-1.30	-154.8	-231.9 -77.8
> h/2*	-0.70	-83.4	-160.4	-6.3	> h/2*	-0.70	-83.4	-160.4 -6.3
Pos/min windward roof press.	-0.18	-21.4	-98.5	55.6	Min press.	-0.18	-21.4	-98.5 55.6

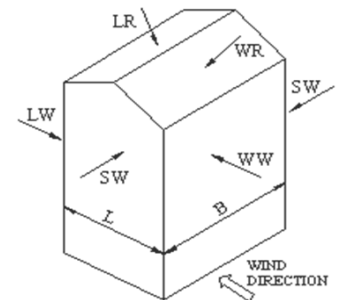
\*\*Roof angle < 10 degrees. Therefore, leeward roof is included in windward roof pressure zones.

\*Horizontal distance from windward edge

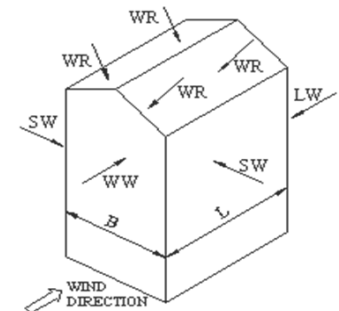
For monoslope roofs, entire roof surface is either windward or leeward surface.

**Windward Wall Pressures at "z" (psf)**

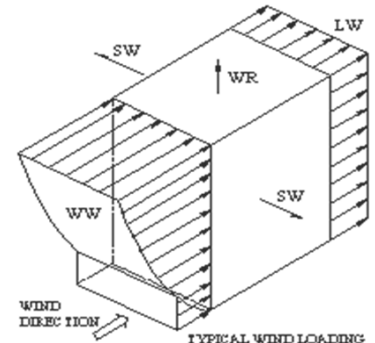
z	Kz	Kzt	Windward Wall			Combined WW + LW	
			qzGCp	w/+qiGCpi	w/-qiGCpi	Normal to Ridge	Parallel to Ridge
h= 0 to 15'	1.03	1.00	95.3	18.2	172.3	154.8	154.8



WIND NORMAL TO RIDGE



WIND PARALLEL TO RIDGE



TYPICAL WIND LOADING

**NOTE:**

See figure in ASCE7 for the application of full and partial loading of the above wind pressures. There are 4 different loading cases.

**Parapet**

z	Kz	Kzt	qp (psf)
0.0 ft	1.03	1.00	0.0

Windward parapet: 0.0 psf (GCpn = +1.5)  
Leeward parapet: 0.0 psf (GCpn = -1.0)

Windward roof overhangs ( add to windward roof pressure) : 95.3 psf (upward)



**Atkins Global**

S Keller Rd  
Orlando, FL  
954-233-4399

JOB TITLE PR CMU Prescriptive Design

JOB NO.

SHEET NO.

CALCULATED BY EEB

DATE 1/6/20

CHECKED BY MJR

DATE

## Ultimate Wind Pressures

### Wind Loads - Components & Cladding : $h \leq 60'$

Kh (case 1) = 1.03      h = 10.5 ft  
Base pressure (qh) = **140.1 psf**      0.6h = 6.3 ft  
Minimum parapet ht = 0.0 ft      GCpi = +/-0.55  
Roof Angle (θ) = 0.0 deg      qi = 140.1 psf for  
Type of roof = Monoslope      positive internal pressures

#### Roof

Area	Surface Pressure (psf)							
	10 sf	20 sf	50 sf	100 sf	200 sf	350 sf	500 sf	1000 sf
Negative Zone 1	-315.3	-297.9	-274.9	-257.5	-240.1	-226.1	-217.2	-217.2
Negative Zone 1'	-203.2	-203.2	-203.2	-203.2	-182.1	-165.0	-154.2	-133.1
Negative Zone 2	-399.3	-377	-347.4	-325.1	-302.8	-284.7	-273.2	-273.2
Negative Zone 3	-525.4	-480.7	-421.7	-377	-332.3	-296.2	-273.2	-273.2
Positive All Zones	119.1	114.9	109.3	105.1	105.1	105.1	105.1	105.1
Overhang Zone 1&1'	-238.2	-234	-228.4	-224.2	-188.0	-158.7	-140.1	-140.1
Overhang Zone 2	-322.3	-292.5	-253.1	-223.3	-193.5	-169.5	-154.1	-154.1
Overhang Zone 3	-448.4	-396.2	-327.3	-275.2	-223.0	-181.0	-154.1	-154.1

Overhang pressures in the table above assume an internal pressure coefficient (GCpi) of 0.0

Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 77.1 psf)

User input	
75 sf	500 sf
-264.7	-217.2
-203.2	-154.2
-334.4	-273.2
-395.5	-273.2
106.8	105.1
-225.9	-140.1
-235.7	-154.1
-296.8	-154.1

#### Parapet

qp = 0.0 psf

Solid Parapet Pressure	Surface Pressure (psf)					
	10 sf	20 sf	50 sf	100 sf	200 sf	500 sf
CASE A: Zone 2 :	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3 :	0.0	0.0	0.0	0.0	0.0	0.0
CASE B : Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0
Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0

User input
40 sf
0.0
0.0
0.0
0.0

#### Walls

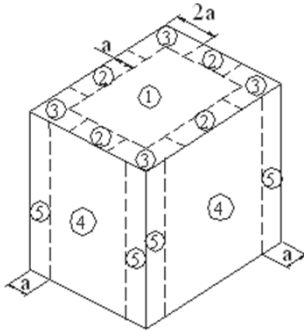
Area	GCp +/- GCpi				Surface Pressure at h			
	10 sf	100 sf	200 sf	500 sf	10 sf	100 sf	200 sf	500 sf
Negative Zone 4	-1.54	-1.38	-1.33	-1.27	-203.2	-193.5	-186.8	-177.9
Negative Zone 5	-1.81	-1.49	-1.40	-1.27	-329.3	-209.1	-195.7	-177.9
Positive Zone 4 & 5	1.45	1.29	1.24	1.18	203.2	180.9	174.2	165.3

Note: GCp reduced by 10% due to roof angle <= 10 deg.

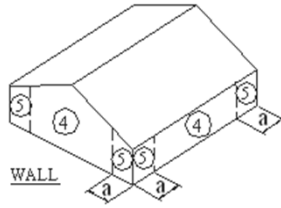
User input	
50 sf	20 sf
-200.2	-209.1
-222.5	-240.2
187.6	196.5



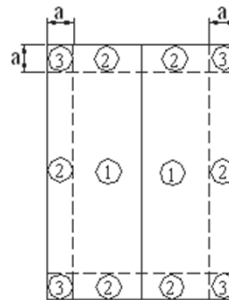
**Location of C&C Wind Pressure Zones - ASCE 7-10 & earlier**



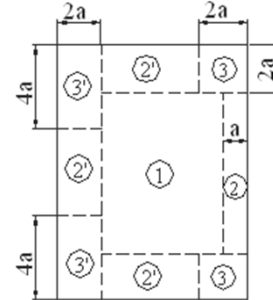
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



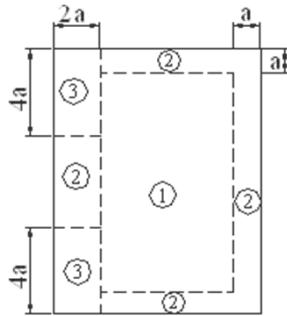
Walls  $h \leq 60'$   
& alt design  $h < 90'$



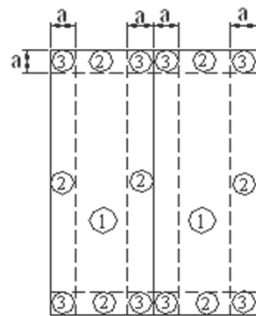
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



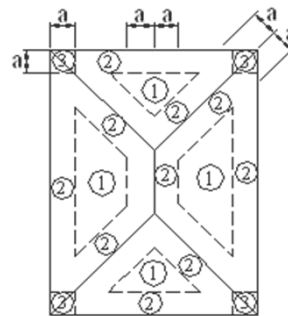
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



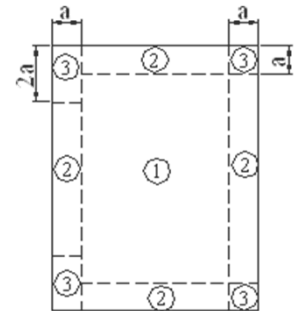
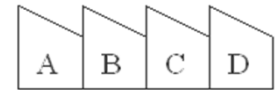
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



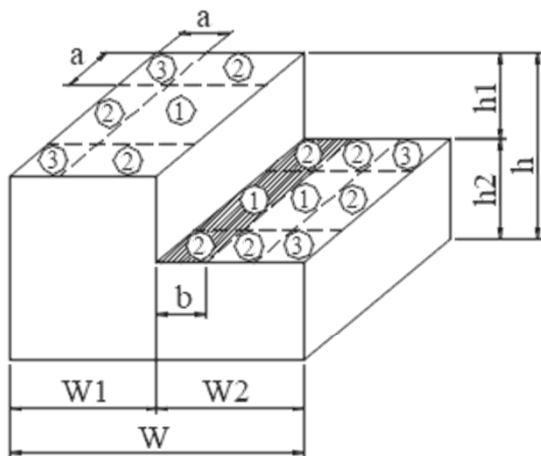
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



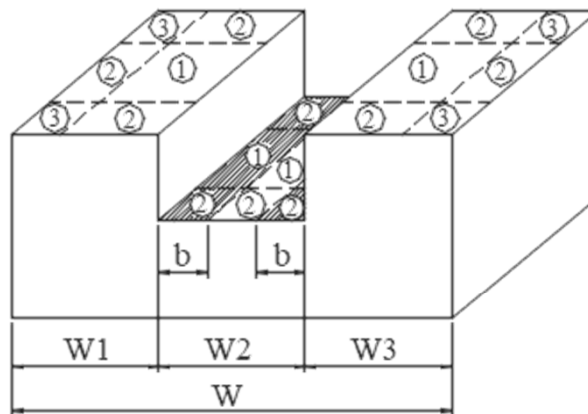
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

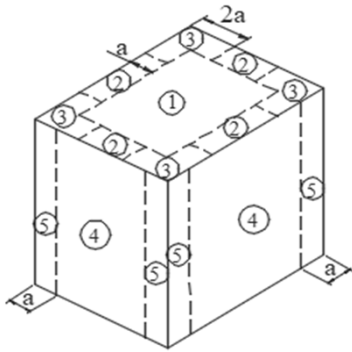


Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$

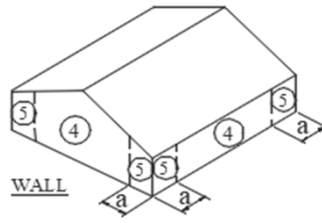




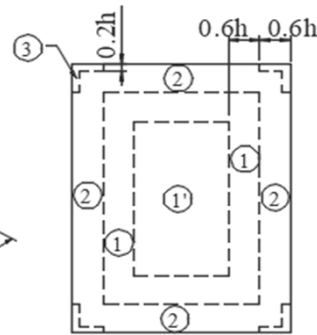
**Location of C&C Wind Pressure Zones - ASCE 7-16**



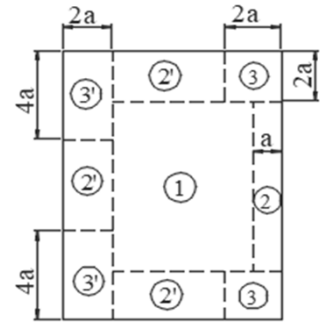
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



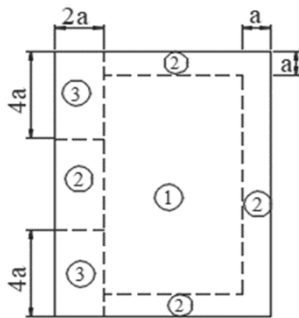
Walls  $h \leq 60'$   
& alt design  $h < 90'$



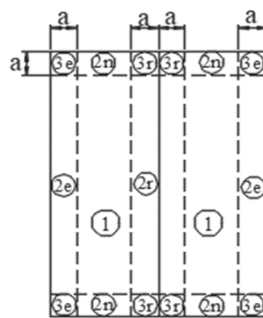
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



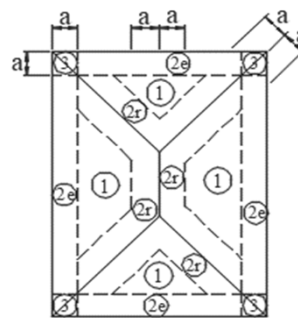
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



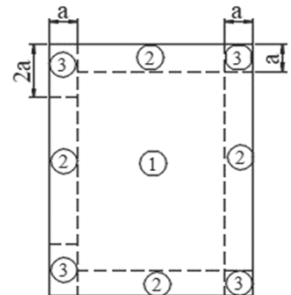
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



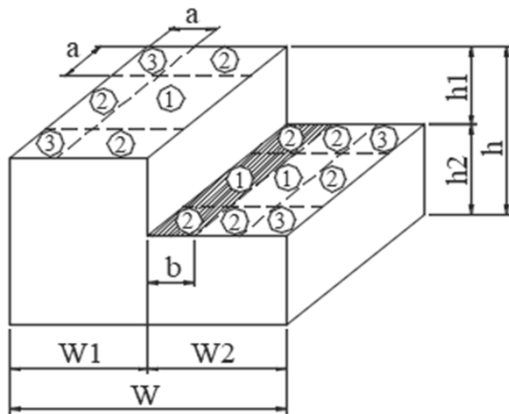
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



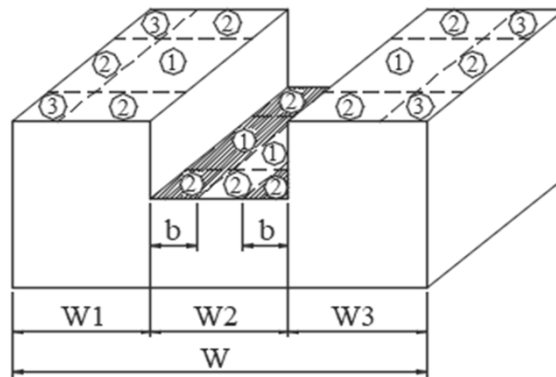
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$





FEMA - PUERTO RICO PRESCRIPTIVE DESIGN HOUSE  
ELEMENTS MODEL REACTIONS FOR CONCEPT FOUNDATION  
MODEL ANALYSIS



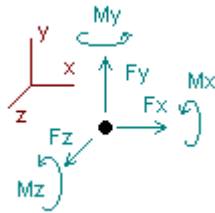
Current Date: 1/10/2020 10:52 AM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\190 Exp D CMU Design 2 Story\_with Conc Frame\_6 in.etz\

## Analysis result

### Reactions



Vseismic =  $(0.2 \times 159.4) / 4 = 7.89$   
Therefore, Wind Controls, see reactions on pages 2-4.

Direction of positive forces and moments

Node	Forces [Kip]			Moments [Kip*ft]		
	FX	FY	FZ	MX	MY	MZ
Condition DL=Dead Load						
3	0.59272	10.99016	0.01747	0.00000	0.00000	0.00000
4	0.60530	6.76885	0.55404	0.00000	0.00000	0.00000
5	-0.11966	8.38738	0.11857	0.00000	0.00000	0.00000
6	1.37289	14.22302	-0.60624	0.00000	0.00000	0.00000
7	-1.43727	13.95079	-0.53806	0.00000	0.00000	0.00000
8	0.48990	15.98248	-0.76043	0.00000	0.00000	0.00000
9	-1.57726	13.35661	-0.18165	0.00000	0.00000	0.00000
26	0.34544	8.35221	0.30165	0.00000	0.00000	0.00000
80	0.49211	2.76294	-0.03738	0.00000	0.00000	0.00000
82	-0.51991	2.29466	-0.03337	0.00000	0.00000	0.00000
FEM: 115	0.52804	3.55711	-0.00486	0.00000	0.00000	0.00000
FEM: 126	-1.16321	11.52911	0.01247	0.00000	0.00000	0.00000
FEM: 138	1.79876	7.38591	0.03398	0.00000	0.00000	0.00000
FEM: 139	1.08902	8.70216	-0.16806	0.00000	0.00000	0.00000
FEM: 140	-0.30003	8.00909	-0.17125	0.00000	0.00000	0.00000
FEM: 141	-0.59781	6.42171	-0.15723	0.00000	0.00000	0.00000
FEM: 142	-1.23217	6.91681	-0.02091	0.00000	0.00000	0.00000
FEM: 180	0.03132	2.15651	-0.43795	0.00000	0.00000	0.00000
FEM: 181	0.01120	0.93070	-0.63738	0.00000	0.00000	0.00000
FEM: 182	0.01886	1.93361	-1.07404	0.00000	0.00000	0.00000
FEM: 206	-0.00521	1.18256	0.03530	0.00000	0.00000	0.00000
FEM: 97	-0.02838	0.78695	0.50263	0.00000	0.00000	0.00000
FEM: 96	-0.02262	0.18554	-0.01032	0.00000	0.00000	0.00000
FEM: 207	-0.00508	0.78699	0.40897	0.00000	0.00000	0.00000
FEM: 230	0.00009	3.69734	0.34092	0.00000	0.00000	0.00000
FEM: 247	0.07060	2.74326	-0.75073	0.00000	0.00000	0.00000
FEM: 248	0.02519	1.01480	-0.67498	0.00000	0.00000	0.00000
FEM: 249	-0.04304	2.19392	-0.33421	0.00000	0.00000	0.00000
FEM: 274	0.17621	0.31470	0.00731	0.00000	0.00000	0.00000
FEM: 329	0.25666	2.57940	-0.01992	0.00000	0.00000	0.00000
FEM: 330	-0.17447	2.37603	-0.00902	0.00000	0.00000	0.00000
FEM: 331	-0.48693	1.72236	0.01264	0.00000	0.00000	0.00000
SUM	0.19126	174.19567	-4.28202	0.00000	0.00000	0.00000



	Fx	Fy	Fz			
Condition	WLX=Wind Load X					
3	-1.31961	-8.78349	-0.63455	0.00000	0.00000	0.00000
4	-0.39102	-2.23311	0.16843	0.00000	0.00000	0.00000
5	0.00631	-1.19063	0.72218	0.00000	0.00000	0.00000
6	-1.89598	-12.13287	0.22589	0.00000	0.00000	0.00000
7	-0.33855	-4.18068	0.37804	0.00000	0.00000	0.00000
8	-1.06336	-11.89495	0.30867	0.00000	0.00000	0.00000
9	-0.21575	0.24553	-0.77607	0.00000	0.00000	0.00000
26	-0.48307	-11.26926	-0.68961	0.00000	0.00000	0.00000
80	-0.21981	-1.45457	0.73670	0.00000	0.00000	0.00000
82	0.12716	-0.59310	1.27424	0.00000	0.00000	0.00000
FEM: 115	-0.32109	-0.90660	0.38973	0.00000	0.00000	0.00000
FEM: 126	-0.86731	-4.14990	-0.56831	0.00000	0.00000	0.00000
FEM: 138	-3.44926	-5.01774	-0.98345	0.00000	0.00000	0.00000
FEM: 139	-2.66472	-5.11156	-1.60712	0.00000	0.00000	0.00000
FEM: 140	-1.72839	-4.00557	-1.12692	0.00000	0.00000	0.00000
FEM: 141	-2.09388	-4.26240	-1.24288	0.00000	0.00000	0.00000
FEM: 142	-1.25168	-4.66269	-0.87158	0.00000	0.00000	0.00000
FEM: 180	0.01442	-1.73802	-0.51719	0.00000	0.00000	0.00000
FEM: 181	-0.15527	-0.73938	-0.60384	0.00000	0.00000	0.00000
FEM: 182	-0.07498	-0.88375	-0.29131	0.00000	0.00000	0.00000
FEM: 206	-0.03948	-1.43569	-0.19612	0.00000	0.00000	0.00000
FEM: 97	-0.13473	-1.28462	-0.44019	0.00000	0.00000	0.00000
FEM: 96	-0.11517	-0.84198	0.47395	0.00000	0.00000	0.00000
FEM: 207	0.00511	-0.41247	0.60634	0.00000	0.00000	0.00000
FEM: 230	-0.55664	-3.78997	-1.04429	0.00000	0.00000	0.00000
FEM: 247	-0.22664	-1.27486	-0.19088	0.00000	0.00000	0.00000
FEM: 248	-0.42021	-1.05213	-0.98207	0.00000	0.00000	0.00000
FEM: 249	-0.59739	-3.55325	-1.14588	0.00000	0.00000	0.00000
FEM: 274	-0.12288	-0.10390	-0.28754	0.00000	0.00000	0.00000
FEM: 329	-0.42691	-2.45071	0.63101	0.00000	0.00000	0.00000
FEM: 330	-0.07094	-1.63202	0.66257	0.00000	0.00000	0.00000
FEM: 331	-0.03854	-0.91840	0.65150	0.00000	0.00000	0.00000
SUM	-21.13026	-103.71474	-6.97055	0.00000	0.00000	0.00000

Condition	WLZ=Wind Load Z					
3	1.11964	-2.46496	-3.71761	0.00000	0.00000	0.00000
4	-0.09028	-10.06238	-2.30776	0.00000	0.00000	0.00000
5	0.08272	-0.42898	-0.86147	0.00000	0.00000	0.00000
6	0.13545	12.17977	-1.24812	0.00000	0.00000	0.00000
7	0.98828	10.74682	-1.31699	0.00000	0.00000	0.00000
8	-0.16195	-1.24925	-2.26792	0.00000	0.00000	0.00000
9	0.22306	-2.41588	-0.29670	0.00000	0.00000	0.00000
26	0.02468	-14.39751	-2.76074	0.00000	0.00000	0.00000
80	-0.45496	-2.40802	-1.15776	0.00000	0.00000	0.00000
82	0.26116	-0.49433	-1.38118	0.00000	0.00000	0.00000
FEM: 115	0.14430	-1.20652	-0.46177	0.00000	0.00000	0.00000
FEM: 126	-0.12128	-1.12179	-0.08904	0.00000	0.00000	0.00000
FEM: 138	0.40120	1.15283	-0.16221	0.00000	0.00000	0.00000
FEM: 139	0.64964	-1.10945	-0.51394	0.00000	0.00000	0.00000
FEM: 140	1.03975	-1.82778	-0.37292	0.00000	0.00000	0.00000
FEM: 141	1.49065	-0.50978	-0.40465	0.00000	0.00000	0.00000
FEM: 142	1.55186	1.18376	-0.22695	0.00000	0.00000	0.00000
FEM: 180	-0.14983	-4.43424	-3.77313	0.00000	0.00000	0.00000
FEM: 181	-0.22822	-3.22838	-5.75676	0.00000	0.00000	0.00000
FEM: 182	-0.07933	1.37169	-5.56743	0.00000	0.00000	0.00000
FEM: 206	-0.07440	-4.11391	0.85686	0.00000	0.00000	0.00000
FEM: 97	-0.08957	-3.22394	0.08973	0.00000	0.00000	0.00000
FEM: 96	0.03881	5.64325	-2.03807	0.00000	0.00000	0.00000



	Fx	Fy	Fz			
FEM: 207	-0.09132	4.65481	-2.28769	0.00000	0.00000	0.00000
FEM: 230	0.51413	-1.41558	-7.48293	0.00000	0.00000	0.00000
FEM: 247	0.19556	3.29096	-3.32623	0.00000	0.00000	0.00000
FEM: 248	0.29343	-0.46941	-4.98000	0.00000	0.00000	0.00000
FEM: 249	0.17076	-3.90665	-3.02236	0.00000	0.00000	0.00000
FEM: 274	-0.26739	-0.38583	0.62736	0.00000	0.00000	0.00000
FEM: 329	0.69835	-2.97656	-0.65830	0.00000	0.00000	0.00000
FEM: 330	0.55239	-1.54864	-0.72316	0.00000	0.00000	0.00000
FEM: 331	0.36339	-0.72505	-0.71957	0.00000	0.00000	0.00000

---

SUM	9.13067	-25.90094	-58.30941	0.00000	0.00000	0.00000
-----	---------	-----------	-----------	---------	---------	---------

Condition **RLL=Roof Live Load**

3	0.00168	0.07888	-0.01319	0.00000	0.00000	0.00000
4	0.01396	0.14387	0.00363	0.00000	0.00000	0.00000
5	-0.00596	0.18437	-0.00018	0.00000	0.00000	0.00000
6	0.14736	0.80433	-0.00140	0.00000	0.00000	0.00000
7	-0.15891	0.85054	-0.00388	0.00000	0.00000	0.00000
8	0.01810	0.23304	-0.00663	0.00000	0.00000	0.00000
9	-0.01433	0.21970	0.00047	0.00000	0.00000	0.00000
26	0.03802	0.51728	-0.00926	0.00000	0.00000	0.00000
80	0.01206	0.06748	-0.00016	0.00000	0.00000	0.00000
82	-0.04088	0.13491	0.00017	0.00000	0.00000	0.00000
FEM: 115	0.00901	0.07680	-0.00003	0.00000	0.00000	0.00000
FEM: 126	0.00433	0.17596	0.00032	0.00000	0.00000	0.00000
FEM: 138	0.20401	0.56465	0.00009	0.00000	0.00000	0.00000
FEM: 139	0.12084	0.75020	0.00033	0.00000	0.00000	0.00000
FEM: 140	-0.03542	0.71225	0.00031	0.00000	0.00000	0.00000
FEM: 141	-0.07986	0.53274	0.00033	0.00000	0.00000	0.00000
FEM: 142	-0.16078	0.53821	0.00003	0.00000	0.00000	0.00000
FEM: 180	-0.00041	0.14164	0.02629	0.00000	0.00000	0.00000
FEM: 181	-0.00020	0.05827	0.02277	0.00000	0.00000	0.00000
FEM: 182	0.00027	0.03060	0.00159	0.00000	0.00000	0.00000
FEM: 206	0.00014	0.01950	0.00285	0.00000	0.00000	0.00000
FEM: 97	0.00011	0.01570	0.00672	0.00000	0.00000	0.00000
FEM: 96	0.00014	0.02113	-0.00585	0.00000	0.00000	0.00000
FEM: 207	0.00003	0.03330	0.00044	0.00000	0.00000	0.00000
FEM: 230	0.00010	0.11457	-0.04936	0.00000	0.00000	0.00000
FEM: 247	0.00001	0.02863	-0.00697	0.00000	0.00000	0.00000
FEM: 248	0.00014	0.04527	0.01395	0.00000	0.00000	0.00000
FEM: 249	0.00040	0.14116	0.03275	0.00000	0.00000	0.00000
FEM: 274	0.00341	0.00558	0.00050	0.00000	0.00000	0.00000
FEM: 329	0.03286	0.17094	-0.00005	0.00000	0.00000	0.00000
FEM: 330	-0.00866	0.15992	-0.00005	0.00000	0.00000	0.00000
FEM: 331	-0.03777	0.10660	-0.00007	0.00000	0.00000	0.00000

---

SUM	0.06379	7.67802	0.01647	0.00000	0.00000	0.00000
-----	---------	---------	---------	---------	---------	---------

Condition **EQX=Earthquake X**

4	-7.98000	0.00000	0.00000	0.00000	0.00000	0.00000
6	-7.98000	0.00000	0.00000	0.00000	0.00000	0.00000
7	-7.98000	0.00000	0.00000	0.00000	0.00000	0.00000
26	-7.98000	0.00000	0.00000	0.00000	0.00000	0.00000

---

SUM	-31.92000	0.00000	0.00000	0.00000	0.00000	0.00000
-----	-----------	---------	---------	---------	---------	---------



	Fx	Fy	Fz			
Condition	EQZ=Earthquake Z					
4	0.00000	0.00000	-7.98000	0.00000	0.00000	0.00000
6	0.00000	0.00000	-7.98000	0.00000	0.00000	0.00000
7	0.00000	0.00000	-7.98000	0.00000	0.00000	0.00000
26	0.00000	0.00000	-7.98000	0.00000	0.00000	0.00000
<hr/>						
SUM	0.00000	0.00000	-31.92000	0.00000	0.00000	0.00000



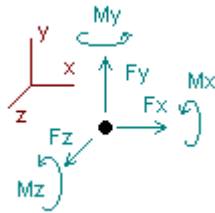
Current Date: 1/10/2020 11:04 AM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\PR Prescriptive Design - Safe Room\_Shells\_cmu.etz\

## Analysis result

### Reactions



Direction of positive forces and moments

Node	Forces [Kip]			Moments [Kip*ft]		
	FX	FY	FZ	MX	MY	MZ
Condition <b>DL=Dead Load</b>						
1	0.18734	4.02866	0.27239	0.00000	0.00000	0.00000
2	-0.01341	3.20992	0.41279	0.00000	0.00000	0.00000
3	0.12909	4.85453	-0.45545	0.00000	0.00000	0.00000
4	-0.12947	4.86026	-0.30572	0.00000	0.00000	0.00000
FEM: 37	-0.23416	1.70485	0.00145	0.00000	0.00000	0.00000
FEM: 49	0.06496	2.24651	0.00144	0.00000	0.00000	0.00000
FEM: 66	-0.00150	3.31514	-0.11342	0.00000	0.00000	0.00000
FEM: 78	0.00263	3.26716	0.18714	0.00000	0.00000	0.00000
FEM: 87	-0.00548	2.28515	-0.00061	0.00000	0.00000	0.00000
SUM	0.00000	29.77219	0.00000	0.00000	0.00000	0.00000
Condition <b>LLR=Roof Live Load</b>						
1	0.00082	0.49748	0.03805	0.00000	0.00000	0.00000
2	-0.00894	0.48629	0.12230	0.00000	0.00000	0.00000
3	0.00483	0.82709	-0.12027	0.00000	0.00000	0.00000
4	-0.00309	0.82849	-0.06666	0.00000	0.00000	0.00000
FEM: 37	-0.01920	0.45542	0.00121	0.00000	0.00000	0.00000
FEM: 49	0.03278	0.42183	0.00028	0.00000	0.00000	0.00000
FEM: 66	-0.00045	0.56592	-0.06232	0.00000	0.00000	0.00000
FEM: 78	0.00110	0.51180	0.08726	0.00000	0.00000	0.00000
FEM: 87	-0.00782	0.20542	0.00016	0.00000	0.00000	0.00000
SUM	0.00000	4.79974	0.00000	0.00000	0.00000	0.00000
Condition <b>WL_X=Wind Load X Direction</b>						
1	-0.78348	-3.79331	-0.06676	0.00000	0.00000	0.00000
2	-1.44013	-2.47821	-0.59015	0.00000	0.00000	0.00000
3	-0.65580	-5.13656	-0.42561	0.00000	0.00000	0.00000
4	-0.98921	1.44207	-0.79909	0.00000	0.00000	0.00000
FEM: 37	-0.21276	1.63041	1.17371	0.00000	0.00000	0.00000
FEM: 49	-1.16868	-0.90809	0.89351	0.00000	0.00000	0.00000
FEM: 66	-1.10344	-1.45118	-0.95556	0.00000	0.00000	0.00000
FEM: 78	-0.53389	-2.83896	0.80355	0.00000	0.00000	0.00000
FEM: 87	-2.55238	-1.31337	-1.47719	0.00000	0.00000	0.00000
SUM	-9.43976	-14.84720	-1.44360	0.00000	0.00000	0.00000



Fx

Fy

Fz

Condition **WL\_Z=Wind Load Z Direction**

1	-0.20559	-3.46858	-1.02095	0.00000	0.00000	0.00000
2	-0.04643	-2.31591	-0.52930	0.00000	0.00000	0.00000
3	-0.02989	2.30118	-1.02889	0.00000	0.00000	0.00000
4	0.06904	0.65647	-0.60250	0.00000	0.00000	0.00000
FEM: 37	0.06367	-0.35633	-1.29766	0.00000	0.00000	0.00000
FEM: 49	-0.06756	-1.05013	-0.95843	0.00000	0.00000	0.00000
FEM: 66	-0.10441	-0.37238	-0.97496	0.00000	0.00000	0.00000
FEM: 78	0.32282	-0.55970	-2.58594	0.00000	0.00000	0.00000
FEM: 87	-0.00164	0.17364	-0.11237	0.00000	0.00000	0.00000

---

SUM	0.00000	-4.99173	-9.11100	0.00000	0.00000	0.00000
-----	---------	----------	----------	---------	---------	---------

Condition **EQ\_X=Earthquake Load X Direction**

1	-1.40000	0.00000	0.00000	0.00000	0.00000	0.00000
2	-1.40000	0.00000	0.00000	0.00000	0.00000	0.00000
3	-1.40000	0.00000	0.00000	0.00000	0.00000	0.00000
4	-1.40000	0.00000	0.00000	0.00000	0.00000	0.00000

---

SUM	-5.60000	0.00000	0.00000	0.00000	0.00000	0.00000
-----	----------	---------	---------	---------	---------	---------

Condition **EQ\_Z=Earthquake Load Z Direction**

1	0.00000	0.00000	-1.40000	0.00000	0.00000	0.00000
2	0.00000	0.00000	-1.40000	0.00000	0.00000	0.00000
3	0.00000	0.00000	-1.40000	0.00000	0.00000	0.00000
4	0.00000	0.00000	-1.40000	0.00000	0.00000	0.00000

---

SUM	0.00000	0.00000	-5.60000	0.00000	0.00000	0.00000
-----	---------	---------	----------	---------	---------	---------



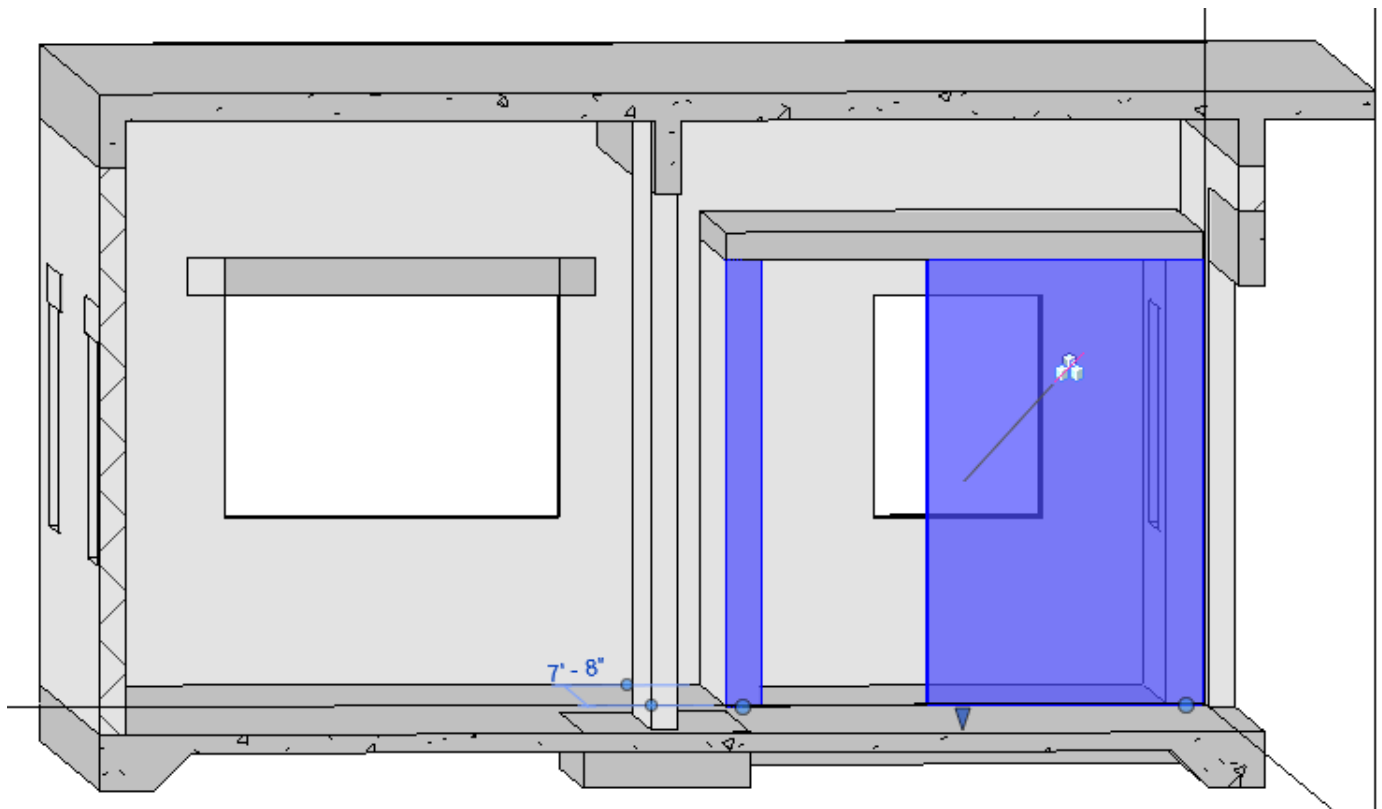
FEMA - PUERTO RICO PRESCRIPTIVE DESIGN HOUSE  
8" SAFE ROOM CMU AND 6" CMU EXTERIOR WALL DESIGN



PR FEMA SAFE ROOM WALL  
DESIGN



PR FEMA HOUSE SAFE ROOM  
DOOR WALL DESIGN





Current Date: 1/10/2020 8:41 AM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\Safe Room\PR House Safe RM Door Wall.bak\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : Warnings in design

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 8.50 [ft]  
 Total length : 8.00 [ft]  
 Base support type : Continuous  
 Wall bottom restraint : Pinned  
 Column bottom restraint : Fixed  
 Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
 Mortar type : Port/Mort - M/S  
 Grouting type : Full grouting  
 Masonry compression strength (F'm) : 1500 [Lb/in2]  
 Steel tension strength (fy) : 60000 [Lb/in2]  
 Steel allowable tension strength (Fs) : 32000 [Lb/in2]  
 Joint reinforcement allowable tension strength (Fs) : 30000 [Lb/in2]  
 Steel elasticity modulus (Es) : 2.9E07 [Lb/in2]  
 Masonry elasticity modulus (Em) : 1.35E06 [Lb/in2]  
 Masonry unit weight : 0.135 [Kip/ft3]

#### Seismic data:

Seismic design category : SDC D  
 Response modification factor : 1.00  
 Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft3]
1	8.50	7.63	0.14

#### Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	0.00	0.00	3.00	7.00

Flanges:



Distance [ft]	Thickness [in]	Width [ft]	Position X	Position Z
0.00	7.63	2.81	Centered	Back
8.00	7.63	2.81	Centered	Back

**Load conditions:**

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WLx	No	WIND	Wind Load in X
WLz	No	WIND	Wind Load in Z
EQx	No	EARTH	Earthquake in X
EQz	No	EARTH	Earthquake in Z
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		1.4DL
D2	Yes		1.2DL+1.6LL
D3	Yes		1.2DL+0.5LLR
D4	Yes		1.2DL+1.6LL+0.5LLR
D5	Yes		1.2DL+1.6LL+0.5LLR+1.6EQx+1.6EQz
D6	Yes		1.2DL+1.6LL+0.5LLR+0.9EQx+0.9EQz
D7	Yes		1.2DL+1.6LLR
D8	Yes		1.2DL+0.5WLx
D9	Yes		1.2DL+0.5WLz
D10	Yes		1.2DL+1.6LLR+LL
D11	Yes		1.2DL+1.6LLR+0.5WLx
D12	Yes		1.2DL+1.6LLR+0.5WLz
D13	Yes		1.2DL+WLx
D14	Yes		1.2DL+WLz
D15	Yes		1.2DL+WLx+0.5LLR
D16	Yes		1.2DL+WLz+0.5LLR
D17	Yes		1.2DL+WLx+LL
D18	Yes		1.2DL+WLz+LL
D19	Yes		1.2DL+WLx+LL+0.5LLR
D20	Yes		1.2DL+WLz+LL+0.5LLR
D21	Yes		0.9DL+WLx
D22	Yes		0.9DL+WLz
D23	Yes		0.9DL+WLx+1.6EQx+1.6EQz
D24	Yes		0.9DL+WLz+1.6EQx+1.6EQz
D25	Yes		0.9DL+WLx+0.9EQx+0.9EQz
D26	Yes		0.9DL+WLz+0.9EQx+0.9EQz
D27	Yes		DL
D28	Yes		DL+LL
D29	Yes		DL+LL+EQx+EQz
D30	Yes		DL+LL+0.6EQx+0.6EQz
D31	Yes		DL+LLR
D32	Yes		DL+0.75LL
D33	Yes		DL+0.75LLR
D34	Yes		DL+0.75LL+0.75LLR
D35	Yes		DL+0.6WLx
D36	Yes		DL+0.6WLz
D37	Yes		DL+0.75LL+0.45WLx+0.75LLR
D38	Yes		DL+0.75LL+0.45WLz+0.75LLR
D39	Yes		DL+0.75LL+0.45WLx
D40	Yes		DL+0.75LL+0.45WLz
D41	Yes		DL+0.45WLx+0.75LLR
D42	Yes		DL+0.45WLz+0.75LLR
D43	Yes		0.6DL+0.6WLx
D44	Yes		0.6DL+0.6WLz



D45	Yes	$0.6DL+0.6WLx+EQx+EQz$
D46	Yes	$0.6DL+0.6WLz+EQx+EQz$
D47	Yes	$0.6DL+0.6WLx+0.6EQx+0.6EQz$
D48	Yes	$0.6DL+0.6WLz+0.6EQx+0.6EQz$
S1	Yes	DL
S2	Yes	DL+LL
S3	Yes	DL+LL+EQx+EQz
S4	Yes	DL+LL+0.6EQx+0.6EQz
S5	Yes	DL+LLR
S6	Yes	DL+0.75LL
S7	Yes	DL+0.75LLR
S8	Yes	DL+0.75LL+0.75LLR
S9	Yes	DL+0.6WLx
S10	Yes	DL+0.6WLz
S11	Yes	DL+0.75LL+0.45WLx+0.75LLR
S12	Yes	DL+0.75LL+0.45WLz+0.75LLR
S13	Yes	$0.6DL+0.6WLx$
S14	Yes	$0.6DL+0.6WLz$
S15	Yes	$0.6DL+0.6WLx+EQx+EQz$
S16	Yes	$0.6DL+0.6WLz+EQx+EQz$
S17	Yes	$0.6DL+0.6WLx+0.6EQx+0.6EQz$
S18	Yes	$0.6DL+0.6WLz+0.6EQx+0.6EQz$

#### Distributed loads:

Consider self weight : No

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.30	0.00
1	LLR	Vertical	0.30	0.00
1	WLx	Vertical	-0.93	0.00
1	WLz	Vertical	-0.31	0.00

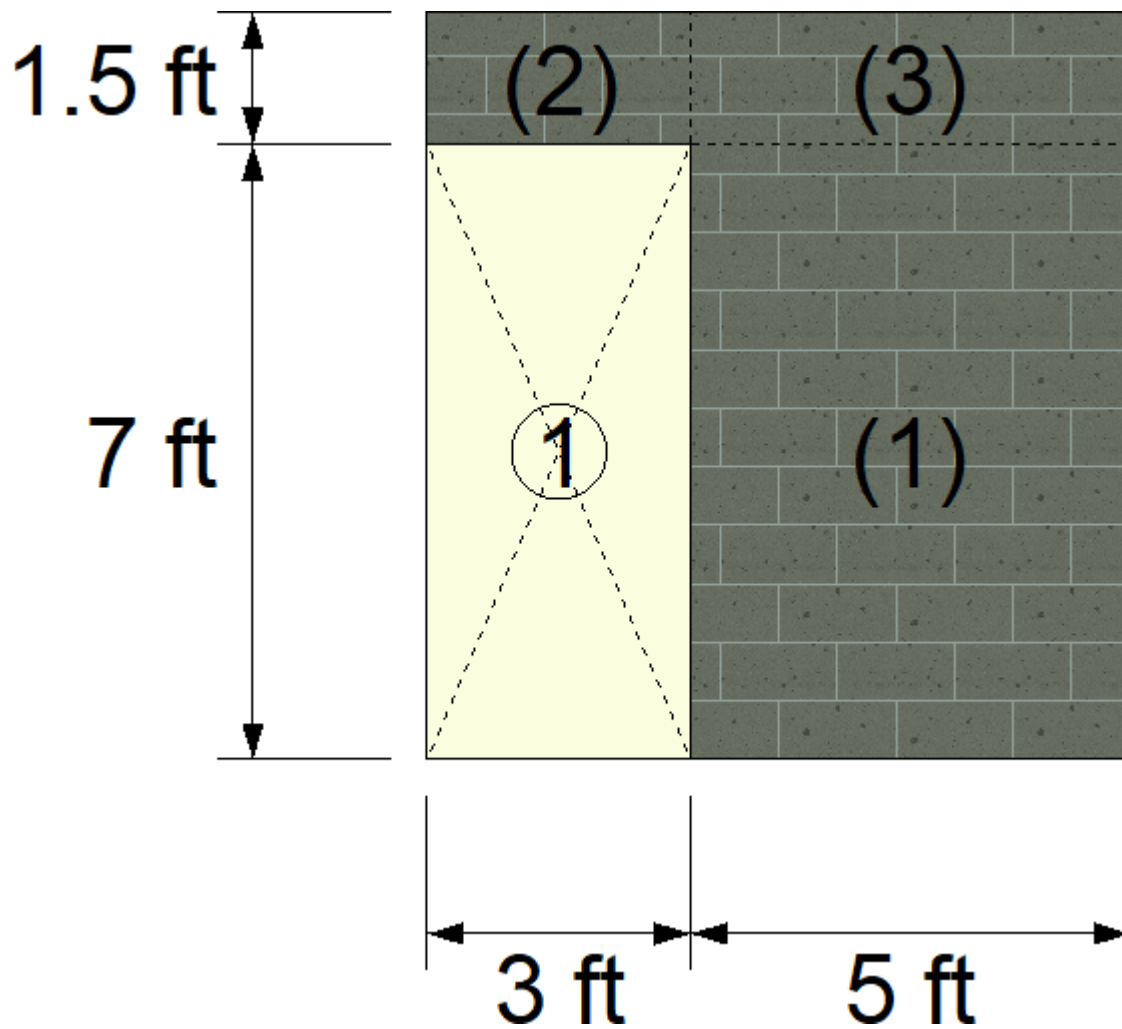
#### Out-of-plane loads:

Story	Condition	Magnitude [Kip/ft2]
1	WLx	0.16
1	WLz	-0.17
Parapet	WLx	0.16
Parapet	WLz	-0.17

#### BEARING WALL DESIGN:

Status : OK





**Geometry:**

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	3.00	0.00	5.00	7.00
2	0.00	7.00	3.00	1.50
3	3.00	7.00	5.00	1.50

**Vertical reinforcement:**

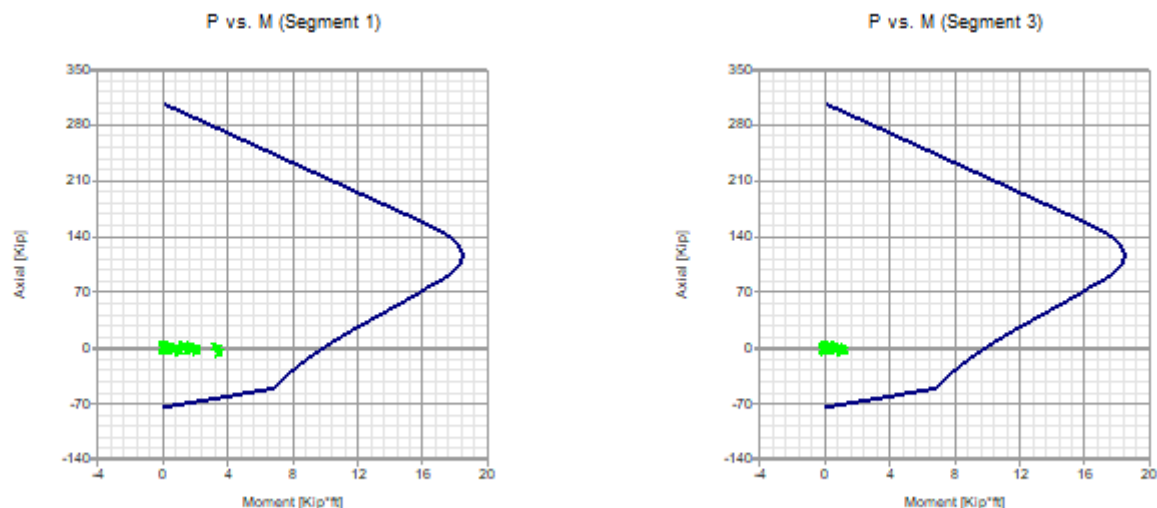
Segment	Bars	Spacing [in]	Ld [in]
1	8-#5	8.00	39.33
2	4-#5	8.00	39.33
3	8-#5	8.00	39.33

**Results: Combined axial flexure**



Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D15(Max)	-5.28	-3.53	9.49	0.37	
2	D11(Max)	1.50	-0.29	6.03	0.05	
3	D15(Max)	-2.75	-1.22	9.67	0.13	

Interaction diagrams, P vs. M:



Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D10(Top)	4.11	152.11	0.03	
2	D7(Max)	2.29	91.27	0.03	
3	D10(Max)	4.22	152.11	0.03	

Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D25(Max)	2671.73	32000.00	0.08	
2	D25(Top)	1691.98	32000.00	0.05	
3	D25(Bottom)	2071.16	32000.00	0.06	

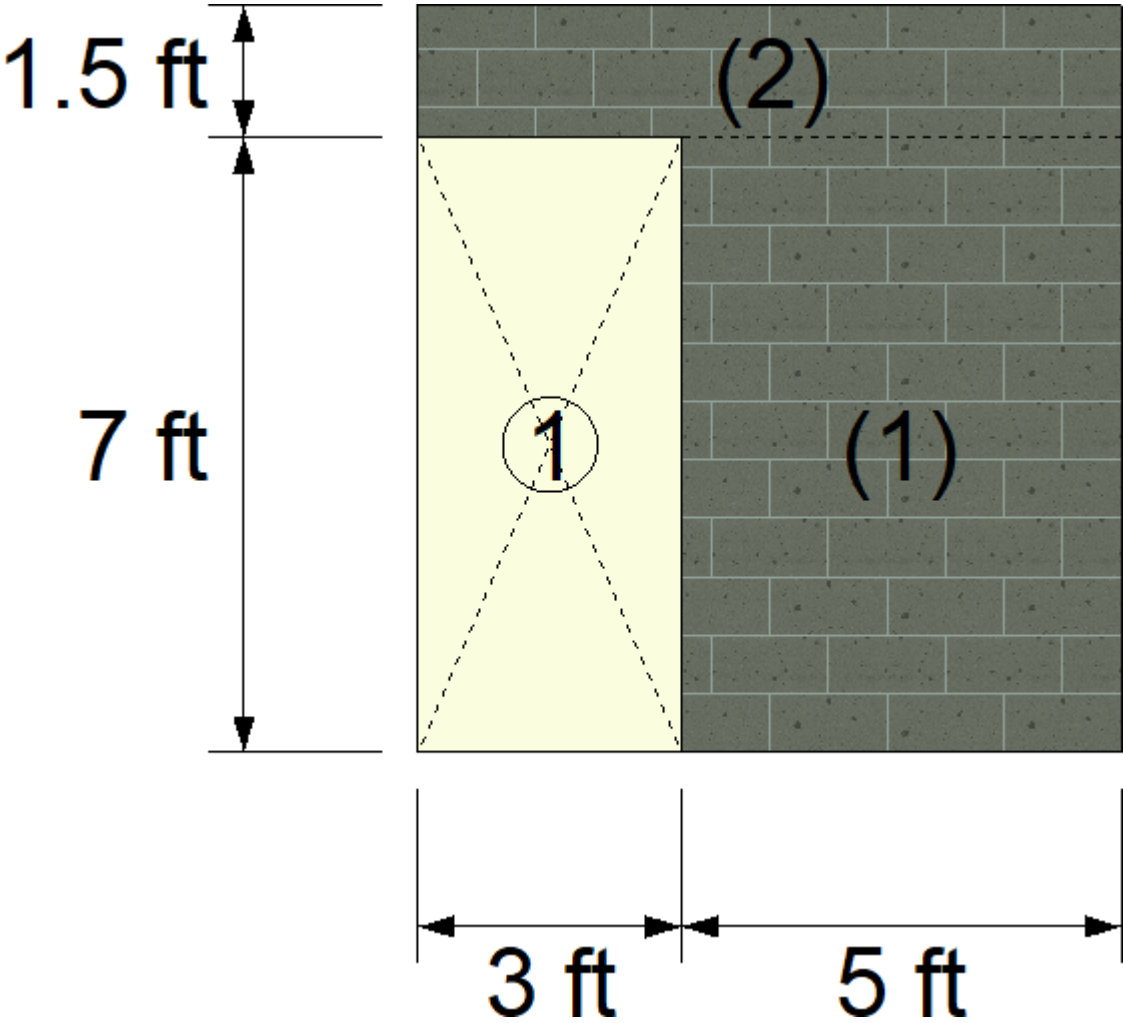
Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D15(Bottom)	14.565	68.086	0.21	
2	D20(Max)	5.938	47.460	0.13	
3	D15(Max)	6.117	43.571	0.14	



SHEAR WALL DESIGN:

Status : OK



Geometry:



Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	3.00	0.00	5.00	7.00
2	0.00	7.00	8.00	1.50

Reinforcement:

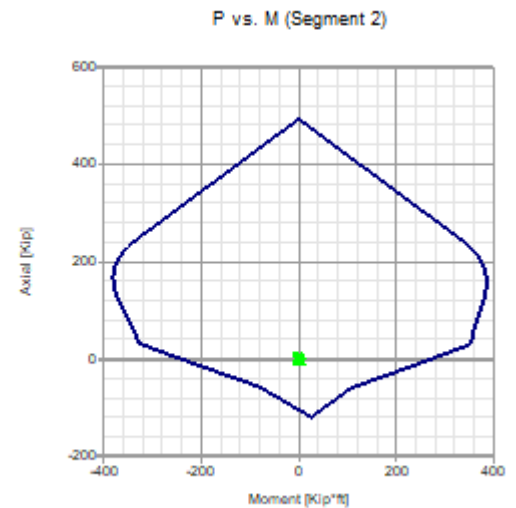
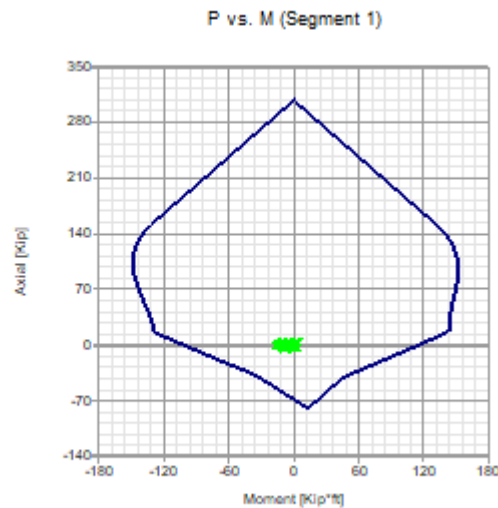
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	8-#5	8.00	0.00	11-W2.8	8.00	9.02
2	4-#5	8.00	0.00	2-W2.8	8.00	9.02
	8-#5	8.00	0.00	2-W2.8	8.00	9.02

Results: Combined axial flexure





Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D19(Bottom)	-0.93	-16.38	100.02	0.16 
2	D15(Bottom)	-3.88	5.85	261.52	0.02 



Interaction diagrams, P vs. M:





Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D10(Top)	4.19	152.06	0.03 
2	D7(Max)	6.31	243.38	0.03 

Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio
1	D25(Top)	1951.97	32000.00	0.06 
2	D25(Top)	1674.83	32000.00	0.05 

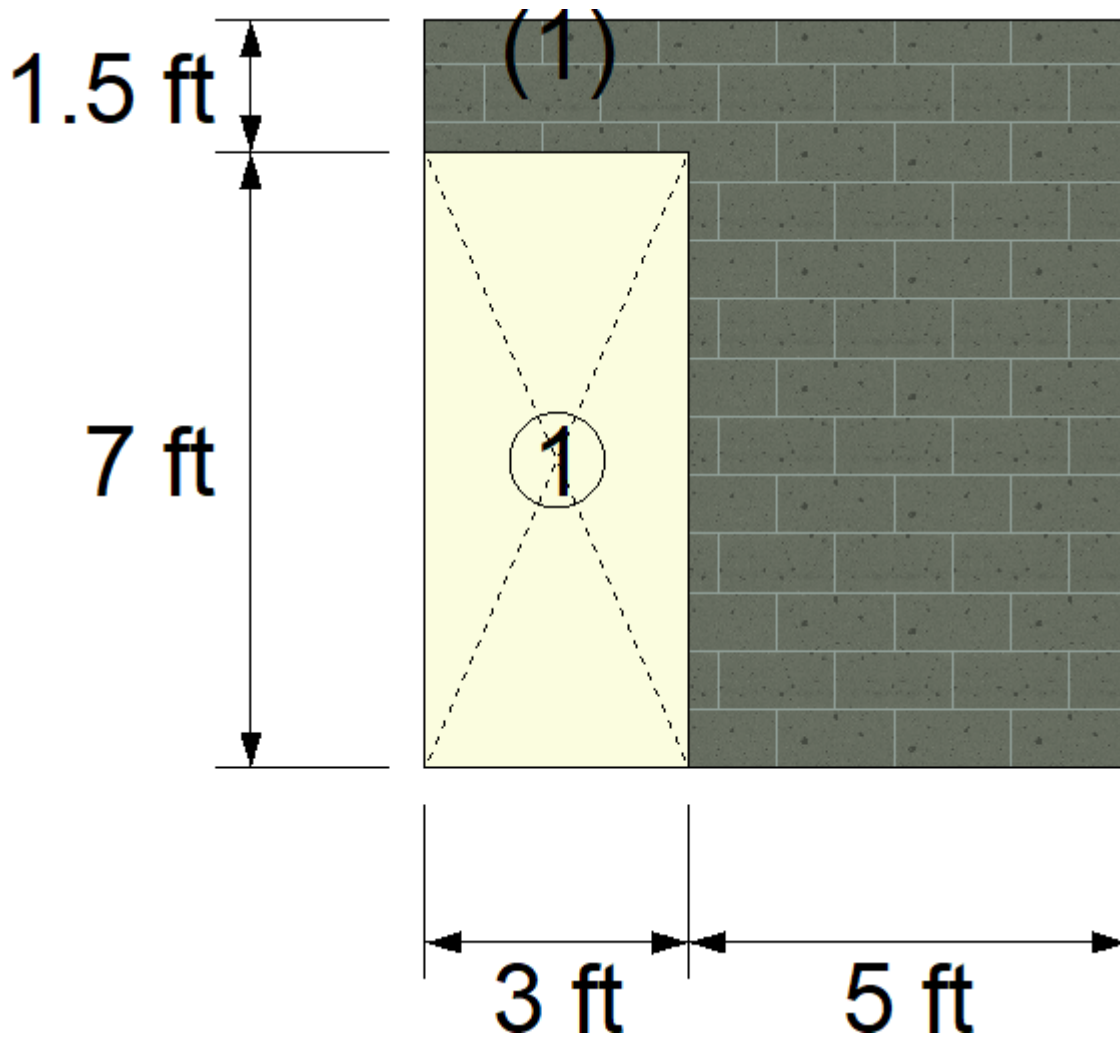
Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio
1	D11(Bottom)	20.242	40.669	0.50 
2	D12(Max)	2.894	51.395	0.06 

LINTEL DESIGN:

Status : Warnings in design  
- Insufficient development length, TMS 402-11 ASD, 8.1.6 (Lintel 1)





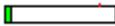
**Geometry:**

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	0.00	0.00	3.00	16.00

**Reinforcement:**


Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	1-#5	0.00	1-#5	0.00	--	0.00	0.00

**Results: Bending**


Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D25(Bottom)	-0.68	10.19	0.07 

**Results: Shear**



Lintel	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio	
1	D15(Top)	38.499	43.571	0.88	

#### Results: Deflection

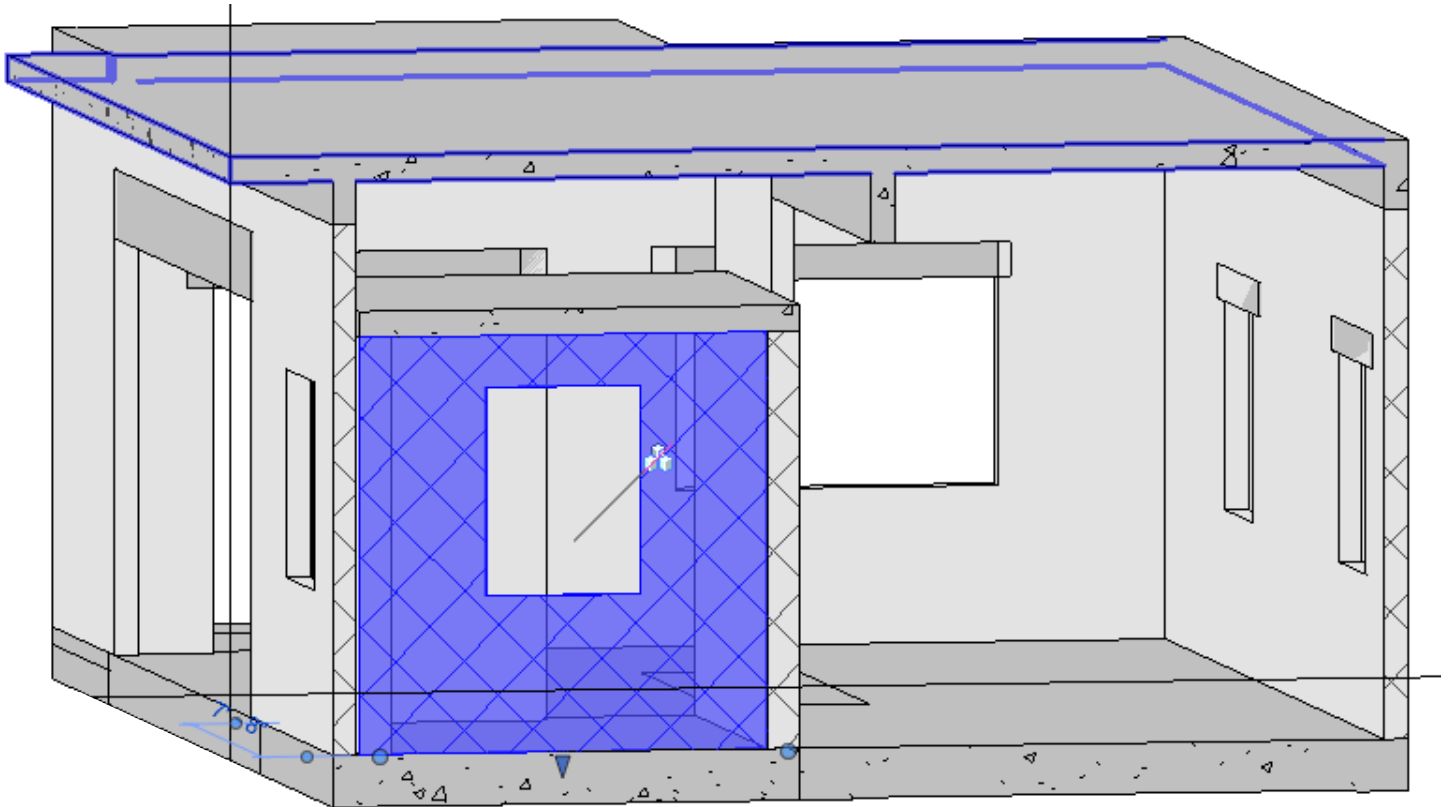
Lintel	Condition	$\delta_s$ [in]	$\delta_{max}$ [in]	Ratio	
1		0.00	0.00	0.00	

#### Notes:

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE SAFE ROOM  
WINDOW WALL DESIGN







Current Date: 1/10/2020 8:54 AM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\Safe Room\PR House Safe RM Window Wall.bak\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 8.50 [ft]  
Total length : 8.00 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Full grouting  
Masonry compression strength ( $F'_m$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	8.50	7.63	0.14

#### Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	2.50	3.00	3.00	4.00

Flanges:



Distance [ft]	Thickness [in]	Width [ft]	Position X	Position Z
0.00	7.63	2.81	Centered	Front
8.00	7.63	2.81	Centered	Front

**Load conditions:**

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
RLL	No	LLR	Roof Live Load
WLx	No	WIND	Wind Load in X
WLz	No	WIND	Wind Load in Z
EQx	No	EQ	Earthquake in X
EQz	No	EQ	Earthquake in Z
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		1.4DL
D2	Yes		1.2DL+1.6LL
D3	Yes		1.2DL+0.5RLL
D4	Yes		1.2DL+1.6LL+0.5RLL
D5	Yes		1.2DL+1.6RLL
D6	Yes		1.2DL+0.5WLx
D7	Yes		1.2DL+0.5WLz
D8	Yes		1.2DL+1.6RLL+LL
D9	Yes		1.2DL+1.6RLL+0.5WLx
D10	Yes		1.2DL+1.6RLL+0.5WLz
D11	Yes		1.2DL+WLx
D12	Yes		1.2DL+WLz
D13	Yes		1.2DL+WLx+0.5RLL
D14	Yes		1.2DL+WLz+0.5RLL
D15	Yes		1.2DL+WLx+LL
D16	Yes		1.2DL+WLz+LL
D17	Yes		1.2DL+WLx+LL+0.5RLL
D18	Yes		1.2DL+WLz+LL+0.5RLL
D19	Yes		1.2DL+EQx
D20	Yes		1.2DL+EQz
D21	Yes		1.2DL+EQx+LL
D22	Yes		1.2DL+EQz+LL
D23	Yes		0.9DL+WLx
D24	Yes		0.9DL+WLz
D25	Yes		0.9DL+EQx
D26	Yes		0.9DL+EQz
D27	Yes		DL
D28	Yes		DL+LL
D29	Yes		DL+RLL
D30	Yes		DL+0.75LL
D31	Yes		DL+0.75RLL
D32	Yes		DL+0.75LL+0.75RLL
D33	Yes		DL+0.6WLx
D34	Yes		DL+0.6WLz
D35	Yes		DL+0.7EQx
D36	Yes		DL+0.7EQz
D37	Yes		DL+0.75LL+0.45WLx+0.75RLL
D38	Yes		DL+0.75LL+0.45WLz+0.75RLL
D39	Yes		DL+0.75LL+0.45WLx
D40	Yes		DL+0.75LL+0.45WLz
D41	Yes		DL+0.45WLx+0.75RLL
D42	Yes		DL+0.45WLz+0.75RLL
D43	Yes		DL+0.75LL+0.525EQx
D44	Yes		DL+0.75LL+0.525EQz



D45	Yes	DL+0.525EQx
D46	Yes	DL+0.525EQz
D47	Yes	0.6DL+0.6WLx
D48	Yes	0.6DL+0.6WLz
D49	Yes	0.6DL+0.7EQx
D50	Yes	0.6DL+0.7EQz
S1	Yes	DL
S2	Yes	DL+LL
S3	Yes	DL+RLL
S4	Yes	DL+0.75LL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75LL+0.75RLL
S7	Yes	DL+0.6WLx
S8	Yes	DL+0.6WLz
S9	Yes	DL+0.7EQx
S10	Yes	DL+0.7EQz
S11	Yes	DL+0.75LL+0.45WLx+0.75RLL
S12	Yes	DL+0.75LL+0.45WLz+0.75RLL
S13	Yes	DL+0.525EQx
S14	Yes	DL+0.525EQz
S15	Yes	0.6DL+0.6WLx
S16	Yes	0.6DL+0.6WLz
S17	Yes	0.6DL+0.7EQx
S18	Yes	0.6DL+0.7EQz

#### **Distributed loads:**

Consider self weight : No

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.30	0.00
1	RLL	Vertical	0.30	0.00
1	WLx	Vertical	-0.93	0.00
1	WLz	Vertical	-0.31	0.00

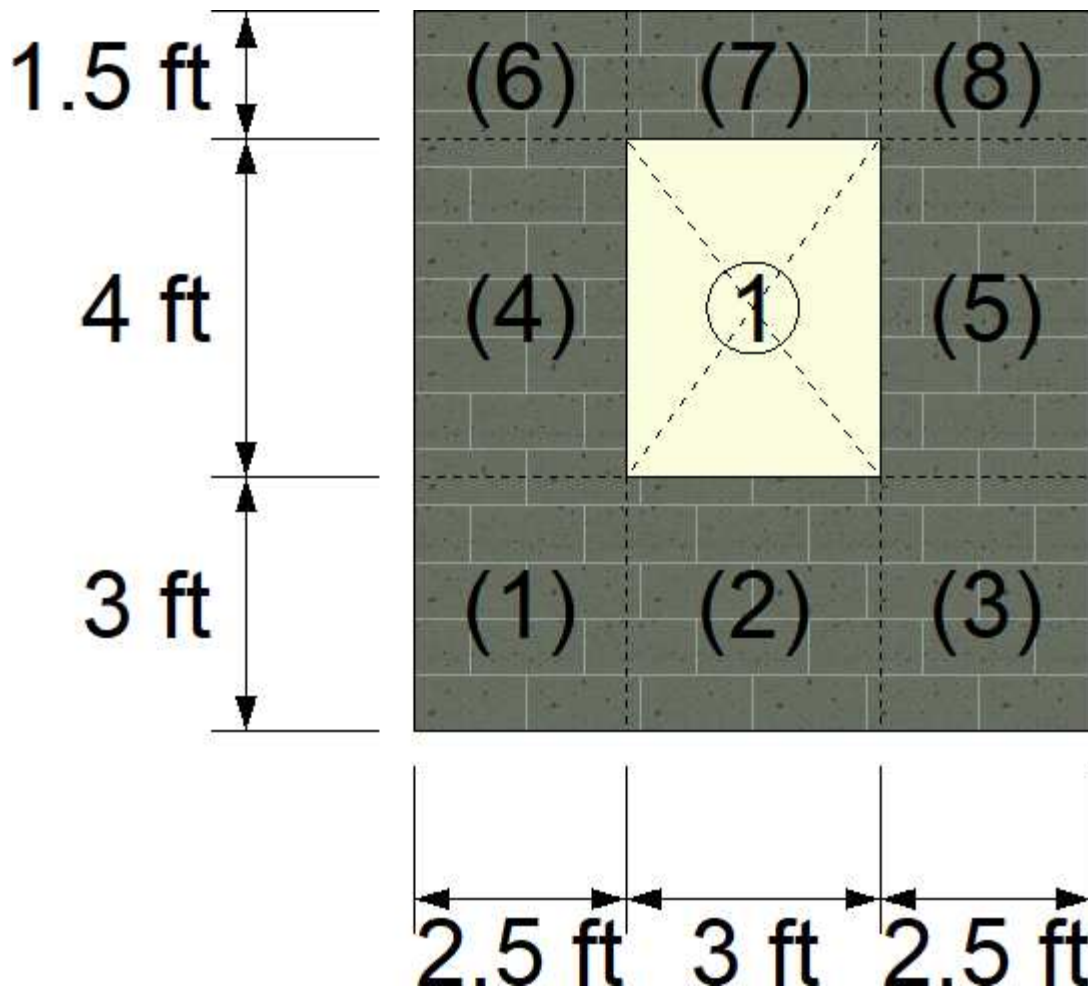
#### **Out-of-plane loads:**

Story	Condition	Magnitude [Kip/ft2]
1	WLx	0.16
1	WLz	-0.17
Parapet	WLx	0.16
Parapet	WLz	-0.17

#### **BEARING WALL DESIGN:**

Status : OK





**Geometry:**

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	2.50	3.00
2	2.50	0.00	3.00	3.00
3	5.50	0.00	2.50	3.00
4	0.00	3.00	2.50	4.00
5	5.50	3.00	2.50	4.00
6	0.00	7.00	2.50	1.50
7	2.50	7.00	3.00	1.50
8	5.50	7.00	2.50	1.50

**Vertical reinforcement:**

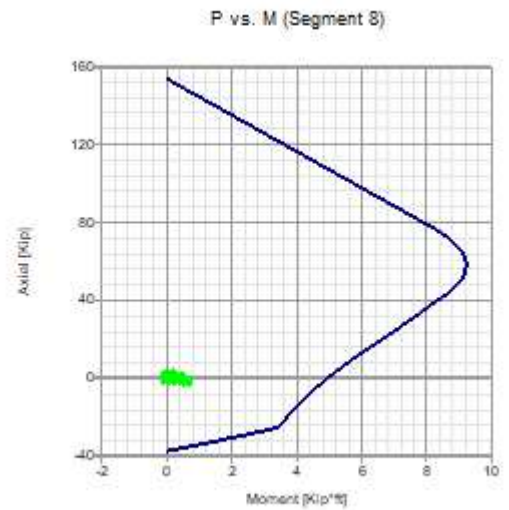
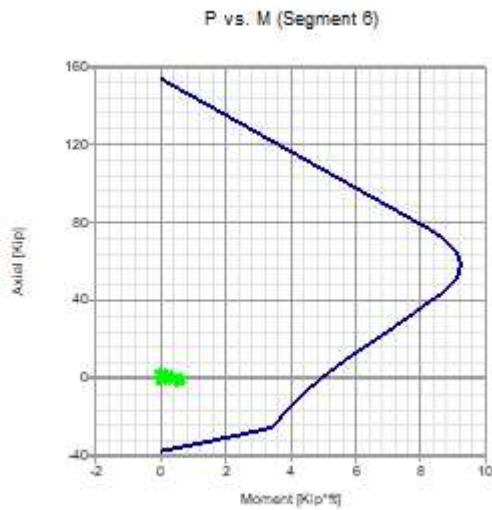
Segment	Bars	Spacing [in]	Ld [in]
1	4-#5	8.00	39.33
2	2-#5	16.00	39.33
3	4-#5	8.00	39.33
4	4-#5	8.00	39.33
5	4-#5	8.00	39.33
6	4-#5	8.00	39.33
7	2-#5	16.00	39.33
8	4-#5	8.00	39.33



### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D15(Top)	-0.26	-0.44	4.91	0.09
2	D15(Max)	0.25	-0.61	4.81	0.13
3	D17(Top)	0.23	-0.51	4.95	0.10
4	D15(Top)	-1.05	-0.62	4.86	0.13
5	D17(Max)	-0.11	-0.66	4.92	0.13
6	D15(Max)	-1.69	-0.66	4.81	0.14
7	D15(Max)	-1.28	-0.31	4.68	0.07
8	D15(Max)	-1.75	-0.66	4.81	0.14

### Interaction diagrams, P vs. M:



### Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D8(Top)	2.79	76.06	0.04
2	D8(Bottom)	0.74	91.50	0.01
3	D10(Bottom)	2.76	76.06	0.04
4	D8(Max)	3.35	76.06	0.04
5	D8(Top)	2.95	76.06	0.04
6	D8(Bottom)	2.89	76.06	0.04
7	D5(Top)	2.52	91.50	0.03
8	D8(Bottom)	2.95	76.06	0.04

### Results: Axial tension



Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D15(Bottom)	3544.89	32000.00	0.11	
2	D24(Bottom)	681.33	32000.00	0.02	
3	D15(Bottom)	2906.08	32000.00	0.09	
4	D23(Top)	1255.82	32000.00	0.04	
5	D23(Top)	1238.40	32000.00	0.04	
6	D23(Max)	1750.81	32000.00	0.05	
7	D23(Top)	2885.37	32000.00	0.09	
8	D23(Max)	1796.63	32000.00	0.06	

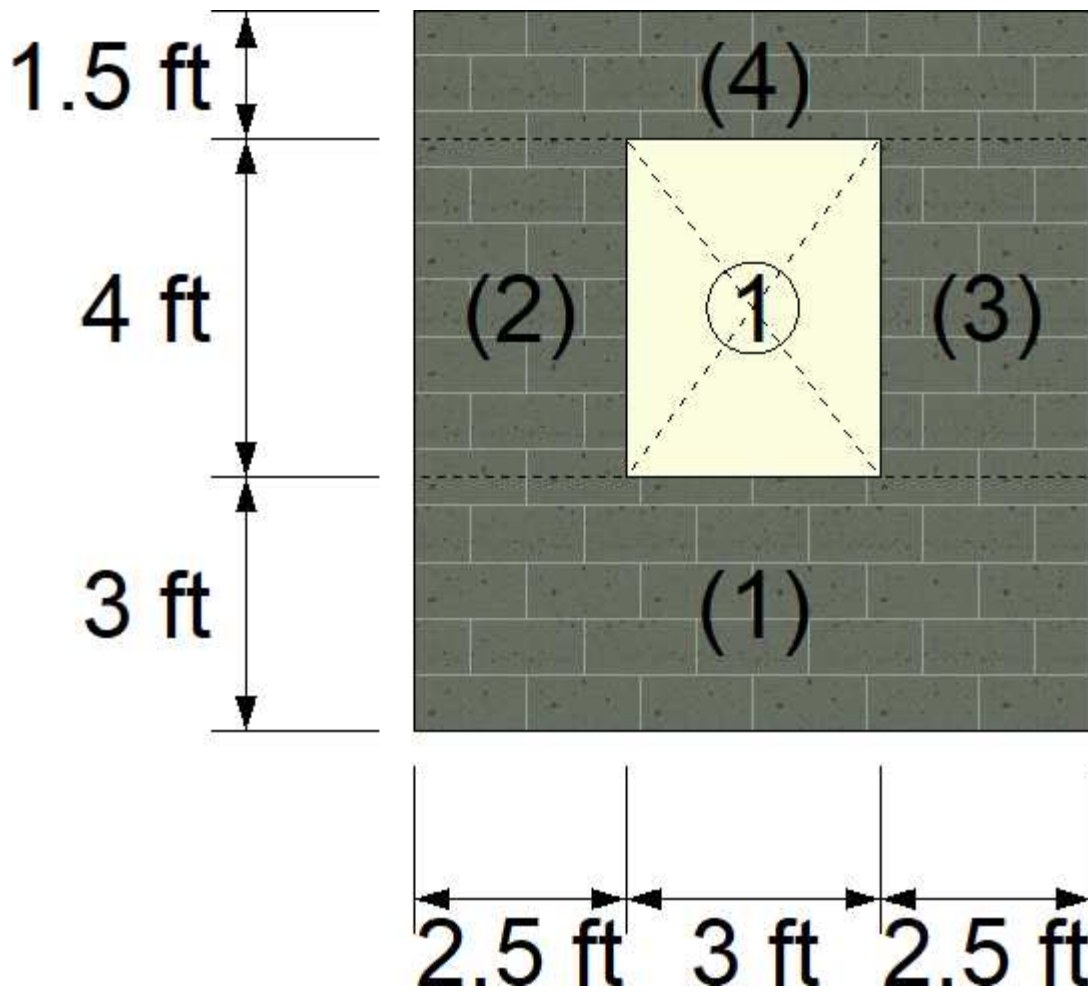
#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D17(Bottom)	11.753	58.864	0.20	
2	D15(Max)	5.185	44.027	0.12	
3	D17(Max)	9.451	43.571	0.22	
4	D17(Top)	5.545	43.571	0.13	
5	D15(Top)	4.629	43.571	0.11	
6	D15(Top)	11.862	73.600	0.16	
7	D15(Max)	4.089	43.571	0.09	
8	D15(Top)	11.984	77.133	0.16	

#### SHEAR WALL DESIGN:

Status : OK





#### Geometry:


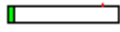
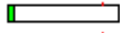
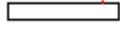
Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	8.00	3.00
2	0.00	3.00	2.50	4.00
3	5.50	3.00	2.50	4.00
4	0.00	7.00	8.00	1.50

#### Reinforcement:

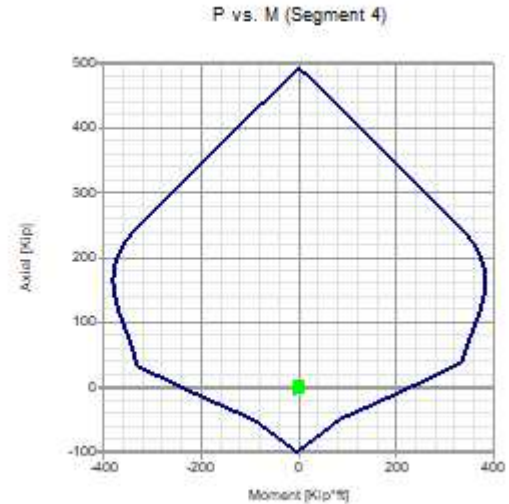
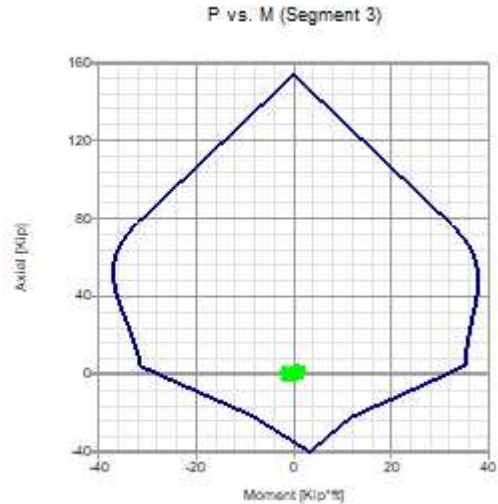
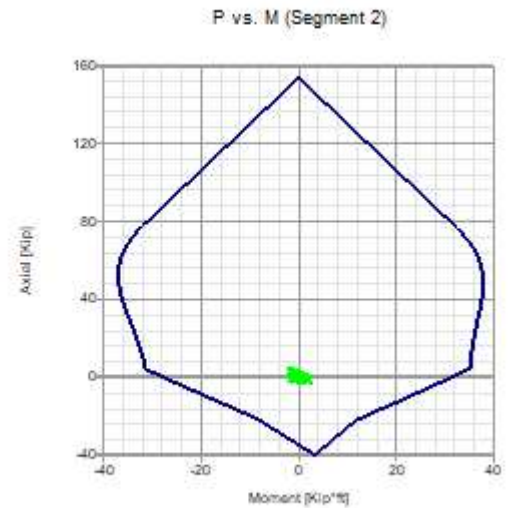
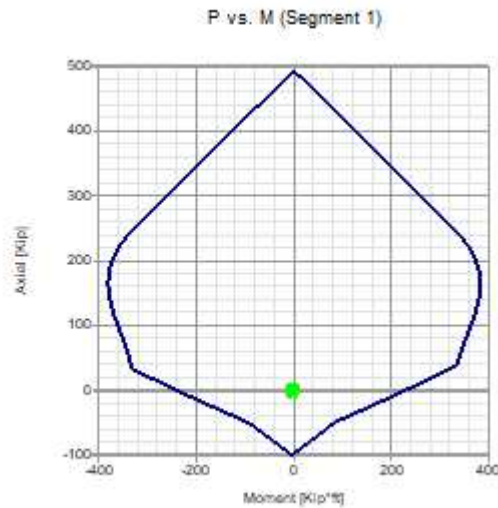
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	4-#5	8.00	0.00	4-W2.8	8.00	9.02
	2-#5	16.00	0.00	4-W2.8	8.00	9.02
	4-#5	8.00	0.00	4-W2.8	8.00	9.02
2	4-#5	8.00	0.00	6-W2.8	8.00	9.02
3	4-#5	8.00	0.00	6-W2.8	8.00	9.02
4	4-#5	8.00	0.00	2-W2.8	8.00	9.02
	2-#5	16.00	0.00	2-W2.8	8.00	9.02
	4-#5	8.00	0.00	2-W2.8	8.00	9.02

#### Results: Combined axial flexure



Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D9(Bottom)	-0.97	-6.05	236.03	0.03	
2	D15(Max)	-0.61	1.96	30.63	0.06	
3	D15(Max)	-0.25	-1.88	27.39	0.07	
4	D9(Max)	2.95	0.71	235.97	0.00	

Interaction diagrams, P vs. M:



Results: Axial compression



Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D8(Top)	5.05	243.59	0.02	
2	D8(Max)	3.35	76.03	0.04	
3	D8(Max)	3.16	76.03	0.04	
4	D8(Bottom)	6.66	243.59	0.03	

#### Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D15(Bottom)	2362.80	32000.00	0.07	
2	D23(Top)	1251.73	32000.00	0.04	
3	D23(Top)	1228.77	32000.00	0.04	
4	D23(Max)	1562.39	32000.00	0.05	

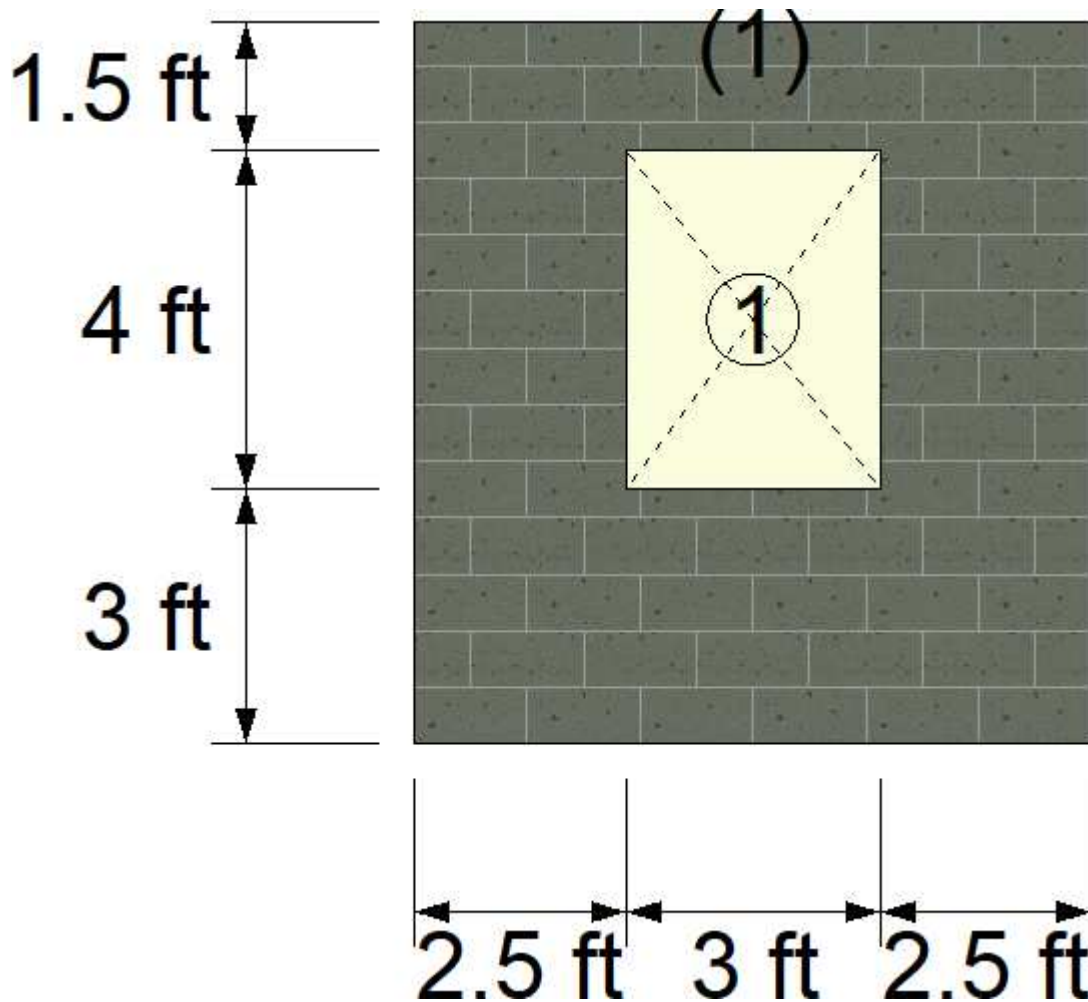
#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D9(Bottom)	11.926	49.993	0.24	
2	D17(Max)	15.024	42.068	0.36	
3	D10(Bottom)	20.451	51.409	0.40	
4	D9(Bottom)	2.884	54.216	0.05	

#### LINTEL DESIGN:

Status : OK





**Geometry:**

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	2.50	3.00	3.00	16.00

**Reinforcement:**


Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	1-#5	1.00	1-#5	0.00	--	0.00	0.00

**Results: Bending**


Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D23(Bottom)	-0.90	10.19	0.09

**Results: Shear**



Lintel	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio	
1	D8(Top)	14.503	43.571	0.33	

#### Results: Deflection

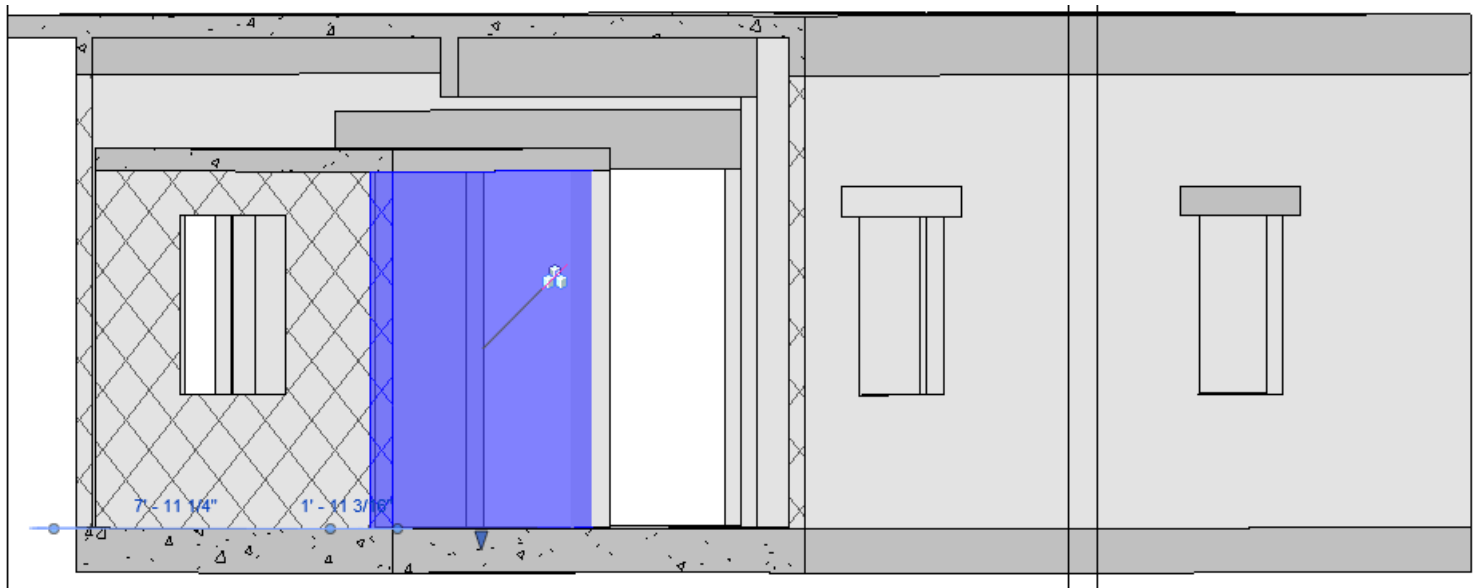
Lintel	Condition	$\delta_s$ [in]	$\delta_{max}$ [in]	Ratio	
1		0.00	0.00	0.00	

#### Notes:

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE SAFE ROOM  
WALL DESIGN







Current Date: 1/10/2020 8:46 AM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\Safe Room\PR House Safe RM Wall.bak\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 8.50 [ft]  
Total length : 8.00 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Full grouting  
Masonry compression strength ( $F'm$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	8.50	7.63	0.14

#### Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
RLL	No	LLR	Roof Live Load
WLx	No	WIND	Wind Load in X
WLz	No	WIND	Wind Load in Z
EQx	No	EQ	Earthquake in X
EQz	No	EQ	Earthquake in Z
SM1	Yes		DL
DM1	Yes		DL



S1	Yes	DL
S2	Yes	DL+LL
S3	Yes	DL+RLL
S4	Yes	DL+0.75LL
S5	Yes	DL+0.75RLL
S6	Yes	DL+0.75LL+0.75RLL
S7	Yes	DL+0.6WLx
S8	Yes	DL+0.6WLz
S9	Yes	DL+0.7EQx
S10	Yes	DL+0.7EQz
S11	Yes	DL+0.75LL+0.75RLL+0.45WLx
S12	Yes	DL+0.75LL+0.75RLL+0.45WLz
S13	Yes	DL+0.525EQx
S14	Yes	DL+0.525EQz
S15	Yes	0.6DL+0.6WLx
S16	Yes	0.6DL+0.6WLz
S17	Yes	0.6DL+0.7EQx
S18	Yes	0.6DL+0.7EQz
D1	Yes	DL
D2	Yes	DL+LL
D3	Yes	DL+RLL
D4	Yes	DL+0.75LL
D5	Yes	DL+0.75RLL
D6	Yes	DL+0.75LL+0.75RLL
D7	Yes	DL+0.6WLx
D8	Yes	DL+0.6WLz
D9	Yes	DL+0.7EQx
D10	Yes	DL+0.7EQz
D11	Yes	DL+0.75LL+0.75RLL+0.45WLx
D12	Yes	DL+0.75LL+0.75RLL+0.45WLz
D13	Yes	DL+0.75LL+0.45WLx
D14	Yes	DL+0.75LL+0.45WLz
D15	Yes	DL+0.75RLL+0.45WLx
D16	Yes	DL+0.75RLL+0.45WLz
D17	Yes	DL+0.75LL+0.525EQx
D18	Yes	DL+0.75LL+0.525EQz
D19	Yes	DL+0.525EQx
D20	Yes	DL+0.525EQz
D21	Yes	0.6DL+0.6WLx
D22	Yes	0.6DL+0.6WLz
D23	Yes	0.6DL+0.7EQx
D24	Yes	0.6DL+0.7EQz
D25	Yes	1.4DL
D26	Yes	1.2DL+1.6LL
D27	Yes	1.2DL+0.5RLL
D28	Yes	1.2DL+1.6LL+0.5RLL
D29	Yes	1.2DL+1.6RLL
D30	Yes	1.2DL+0.5WLx
D31	Yes	1.2DL+0.5WLz
D32	Yes	1.2DL+LL+1.6RLL
D33	Yes	1.2DL+1.6RLL+0.5WLx
D34	Yes	1.2DL+1.6RLL+0.5WLz
D35	Yes	1.2DL+WLx
D36	Yes	1.2DL+WLz
D37	Yes	1.2DL+0.5RLL+WLx
D38	Yes	1.2DL+0.5RLL+WLz
D39	Yes	1.2DL+LL+WLx
D40	Yes	1.2DL+LL+WLz
D41	Yes	1.2DL+LL+0.5RLL+WLx
D42	Yes	1.2DL+LL+0.5RLL+WLz
D43	Yes	1.2DL+EQx
D44	Yes	1.2DL+EQz
D45	Yes	1.2DL+LL+EQx
D46	Yes	1.2DL+LL+EQz



D47	Yes	0.9DL+WLx
D48	Yes	0.9DL+WLz
D49	Yes	0.9DL+EQx
D50	Yes	0.9DL+EQz

**Distributed loads:**

Consider self weight : No

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.30	0.00
1	RLL	Vertical	0.30	0.00
1	WLx	Vertical	-0.93	0.00
1	WLz	Vertical	-0.31	0.00

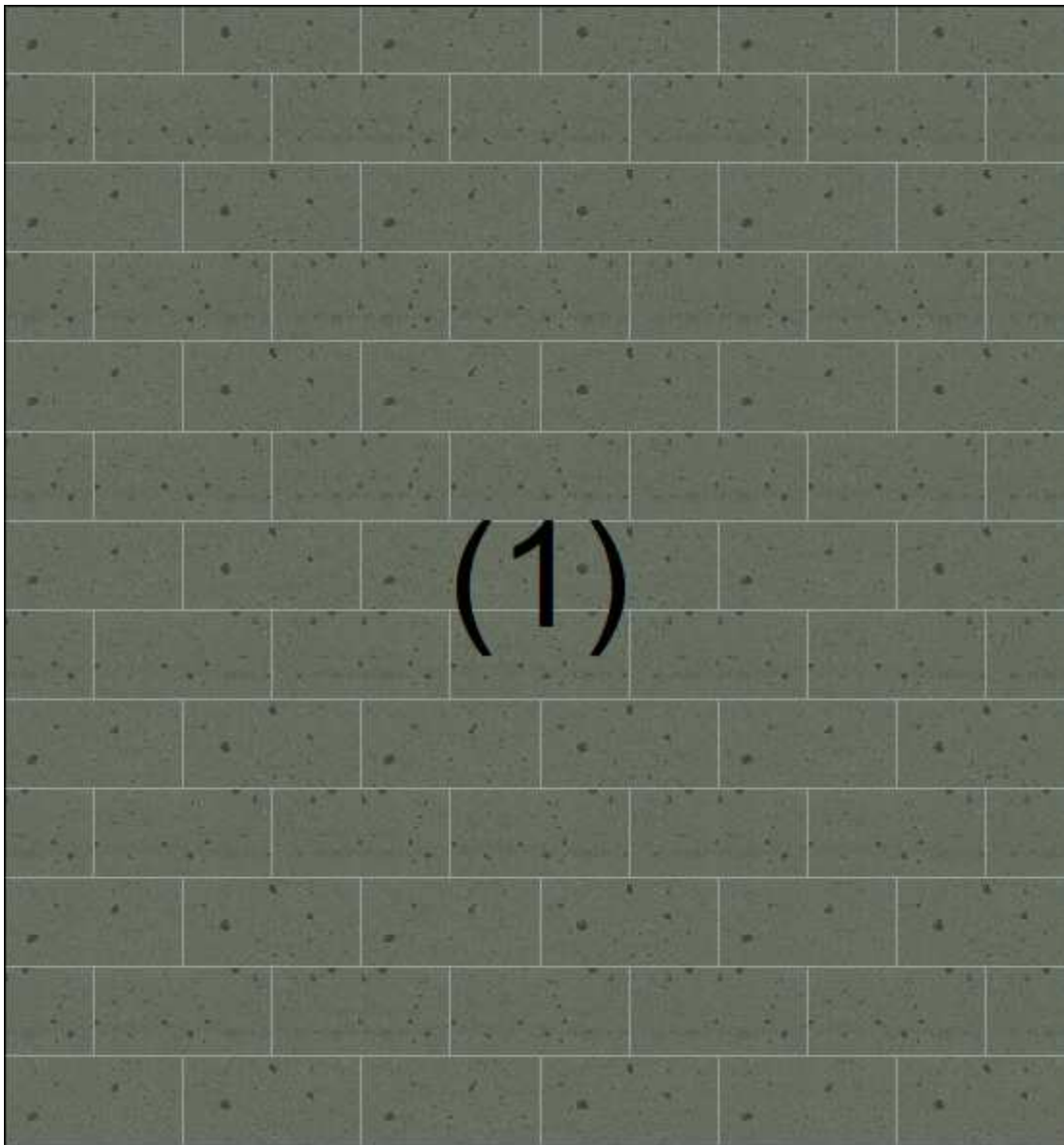
**Out-of-plane loads:**

Story	Condition	Magnitude [Kip/ft2]
1	WLx	0.16
1	WLz	-0.17
Parapet	WLx	0.16
Parapet	WLz	-0.17

**BEARING WALL DESIGN:**

Status : OK





**Geometry:**


Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	8.00	8.50

**Vertical reinforcement:**

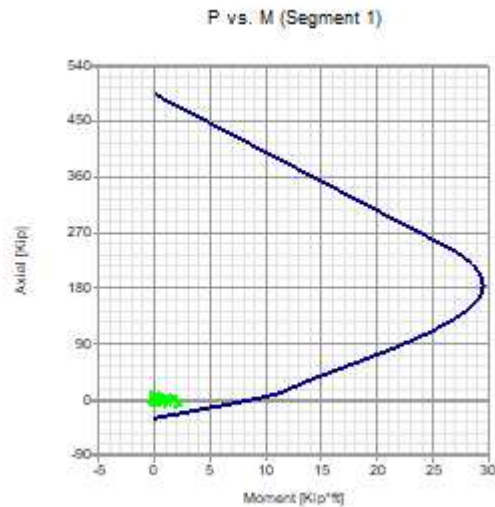
Segment	Bars	Spacing [in]	Ld [in]
1	3-#5	32.00	39.33

**Results: Combined axial flexure**




Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D37(Max)	-5.47	-2.26	7.06	0.32 


Interaction diagrams, P vs. M:




Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D29(Top)	6.22	244.32	0.03 

Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio
1	D47(Max)	7306.12	32000.00	0.23 

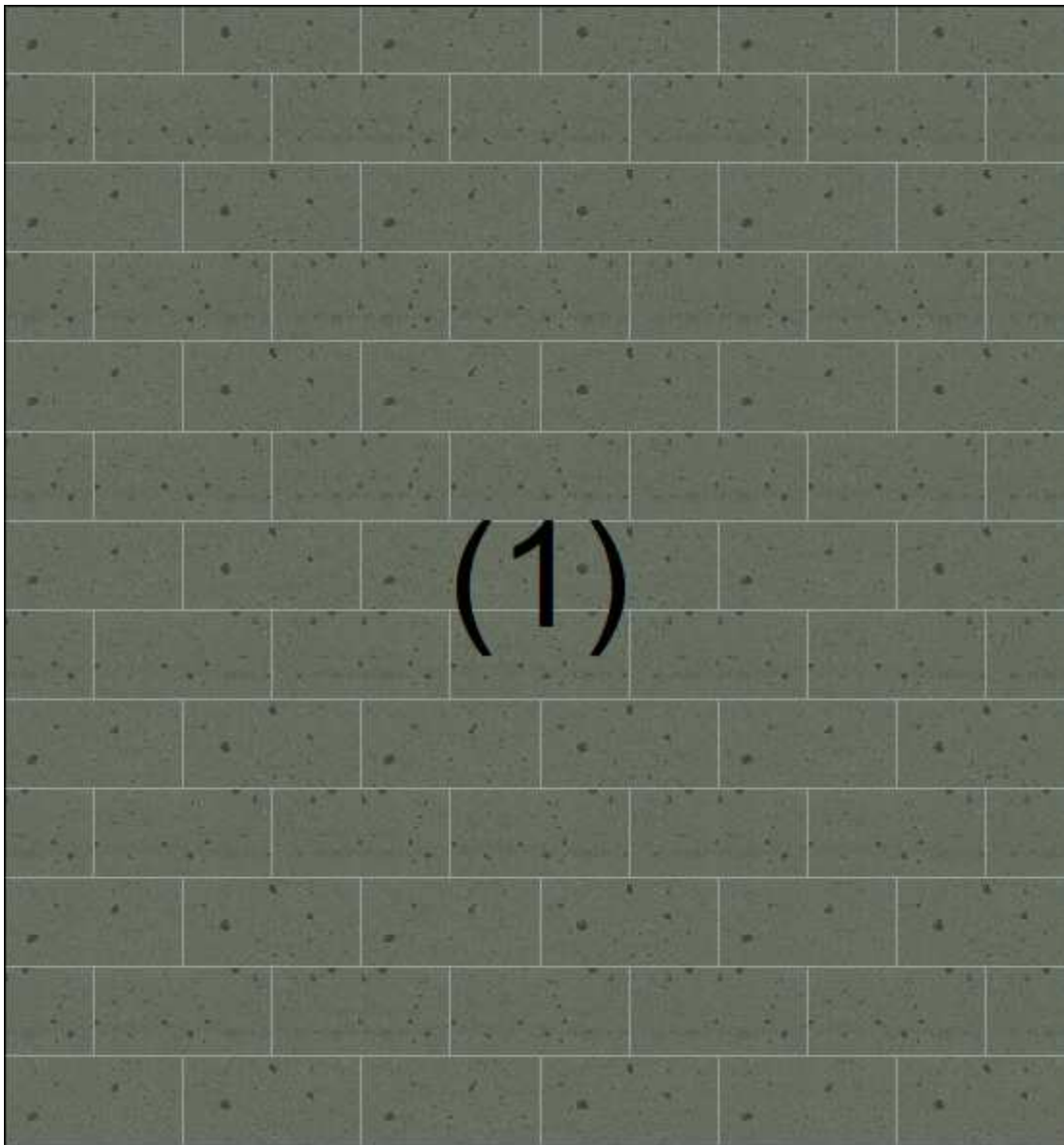
Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio
1	D37(Bottom)	10.494	66.549	0.16 

SHEAR WALL DESIGN:

Status : OK





**Geometry:**

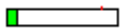
Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	8.00	8.50

**Reinforcement:**

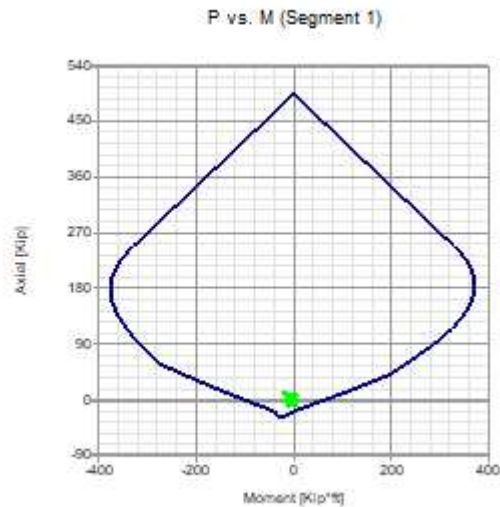
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	3-#5	32.00	0.00	13-W2.8	8.00	9.02

**Results: Combined axial flexure**




Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D34(Bottom)	3.38	-11.14	112.24	0.10 


Interaction diagrams, P vs. M:




Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D32(Top)	6.22	244.32	0.03 

Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio
1	D47(Top)	6291.08	32000.00	0.20 

Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio
1	D34(Bottom)	13.606	49.144	0.28 

Notes:



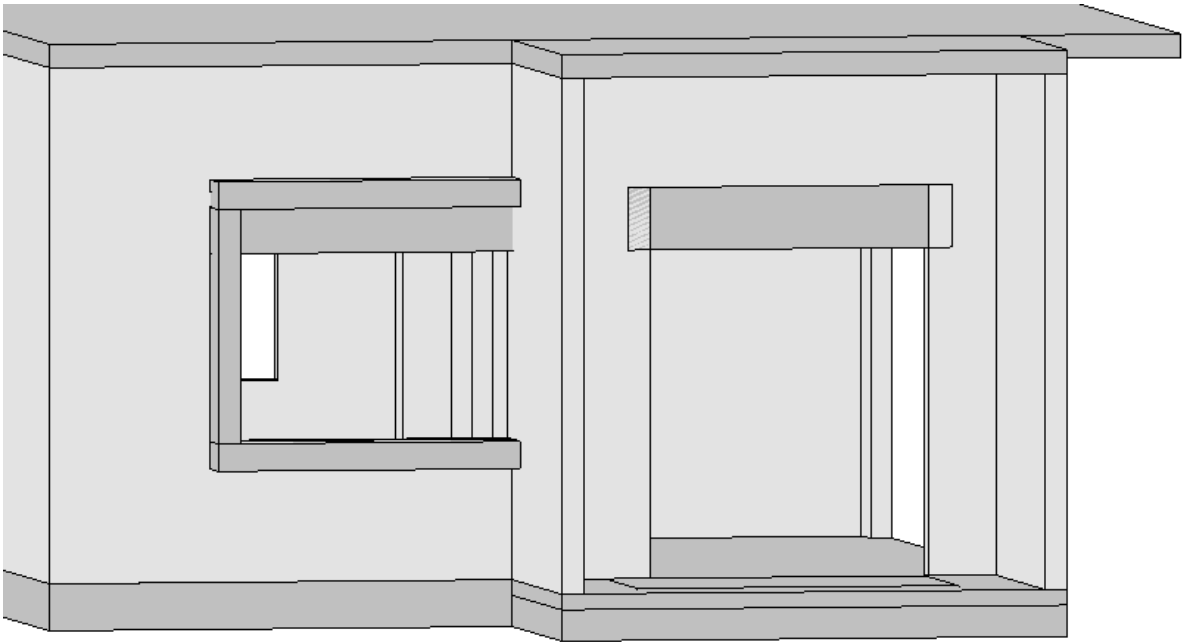
- \*  $P$  = Axial load
- \*  $P_a$  = Allowable compressive force due to axial load.
- \*  $M$  = Moment at the section under consideration.
- \*  $M_a$  = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \*  $f_a$  = Calculated compressive stress due to axial load only
- \*  $f_b$  = Calculated compressive stress due to axial flexure only
- \*  $f_t$  = Calculated axial tension
- \*  $F_a$  = Allowable compressive stress due to axial load only
- \*  $F_b$  = Allowable compressive stress due to axial flexure only
- \*  $f_v$  = Calculated shear stress
- \*  $F_s$  = Allowable tensile or compressive stress
- \*  $F_v$  = Allowable shear stress
- \*  $l_d$  = Embedment length
- \*  $A_s$  = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE MAIN  
STRUCTURE DESIGN



PR FEMA HOUSE ENTRY DOOR  
WALL DESIGN





Current Date: 1/9/2020 5:19 PM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\190 mph Exp D\PR House Entry Door Wall Design\_6 in 190 Exp D.msw\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : Warnings in design

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 11.50 [ft]  
Total length : 10.50 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Full grouting  
Masonry compression strength (F'm) : 1500 [Lb/in2]  
Steel tension strength (fy) : 60000 [Lb/in2]  
Steel allowable tension strength (Fs) : 32000 [Lb/in2]  
Joint reinforcement allowable tension strength (Fs) : 30000 [Lb/in2]  
Steel elasticity modulus (Es) : 2.9E07 [Lb/in2]  
Masonry elasticity modulus (Em) : 1.35E06 [Lb/in2]  
Masonry unit weight : 0.135 [Kip/ft3]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft3]
1	11.50	5.63	0.14

#### Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	2.00	0.00	6.00	7.00

Flanges:



Distance [ft]	Thickness [in]	Width [ft]	Position X	Position Z
0.00	5.63	2.81	Centered	Front
10.50	5.63	2.79	Centered	Centered

**Load conditions:**

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WL_X	No	WIND	Wind Load X-Direction
WL_Z	No	WIND	Wind Load Z-Direction
EQ_X	No	EQ	Earthquake X-Direction
EQ_Z	No	EQ	Earthquake Z-Direction
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		DL
D2	Yes		DL+LL
D3	Yes		DL+LLR
D4	Yes		DL+0.75LL
D5	Yes		DL+0.75LLR
D6	Yes		DL+0.75LL+0.75LLR
D7	Yes		DL+0.6WL_X
D8	Yes		DL+0.6WL_Z
D9	Yes		1.126DL+0.91EQ_X
D10	Yes		1.126DL+0.91EQ_Z
D11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
D12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
D13	Yes		DL+0.75LL+0.45WL_X
D14	Yes		DL+0.75LL+0.45WL_Z
D15	Yes		DL+0.75LLR+0.45WL_X
D16	Yes		DL+0.75LLR+0.45WL_Z
D17	Yes		1.09DL+0.75LL+0.683EQ_X
D18	Yes		1.09DL+0.75LL+0.683EQ_Z
D19	Yes		1.09DL+0.683EQ_X
D20	Yes		1.09DL+0.683EQ_Z
D21	Yes		0.6DL+0.6WL_X
D22	Yes		0.6DL+0.6WL_Z
D23	Yes		0.474DL+0.91EQ_X
D24	Yes		0.474DL+0.91EQ_Z
S1	Yes		DL
S2	Yes		DL+LL
S3	Yes		DL+LLR
S4	Yes		DL+0.75LL
S5	Yes		DL+0.75LLR
S6	Yes		DL+0.75LL+0.75LLR
S7	Yes		DL+0.6WL_X
S8	Yes		DL+0.6WL_Z
S9	Yes		1.126DL+0.91EQ_X
S10	Yes		1.126DL+0.91EQ_Z
S11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
S12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
S13	Yes		1.09DL+0.683EQ_X
S14	Yes		1.09DL+0.683EQ_Z
S15	Yes		0.6DL+0.6WL_X
S16	Yes		0.6DL+0.6WL_Z
S17	Yes		0.474DL+0.91EQ_X
S18	Yes		0.474DL+0.91EQ_Z



**Distributed loads:**

Consider self weight : No

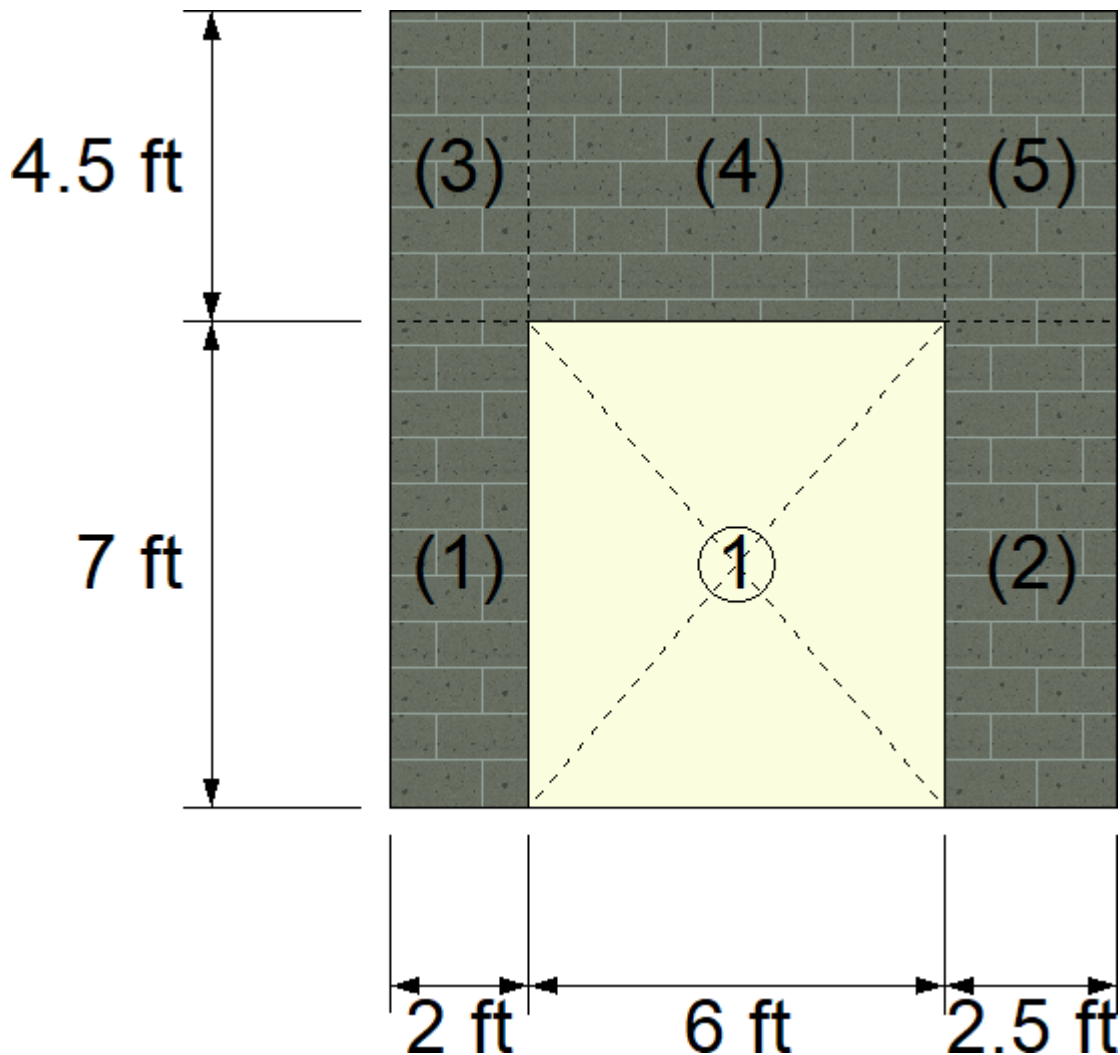
Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.23	0.00
1	LL	Vertical	0.06	0.00

**Out-of-plane loads:**

Story	Condition	Magnitude [Kip/ft2]
1	WL_X	0.03
1	WL_Z	0.04
Parapet	WL_X	0.03
Parapet	WL_Z	0.04

**BEARING WALL DESIGN:**

Status : OK





### Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	2.00	7.00
2	8.00	0.00	2.50	7.00
3	0.00	7.00	2.00	4.50
4	2.00	7.00	6.00	4.50
5	8.00	7.00	2.50	4.50

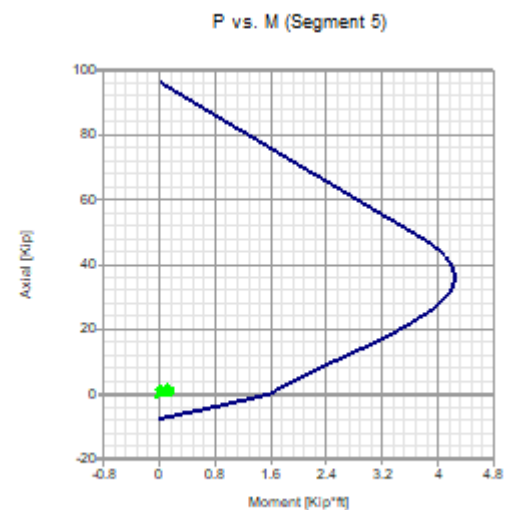
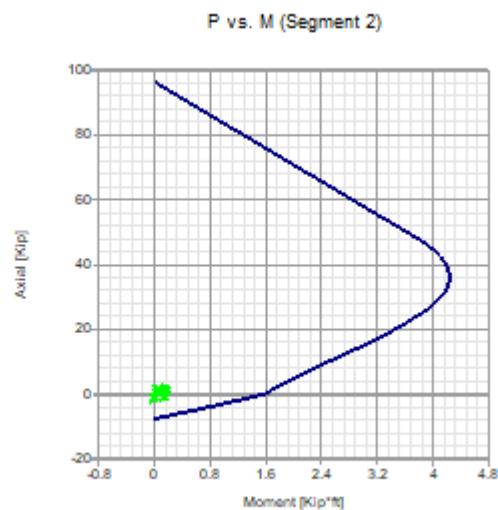
### Vertical reinforcement:

Segment	Bars	Spacing [in]	Ld [in]
1	1-#5	40.00	39.33
2	1-#5	40.00	39.33
3	1-#5	40.00	39.33
4	2-#5	40.00	39.33
5	1-#5	40.00	39.33

### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D8(Top)	0.96	-0.13	1.34	0.10
2	D8(Max)	-0.93	-0.16	1.38	0.11
3	D8(Bottom)	0.96	-0.13	1.34	0.09
4	D8(Max)	1.01	-0.40	3.86	0.10
5	D8(Bottom)	1.55	-0.18	1.70	0.10

### Interaction diagrams, P vs. M:



### Results: Axial compression



Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D12(Max)	1.08	31.98	0.03	
2	D18(Top)	1.82	39.97	0.05	
3	D12(Bottom)	1.02	31.98	0.03	
4	D18(Top)	1.74	95.94	0.02	
5	D17(Bottom)	1.82	39.97	0.05	

#### Results: Axial tension

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D22(Bottom)	2174.85	32000.00	0.07	
2	D8(Bottom)	5548.80	32000.00	0.17	
3	DM1(Top)	0.00	32000.00	0.00	
4	DM1(Top)	0.00	32000.00	0.00	
5	DM1(Top)	0.00	32000.00	0.00	

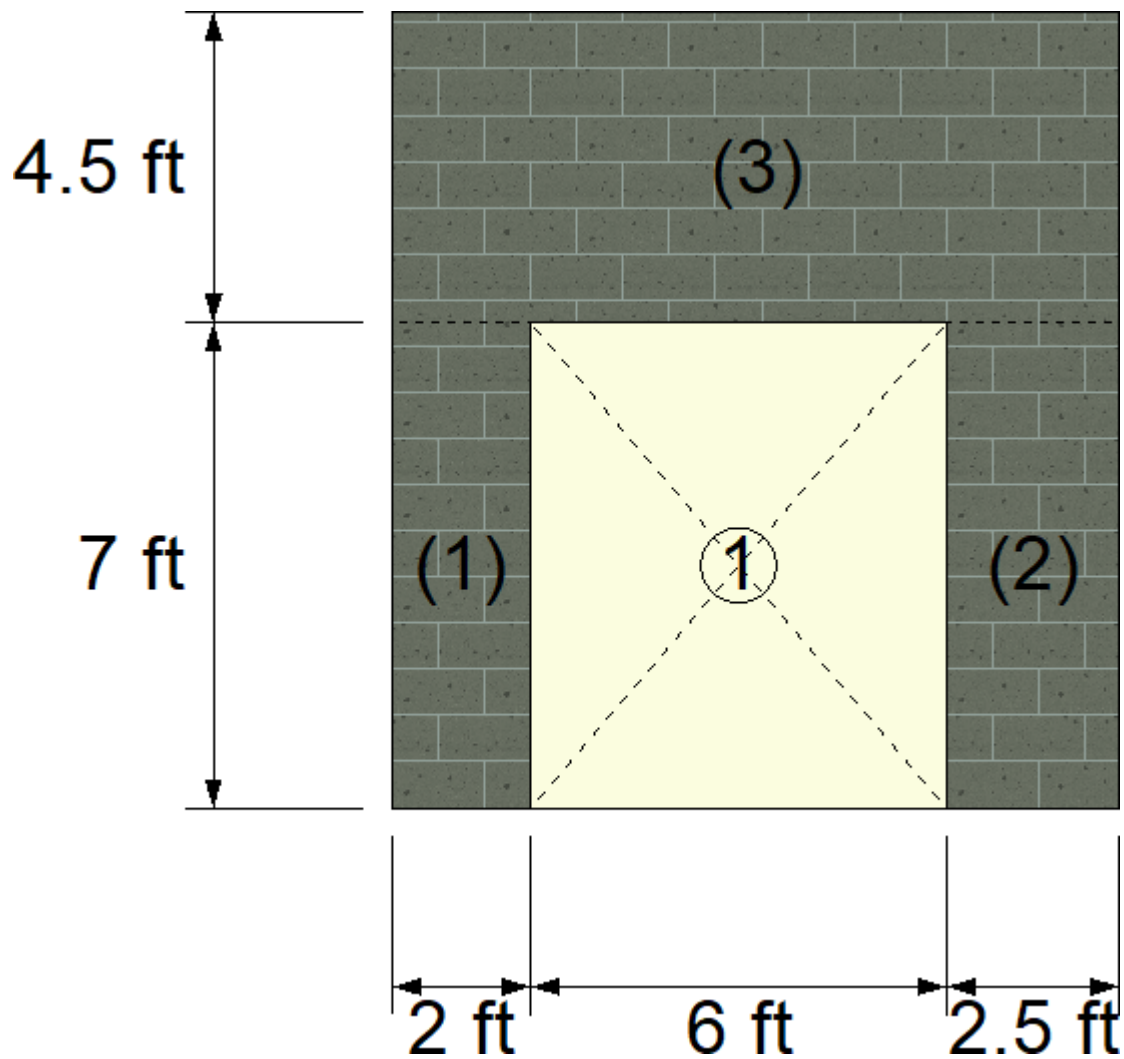
#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D8(Bottom)	2.965	43.571	0.07	
2	D8(Bottom)	3.252	72.352	0.04	
3	D22(Top)	2.325	72.245	0.03	
4	D8(Top)	2.026	79.072	0.03	
5	D8(Top)	2.841	76.352	0.04	

#### SHEAR WALL DESIGN:

Status : OK





**Geometry:**

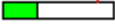


Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	2.00	7.00
2	8.00	0.00	2.50	7.00
3	0.00	7.00	10.50	4.50

**Reinforcement:**

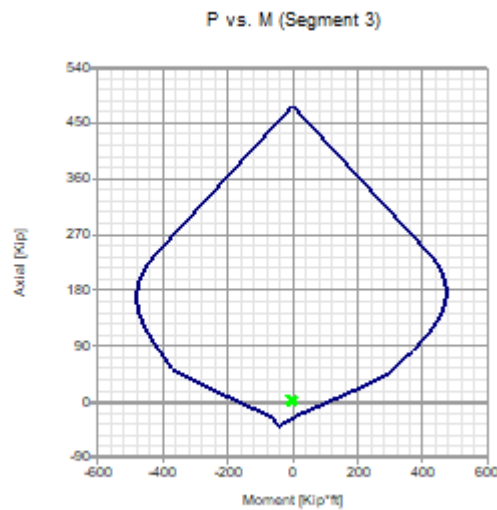
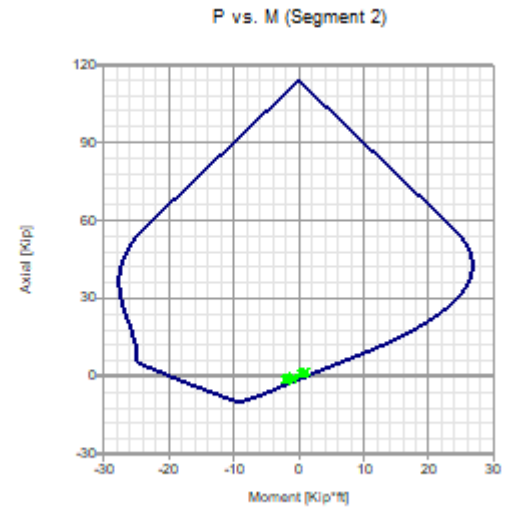
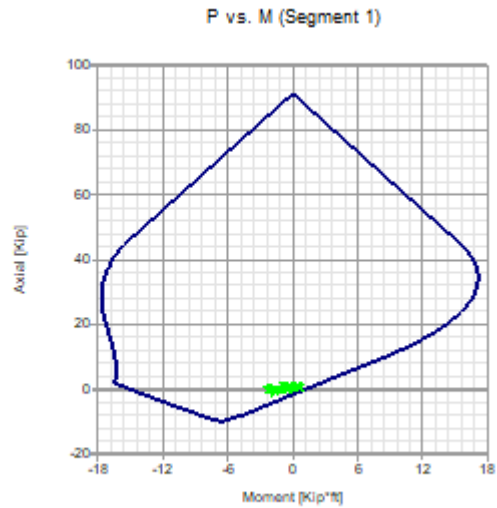
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	1-#5	40.00	0.00	11-W2.8	8.00	9.02
2	1-#5	40.00	0.00	11-W2.8	8.00	9.02
3	1-#5	40.00	0.00	7-W2.8	8.00	9.02
	2-#5	40.00	0.00	7-W2.8	8.00	9.02
	1-#5	40.00	0.00	7-W2.8	8.00	9.02

**Results: Combined axial flexure**

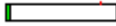
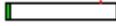
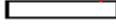


Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D10(Top)	0.67	0.59	1.60	0.37	
2	D9(Top)	1.83	1.05	2.92	0.36	
3	D10(Bottom)	2.87	-4.33	178.60	0.02	

Interaction diagrams, P vs. M:






Results: Axial compression




Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D14(Max)	1.06	31.96	0.03	
2	D18(Top)	1.93	39.97	0.05	
3	D12(Max)	3.26	167.87	0.02	



# Results: Axial tension

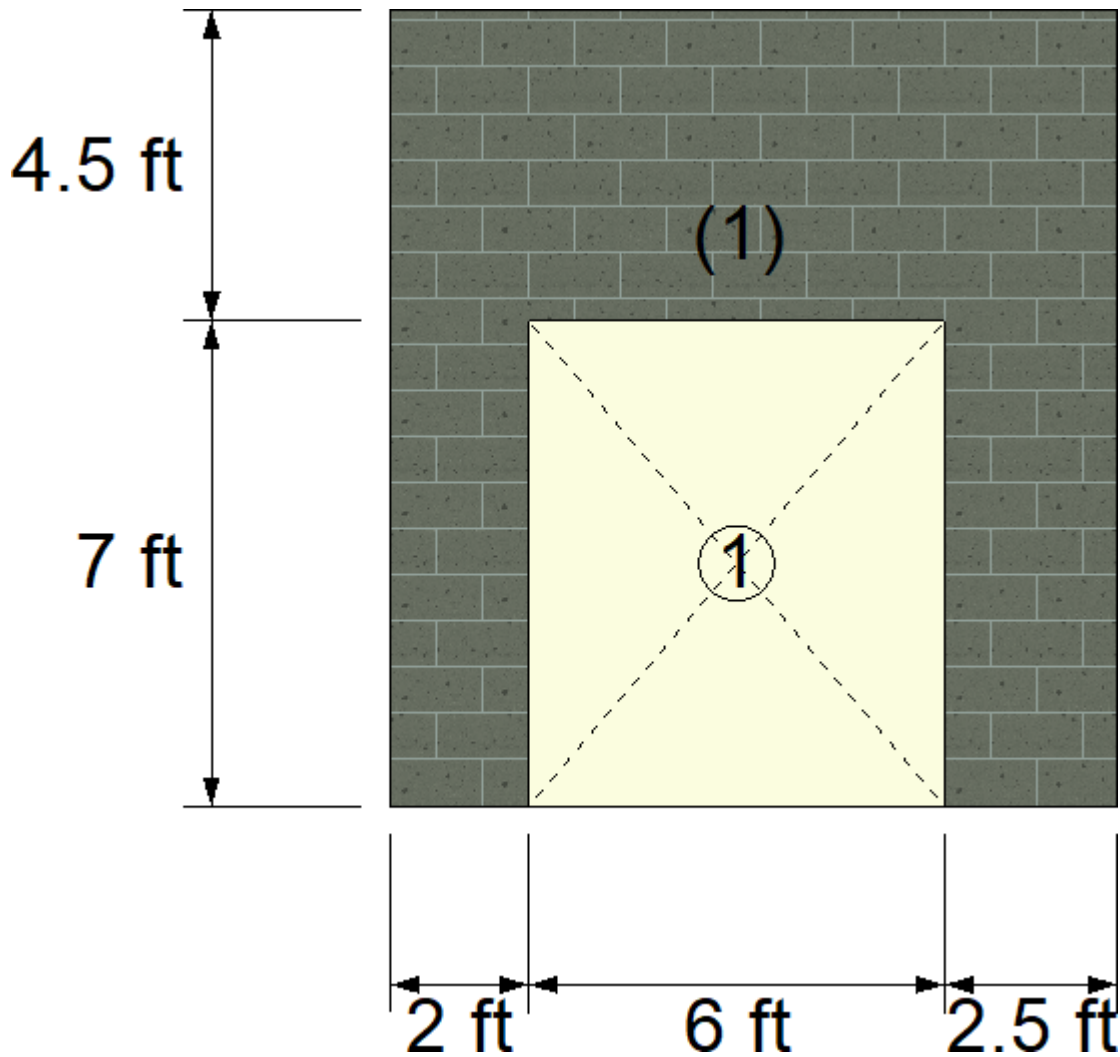
Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D22(Bottom)	1328.83	32000.00	0.04	
2	D8(Bottom)	4166.33	32000.00	0.13	
3	DM1(Top)	0.00	32000.00	0.00	

# Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D10(Max)	9.703	44.976	0.22	
2	D10(Top)	14.266	52.746	0.27	
3	D9(Bottom)	3.255	52.917	0.06	

# LINTEL DESIGN:

Status : Warnings in design  
- Insufficient development length, TMS 402-11 ASD, 8.1.6 (Lintel 1)





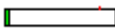
**Geometry:**

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	2.00	0.00	6.00	24.00

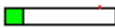
**Reinforcement:**

Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	1-#5	2.00	1-#5	0.00	--	0.00	0.00

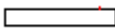
**Results: Bending**

Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D8(Bottom)	-0.85	16.25	0.05	

**Results: Shear**

Lintel	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D18(Bottom)	8.746	43.571	0.20	

**Results: Deflection**

Lintel	Condition	$\delta_s$ [in]	$\delta_{max}$ [in]	Ratio	
1		0.00	0.00	0.00	

**Notes:**

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



Current Date: 1/9/2020 5:33 PM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\190 mph Exp D\PR House Front Window Wall Design\_6 in 190 Exp D.msw\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 11.50 [ft]  
Total length : 10.00 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : None

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Partial grouting  
Mortar bed type : Full bed  
Masonry compression strength ( $F'_m$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	11.50	5.63	0.08

#### Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	3.67	3.00	6.00	4.00

#### Load conditions:



ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WL_X	No	WIND	Wind Load X-Direction
WL_Z	No	WIND	Wind Load Z-Direction
EQ_X	No	EQ	Earthquake X-Direction
EQ_Z	No	EQ	Earthquake Z-Direction
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		DL
D2	Yes		DL+LL
D3	Yes		DL+LLR
D4	Yes		DL+0.75LL
D5	Yes		DL+0.75LLR
D6	Yes		DL+0.75LL+0.75LLR
D7	Yes		DL+0.6WL_X
D8	Yes		DL+0.6WL_Z
D9	Yes		1.126DL+0.91EQ_X
D10	Yes		1.126DL+0.91EQ_Z
D11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
D12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
D13	Yes		DL+0.75LL+0.45WL_X
D14	Yes		DL+0.75LL+0.45WL_Z
D15	Yes		DL+0.75LLR+0.45WL_X
D16	Yes		DL+0.75LLR+0.45WL_Z
D17	Yes		1.09DL+0.75LL+0.683EQ_X
D18	Yes		1.09DL+0.75LL+0.683EQ_Z
D19	Yes		1.09DL+0.683EQ_X
D20	Yes		1.09DL+0.683EQ_Z
D21	Yes		0.6DL+0.6WL_X
D22	Yes		0.6DL+0.6WL_Z
D23	Yes		0.474DL+0.91EQ_X
D24	Yes		0.474DL+0.91EQ_Z
S1	Yes		DL
S2	Yes		DL+LL
S3	Yes		DL+LLR
S4	Yes		DL+0.75LL
S5	Yes		DL+0.75LLR
S6	Yes		DL+0.75LL+0.75LLR
S7	Yes		DL+0.6WL_X
S8	Yes		DL+0.6WL_Z
S9	Yes		1.126DL+0.91EQ_X
S10	Yes		1.126DL+0.91EQ_Z
S11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
S12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
S13	Yes		1.09DL+0.683EQ_X
S14	Yes		1.09DL+0.683EQ_Z
S15	Yes		0.6DL+0.6WL_X
S16	Yes		0.6DL+0.6WL_Z
S17	Yes		0.474DL+0.91EQ_X
S18	Yes		0.474DL+0.91EQ_Z

**Distributed loads:**

Consider self weight : No

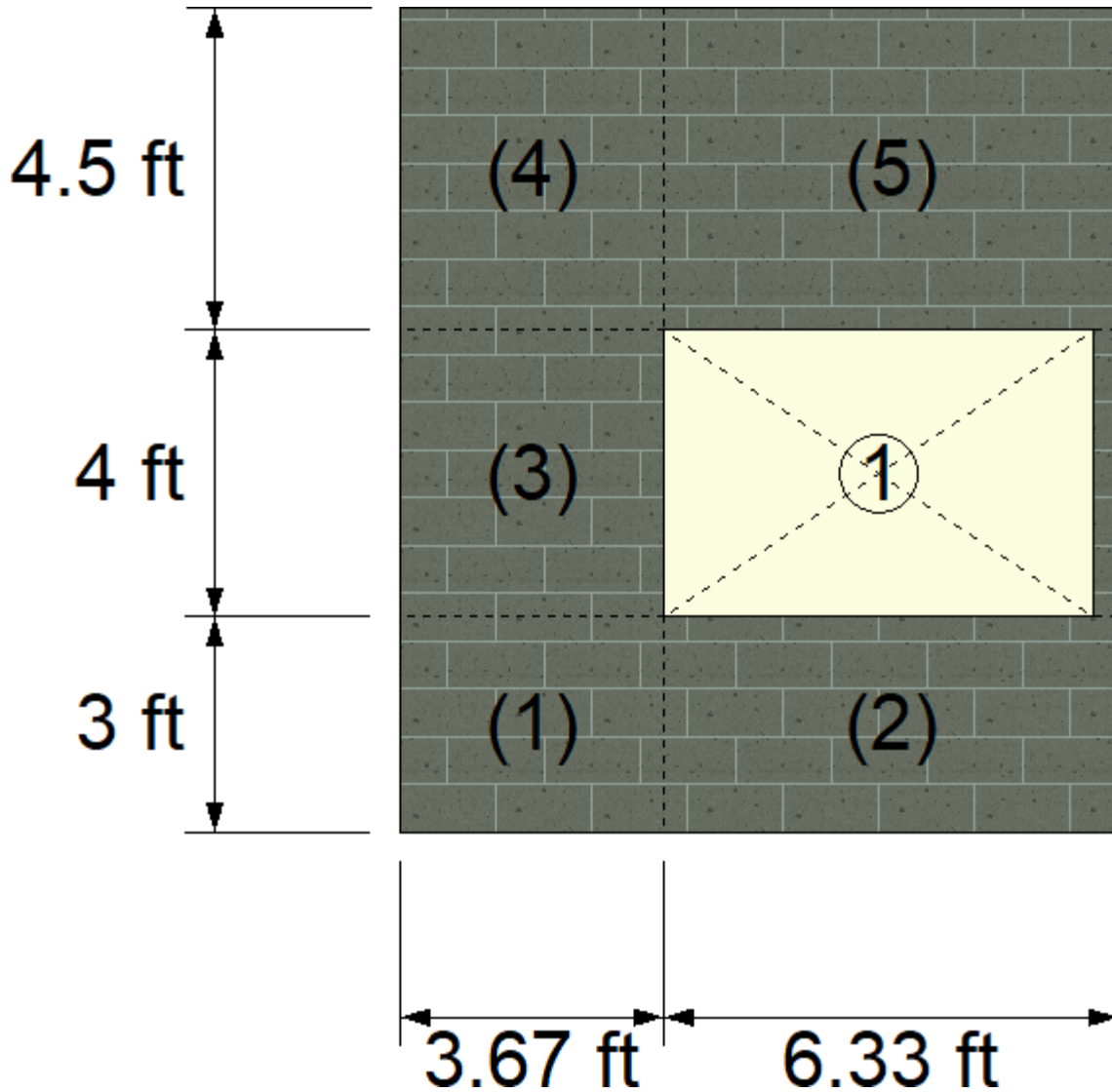
**Out-of-plane loads:**



Story	Condition	Magnitude [Kip/ft2]
1	WL_X	-0.03
1	WL_Z	-0.04
Parapet	WL_X	-0.03
Parapet	WL_Z	-0.04

# BEARING WALL DESIGN:

Status : OK



## Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	3.67	3.00
2	3.67	0.00	6.33	3.00
3	0.00	3.00	3.67	4.00
4	0.00	7.00	3.67	4.50
5	3.67	7.00	6.33	4.50



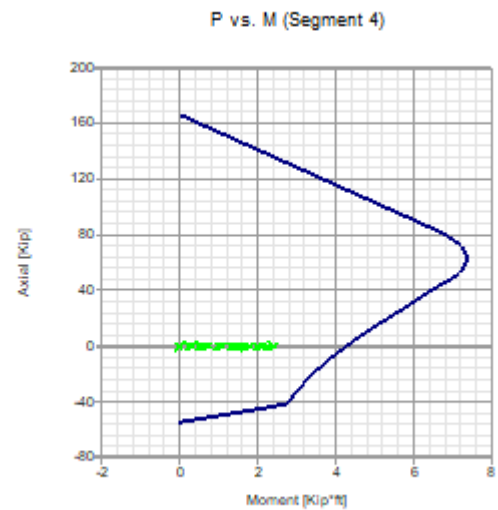
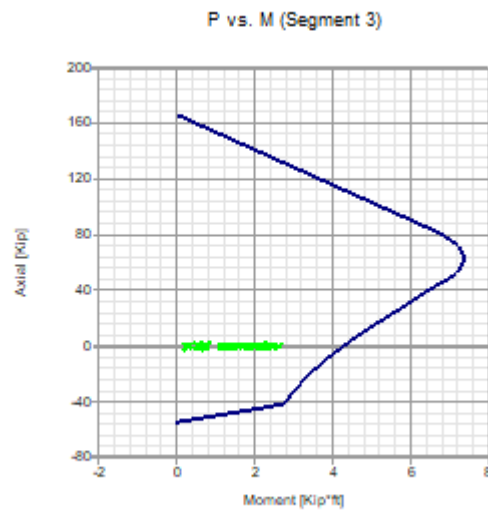
### Vertical reinforcement:

Segment	Bars	Spacing [in]	Ld [in]
1	6-#5	8.00	39.33
2	9-#5	8.00	39.33
3	6-#5	8.00	39.33
4	6-#5	8.00	39.33
5	9-#5	8.00	39.33

### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D22(Top)	-0.15	2.02	4.26	0.47
2	D22(Max)	0.23	0.55	7.38	0.07
3	D22(Max)	-0.09	2.63	4.27	0.62
4	D22(Bottom)	-0.03	2.39	4.27	0.56
5	D22(Max)	0.00	0.94	7.37	0.13

### Interaction diagrams, P vs. M:








### Results: Axial compression






Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	DM1(Top)	-0.26	58.34	0.00
2	D10(Bottom)	0.64	100.71	0.01
3	DM1(Top)	-0.06	58.34	0.00
4	D10(Top)	0.00	58.34	0.00
5	D9(Bottom)	0.02	100.71	0.00

### Results: Axial tension



Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D9(Bottom)	371.72	32000.00	0.01	
2	DM1(Top)	0.00	32000.00	0.00	
3	D9(Bottom)	169.61	32000.00	0.01	
4	D10(Bottom)	38.37	32000.00	0.00	
5	D10(Max)	2.76	32000.00	0.00	

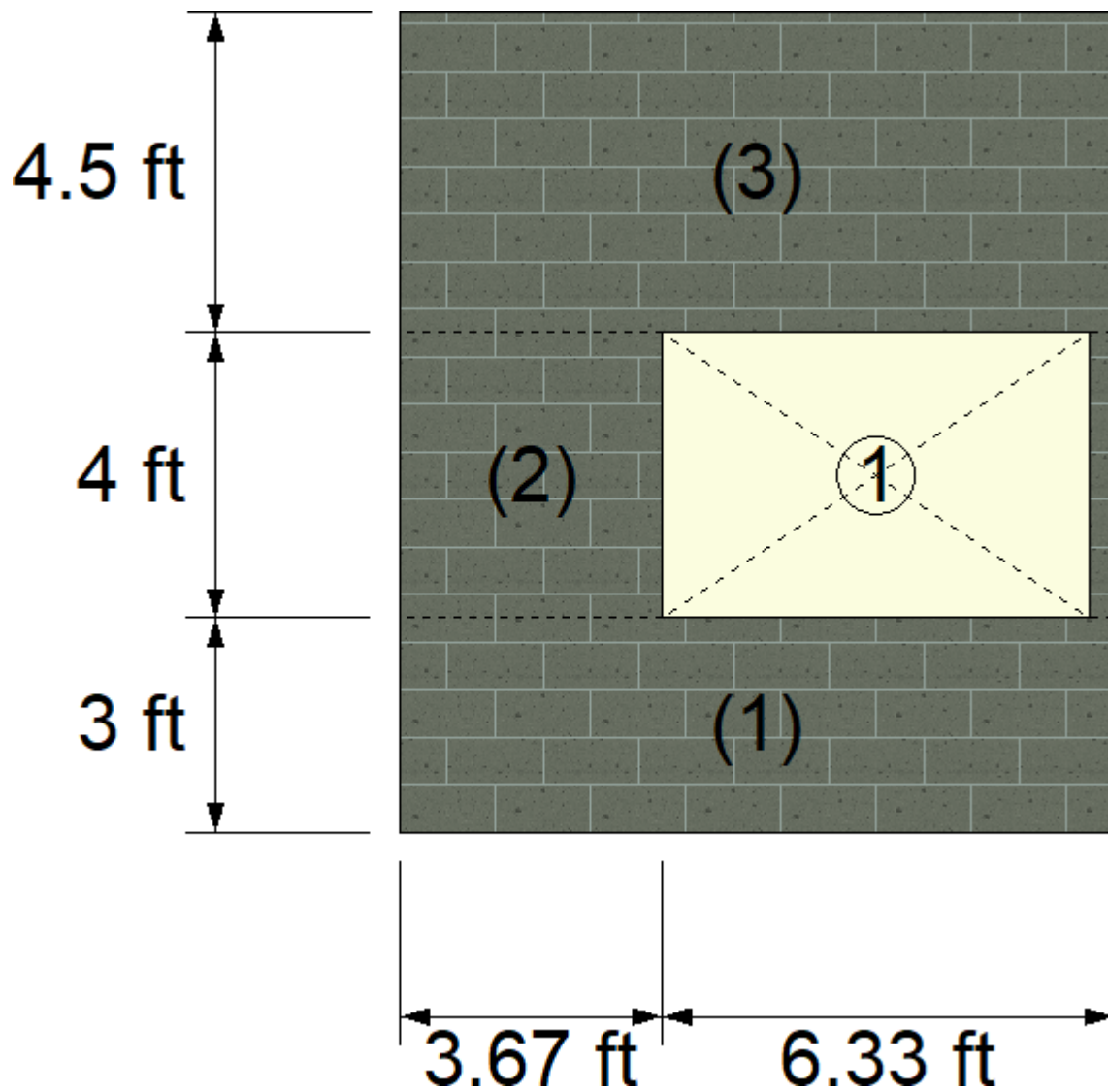
#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D22(Top)	5.690	43.571	0.13	
2	D22(Top)	3.245	43.770	0.07	
3	D22(Top)	5.869	43.571	0.13	
4	D22(Bottom)	5.913	43.571	0.14	
5	D22(Bottom)	2.658	43.583	0.06	

#### SHEAR WALL DESIGN:

Status : OK





**Geometry:**

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	10.00	3.00
2	0.00	3.00	3.67	4.00
3	0.00	7.00	10.00	4.50

**Reinforcement:**

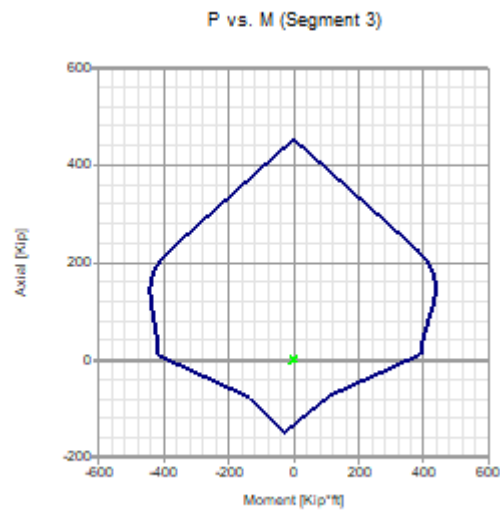
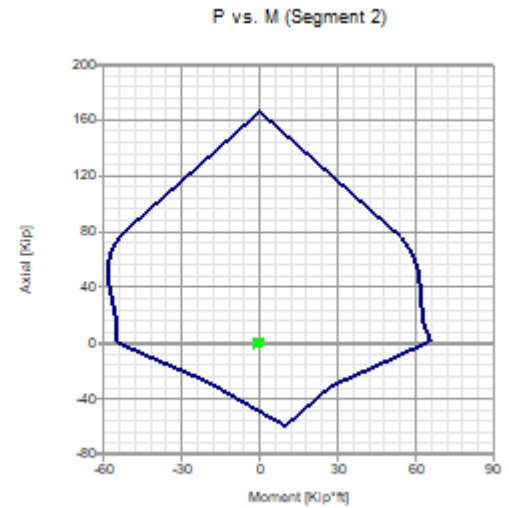
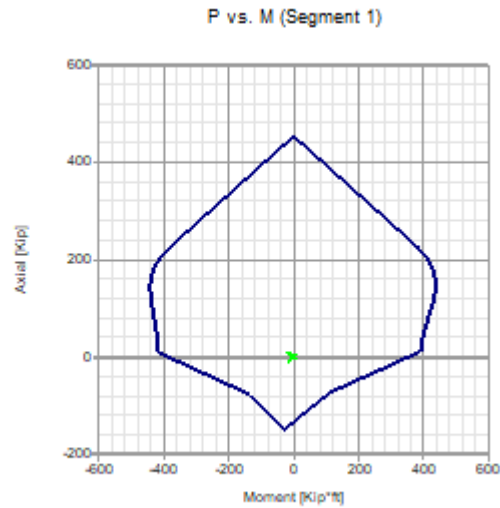
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	6-#5	8.00	0.00	4-W2.8	8.00	9.02
	9-#5	8.00	0.00	4-W2.8	8.00	9.02
2	6-#5	8.00	0.00	6-W2.8	8.00	9.02
3	6-#5	8.00	0.00	7-W2.8	8.00	9.02
	9-#5	8.00	0.00	7-W2.8	8.00	9.02

**Results: Combined axial flexure**



Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D10(Bottom)	0.01	-4.20	384.29	0.01	<input type="text"/>
2	D10(Bottom)	-0.25	-1.00	53.93	0.02	<input type="text"/>
3	D10(Bottom)	-0.04	-0.67	384.12	0.00	<input type="text"/>

Interaction diagrams, P vs. M:



Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D9(Top)	0.03	159.05	0.00	<input type="text"/>
2	DM1(Top)	-0.06	58.30	0.00	<input type="text"/>
3	D10(Top)	0.01	159.05	0.00	<input type="text"/>



**Results: Axial tension**

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D10(Max)	4.46	32000.00	0.00	
2	D10(Bottom)	136.91	32000.00	0.00	
3	D9(Bottom)	9.61	32000.00	0.00	

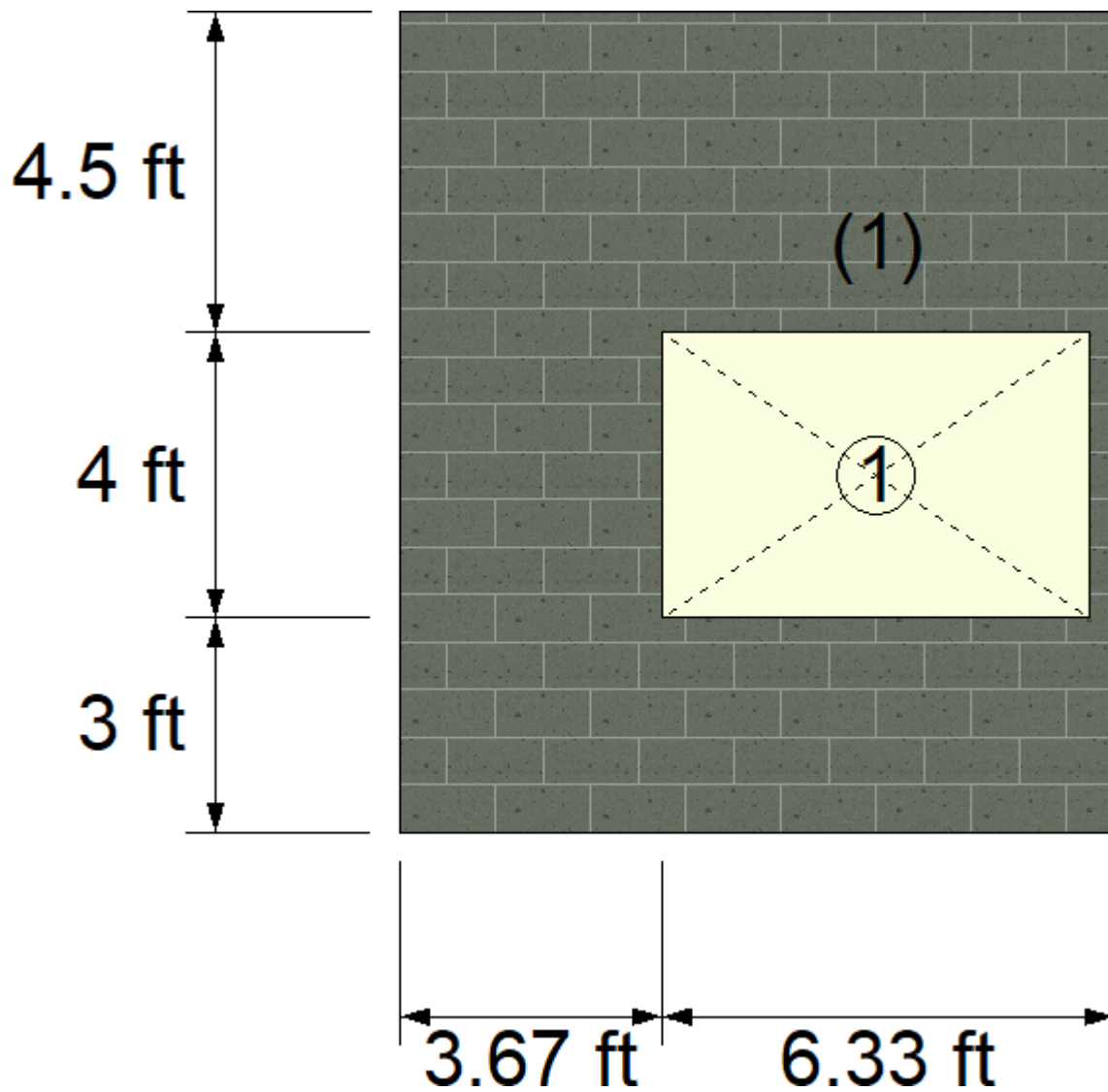
**Results: Shear**

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D9(Bottom)	2.267	36.107	0.06	
2	D9(Bottom)	4.630	35.391	0.13	
3	D9(Bottom)	1.136	41.467	0.03	

**LINTEL DESIGN:**

Status : OK





**Geometry:**

Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	3.67	3.00	6.00	24.00

**Reinforcement:**

Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	Ld [in]
1	--	0.00	1-#5	0.50	--	0.00	0.00

**Results: Bending**

Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D10(Top)	0.34	16.25	0.02	<input type="text" value="0.02"/>



**Results: Shear**

Lintel	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio	
1	D9(Top)	1.167	43.571	0.03	<input type="text"/>

**Results: Deflection**

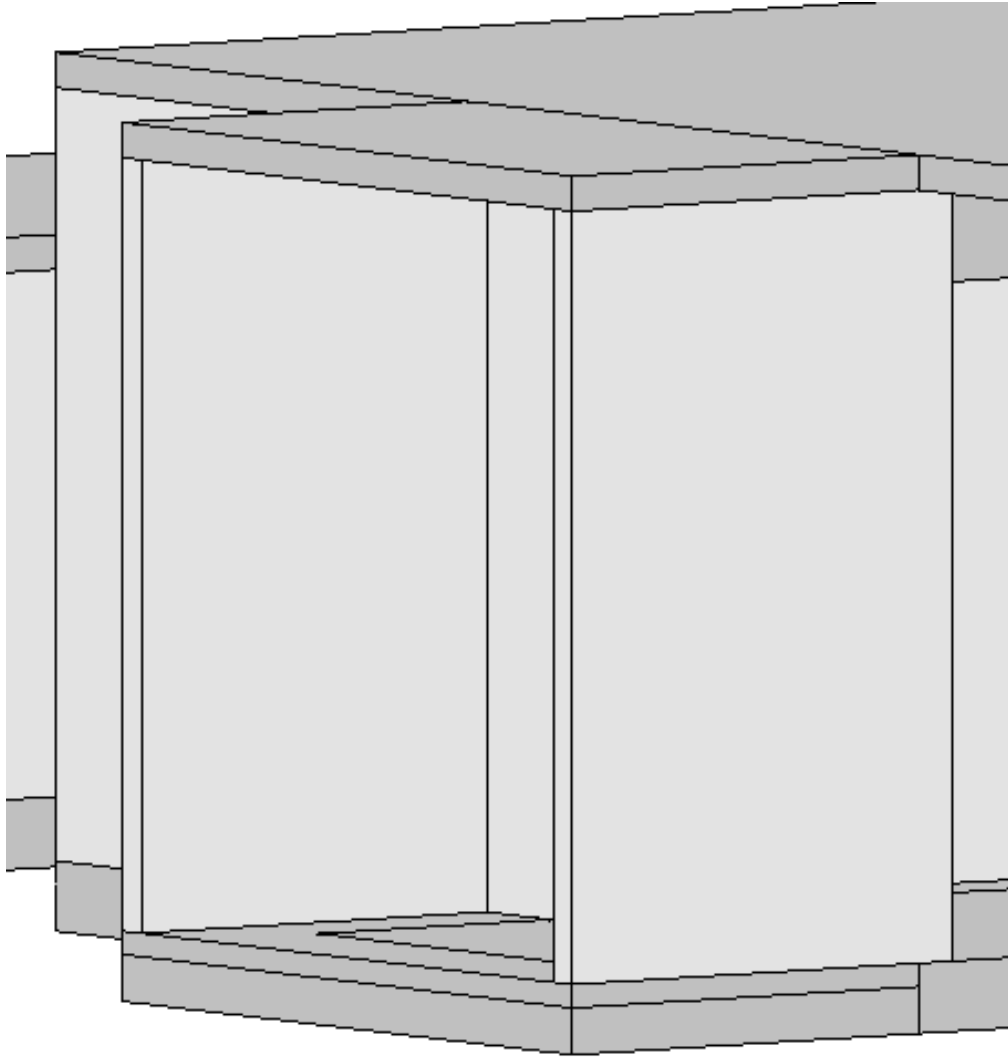
Lintel	Condition	$\delta_s$ [in]	$\delta_{max}$ [in]	Ratio	
1		0.00	0.00	0.00	<input type="text"/>

**Notes:**

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE ENTRY WALL  
DESIGN







Current Date: 1/9/2020 5:21 PM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\190 mph Exp D\PR House Entry Wall Design\_6 in 190 Exp D.msw\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 11.50 [ft]  
Total length : 6.32 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Partial grouting  
Mortar bed type : Full bed  
Masonry compression strength ( $F'_m$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	11.50	5.63	0.08

#### Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WL_X	No	WIND	Wind Load X-Direction
WL_Z	No	WIND	Wind Load Z-Direction
EQ_X	No	EQ	Earthquake X-Direction
EQ_Z	No	EQ	Earthquake Z-Direction
SM1	Yes		DL



DM1	Yes	DL
D1	Yes	DL
D2	Yes	DL+LL
D3	Yes	DL+LLR
D4	Yes	DL+0.75LL
D5	Yes	DL+0.75LLR
D6	Yes	DL+0.75LL+0.75LLR
D7	Yes	DL+0.6WL_X
D8	Yes	DL+0.6WL_Z
D9	Yes	1.126DL+0.91EQ_X
D10	Yes	1.126DL+0.91EQ_Z
D11	Yes	DL+0.75LL+0.75LLR+0.45WL_X
D12	Yes	DL+0.75LL+0.75LLR+0.45WL_Z
D13	Yes	DL+0.75LL+0.45WL_X
D14	Yes	DL+0.75LL+0.45WL_Z
D15	Yes	DL+0.75LLR+0.45WL_X
D16	Yes	DL+0.75LLR+0.45WL_Z
D17	Yes	1.09DL+0.75LL+0.683EQ_X
D18	Yes	1.09DL+0.75LL+0.683EQ_Z
D19	Yes	1.09DL+0.683EQ_X
D20	Yes	1.09DL+0.683EQ_Z
D21	Yes	0.6DL+0.6WL_X
D22	Yes	0.6DL+0.6WL_Z
D23	Yes	0.474DL+0.91EQ_X
D24	Yes	0.474DL+0.91EQ_Z
S1	Yes	DL
S2	Yes	DL+LL
S3	Yes	DL+LLR
S4	Yes	DL+0.75LL
S5	Yes	DL+0.75LLR
S6	Yes	DL+0.75LL+0.75LLR
S7	Yes	DL+0.6WL_X
S8	Yes	DL+0.6WL_Z
S9	Yes	1.126DL+0.91EQ_X
S10	Yes	1.126DL+0.91EQ_Z
S11	Yes	DL+0.75LL+0.75LLR+0.45WL_X
S12	Yes	DL+0.75LL+0.75LLR+0.45WL_Z
S13	Yes	1.09DL+0.683EQ_X
S14	Yes	1.09DL+0.683EQ_Z
S15	Yes	0.6DL+0.6WL_X
S16	Yes	0.6DL+0.6WL_Z
S17	Yes	0.474DL+0.91EQ_X
S18	Yes	0.474DL+0.91EQ_Z

#### **Distributed loads:**

Consider self weight : No

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	1.45	0.00
1	LL	Vertical	0.11	0.00
1	LLR	Vertical	0.11	0.00
1	WL_X	Vertical	-1.30	0.00
1	WL_Z	Vertical	-0.40	0.00

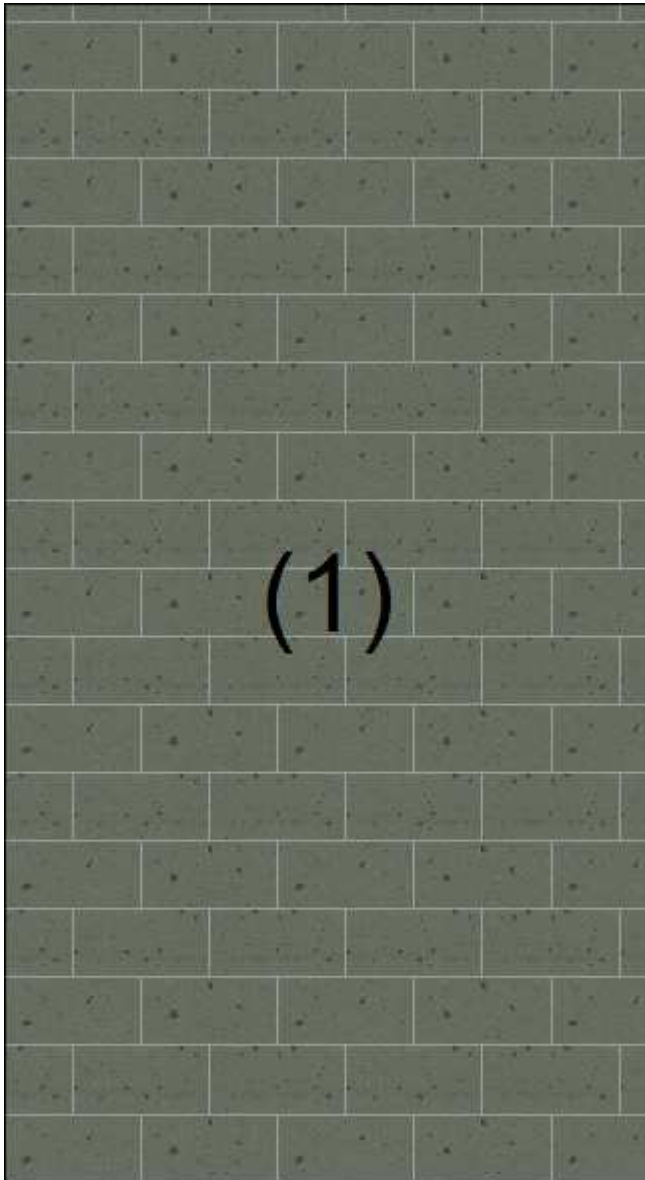
#### **Out-of-plane loads:**



Story	Condition	Magnitude [Kip/ft2]
1	WL_X	0.07
1	WL_Z	-0.08
Parapet	WL_X	0.07
Parapet	WL_Z	-0.08

#### BEARING WALL DESIGN:

Status : OK



#### Geometry:


Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	6.32	11.50



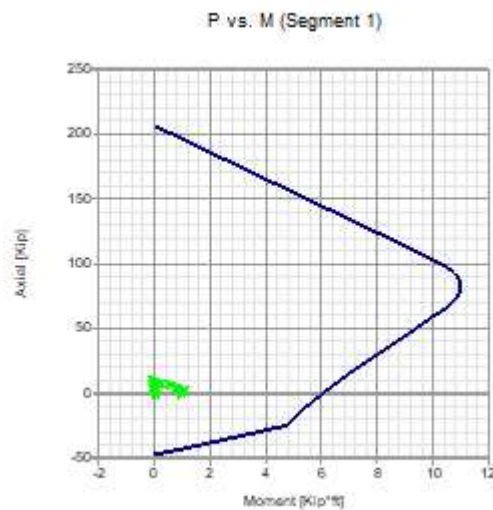
#### Vertical reinforcement:

Segment	Bars	Spacing [in]	Ld [in]
1	5-#5	16.00	39.33

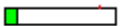
#### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D7(Max)	3.08	-1.07	6.22	0.17 

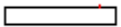
#### Interaction diagrams, P vs. M:



#### Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D17(Top)	10.05	80.21	0.13 

#### Results: Axial tension

Segment	Condition	ft [Lb/in <sup>2</sup> ]	Fs [Lb/in <sup>2</sup> ]	Ratio
1	D21(Bottom)	253.91	32000.00	0.01 

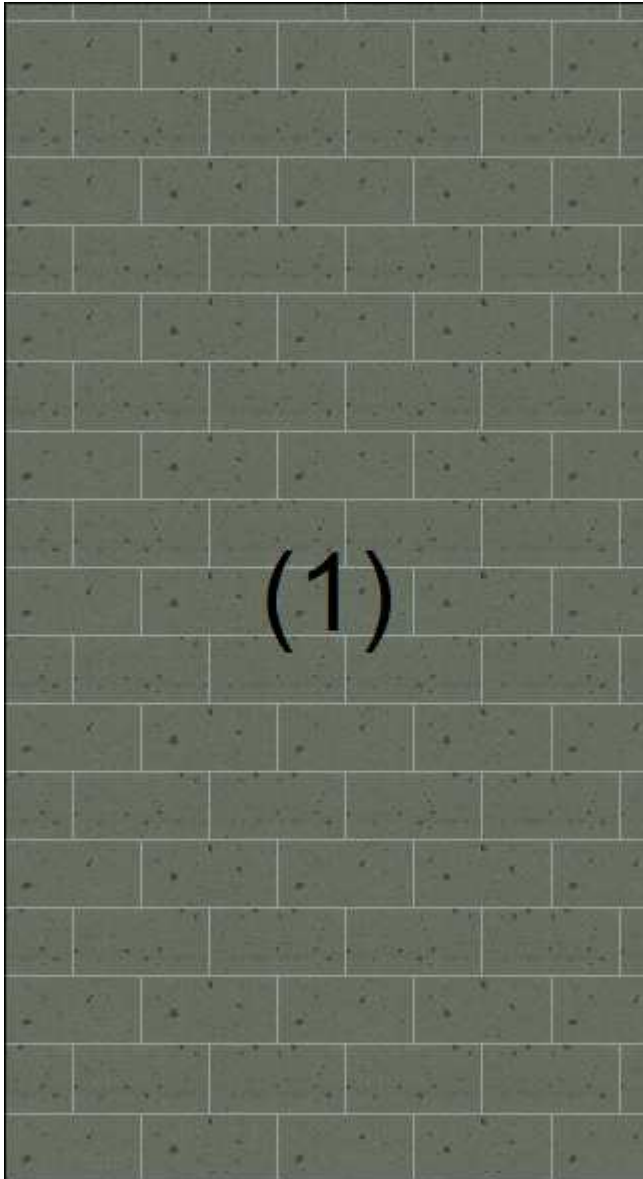
#### Results: Shear



Segment	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio
1	D7(Bottom)	3.954	73.336	0.05

#### SHEAR WALL DESIGN:

Status : OK



#### Geometry:

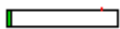
Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	6.32	11.50

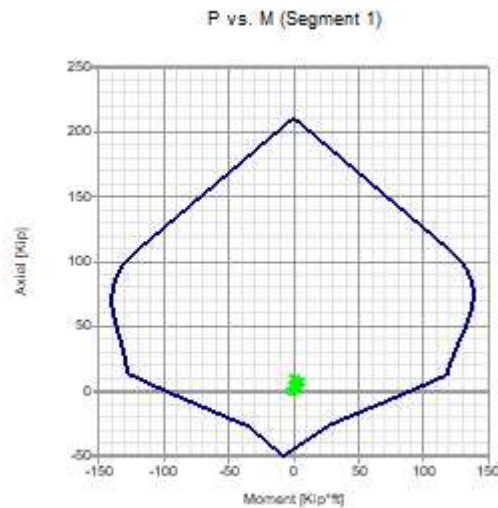


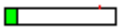
**Reinforcement:**

Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	5-#5	16.00	0.00	9-W2.8	16.00	9.02

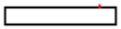
**Results: Combined axial flexure**

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D18(Max)	8.14	5.43	107.27	0.05 

**Interaction diagrams, P vs. M:****Results: Axial compression**


Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D17(Top)	10.05	81.43	0.12 

**Results: Axial tension**

Segment	Condition	ft [Lb/in <sup>2</sup> ]	Fs [Lb/in <sup>2</sup> ]	Ratio
1	D21(Bottom)	240.99	32000.00	0.01 

**Results: Shear**



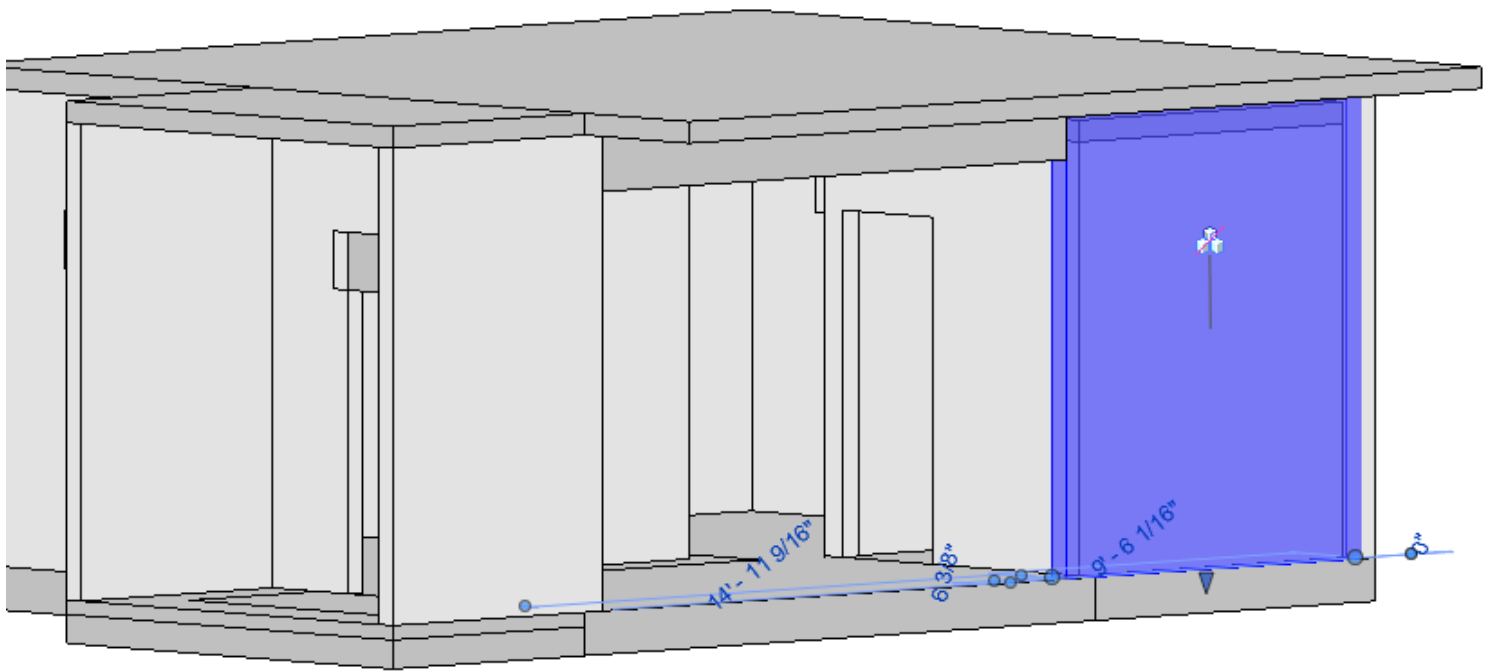
Segment	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio	
1	D10(Bottom)	10.216	38.960	0.26	

**Notes:**

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE LONG SIDE  
WALL DESIGN





Current Date: 1/9/2020 5:35 PM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\190 mph Exp D\PR House Long Safe Side Wall Design\_6 in 190 Exp D.msw\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 11.50 [ft]  
Total length : 10.23 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : Flanges

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Partial grouting  
Mortar bed type : Full bed  
Masonry compression strength ( $F'_m$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	11.50	5.63	0.08

#### Load conditions:

ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WL_X	No	WIND	Wind Load X-Direction
WL_Z	No	WIND	Wind Load Z-Direction
EQ_X	No	EQ	Earthquake X-Direction
EQ_Z	No	EQ	Earthquake Z-Direction
SM1	Yes		DL



DM1	Yes	DL
D1	Yes	DL
D2	Yes	DL+LL
D3	Yes	DL+LLR
D4	Yes	DL+0.75LL
D5	Yes	DL+0.75LLR
D6	Yes	DL+0.75LL+0.75LLR
D7	Yes	DL+0.6WL_X
D8	Yes	DL+0.6WL_Z
D9	Yes	1.126DL+0.91EQ_X
D10	Yes	1.126DL+0.91EQ_Z
D11	Yes	DL+0.75LL+0.75LLR+0.45WL_X
D12	Yes	DL+0.75LL+0.75LLR+0.45WL_Z
D13	Yes	DL+0.75LL+0.45WL_X
D14	Yes	DL+0.75LL+0.45WL_Z
D15	Yes	DL+0.75LLR+0.45WL_X
D16	Yes	DL+0.75LLR+0.45WL_Z
D17	Yes	1.09DL+0.75LL+0.683EQ_X
D18	Yes	1.09DL+0.75LL+0.683EQ_Z
D19	Yes	1.09DL+0.683EQ_X
D20	Yes	1.09DL+0.683EQ_Z
D21	Yes	0.6DL+0.6WL_X
D22	Yes	0.6DL+0.6WL_Z
D23	Yes	0.474DL+0.91EQ_X
D24	Yes	0.474DL+0.91EQ_Z
S1	Yes	DL
S2	Yes	DL+LL
S3	Yes	DL+LLR
S4	Yes	DL+0.75LL
S5	Yes	DL+0.75LLR
S6	Yes	DL+0.75LL+0.75LLR
S7	Yes	DL+0.6WL_X
S8	Yes	DL+0.6WL_Z
S9	Yes	1.126DL+0.91EQ_X
S10	Yes	1.126DL+0.91EQ_Z
S11	Yes	DL+0.75LL+0.75LLR+0.45WL_X
S12	Yes	DL+0.75LL+0.75LLR+0.45WL_Z
S13	Yes	1.09DL+0.683EQ_X
S14	Yes	1.09DL+0.683EQ_Z
S15	Yes	0.6DL+0.6WL_X
S16	Yes	0.6DL+0.6WL_Z
S17	Yes	0.474DL+0.91EQ_X
S18	Yes	0.474DL+0.91EQ_Z

#### **Distributed loads:**

Consider self weight : No

Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.82	0.00
1	LL	Vertical	1.03	0.00
1	LLR	Vertical	0.21	0.00
1	WL_X	Vertical	-1.30	0.00
1	WL_Z	Vertical	-0.40	0.00

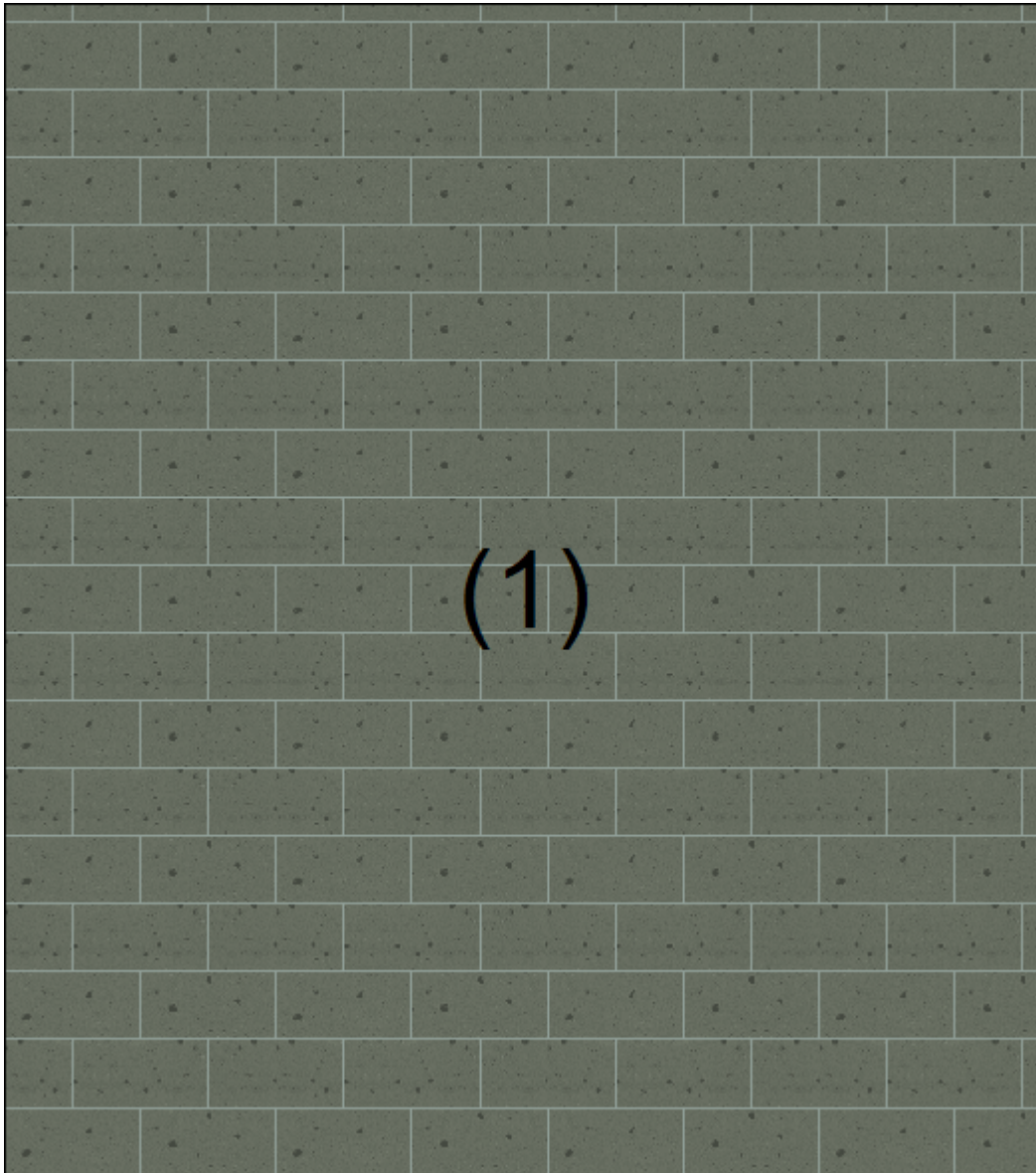
#### **Out-of-plane loads:**



Story	Condition	Magnitude [Kip/ft2]
1	WL_X	0.07
1	WL_Z	-0.08
Parapet	WL_X	0.07
Parapet	WL_Z	-0.08

#### BEARING WALL DESIGN:

Status : OK



#### Geometry:

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	10.23	11.50



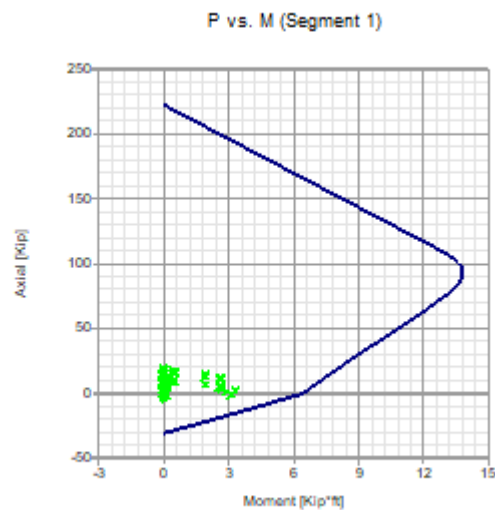
#### Vertical reinforcement:

Segment	Bars	Spacing [in]	Ld [in]
1	3-#5	40.00	39.33

#### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D21(Max)	-1.39	-3.12	6.12	0.51

#### Interaction diagrams, P vs. M:



#### Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D2(Top)	18.64	109.00	0.17

#### Results: Axial tension

Segment	Condition	ft [Lb/in <sup>2</sup> ]	Fs [Lb/in <sup>2</sup> ]	Ratio
1	D21(Bottom)	4350.20	32000.00	0.14

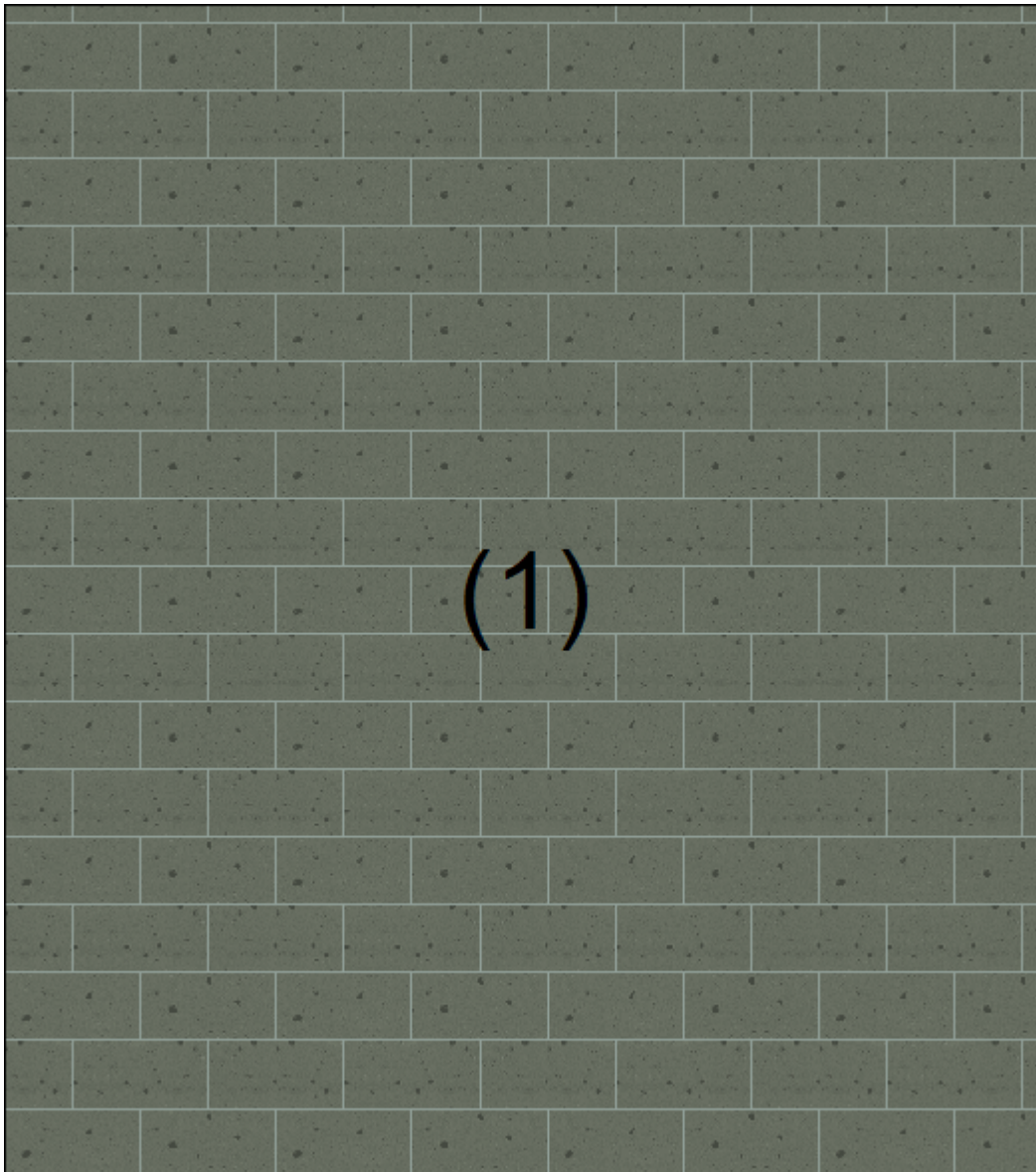
#### Results: Shear



Segment	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio
1	D7(Bottom)	4.593	69.514	0.07

#### SHEAR WALL DESIGN:

Status : OK



#### Geometry:


Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	10.23	11.50

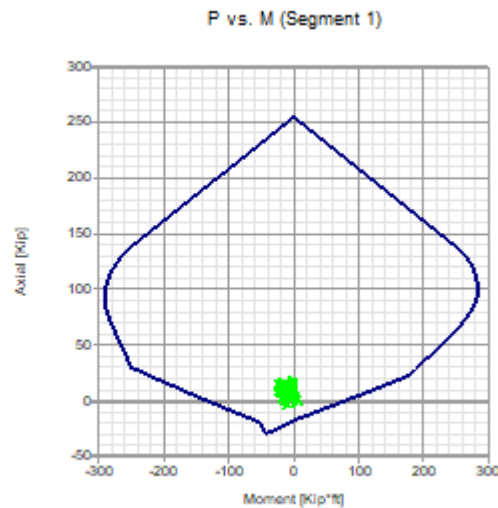


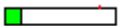
**Reinforcement:**

Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	3-#5	40.00	0.00	9-W2.8	16.00	9.02

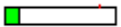
**Results: Combined axial flexure**

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D11(Bottom)	8.64	-23.73	167.35	0.14 

**Interaction diagrams, P vs. M:****Results: Axial compression**


Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D2(Top)	18.64	106.36	0.18 

**Results: Axial tension**

Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio
1	D21(Bottom)	4471.74	32000.00	0.14 

**Results: Shear**



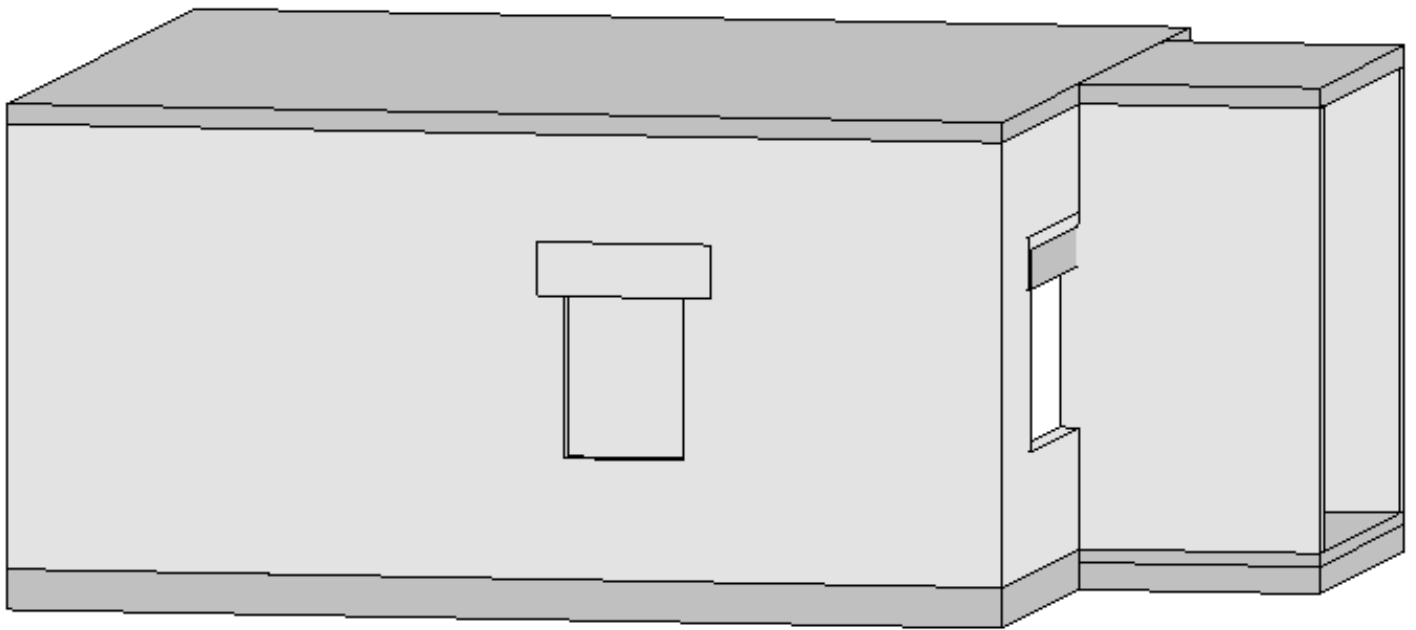
Segment	Condition	$f_v$ [Lb/in <sup>2</sup> ]	$F_v$ [Lb/in <sup>2</sup> ]	Ratio	
1	D7(Bottom)	10.299	31.037	0.33	

**Notes:**

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \*  $\delta_s$  = Calculated deflection
- \*  $\delta_{max}$  = Maximum allowable deflection



PR FEMA HOUSE LONG  
OPPOSITE SIDE WALL DESIGN





Current Date: 1/9/2020 5:37 PM

Units system: English

File name: \\FUSOLA1000\ah\$\STRUCTURAL\PROJECTS\100060693 PR FEMA\Prescriptive Designs\Calculations\Elements Wall Designs\190 mph Exp D\PR House Long Side Wall Design\_6 in 190 Exp D.msw\

## Design Results

### Masonry wall

#### GENERAL INFORMATION:

Global status : OK

Design code : TMS 402-13 ASD

#### Geometry:

Total height : 11.50 [ft]  
Total length : 24.65 [ft]  
Base support type : Continuous  
Wall bottom restraint : Pinned  
Column bottom restraint : Fixed  
Rigidity elements : None

#### Materials:

Material : CMU 1.5-60  
Mortar type : Port/Mort - M/S  
Grouting type : Partial grouting  
Mortar bed type : Full bed  
Masonry compression strength ( $F'_m$ ) : 1500 [Lb/in<sup>2</sup>]  
Steel tension strength ( $f_y$ ) : 60000 [Lb/in<sup>2</sup>]  
Steel allowable tension strength ( $F_s$ ) : 32000 [Lb/in<sup>2</sup>]  
Joint reinforcement allowable tension strength ( $F_s$ ) : 30000 [Lb/in<sup>2</sup>]  
Steel elasticity modulus ( $E_s$ ) : 2.9E07 [Lb/in<sup>2</sup>]  
Masonry elasticity modulus ( $E_m$ ) : 1.35E06 [Lb/in<sup>2</sup>]  
Masonry unit weight : 0.135 [Kip/ft<sup>3</sup>]

#### Seismic data:

Seismic design category : SDC D  
Response modification factor : 1.00  
Shear wall type : Special

Number of stories: 1

Story	Story height [ft]	Wall thickness [in]	Effective unit weight [Kip/ft <sup>3</sup> ]
1	11.50	5.63	0.08

#### Openings:

Reference	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
Lower left	13.63	3.25	3.00	4.00

#### Load conditions:



ID	Comb.	Category	Description
DL	No	DL	Dead Load
LL	No	LL	Live Load
LLR	No	LLR	Roof Live Load
WL_X	No	WIND	Wind Load X-Direction
WL_Z	No	WIND	Wind Load Z-Direction
EQ_X	No	EQ	Earthquake X-Direction
EQ_Z	No	EQ	Earthquake Z-Direction
SM1	Yes		DL
DM1	Yes		DL
D1	Yes		DL
D2	Yes		DL+LL
D3	Yes		DL+LLR
D4	Yes		DL+0.75LL
D5	Yes		DL+0.75LLR
D6	Yes		DL+0.75LL+0.75LLR
D7	Yes		DL+0.6WL_X
D8	Yes		DL+0.6WL_Z
D9	Yes		1.126DL+0.91EQ_X
D10	Yes		1.126DL+0.91EQ_Z
D11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
D12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
D13	Yes		DL+0.75LL+0.45WL_X
D14	Yes		DL+0.75LL+0.45WL_Z
D15	Yes		DL+0.75LLR+0.45WL_X
D16	Yes		DL+0.75LLR+0.45WL_Z
D17	Yes		1.09DL+0.75LL+0.683EQ_X
D18	Yes		1.09DL+0.75LL+0.683EQ_Z
D19	Yes		1.09DL+0.683EQ_X
D20	Yes		1.09DL+0.683EQ_Z
D21	Yes		0.6DL+0.6WL_X
D22	Yes		0.6DL+0.6WL_Z
D23	Yes		0.474DL+0.91EQ_X
D24	Yes		0.474DL+0.91EQ_Z
S1	Yes		DL
S2	Yes		DL+LL
S3	Yes		DL+LLR
S4	Yes		DL+0.75LL
S5	Yes		DL+0.75LLR
S6	Yes		DL+0.75LL+0.75LLR
S7	Yes		DL+0.6WL_X
S8	Yes		DL+0.6WL_Z
S9	Yes		1.126DL+0.91EQ_X
S10	Yes		1.126DL+0.91EQ_Z
S11	Yes		DL+0.75LL+0.75LLR+0.45WL_X
S12	Yes		DL+0.75LL+0.75LLR+0.45WL_Z
S13	Yes		1.09DL+0.683EQ_X
S14	Yes		1.09DL+0.683EQ_Z
S15	Yes		0.6DL+0.6WL_X
S16	Yes		0.6DL+0.6WL_Z
S17	Yes		0.474DL+0.91EQ_X
S18	Yes		0.474DL+0.91EQ_Z

**Distributed loads:**

Consider self weight : No



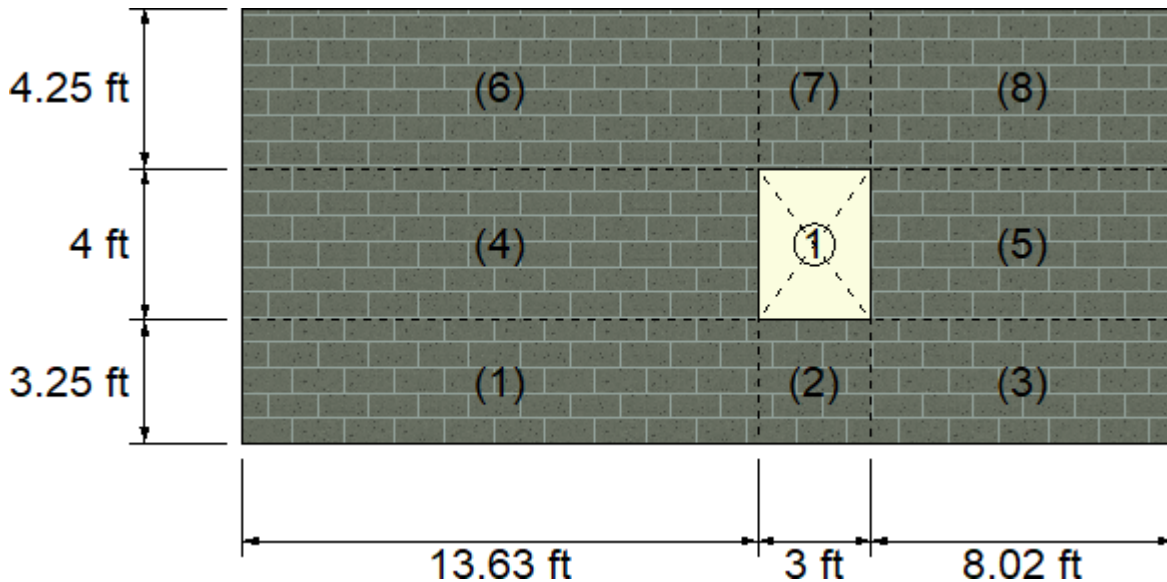
Story	Condition	Direction	Magnitude [Kip/ft]	Eccentricity [ft]
1	DL	Vertical	0.82	0.00
1	LL	Vertical	1.03	0.00
1	LLR	Vertical	0.21	0.00
1	WL_X	Vertical	-1.30	0.00
1	WL_Z	Vertical	-0.40	0.00

**Out-of-plane loads:**

Story	Condition	Magnitude [Kip/ft2]
1	WL_X	0.07
1	WL_Z	0.02
Parapet	WL_X	0.07
Parapet	WL_Z	0.02

**BEARING WALL DESIGN:**

Status : OK



**Geometry:**

Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	13.63	3.25
2	13.63	0.00	3.00	3.25
3	16.63	0.00	8.02	3.25
4	0.00	3.25	13.63	4.00
5	16.63	3.25	8.02	4.00
6	0.00	7.25	13.63	4.25
7	13.63	7.25	3.00	4.25
8	16.63	7.25	8.02	4.25

**Vertical reinforcement:**

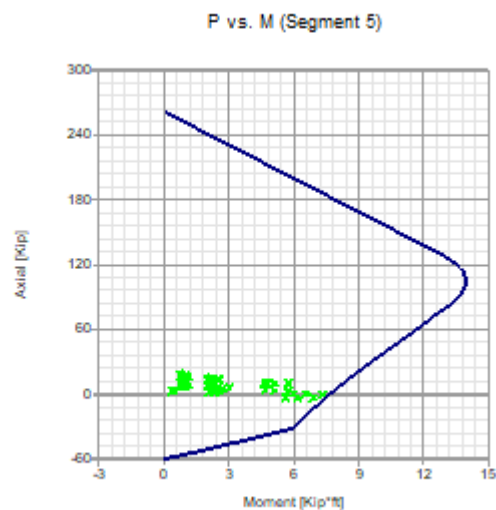
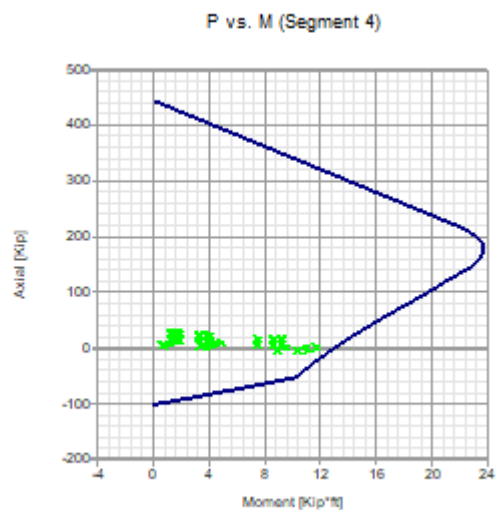


Segment	Bars	Spacing [in]	Ld [in]
1	10-#5	16.00	39.33
2	1-#5	40.00	39.33
3	6-#5	16.00	39.33
4	10-#5	16.00	39.33
5	6-#5	16.00	39.33
6	10-#5	16.00	39.33
7	1-#5	40.00	39.33
8	6-#5	16.00	39.33

#### Results: Combined axial flexure

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio
1	D7(Top)	0.37	-9.54	13.03	0.73
2	D7(Max)	0.09	-0.83	1.89	0.44
3	D7(Top)	0.63	-5.98	7.69	0.78
4	D7(Max)	0.46	-11.76	13.03	0.90
5	D7(Max)	0.56	-7.34	7.68	0.96
6	D7(Bottom)	0.50	-10.98	13.03	0.84
7	D21(Max)	-0.57	-1.16	1.76	0.66
8	D7(Bottom)	0.47	-6.54	7.68	0.85



#### Interaction diagrams, P vs. M:











#### Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio
1	D2(Top)	27.43	172.88	0.16
2	D2(Bottom)	3.23	24.39	0.13
3	D2(Top)	17.65	101.72	0.17
4	D2(Max)	27.89	172.88	0.16
5	D2(Max)	17.94	101.72	0.18
6	D2(Bottom)	27.47	172.88	0.16











7	D2(Top)	5.50	24.39	0.23	
8	D2(Bottom)	16.82	101.72	0.17	

#### Results: Axial tension

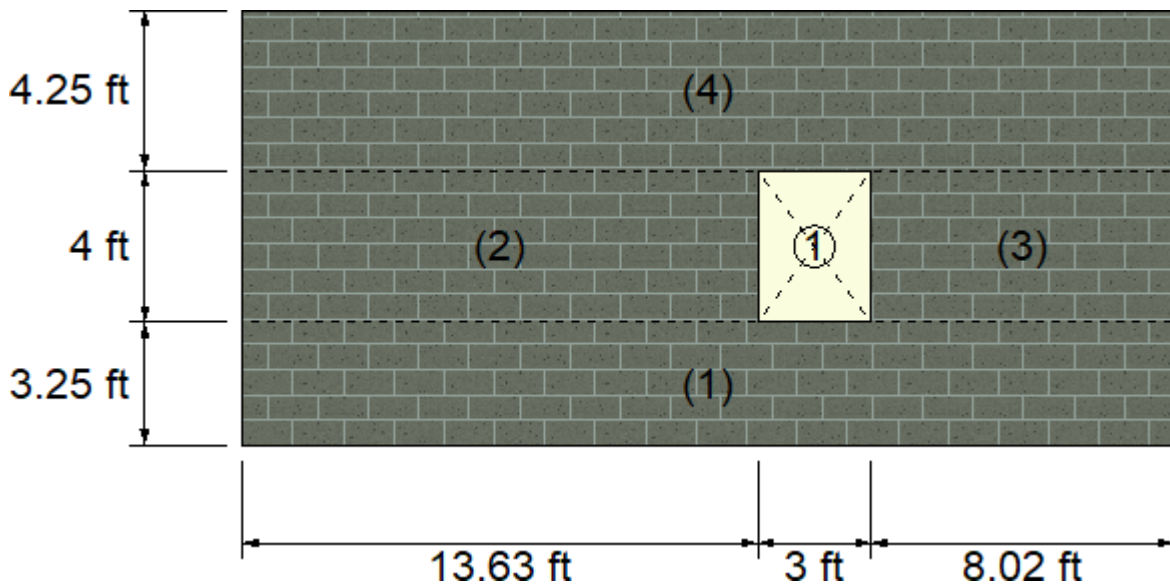
Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D21(Top)	1401.20	32000.00	0.04	
2	D21(Bottom)	1765.77	32000.00	0.06	
3	D21(Top)	1371.64	32000.00	0.04	
4	D21(Max)	1404.82	32000.00	0.04	
5	D21(Max)	1427.79	32000.00	0.04	
6	D21(Bottom)	1371.59	32000.00	0.04	
7	D21(Top)	3066.76	32000.00	0.10	
8	D21(Bottom)	1358.81	32000.00	0.04	

#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D7(Max)	7.326	43.727	0.17	
2	D7(Max)	5.662	43.784	0.13	
3	D7(Max)	7.576	44.176	0.17	
4	D7(Bottom)	3.465	43.774	0.08	
5	D7(Top)	3.537	44.009	0.08	
6	D7(Max)	5.927	43.847	0.14	
7	D7(Max)	4.844	43.785	0.11	
8	D7(Max)	5.623	43.996	0.13	

#### SHEAR WALL DESIGN:

Status : OK



Geometry:







Segment	X Coordinate [ft]	Y Coordinate [ft]	Width [ft]	Height [ft]
1	0.00	0.00	24.65	3.25
2	0.00	3.25	13.63	4.00
3	16.63	3.25	8.02	4.00
4	0.00	7.25	24.65	4.25

**Reinforcement:**

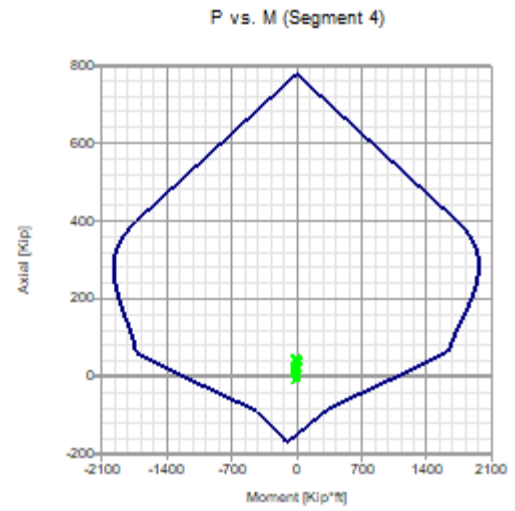
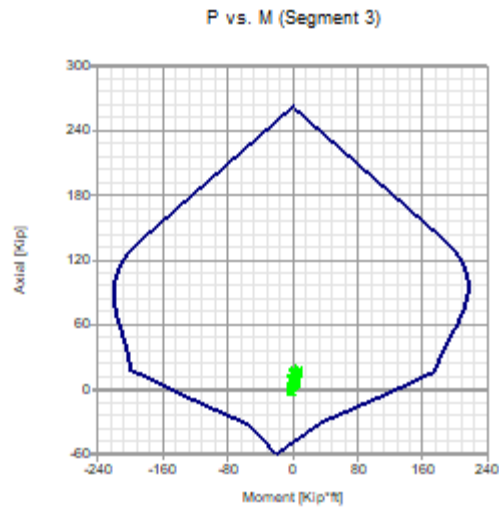
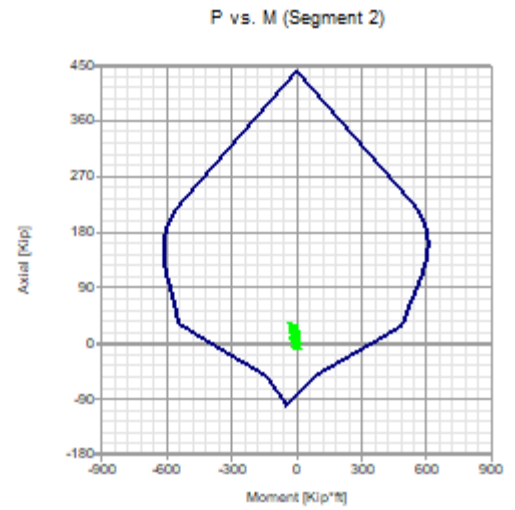
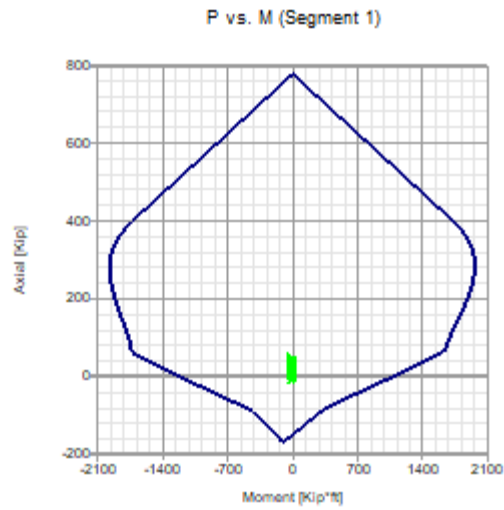
Segment	Vertical reinforcement			Horizontal reinforcement		
	Bars	Spacing [in]	Ld [in]	Bars	Spacing [in]	Ld [in]
1	10-#5	16.00	0.00	3-W2.8	16.00	9.02
	1-#5	40.00	0.00	3-W2.8	16.00	9.02
	6-#5	16.00	0.00	3-W2.8	16.00	9.02
2	10-#5	16.00	0.00	3-W2.8	16.00	9.02
3	6-#5	16.00	0.00	3-W2.8	16.00	9.02
4	10-#5	16.00	0.00	3-W2.8	16.00	9.02
	1-#5	40.00	0.00	3-W2.8	16.00	9.02
	6-#5	16.00	0.00	3-W2.8	16.00	9.02

**Results: Combined axial flexure**

Segment	Condition	P [Kip]	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D7(Bottom)	0.99	-10.06	1216.02	0.01	
2	D2(Max)	28.00	-15.17	525.16	0.03	
3	D2(Max)	17.94	7.92	175.27	0.05	
4	D9(Bottom)	22.91	-2.02	1402.09	0.00	

**Interaction diagrams, P vs. M:**





#### Results: Axial compression

Segment	Condition	P [Kip]	Pa [Kip]	Ratio	
1	D2(Top)	46.40	305.44	0.15	<div><div></div></div>
2	D2(Max)	28.00	171.88	0.16	<div><div></div></div>
3	D2(Max)	17.94	101.78	0.18	<div><div></div></div>
4	D2(Bottom)	45.86	305.44	0.15	<div><div></div></div>

#### Results: Axial tension



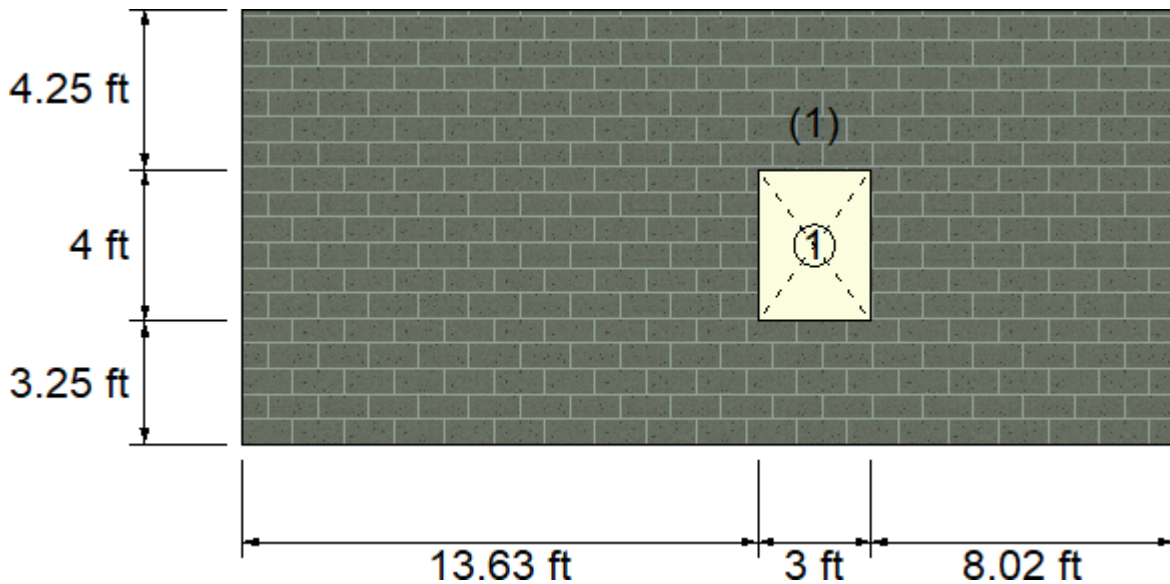
Segment	Condition	ft [Lb/in2]	Fs [Lb/in2]	Ratio	
1	D21(Top)	1367.82	32000.00	0.04	
2	D21(Max)	1435.87	32000.00	0.04	
3	D21(Max)	1424.00	32000.00	0.04	
4	D21(Bottom)	1350.55	32000.00	0.04	

#### Results: Shear

Segment	Condition	fv [Lb/in2]	Fv [Lb/in2]	Ratio	
1	D10(Max)	3.672	40.571	0.09	
2	D7(Bottom)	2.568	36.437	0.07	
3	D2(Max)	8.173	39.238	0.21	
4	D9(Bottom)	1.318	42.013	0.03	

#### LINTEL DESIGN:

Status : OK



#### Geometry:

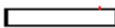
Lintel	X Coordinate [ft]	Y Coordinate [ft]	Length [ft]	Depth [in]
1	13.63	3.25	3.00	16.00

#### Reinforcement:

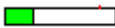
Lintel	Top long. reinforcement		Bottom long. reinforcement		Transverse reinforcement		Ld [in]
	Bars	Extent [in]	Bars	Extent [in]	Bars	Spacing [in]	
1	1-#5	0.50	1-#5	0.50	--	0.00	0.00

#### Results: Bending

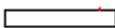


Lintel	Condition	M [Kip*ft]	Ma [Kip*ft]	Ratio	
1	D2(Top)	0.26	8.90	0.03	

#### Results: Shear

Lintel	Condition	f <sub>v</sub> [Lb/in <sup>2</sup> ]	F <sub>v</sub> [Lb/in <sup>2</sup> ]	Ratio	
1	D2(Top)	13.327	43.571	0.31	

#### Results: Deflection

Lintel	Condition	δ <sub>s</sub> [in]	δ <sub>max</sub> [in]	Ratio	
1		0.00	0.00	0.00	

#### Notes:

- \* P = Axial load
- \* Pa = Allowable compressive force due to axial load.
- \* M = Moment at the section under consideration.
- \* Ma = Wall allowable moment due to axial force or lintel pure flexure allowable moment
- \* fa = Calculated compressive stress due to axial load only
- \* fb = Calculated compressive stress due to axial flexure only
- \* ft = Calculated axial tension
- \* Fa = Allowable compressive stress due to axial load only
- \* Fb = Allowable compressive stress due to axial flexure only
- \* fv = Calculated shear stress
- \* Fs = Allowable tensile or compressive stress
- \* Fv = Allowable shear stress
- \* ld = Embedment length
- \* As = Effective cross sectional area of reinforcement
- \* δ<sub>s</sub> = Calculated deflection
- \* δ<sub>max</sub> = Maximum allowable deflection



$$L1 := 9.667 \cdot 12 = 116.004$$

$$L2 := 10.833 \cdot 12 = 129.996$$

$$L3 := 15.25 \cdot 12 = 183$$

$$\overset{\text{ww}}{T} := 5.667$$

$$\overset{\text{ww}}{I1} := \frac{(L1^3 \cdot T)}{12} = 7.372 \times 10^5$$

$$I2 := \frac{(L2^3 \cdot T)}{12} = 1.037 \times 10^6$$

$$I3 := \frac{(L3^3 \cdot T)}{12} = 2.894 \times 10^6$$

$$IT := I1 + I2 + I3 = 4.669 \times 10^6$$

**Wal 1 Rigidity**

$$R1 := \frac{I1}{IT} = 0.158$$

**Wal 2 Rigidity**

$$R2 := \frac{I2}{IT} = 0.222$$

**Wal 3 Rigidity**

$$R3 := \frac{I3}{IT} = 0.62$$



FEMA - PUERTO RICO PRESCRIPTIVE DESIGN HOUSE  
LINTEL DESIGN



Subject: FR House Lintel Design

**ATKINS**

Comp by: EEB

Date: 11/27/19

Sheet Number: 1

Check by: UJR

Job Number: 105060693

Lintel for 3'-0" Opening: (6 1/2" Bearing)

$$\text{Load: } (0.33)(135 \text{ pcf})(6 \frac{1}{2}")(4' + 1 \frac{1}{2}') = 90.96 \text{ pft}$$

$$\text{Lateral Load: } (76.1 \text{ pcf})(16 \frac{1}{2}")(101.5 \text{ pft})(0.6) = 60.9 \text{ pft}$$

Per the Cast Crete Catalogue: GF1B-1B: 3350 pft Gravity + 953 pft Lateral  
OR GF8: 1887 pft Gravity + 609 pft Lateral

Lintel for 6'-0" Opening: (6 1/2" Bearing)

$$\text{Load: } (0.33)(135 \text{ pcf})(6 \frac{1}{2}')(7' + 1 \frac{1}{2}') = 157.8 \text{ pft}$$


$$\text{Lateral Load: } (76.1 \text{ pcf})(16 \frac{1}{2}")(101.5 \text{ pft})(0.6) = 94.7 \text{ pft}$$


Per the Cast Crete Catalogue: GF1B-1B will work,  
(2853 pft Gravity, 653 pft Lateral)

OR GF8: 883 pft Gravity + 367 pft Lateral

**PER ELEMENTS WALL DESIGN, THE SAFE ROOM REQUIRES A 16" DEEP LINTEL.**



		GRAVITY							
TYPE OF LINTEL OVERALL LINTEL LENGTH		6U8	6F8-1B	6F12-1B	6F16-1B	6F20-1B	6F24-1B	6F28-1B	6F32-1B
2'-8" TO	3'-6" PRECAST	2332	2676	3892	5050	6148	7227	8297	9357
3'-7" TO	4'-0" PRECAST	2025	2313	3892	5050	6148	7227	8297	9357
4'-1" TO	4'-6" PRECAST	1654	1887	3633	5050	6148	7227	8297	9357
4'-7" TO	5'-10" PRECAST	1067	1260	2198	3557	5734	7227	8297 <sup>(31)</sup>	8225 <sup>(19)</sup>
5'-11" TO	6'-6" PRECAST	949	1078	1831	2850	4328	6737	8297	9357
6'-7" TO	7'-6" PRECAST	779	883	1459	2188	3151	4524	6654	9357 <sup>(11)</sup>
7'-7" TO	9'-4" PRECAST	584	660	1056	1523	2084	2795	3731	5017
9'-5" TO	10'-6" PRECAST	503	566	895	1270	1706	2236	2898	3747
10'-7" TO	11'-4" PRECAST	457	513	805	1133	1507	1952	2492	3163
11'-5" TO	12'-0" PRECAST	425	477	744	1042	1377	1769	2238	2808
12'-1" TO	13'-4" PRECAST	373	417	646	895	1170	1485	1852	2285
13'-5" TO	14'-0" PRECAST	351	392	605	835	1087	1373	1703	2087
14'-1" TO	17'-4" PRECAST	NR	299	455	620	794	985	1198	1437

		UPLIFT							LATERAL		
TYPE OF LINTEL OVERALL LINTEL LENGTH		6F8-1T	6F12-1T	6F16-1T	6F20-1T	6F24-1T	6F28-1T	6F32-1T	6U8	6F8	RCMU
2'-8" TO 3'-6"	PRECAST	1412	2074	2715	3356	3997	4638	5279	587	1055	596
3'-7" TO 4'-0"	PRECAST	1225	1800	2357	2913	3470	4027	4583	487	787	445
4'-1" TO 4'-6"	PRECAST	1083	1592	2084	2577	3069	3562	4055	416	609	344
4'-7" TO 5'-10"	PRECAST	831	1222	1600	1979	2357	2736	3114	300	350	198
5'-11" TO 6'-6"	PRECAST	723	1097 <sup>(9)</sup>	1437 <sup>(1)</sup>	1777	2117	2457	2797	263	496	157
6'-7" TO 7'-6"	PRECAST	648 <sup>(16)</sup>	863 <sup>(13)</sup>	1249 <sup>(14)</sup>	1544 <sup>(9)</sup>	1840 <sup>(6)</sup>	2135 <sup>(4)</sup>	2431 <sup>(2)</sup>	222	367	116
7'-7" TO 9'-4"	PRECAST	575	571 <sup>(12)</sup>	980 <sup>(27)</sup>	1252 <sup>(26)</sup>	1492 <sup>(24)</sup>	1732 <sup>(22)</sup>	1972 <sup>(20)</sup>	173	352	74
9'-5" TO 10'-6"	PRECAST	514	462 <sup>(12)</sup>	787 <sup>(27)</sup>	1121 <sup>(33)</sup>	1336 <sup>(31)</sup>	1551 <sup>(29)</sup>	1766 <sup>(28)</sup>	151	276	58
10'-7" TO 11'-4"	PRECAST	474	404 <sup>(11)</sup>	685 <sup>(26)</sup>	985 <sup>(33)</sup>	1213 <sup>(33)</sup>	1442 <sup>(33)</sup>	1645 <sup>(32)</sup>	139	311	49
11'-5" TO 12'-0"	PRECAST	454 <sup>(7)</sup>	367 <sup>(11)</sup>	619 <sup>(26)</sup>	888 <sup>(33)</sup>	1093 <sup>(33)</sup>	1299 <sup>(33)</sup>	1506 <sup>(33)</sup>	131	277	44
12'-1" TO 13'-4"	PRECAST	402 <sup>(13)</sup>	308 <sup>(11)</sup>	516 <sup>(25)</sup>	736 <sup>(32)</sup>	906 <sup>(32)</sup>	1076 <sup>(32)</sup>	1247 <sup>(32)</sup>	117	223	35
13'-5" TO 14'-0"	PRECAST	368 <sup>(13)</sup>	285 <sup>(10)</sup>	475 <sup>(24)</sup>	677 <sup>(31)</sup>	832 <sup>(32)</sup>	989 <sup>(32)</sup>	1145 <sup>(32)</sup>	111	202	32
14'-1" TO 17'-4"	PRECAST	253 <sup>(12)</sup>	208 <sup>(9)</sup>	338 <sup>(22)</sup>	476 <sup>(29)</sup>	585 <sup>(29)</sup>	693 <sup>(29)</sup>	803 <sup>(29)</sup>	NR	130	21



FEMA - PUERTO RICO PRESCRIPTIVE DESIGN HOUSE  
TYPICAL MONOLITHIC FOUNDATION



<b>BEAM ON ELASTIC FOUNDATION ANALYSIS</b> <b>For Soil Supported Beam, Combined Footing, Slab Strip or Mat Strip</b> <b>of Assumed Finite Length with Both Ends Free</b>			
Job Name:	CMU PRESCRIPTIVE DESIGN	Subject:	TURNDOWN FOUNDATION
Job Number:		Originator:	Checker:

**Input Data:**

**Beam Data:**

Length, L = 24.0000 ft.  
Width, W = 1.5000 ft.  
Thickness, T = 1.5000 ft.  
Modulus, E = 3605 ksi  
Subgrade, K = 250 pci  
Inertia, I = 0.422 ft.<sup>4</sup>

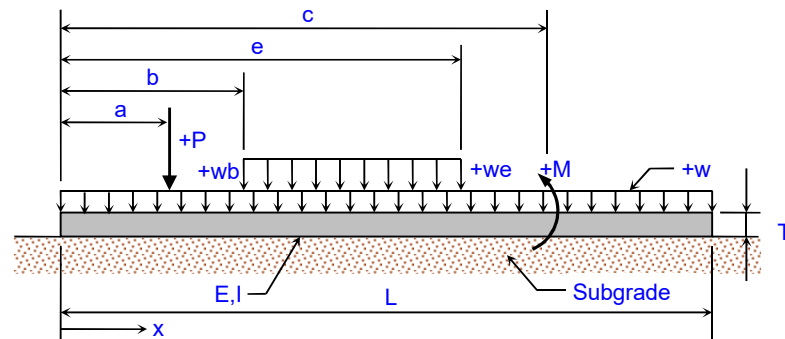
**Beam Loadings:**

Full Uniform:  
w = 2.2500 kips/ft.

	Start		End
Distributed:	b (ft.)	Wb (kips/ft.)	e (ft.)
#1:			
#2:			
#3:			
#4:			
#5:			
#6:			

	a (ft.)	P (kips)
#1:		
#2:		
#3:		
#4:		
#5:		
#6:		
#7:		
#8:		
#9:		
#10:		
#11:		
#12:		

	C (ft.)	M (ft-kips)
#1:		
#2:		
#3:		
#4:		



**Nomenclature**

**Results:**

**Beam Flexibility Criteria:**

for  $\beta^*L \leq \pi/4$  beam is rigid  
for  $\pi/4 < \beta^*L < \pi$  beam is semi-rigid  
for  $\beta^*L \geq \pi$  beam is flexible  
for  $\beta^*L \geq 6$  beam is semi-infinite long

$\beta = 0.165$   $\beta = ((K*W)/(4*E*144*I))^{(1/4)}$   
 $\beta^*L = 3.96$   $\beta^*L = \text{Flexibility Factor}$

**Beam is flexible**

**Max. Shears and Locations:**

+V(max) = 0.00 k @ x = 0.00 ft.  
-V(max) = 0.00 k @ x = 0.00 ft.

**Max. Moments and Locations:**

+M(max) = 0.00 ft-k @ x = 0.00 ft.  
-M(max) = 0.00 ft-k @ x = 0.00 ft.

**Max. Deflection and Location:**

$\Delta(\text{max}) = -0.042$  in. @ x = 0.00 ft.

**Max. Soil Pressure and Location:**


Q(max) = 1.500 ksf @ x = 0.00 ft.

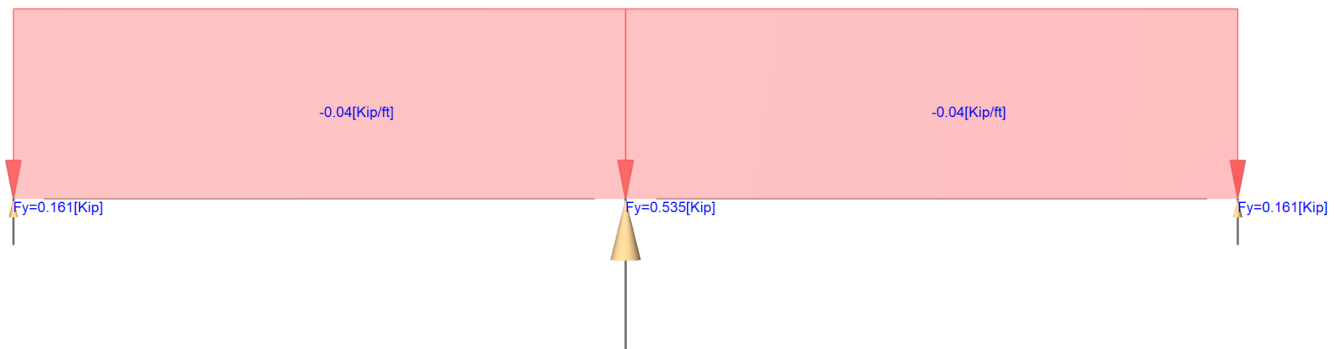


# WOOD DESIGN CALCULATIONS FOR SINGLE STORY CMU STRUCTURE




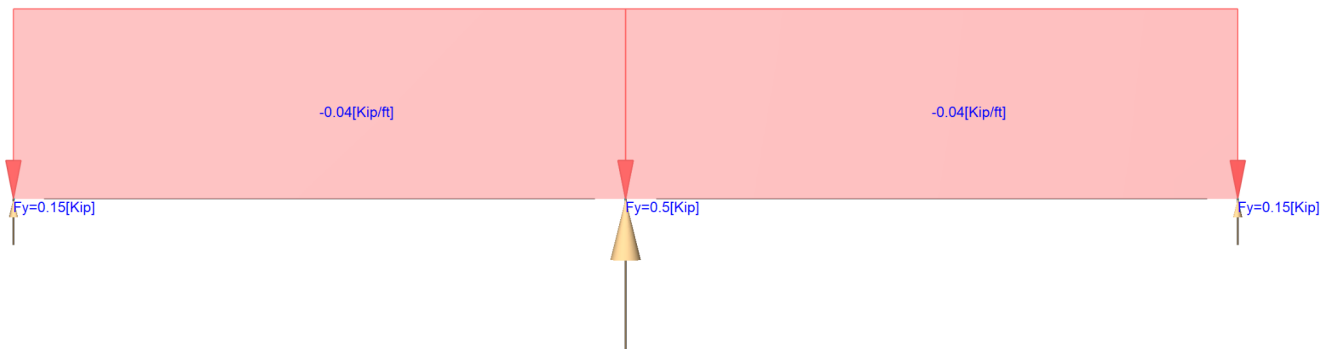
## Loads

 Distributed user loads - Members






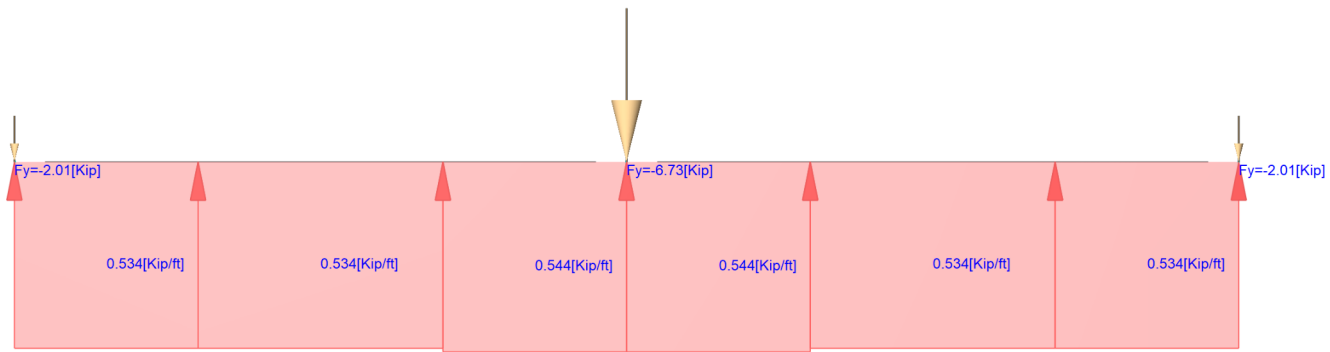
## Loads

 Distributed user loads - Members

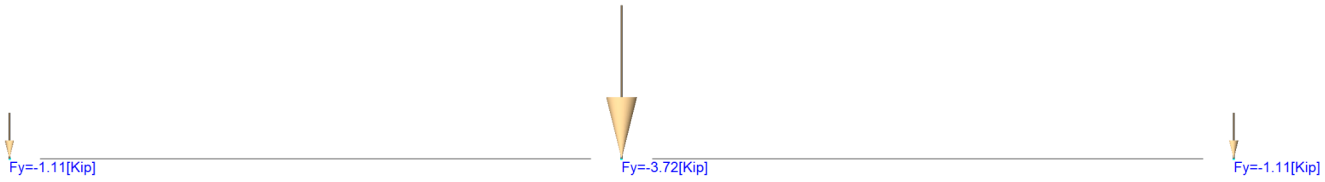


## Loads

 Distributed user loads - Members




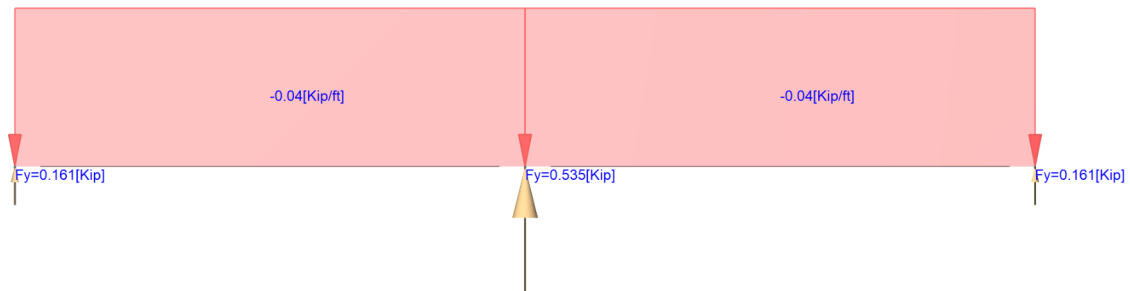







## Loads

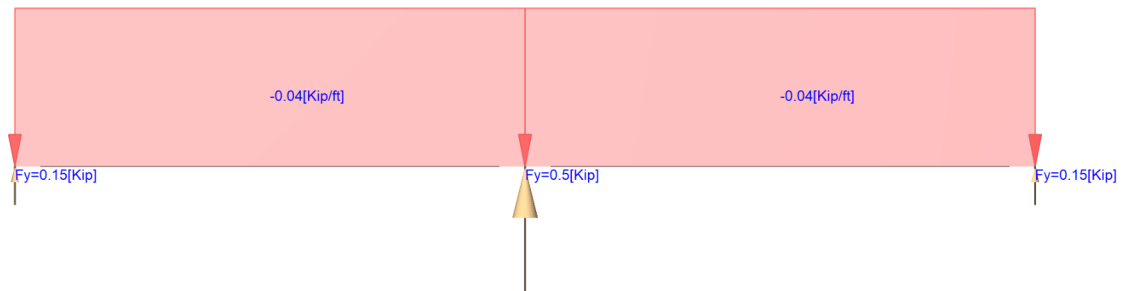
 Distributed user loads - Members






Loads

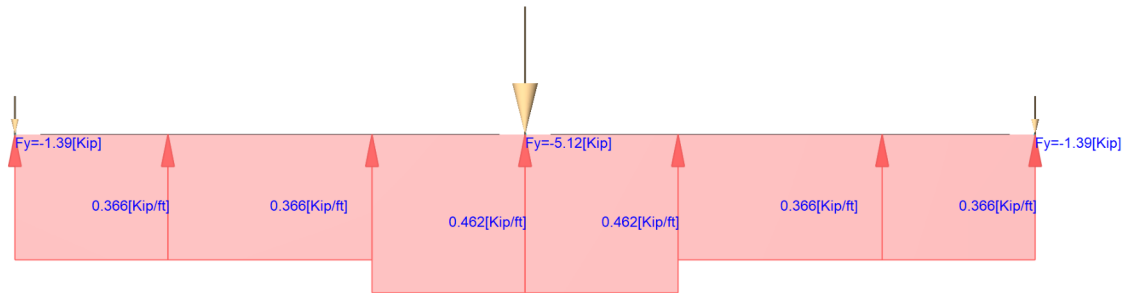
 Distributed user loads - Members



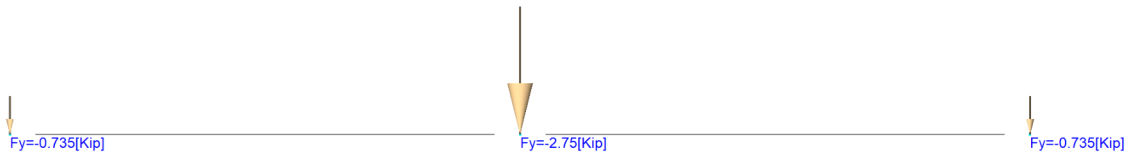


## Loads

 Distributed user loads - Members









## META/HETA/HHETA/HETAL/DETAL/TSS/TBP8

## Embedded Truss Anchors and Truss Seat Snap-In (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

Model No.	H (in.)	1-Ply Southern Pine (SP) Rafter/Truss				2- or 3-Ply Southern Pine (SP) Rafter/Truss					Code Ref.
		Fasteners (in.)	Uplift (160)	F <sub>1</sub> (160)	F <sub>2</sub> (160)	Fasteners (in.)	Uplift (160)		F <sub>1</sub> (160)	F <sub>2</sub> (160)	
			GFCMU/Concrete				GFCMU	Concrete			
Single Anchor											
META12	8	(7) 0.148 x 1 ½	1,420	340	770	(6) 0.162 x 3 ½	1,450	1,450	340	770	FL
META16	12	(8) 0.148 x 1 ½	1,450	340	770	(6) 0.162 x 3 ½	1,450	1,450	340	770	
META18	14										
META20	16										
META24	20										
META40	36										
HETA12	8	(7) 0.148 x 1 ½	1,455	340	770	(7) 0.162 x 3 ½	1,730	1,730	340	770	
HETA16	12	(9) 0.148 x 1 ½	1,810	340	770	(8) 0.162 x 3 ½	1,810	1,810	340	770	
HETA20	16										
HETA24	20										
HETA40	36										
HHETA16	12										
HHETA20	16	(10) 0.148 x 1 ½	2,120	340	770	(9) 0.162 x 3 ½	2,120	2,120	340	770	
HHETA24	20	(10) 0.148 x 1 ½	2,120	340	770	(9) 0.162 x 3 ½	2,120	2,120	340	770	
HHETA40	36										
HETAL12	7	(10) 0.148 x 1 ½	1,040	390	1,040	(10) 0.162 x 3 ½	1,235	1,235	390	1,040	
HETAL16	11	(14) 0.148 x 1 ½	1,810	390	1,040	(13) 0.162 x 3 ½	1,810	1,810	390	1,040	
HETAL20	15										
Double Anchor											
META12	8	(10) 0.148 x 1 ½	1,875	680	770	(14) 0.162 x 3 ½	1,795	2,435	1,285	1,080	FL
META16	12	(10) 0.148 x 1 ½	1,875	680	770	(14) 0.162 x 3 ½	1,795	2,435	1,285	1,080	
META18	14										
META20	16										
META24	20										
META40	36										
HETA12	8	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	2,560	1,350	1,430	
HETA16	12	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	2,560	1,350	1,430	
HETA20	16										
HETA24	20										
HETA40	36										
HHETA16	12										
HHETA20	16	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	3,180	1,350	1,430	
HHETA24	20										
HHETA40	36										
DETAL20	15¾	(18) 0.148 x 1 ½	2,480	2,000	1,370	—	—	—	—	—	

1. Loads have been increased for wind or earthquake loading, with no further increase allowed. Reduce where other loads govern.

2. Concrete shall have a minimum compressive strength of  $f'_c = 2,500$  psi.

3. Grout-filled CMU (GFCMU) shall have a minimum compressive strength of  $f'_m = 1,500$  psi.

4. For simultaneous loads in more than one direction, the connector must be evaluated using the Unity Equation, as described in General Instructions for the Designer.

5.  $F_1$  lateral load toward face of HETAL is 1,870 lb.

6. The HHETA allowable  $F_1$  load can be increased to 435 lb. if the strap is wrapped over the truss and a minimum of 12 nails are installed.

7. The DETAL20 requires (6) 0.148" x 1 ½" nails in the truss seat and (6) 0.148" x 1 ½" nails in each strap. For double META/HETA/HHETA installations, install half of the required fasteners in each strap.

8.  $F_1$  lateral loads listed for double META/HETA/HHETA on 2- or 3-ply rafter/truss may cause an additional ¼" deflection beyond the standard ½" limit where the straps are installed not wrapped over the heel as shown.

9. Minimum edge distance for META/HETA/HHETA is 1 ½" for concrete and 2" for masonry. Where edge distance is less than 2" for masonry, the maximum uplift load is 1,005 lb.

10. It is acceptable to use a reduced number of fasteners provided that there is a reduction in uplift allowable load. Calculate the connector allowable load for a reduced number of nails as follows: Allowable Load = (No. of Nails Used) / (No. of Nails in Table) x Table Load. Lateral loads require the lowest 6 nail holes filled for META and lowest 7 nail holes filled for HETA/HHETA.

11. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



# META/HETA/HHETA/HETAL/DETAL/TSS/TBP8

## Embedded Truss Anchors and Truss Seat Snap-In (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

Model No.	H (in.)	1-Ply Southern Pine (SP) Rafter/Truss				2- or 3-Ply Southern Pine (SP) Rafter/Truss					Code Ref.
		Fasteners (in.)	Uplift (160)	F <sub>1</sub> (160)	F <sub>2</sub> (160)	Fasteners (in.)	Uplift (160)		F <sub>1</sub> (160)	F <sub>2</sub> (160)	
			GFCMU/Concrete				GFCMU	Concrete			
Single Anchor											
META12	8	(7) 0.148 x 1 ½	1,420	340	770	(6) 0.162 x 3 ½	1,450	1,450	340	770	FL
META16	12	(8) 0.148 x 1 ½	1,450	340	770	(6) 0.162 x 3 ½	1,450	1,450	340	770	
META18	14										
META20	16										
META24	20										
META40	36										
HETA12	8	(7) 0.148 x 1 ½	1,455	340	770	(7) 0.162 x 3 ½	1,730	1,730	340	770	
HETA16	12	(9) 0.148 x 1 ½	1,810	340	770	(8) 0.162 x 3 ½	1,810	1,810	340	770	
HETA20	16										
HETA24	20										
HETA40	36										
HHETA16	12	(10) 0.148 x 1 ½	2,120	340	770	(9) 0.162 x 3 ½	2,120	2,120	340	770	
HHETA20	16										
HHETA24	20										
HHETA40	36										
HETAL12	7	(10) 0.148 x 1 ½	1,040	390	1,040	(10) 0.162 x 3 ½	1,235	1,235	390	1,040	
HETAL16	11	(14) 0.148 x 1 ½	1,810	390	1,040	(13) 0.162 x 3 ½	1,810	1,810	390	1,040	
HETAL20	15										
Double Anchor											
META12	8	(10) 0.148 x 1 ½	1,875	680	770	(14) 0.162 x 3 ½	1,795	2,435	1,285	1,080	FL
META16	12	(10) 0.148 x 1 ½	1,875	680	770	(14) 0.162 x 3 ½	1,795	2,435	1,285	1,080	
META18	14										
META20	16										
META24	20										
META40	36										
HETA12	8	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	2,560	1,350	1,430	
HETA16	12	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	2,560	1,350	1,430	
HETA20	16										
HETA24	20										
HETA40	36										
HHETA16	12	(10) 0.148 x 1 ½	1,920	680	770	(12) 0.162 x 3 ½	2,365	3,180	1,350	1,430	
HHETA20	16										
HHETA24	20										
HHETA40	36										
DETAL20	15¾	(18) 0.148 x 1 ½	2,480	2,000	1,370	—	—	—	—	—	

1. Loads have been increased for wind or earthquake loading, with no further increase allowed. Reduce where other loads govern.
2. Concrete shall have a minimum compressive strength of  $f'_c = 2,500$  psi.
3. Grout-filled CMU (GFCMU) shall have a minimum compressive strength of  $f'_m = 1,500$  psi.
4. For simultaneous loads in more than one direction, the connector must be evaluated using the Unity Equation, as described in General Instructions for the Designer.
5.  $F_1$  lateral load toward face of HETAL is 1,870 lb.
6. The HHETA allowable  $F_1$  load can be increased to 435 lb. if the strap is wrapped over the truss and a minimum of 12 nails are installed.
7. The DETAL20 requires (6) 0.148" x 1 ½" nails in the truss seat and (6) 0.148" x 1 ½" nails in each strap. For double META/HETA/HHETA installations, install half of the required fasteners in each strap.
8.  $F_1$  lateral loads listed for double META/HETA/HHETA on 2- or 3-ply rafter/truss may cause an additional ¼" deflection beyond the standard ½" limit where the straps are installed not wrapped over the heel as shown.
9. Minimum edge distance for META/HETA/HHETA is 1 ½" for concrete and 2" for masonry. Where edge distance is less than 2" for masonry, the maximum uplift load is 1,005 lb.
10. It is acceptable to use a reduced number of fasteners provided that there is a reduction in uplift allowable load. Calculate the connector allowable load for a reduced number of nails as follows: Allowable Load = (No. of Nails Used) / (No. of Nails in Table) x Table Load. Lateral loads require the lowest 6 nail holes filled for META and lowest 7 nail holes filled for HETA/HHETA.
11. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



## PLYWOOD SHEATHING CALCULATIONS



**Table 3.2.2 Nominal Uniform Load Capacities (psf) for Roof Sheathing Resisting Out-of-Plane Wind Loads<sup>1,2,6</sup>**

Sheathing Type <sup>5</sup>	Span Rating or Grade	Minimum Thickness (in.)	Strength Axis <sup>7</sup> Applied Perpendicular to Supports						Strength Axis <sup>7</sup> Applied Parallel to Supports		
			Rafter/Truss Spacing (in.)						Rafter/Truss Spacing (in.)		
			12	16	19.2	24	32	48	12	16	24
			Nominal Uniform Loads (psf)						Nominal Uniform Loads (psf)		
Wood Structural Panels (Sheathing Grades, C-C, C-D, C-C Plugged, OSB)	24/0	3/8	425	240	165	105	-	-	90	50	30 <sup>3</sup>
	24/16	7/16	540	305	210	135	-	-	110	60	35 <sup>3</sup>
	32/16	15/32	625	355	245	155	90	-	155	90	45 <sup>3</sup>
	40/20	19/32	955	595	415	265	150	-	255	145	75 <sup>3</sup>
	48/24	23/32	1160 <sup>3</sup>	840 <sup>3</sup>	615 <sup>3</sup>	395 <sup>3</sup>	220 <sup>3</sup>	100 <sup>3</sup>	455 <sup>3</sup>	255 <sup>3</sup>	115 <sup>3</sup>
Wood Structural Panels (Single Floor Grades, Underlayment, C-C Plugged)	16 o.c.	19/32	705	395	275	175	100	-	170	95	50 <sup>3</sup>
	20 o.c.	19/32	815	455	320	205	115	-	235	135	70 <sup>3</sup>
	24 o.c.	23/32	1160 <sup>3</sup>	670 <sup>3</sup>	465 <sup>3</sup>	300 <sup>3</sup>	170 <sup>3</sup>	-	440 <sup>3</sup>	250 <sup>3</sup>	110 <sup>3</sup>
	32 o.c.	7/8	1395 <sup>4</sup>	1000 <sup>4</sup>	695 <sup>4</sup>	445 <sup>4</sup>	250 <sup>4</sup>	110 <sup>4</sup>	1160 <sup>4</sup>	655 <sup>4</sup>	290 <sup>4</sup>
	48 o.c.	1-1/8	1790 <sup>4</sup>	1295 <sup>4</sup>	1060 <sup>4</sup>	805 <sup>4</sup>	455 <sup>4</sup>	200 <sup>4</sup>	1790 <sup>4</sup>	1145 <sup>4</sup>	510 <sup>4</sup>

1. Nominal capacities shall be adjusted in accordance with Section 3.2.3 to determine ASD uniform load capacity and LRFD uniform resistances.

2. Unless otherwise noted, tabulated values are based on the lesser of nominal values for either OSB or plywood with 5 or more plies.

3. Tabulated values are based on the lesser of nominal values for either OSB or plywood with 4 or more plies.

4. Tabulated values are based on the lesser of nominal values for either OSB or plywood with 5 or more plies.

5. Wood structural panels shall conform to the requirements for its type in DOC PS 1 or PS 2.

6. Tabulated values are for maximum bending loads from wind. Loads are limited by bending or shear stress assuming a 2-span continuous condition. Where panels are continuous over 3 or more spans, the tabulated values shall be permitted to be increased in accordance with the *ASD/LRFD Manual for Engineered Wood Construction*.

7. Strength axis is defined as the axis parallel to the face and back orientation of the flakes or the grain (veneer), which is generally the long panel direction, unless otherwise marked.

### 3.3 Connections

Connections resisting induced wind and seismic forces shall be designed in accordance with the methods referenced in 2.1.2.1 for allowable stress design (ASD) and 2.1.2.2 for strength design (LRFD).



Check Withdrawal Values of 10d Ring Shank Nails for plywood sheathing attachment.

Zone 3r Wind Uplift  $Z_{3r} := 317.7 \text{ PSF (Ultimate)}$

$Z_{3ra} := 317.3 \cdot 0.6 = 190.38 \text{ PSF (Allowable)}$

Fastener tributary Area  $FTA := 0.25 \cdot 2 = 0.5 \text{ SQFT (based on truss spacing of 24" O.C.)}$

Pullout acting on one Fastener:  $FPO := Z_{3ra} \cdot FTA = 95.19 \text{ LB}$

10d Ring Shank Nail Pullout Capacity:  $FPO_a := 81 \text{ LB/IN (PER NDS)}$

**Table 12.2E Roof Sheathing Ring Shank Nail and Post-Frame Ring Shank Nail Reference Withdrawal Design Values,  $W^{1,2}$**

Tabulated withdrawal design values,  $W$ , are in pounds per inch of ring shank penetration into side grain of wood main member (see Appendix Table L5 and Table L6).

Specific Gravity <sup>3</sup> , $G$	Roof Sheathing Ring Shank Nail Diameter, $D$ (in.)			Post-Frame Ring Shank Nail Diameter, $D$ (in.)				
	0.113	0.120	0.131	0.135	0.148	0.177	0.200	0.207
0.73	108	115	126	129	142	170	192	199
0.71	103	109	119	122	134	161	181	188
0.68	94	100	109	112	123	147	166	172
0.67	91	97	106	109	120	143	162	167
0.58	68	73	79	82	90	107	121	125
0.55	62	65	71	74	81	96	109	113
0.51	53	56	61	63	69	83	94	97
0.50	51	54	59	61	67	80	90	93
0.49	49	52	57	58	64	76	86	89
0.47	45	48	52	54	59	70	80	82

10d Ring Shank Nail Length:  $FL := 3 \text{ IN}$

10d Ring Shank Nail Pullout Capacity:  $FPO_{au} := FPO_a \cdot \left[ FL - \left( \frac{19}{32} \right) \right] = 194.906 \text{ LB}$

Allowable Fastener Pullout Capacity:  $FPO_{allow} := \frac{FPO_{au}}{2} = 97.453$

$FPO_{allow} = 97.453 \text{ LB} > FPO = 95.19 \text{ LB}$  (OK to use 10d Ring shank nails at 3" O.C.)



**Table 12S**

**POST FRAME RING SHANK NAILS: Reference Lateral Design Values, Z, for Single Shear (two member) Connections<sup>1,2,3</sup>**

for sawn lumber or SCL with both members of identical specific gravity  
(tabulated lateral design values are calculated based on an assumed length of nail penetration, p, into the main member equal to 10D)

Side Member Thickness	Nail Diameter	Nail Length	G=0.67 Red Oak	G=0.55 Mixed Maple Southern Pine	G=0.5 Douglas Fir-Larch	G=0.49 Douglas Fir-Larch (N)	G=0.46 Douglas Fir(S) Hem-Fir(N)	G=0.43 Hem-Fir	G=0.42 Spruce-Pine-Fir	G=0.37 Redwood
t <sub>s</sub> in.	D in.	L in.	lb	lb	lb	lb	lb	lb	lb	lb
1/2	0.135	3, 3.5	115	89	79	77	72	66	65	56
	0.148	3 - 4.5	129	101	90	87	82	75	73	64
	0.177	3 - 8	167	133	119	116	109	102	99	87
	0.200	3.5 - 8	179	143	129	126	119	110	108	95
	0.207	4 - 8	185	148	134	131	123	115	112	99
3/4	0.135	3, 3.5	135	108	94	91	84	76	74	63
	0.148	3 - 4.5	154	121	105	102	94	85	83	70
	0.177	3 - 8	200	153	134	130	121	111	107	92
	0.200	3.5 - 8	212	162	143	139	129	118	115	100
	0.207	4 - 8	216	166	147	143	133	122	119	103
1	0.135	3, 3.5	135	113	103	101	96	89	86	71
	0.148	3 - 4.5	154	128	118	115	109	99	96	80
	0.177	3 - 8	213	178	155	150	138	125	121	102
	0.200	3.5 - 8	233	188	164	158	146	132	128	108
	0.207	4 - 8	243	192	167	162	149	135	131	111
1 1/4	0.135	3, 3.5	135	113	103	101	96	89	88	78
	0.148	3 - 4.5	154	128	118	115	109	102	100	89
	0.177	3 - 8	213	178	163	159	151	141	136	113
	0.200	3.5 - 8	233	195	178	174	165	149	144	120
	0.207	4 - 8	243	203	186	182	169	152	147	123
1 1/2	0.135	3, 3.5	135	113	103	101	96	89	88	78
	0.148	3 - 4.5	154	128	118	115	109	102	100	89
	0.177	3 - 8	213	178	163	159	151	141	138	123
	0.200	3.5 - 8	233	195	178	174	165	155	151	133
	0.207	4 - 8	243	203	186	182	172	161	158	135
1 3/4	0.135	3, 3.5	135	113	103	101	96	89	88	78



## BLOCKING BETWEEN TRUSSES



$$\text{PSF} \equiv \frac{\text{lb}}{\text{ft}^2} \quad K \equiv 1000\text{lb}$$

Check Lateral force transmission from deck to blocking and blocking to tie beam:

$$\text{MWFRS Pressure X Direction: } \text{WLX} := 78\text{PSF} \cdot 0.6$$

$$\text{MWFRS Pressure Z Direction: } \text{WLZ} := 96\text{PSF} \cdot 0.6$$

$$\text{X Direction Wall Area: } \text{XA} := 20\text{ft} \cdot 11.5\text{ft} = 230\text{ft}^2$$

$$\text{Z Direction Wall Area: } \text{ZA} := 24\text{ft} \cdot 11.5\text{ft} = 276\text{ft}^2$$

$$\text{X Direction Diaphragm Reaction: } \text{RX} := \text{XA} \cdot \left( \frac{\text{WLX}}{4} \right) = 2.691\text{K}$$

$$\text{Z Direction Diaphragm Reaction: } \text{RZ} := \text{ZA} \cdot \left( \frac{\text{WLZ}}{4} \right) = 3.974\text{K}$$

$$\text{X Direction Load Distribution: } \text{XW} := \frac{\text{RX}}{24\text{ft}} = 112.125 \frac{\text{lb}}{\text{ft}}$$

$$\text{Load Per Simpson RBC Clip: } \text{PX} := \text{XW} \cdot 2 = 224.25 \frac{\text{lb}}{\text{ft}}$$

Per Simpson Manual, RBC Clip has capacity of 350 LB, therefore OK for one at each end.

Per NDS 10d Ring Shank Nail shear capacity is 121 lb, therefore nails at 3" O.C. O.K.

$$\text{Z Direction Load Distribution: } \text{ZW} := \frac{\text{RZ}}{20\text{ft}} = 198.72 \frac{\text{lb}}{\text{ft}}$$

$$\text{Load Per Titen HD Anchor: } \text{PZ} := \text{ZW} \cdot 0.667\text{ft} = 132.546\text{lb}$$

1/2" Titen HD anchor w/ 4" embedment Per Simpson Manual:

$$\text{THDv} := \frac{(7455\text{lb} \cdot 0.6)}{4} = 1.118\text{K} > \text{PZ} = 132.546\text{lb} \text{ Therefore O.K.}$$



# RBC

## Roof Boundary Clip

The RBC roof boundary clip is designed to aid installation and transfer shear loads between the roof diaphragm and wall. The locator tabs make proper location of the clip easy. The RBC can be used on wood or masonry walls and will handle roof pitches from 0/12 to 12/12. The RBC is available with prongs into one side (RBCP) for pre-attachment of the part to a block at the truss plant.

**Material:** 20 gauge

**Finish:** Galvanized

**Installation:**

- Use all specified fasteners; see General Notes
- Field bend to desired angle — one time only
- See flier F-C-RBC at [strongtie.com](http://strongtie.com) for more information on installation and code requirements

**Codes:** See p. 12 for Code Reference Key Chart

The RBC installed to blocking resists rotation and lateral displacement of rafter or truss.

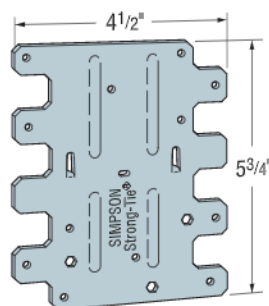
Code references:

- IRC 2012/2015/**2018**, R802.8 Lateral Support
- IBC 2012, 2308.10.6; 2015/**2018**, 2308.7.8 Blocking

Blocking allows proper edge nailing of sheathing.

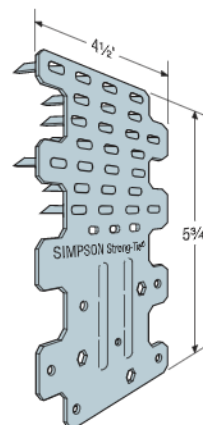
Code references:

- IRC 2012, Table R602.3(1), footnote i, 2015/**2018** Table R602.3(1), footnote h
- IBC 2012/2015/**2018**, 2305.1 Shear Panel Connections



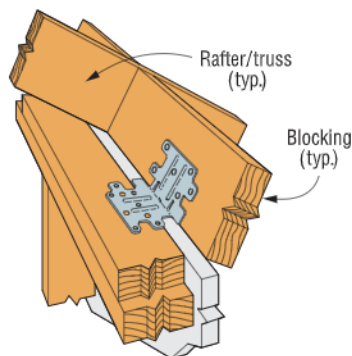
**RBC**

U.S. Patent 7,293,390

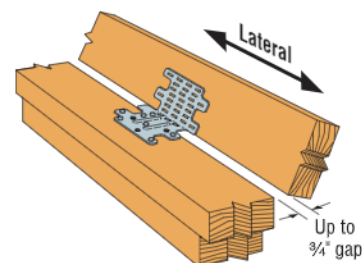


**RBCP - Flat**

U.S. Patent 7,293,390



**Typical RBC Installation Over 1" Foamboard<sup>5</sup>**



**Typical RBCP Installation**

U.S. Patent 7,549,262

Model No.	Type of Connection	Bending Angle	Fasteners (in.)		DF/SP Allowable Loads	SPF/HF Allowable Loads	Code Ref.
			To Wall	To Blocking	Lateral (160)	Lateral (160)	
RBC RBCP	1	45° to 90°	(6) 0.148 x 1 1/2	(6) 0.148 x 1 1/2	445	380	IBC, FL, LA
	2	< 30°	(6) 0.148 x 1 1/2	(6) 0.148 x 1 1/2	435	375	
		30° to 45°	(6) 0.148 x 1 1/2	(6) 0.148 x 1 1/2	465	400	
	3	0° to 45°	(3) 1/4 x 2 1/4 Titen® 2 <sup>4</sup>	(6) 0.148 x 1 1/2	350	350	

1. See pp. 260–261 for Straps and Ties General Notes.

2. Allowable loads are for one anchor attached to blocking a minimum of 1 1/2" thick.

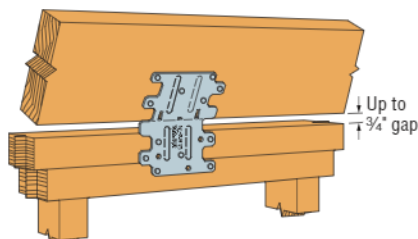
3. RBC/RBCP can be installed with up to a 3/4" gap and achieve 100% of the listed load.

4. When attaching to concrete, use (3) 1/4" x 1 1/2" TTN2-25134H Titen screws.

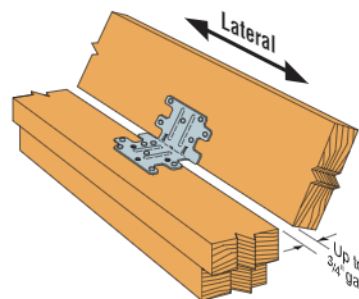
5. RBC/RBCP installed over 1" foam board has a load of 395 lb. (160) in a parallel-to-wall (F<sub>1</sub>) load direction for Douglas fir. For SPF, the load is 340 lb.

6. RBC/RBCP may be installed over 1/2" structural sheathing using 0.148" x 1 1/2" nails with no load reduction.

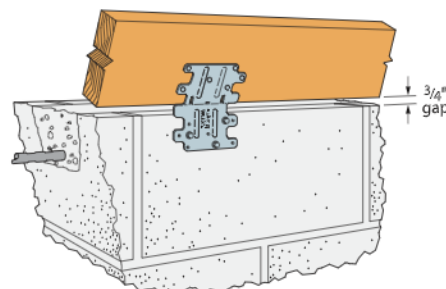
7. **Fasteners:** Nail dimensions in the table are diameter by length. Titen® 2 screws are Simpson Strong-Tie® masonry screws. See pp. 21–22 for fastener information.



**2 Typical RBC Installation (RBCP similar)**



**1 Typical RBC Installation (RBCP similar)**



**3 Typical RBC Installation to CMU Block (RBCP similar)**



## Titen HD® Heavy-Duty Screw Anchor

## Titen HD Anchor Product Data — Zinc Plated

Size (in.)	Model No.	Drill Bit Dia. (in.)	Wrench Size (in.)	Quantity	
				Box	Carton
1/4 x 1 3/8	THDB25178H	1/4	3/8	100	500
1/4 x 2 3/4	THDB25234H	1/4	3/8	50	250
1/4 x 3	THDB25300H	1/4	3/8	50	250
1/4 x 3 1/2	THDB25312H	1/4	3/8	50	250
1/4 x 4	THDB25400H	1/4	3/8	50	250
3/8 x 1 3/4	THD37134H†	3/8	9/16	50	250
3/8 x 2 1/2	THD37212H†	3/8	9/16	50	200
3/8 x 3	THD37300H	3/8	9/16	50	200
3/8 x 4	THD37400H	3/8	9/16	50	200
3/8 x 5	THD37500H	3/8	9/16	50	100
3/8 x 6	THD37600H	3/8	9/16	50	100
1/2 x 3	THD50300H	1/2	3/4	25	100
1/2 x 4	THD50400H	1/2	3/4	20	80
1/2 x 5	THD50500H	1/2	3/4	20	80
1/2 x 6	THD50600H	1/2	3/4	20	80
1/2 x 6 1/2	THD50612H	1/2	3/4	20	40
1/2 x 8	THD50800H	1/2	3/4	20	40
1/2 x 12	THD501200H	1/2	3/4	5	25
1/2 x 13	THD501300H	1/2	3/4	5	25
1/2 x 14	THD501400H	1/2	3/4	5	25
1/2 x 15	THD501500H	1/2	3/4	5	25
5/8 x 4	THDB62400H	5/8	1 1/16	10	40
5/8 x 5	THDB62500H	5/8	1 1/16	10	40
5/8 x 6	THDB62600H	5/8	1 1/16	10	40
5/8 x 6 1/2	THDB62612H	5/8	1 1/16	10	40
5/8 x 8	THDB62800H	5/8	1 1/16	10	20
5/8 x 10	THDB62100H	5/8	1 1/16	10	20
3/4 x 4	THD75400H	3/4	1 1/8	10	40
3/4 x 5	THD75500H	3/4	1 1/8	5	20
3/4 x 6	THDT75600H	3/4	1 1/8	5	20
3/4 x 7	THD75700H	3/4	1 1/8	5	10
3/4 x 8 1/2	THD75812H	3/4	1 1/8	5	10
3/4 x 10	THD75100H	3/4	1 1/8	5	10

## Titen HD Anchor Product Data — Mechanically Galvanized

Size (in.)	Model No.	Drill Bit Dia. (in.)	Wrench Size (in.)	Quantity	
				Box	Carton
3/8 x 3	THD37300HMG	3/8	9/16	50	200
3/8 x 4	THD37400HMG			50	200
3/8 x 5	THD37500HMG			50	100
3/8 x 6	THD37600HMG			50	100
1/2 x 4	THD50400HMG	1/2	3/4	20	80
1/2 x 5	THD50500HMG			20	80
1/2 x 6	THD50600HMG			20	80
1/2 x 6 1/2	THD50612HMG			20	40
1/2 x 8	THD50800HMG			20	40
5/8 x 5	THDB62500HMG	5/8	1 1/16	10	40
5/8 x 6	THDB62600HMG			10	40
5/8 x 6 1/2	THDB62612HMG			10	40
5/8 x 8	THDB62800HMG			10	20
3/4 x 6	THDT75600HMG	3/4	1 1/8	5	20
3/4 x 8 1/2	THD75812HMG			5	10
3/4 x 10	THD75100HMG			5	10

Mechanical galvanizing meets ASTM B695, Class 65, Type 1. Intended for some pressure-treated wood sill plate applications. Not for use in other corrosive or outdoor environments. See p. 248 or visit [strongtie.com/info](http://strongtie.com/info) for more corrosion information.

† These models do not meet minimum embedment depth requirements for strength design and require maximum installation torque of 25 ft. – lb. using a torque wrench, driver drill or cordless 1/4" impact driver with a maximum permitted torque rating of 100 ft. – lb.



## Titen HD Installation Information and Additional Data†

Characteristic	Symbol	Units	Nominal Anchor Diameter, d <sub>a</sub> (in.)									
			¼		⅜		½		⅝		¾	
Installation Information												
Drill Bit Diameter	d <sub>bit</sub>	in.	¼		⅜		½		⅝		¾	
Baseplate Clearance Hole Diameter	d <sub>c</sub>	in.	⅜		½		⅝		¾		⅞	
Maximum Installation Torque	T <sub>inst,max</sub>	ft.-lbf	24 <sup>2</sup>		50 <sup>2</sup>		65 <sup>2</sup>		100 <sup>2</sup>		150 <sup>2</sup>	
Maximum Impact Wrench Torque Rating	T <sub>impact,max</sub>	ft.-lbf	125 <sup>3</sup>		150 <sup>3</sup>		340 <sup>3</sup>		340 <sup>3</sup>		385 <sup>3</sup>	
Minimum Hole Depth	h <sub>hole</sub>	in.	1¼	2⅝	2¾	3½	3¾	4½	4½	6	6	6¾
Nominal Embedment Depth	h <sub>nom</sub>	in.	1⅝	2½	2½	3¼	3¼	4	4	5½	5½	6¼
Critical Edge Distance	c <sub>ac</sub>	in.	3	6	2⅞	3⅝	3⅞	4½	4½	6⅝	6⅝	7⅞
Minimum Edge Distance	c <sub>min</sub>	in.	1½		1¾							
Minimum Spacing	s <sub>min</sub>	in.	3									
Minimum Concrete Thickness	h <sub>min</sub>	in.	3¼	3½	4	5	5	6¼	6	8½	8¾	10
Additional Data												
Anchor Category	Category	—	1									
Yield Strength	f <sub>ya</sub>	psi	100,000		97,000							
Tensile Strength	f <sub>uta</sub>	psi	125,000		110,000							
Minimum Tensile and Shear Stress Area	A <sub>se</sub>	in²	0.042		0.099		0.183		0.276		0.414	
Axial Stiffness in Service Load Range – Uncracked Concrete	β <sub>uncr</sub>	lb./in.	202,000		715,000							
Axial Stiffness in Service Load Range – Cracked Concrete	β <sub>cr</sub>	lb./in.	173,000		345,000							

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318 Appendix D.

2. T<sub>inst,max</sub> is the maximum permitted installation torque for the embedment depth range covered by this table using a torque wrench.

3. T<sub>impact,max</sub> is the maximum permitted torque rating for impact wrenches for the embedment depth range covered by this table.

\* See p. 13 for an explanation of the load table icons.



## Titen HD® Design Information — Concrete

Titen HD Tension Strength Design Data<sup>1</sup>

Characteristic	Symbol	Units	Nominal Anchor Diameter, d <sub>a</sub> (in.)									
			¼	⅜	½	⅝	¾	1	1 ⅛	1 ¼	1 ½	1 ⅞
Nominal Embedment Depth	<i>h<sub>nom</sub></i>	in.	1 ⅝	2 ½	2 ½	3 ¼	3 ¼	4	4	5 ½	5 ½	6 ¼
Steel Strength in Tension												
Tension Resistance of Steel	<i>N<sub>sa</sub></i>	lb.	5,195		10,890		20,130		30,360		45,540	
Strength Reduction Factor — Steel Failure	<i>φ<sub>sa</sub></i>	—	0.65 <sup>2</sup>									
Concrete Breakout Strength in Tension <sup>6,8</sup>												
Effective Embedment Depth	<i>h<sub>ef</sub></i>	in.	1.19	1.94	1.77	2.40	2.35	2.99	2.97	4.24	4.22	4.86
Critical Edge Distance <sup>6</sup>	<i>c<sub>ac</sub></i>	in.	3	6	2 11⁄16	3 ⅝	3 ⅜	4 ½	4 ½	6 ⅝	6 ⅜	7 ⅞
Effectiveness Factor — Uncracked Concrete	<i>k<sub>uncr</sub></i>	—	30	24								
Effectiveness Factor — Cracked Concrete	<i>k<sub>cr</sub></i>	—	17									
Modification Factor	<i>ψ<sub>c,N</sub></i>	—	1.0									
Strength Reduction Factor — Concrete Breakout Failure	<i>φ<sub>cb</sub></i>	—	0.65 <sup>7</sup>									
Pullout Strength in Tension <sup>8</sup>												
Pullout Resistance, Uncracked Concrete ( <i>f</i> ' <sub>c</sub> = 2,500 psi)	<i>N<sub>p,uncr</sub></i>	lb.	— <sup>3</sup>	— <sup>3</sup>	2,700 <sup>4</sup>	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	— <sup>3</sup>	9,810 <sup>4</sup>	— <sup>3</sup>	— <sup>3</sup>
Pullout Resistance, Cracked Concrete ( <i>f</i> ' <sub>c</sub> = 2,500 psi)	<i>N<sub>p,cr</sub></i>	lb.	— <sup>3</sup>	1,905 <sup>4</sup>	1,235 <sup>4</sup>	2,700 <sup>4</sup>	— <sup>3</sup>	— <sup>3</sup>	3,040 <sup>4</sup>	5,570 <sup>4</sup>	6,070 <sup>4</sup>	7,195 <sup>4</sup>
Strength Reduction Factor — Concrete Pullout Failure	<i>φ<sub>p</sub></i>	—	0.65 <sup>5</sup>									
Breakout or Pullout Strength in Tension for Seismic Applications <sup>8</sup>												
Nominal Pullout Strength for Seismic Loads ( <i>f</i> ' <sub>c</sub> = 2,500 psi)	<i>N<sub>p,eq</sub></i>	lb.	— <sup>3</sup>	1,905 <sup>4</sup>	1,235 <sup>4</sup>	2,700 <sup>4</sup>	— <sup>3</sup>	— <sup>3</sup>	3,040 <sup>4</sup>	5,570 <sup>4</sup>	6,070 <sup>4</sup>	7,195 <sup>4</sup>
Strength Reduction Factor — Breakout or Pullout Failure	<i>φ<sub>eq</sub></i>	—	0.65 <sup>5</sup>									

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318-11 Appendix D, except as modified below.
- The tabulated value of  $\phi_{sa}$  applies when the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of  $\phi_{sa}$  must be determined in accordance with ACI 318-11 D.4.4. Anchors are considered brittle steel elements.
- Pullout strength is not reported since concrete breakout controls.
- Adjust the characteristic pullout resistance for other concrete compressive strengths by multiplying the tabular value by  $(f'_{c,specified} / 2,500)^{0.5}$ .
- The tabulated value of  $\phi_p$  or  $\phi_{eq}$  applies when the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of  $\phi$  must be determined in accordance with ACI 318-11 Section D.4.4(c).

- The modification factor  $\psi_{cp,N} = 1.0$  for cracked concrete. Otherwise, the modification factor for uncracked concrete without supplementary reinforcement to control splitting is either:

$$(1) \psi_{cp,N} = 1.0 \text{ if } c_{a,min} \geq c_{ac} \text{ or } (2) \psi_{cp,N} = \frac{c_{a,min}}{c_{ac}} \geq \frac{1.5h_{ef}}{c_{ac}} \text{ if } c_{a,min} < c_{ac}$$

The modification factor,  $\psi_{cp,N}$  is applied to the nominal concrete breakout strength,  $N_{cb}$  or  $N_{cbg}$ .

- The tabulated value of  $\phi_{cb}$  applies when both the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the  $\phi_{cb}$  factors described in ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition A are allowed. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of  $\phi_{cb}$  must be determined in accordance with ACI 318-11 D.4.4(c).

\* See p. 13 for an explanation of the load table icons.



## Titen HD® Design Information — Concrete

Titen HD Shear Strength Design Data<sup>1</sup>

Characteristic	Symbol	Units	Nominal Anchor Diameter, $d_a$ (in.)									
			$\frac{1}{4}$ <sup>5</sup>		$\frac{3}{8}$		$\frac{1}{2}$		$\frac{5}{8}$ <sup>5</sup>		$\frac{3}{4}$	
Nominal Embedment Depth	$h_{nom}$	in.	1 $\frac{5}{8}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{4}$	3 $\frac{1}{4}$	4	4	5 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{4}$
Steel Strength in Shear												
Shear Resistance of Steel	$V_{sa}$	lb.	2,020		4,460		7,455		10,000		16,840	
Strength Reduction Factor — Steel Failure	$\phi_{sa}$	—					0.60 <sup>2</sup>					
Concrete Breakout Strength in Shear <sup>6</sup>												
Outside Diameter	$d_a$	in.	0.25		0.375		0.500		0.625		0.750	
Load Bearing Length of Anchor in Shear	$\ell_e$	in.	1.19	1.94	1.77	2.40	2.35	2.99	2.97	4.24	4.22	4.86
Strength Reduction Factor — Concrete Breakout Failure	$\phi_{cb}$	—					0.70 <sup>4</sup>					
Concrete Pryout Strength in Shear												
Coefficient for Pryout Strength	$k_{cp}$	lb.			1.0				2.0			
Strength Reduction Factor — Concrete Pryout Failure	$\phi_{cp}$	—					0.70 <sup>4</sup>					
Steel Strength in Shear for Seismic Applications												
Shear Resistance for Seismic Loads	$V_{eq}$	lb.	1,695		2,855		4,790		8,000		9,350	
Strength Reduction Factor — Steel Failure	$\phi_{eq}$	—					0.60 <sup>2</sup>					

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318-11 Appendix D, except as modified below.
- The tabulated value of  $\phi_{sa}$  applies when the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of  $\phi_{sa}$  must be determined in accordance with ACI 318 D.4.4.
- The tabulated value of  $\phi_{cb}$  applies when both the load combinations of Section 1605.2.1 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. Condition B applies where

supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the  $\phi_{cb}$  factors described in ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition A are allowed. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of  $\phi_{cb}$  must be determined in accordance with ACI 318-11 D.4.4(c).

- The tabulated value of  $\phi_{cp}$  applies when both the load combinations of IBC Section 1605.2, ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of  $\phi_{cp}$  must be determined in accordance with ACI 318-11 Section D.4.4(c).

Titen HD Tension and Shear Strength Design Data for the Soffit of Normal-Weight or Sand-Lightweight Concrete over Metal Deck<sup>1,6,8</sup>

Characteristic	Symbol	Units	Nominal Anchor Diameter, $d_a$ (in.)									
			Lower Flute						Upper Flute			
			Figure 2		Figure 1		Figure 1		Figure 2		Figure 1	
			1/4 <sup>8</sup>	3/8	1/2	3/4	1	1 1/4	1/4 <sup>8</sup>	3/8	1/2	3/4
Nominal Embedment Depth	$h_{nom}$	in.	1 3/8	2 1/2	1 7/8	2 1/2	2	3 1/2	1 3/8	2 1/2	1 7/8	2
Effective Embedment Depth	$h_{ef}$	in.	1.19	1.94	1.23	1.77	1.29	2.56	1.19	1.94	1.23	1.29
Pullout Resistance, concrete on metal deck (cracked) <sup>2,3,4</sup>	$N_{p,deck,cr}$	lb.	420	535	375	870	905	2,040	655	1,195	500	1,700
Pullout Resistance, concrete on metal deck (uncracked) <sup>2,3,4</sup>	$N_{p,deck,uncr}$	lb.	995	1,275	825	1,905	1,295	2,910	1,555	2,850	1,095	2,430
Steel Strength in Shear, concrete on metal deck <sup>5</sup>	$V_{sa,deck}$	lb.	1,335	1,745	2,240	2,395	2,435	4,430	2,010	2,420	4,180	7,145
Steel Strength in Shear, Seismic	$V_{sa,deck,eq}$	lb.	870	1,135	1,434	1,533	1,565	2,846	1,305	1,575	2,676	4,591

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 and ACI 318-11 Appendix D, except as modified below.
- Concrete compressive strength shall be 3,000 psi minimum. The characteristic pullout resistance for greater compressive strengths shall be increased by multiplying the tabular value by  $(f'_{c,specified}/3,000)^{0.25}$ .
- For anchors installed in the soffit of sand-lightweight or normal-weight concrete over metal deck floor and roof assemblies, as shown in Figure 1 and Figure 2, calculation of the concrete breakout strength may be omitted.
- In accordance with ACI 318-14 Section 17.4.3.2 or ACI 318-11 Section D.5.3.2, the nominal pullout strength in cracked concrete for anchors

- installed in the soffit of sand-lightweight or normal-weight concrete over metal deck floor and roof assemblies  $N_{p,deck,cr}$  shall be substituted for  $N_{p,cr}$ . Where analysis indicates no cracking at service loads, the normal pullout strength in uncracked concrete  $N_{p,deck,uncr}$  shall be substituted for  $N_{p,uncr}$ .
- In accordance with ACI 318-14 Section 17.5.1.2(C) or ACI 318-11 Section D.6.1.2(c), the shear strength for anchors installed in the soffit of sand-lightweight or normal-weight concrete over metal deck floor and roof assemblies  $V_{sa,deck}$  and  $V_{sa,deck,eq}$  shall be substituted for  $V_{sa}$ .
- Minimum edge distance to edge of panel is  $2h_{ef}$ .
- The minimum anchor spacing along the flute must be the greater of  $3h_{ef}$  or 1.5 times the flute width.

\* See p. 13 for an explanation of the load table icons.



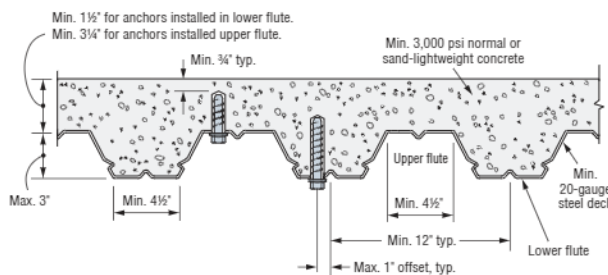
## Titen HD® Design Information — Concrete

Titen HD Anchor Tension and Shear Strength Design  
Data in the Topside of Normal-Weight Concrete or  
Sand-Lightweight Concrete over Metal Deck

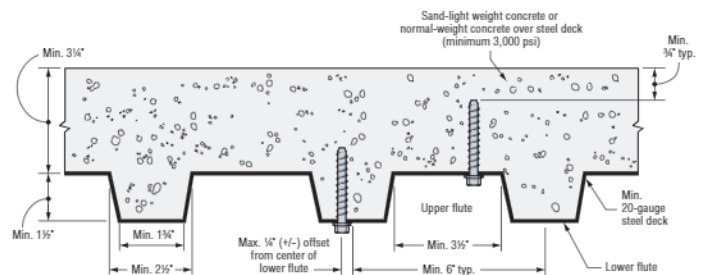


Design Information	Symbol	Units	Nominal Anchor Diameter, $d_a$ (in.)	
			Figure 3	Figure 3
			¼	⅜
Nominal Embedment Depth	$h_{nom}$	in.	1½	2½
Effective Embedment Depth	$h_{ef}$	in.	1.19	1.77
Minimum Concrete Thickness	$h_{min,deck}$	in.	2½	3¼
Critical Edge Distance	$c_{ac,deck,top}$	in.	3¼	7¼
Minimum Edge Distance	$c_{min,deck,top}$	in.	3½	3
Minimum Spacing	$s_{min,deck,top}$	in.	3½	3

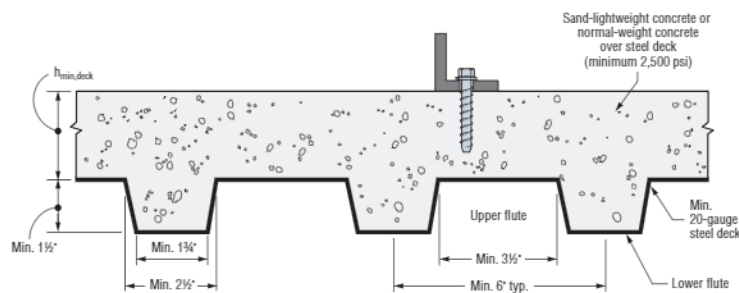
- For anchors installed in the topside of concrete-filled deck assemblies, as shown in Figures 2 and 3, the nominal concrete breakout strength of a single anchor or group of anchors in shear,  $V_{cb}$  or  $V_{cbg}$ , respectively, must be calculated in accordance with ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.2, using the actual member thickness,  $h_{min,deck}$ , in the determination of  $A_{vc}$ .
- Design capacity shall be based on calculations according to values in the tables featured on pp. 116–118.
- Minimum flute depth (distance from top of flute to bottom of flute) is 1½" (see Figures 2 and 3).
- Steel deck thickness shall be minimum 20 gauge.
- Minimum concrete thickness ( $h_{min,deck}$ ) refers to concrete thickness above upper flute (see Figures 2 and 3).



**Figure 1.** Installation of 3/8"- and 1/2"-Diameter Anchors in the Soffit of Concrete over Metal Deck



**Figure 2.** Installation of 1/4"-Diameter Anchors in the Soffit of Concrete over Metal Deck



**Figure 3.** Installation of 1/4"- and 3/8"-Diameter Anchors in the Topside of Concrete over Metal Deck

\* See p. 13 for an explanation of the load table icons.

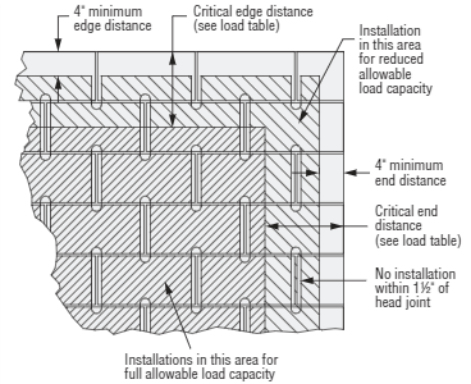


# Titen HD® Design Information — Masonry

Titen HD Allowable Tension and Shear Loads  
in 8" Lightweight, Medium-Weight and  
Normal-Weight Grout-Filled CMU



Size in. (mm)	Drill Bit Dia. in.	Min. Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical End Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Values for 8" Lightweight, Medium-Weight or Normal-Weight Grout-Filled CMU			
						Tension Load		Shear Load	
						Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in the Face of the CMU Wall (See Figure 4)									
3/8 (9.5)	3/8	2 3/4 (70)	12 (305)	12 (305)	6 (152)	2,390 (10.6)	480 (2.1)	4,340 (19.3)	870 (3.9)
1/2 (12.7)	1/2	3 1/2 (89)	12 (305)	12 (305)	8 (203)	3,440 (15.3)	690 (3.1)	6,920 (30.8)	1,385 (6.2)
5/8 (15.9)	5/8	4 1/2 (114)	12 (305)	12 (305)	10 (254)	5,300 (23.6)	1,060 (4.7)	10,420 (46.4)	2,085 (9.3)
3/4 (19.1)	3/4	5 1/2 (140)	12 (305)	12 (305)	12 (305)	7,990 (35.5)	1,600 (7.1)	15,000 (66.7)	3,000 (13.3)



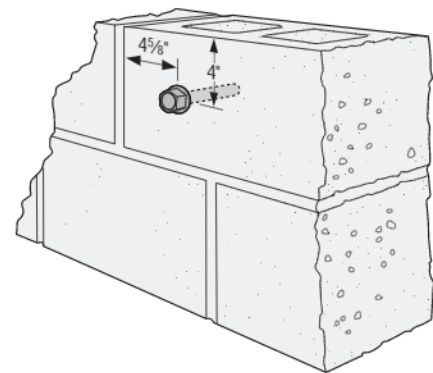
**Figure 4.** Shaded Area = Placement for Full and Reduced Allowable Load Capacity in Grout-Filled CMU

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values for 8"-wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The masonry units must be fully grouted.
4. The minimum specified compressive strength of masonry,  $f'_m$ , at 28 days is 1,500 psi.
5. Embedment depth is measured from the outside face of the concrete masonry unit.
6. Allowable loads may be increased 33 1/3% for short-term loading due to wind or seismic forces where permitted by code.
7. Grout-filled CMU wall design must satisfy applicable design standards and be capable of withstanding applied loads.
8. Refer to allowable load-adjustment factors for spacing and edge distance on p. 123.

Titen HD Allowable Tension and Shear Loads  
in 8" Lightweight, Medium-Weight and  
Normal-Weight Hollow CMU



Size in. (mm)	Drill Bit Dia. in.	Embed. Depth <sup>1</sup> in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	8" Hollow CMU Loads Based on CMU Strength			
					Tension Load		Shear Load	
					Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in Face Shell (See Figure 5)								
3/8 (9.5)	3/8	1 3/4 (45)	4 (102)	4 5/8 (117)	720 (3.2)	145 (0.6)	1,240 (5.5)	250 (1.1)
1/2 (12.7)	1/2	1 3/4 (45)	4 (102)	4 5/8 (117)	760 (3.4)	150 (0.7)	1,240 (5.5)	250 (1.1)
5/8 (15.9)	5/8	1 3/4 (45)	4 (102)	4 5/8 (117)	800 (3.6)	160 (0.7)	1,240 (5.5)	250 (1.1)
3/4 (19.1)	3/4	1 3/4 (45)	4 (102)	4 5/8 (117)	880 (3.9)	175 (0.8)	1,240 (5.5)	250 (1.1)



**Figure 5**

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values for 8"-wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The minimum specified compressive strength of masonry,  $f'_m$ , at 28 days is 1,500 psi.
4. Embedment depth is measured from the outside face of the concrete masonry unit and is based on the anchor being embedded an additional 1/2"- through 1 1/4"-thick face shell.
5. Allowable loads may not be increased for short-term loading due to wind or seismic forces. CMU wall design must satisfy applicable design standards and be capable of withstanding applied loads.
6. Do not use impact wrenches to install in hollow CMU.
7. Set drill to rotation-only mode when drilling into hollow CMU.

\* See p. 13 for an explanation of the load table icons.



## Titen HD® Design Information — Masonry

Titen HD® Allowable Tension and Shear Loads in 8" Lightweight, Medium-Weight and Normal-Weight Grout-Filled CMU Stemwall



Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Critical Spacing Dist. in. (mm)	8" Grout-Filled CMU Allowable Loads Based on CMU Strength					
						Tension		Shear Perp. to Edge		Shear Parallel to Edge	
						Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in Cell Opening or Web (Top of Wall) (See Figure 6)											
½ (12.7)	½	4½ (114)	1¾ (45)	8 (203)	8 (203)	2,860 (12.7)	570 (2.5)	800 (3.6)	160 (0.7)	2,920 (13.0)	585 (2.6)
⅝ (15.9)	⅝	4½ (114)	1¾ (45)	10 (254)	10 (254)	2,860 (12.7)	570 (2.5)	800 (3.6)	160 (0.7)	3,380 (15.0)	675 (3.0)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values are for 8"-wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The masonry units must be fully grouted.
4. The minimum specified compressive strength of masonry,  $f_m$ , at 28 days is 1,500 psi.
5. Allowable loads may be increased 33 ⅓% for short-term loading due to wind or seismic forces where permitted by code.
6. Grout-filled CMU wall design must satisfy applicable design standards and be capable of withstanding applied design loads.
7. Loads are based on anchor installed in either the web or grout-filled cell opening in the top of wall.

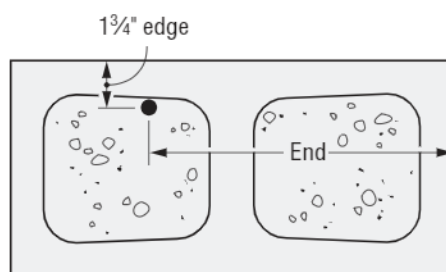


Figure 6. Anchor Installed in Top of Wall

\* See p. 13 for an explanation of the load table icons.



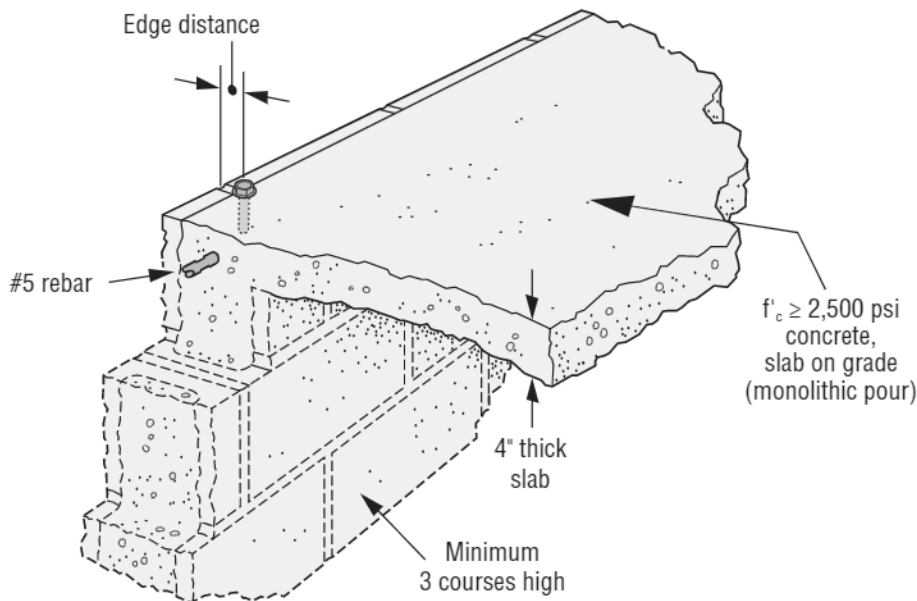
## Titen HD® Design Information — Masonry

Titen HD Allowable Tension Loads for 8" Lightweight, Medium-Weight and Normal-Weight CMU Chair Blocks Filled with Normal-Weight Concrete



Size in. (mm)	Drill Bit Dia. (in.)	Min. Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Critical Spacing in. (mm)	8" Concrete-Filled CMU Chair Block Allowable Tension Loads Based on CMU Strength	
					Ultimate lb. (kN)	Allowable lb. (kN)
3/8 (9.5)	3/8	2 3/8 (60)	1 3/4 (44)	9 1/2 (241)	3,175 (14.1)	635 (2.8)
		3 3/8 (86)	1 3/4 (44)	13 1/2 (343)	5,175 (23.0)	1,035 (4.6)
		5 (127)	2 1/4 (57)	20 (508)	10,584 (47.1)	2,115 (9.4)
1/2 (12.7)	1/2	8 (203)	2 1/4 (57)	32 (813)	13,722 (61.0)	2,754 (12.2)
		10 (254)	2 1/4 (57)	40 (1016)	16,630 (74.0)	3,325 (14.8)
5/8 (15.9)	5/8	5 1/2 (140)	1 3/4 (44)	22 (559)	9,025 (40.1)	1,805 (8.1)

1. The tabulated allowable loads are based on a safety factor of 5.0.
2. Values are for 8"-wide concrete masonry units (CMU) filled with concrete, with minimum compressive strength of 2,500 psi and poured monolithically with the floor slab.
3. Center #5 rebar in CMU cell and concrete slab as shown in the illustration below.



\* See p. 13 for an explanation of the load table icons.



## Titen HD® Design Information — Masonry

Load-Adjustment Factors for Titen HD Anchors in Face-of-Wall Installation  
in 8" Grout-Filled CMU: Edge Distance and Spacing, Tension and Shear Loads

## How to use these charts:

1. The following tables are for reduced edge distance and spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance ( $c_{act}$ ) or spacing ( $s_{act}$ ) at which the anchor is to be installed.
5. The load adjustment factor ( $f_c$  or  $f_s$ ) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges or spacings are multiplied together.

Edge or End Distance Tension ( $f_c$ )

$c_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$c_{cr}$	12	12	12	12
	$c_{min}$	4	4	4	4
	$f_{cmin}$	1.00	1.00	0.83	0.66
4		1.00	1.00	0.83	0.66
6		1.00	1.00	0.87	0.75
8		1.00	1.00	0.92	0.83
10		1.00	1.00	0.96	0.92
12		1.00	1.00	1.00	1.00

See notes below.

Edge or End Distance Shear ( $f_c$ ) Shear Load Perpendicular to Edge or End (Directed Towards Edge or End)

$c_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$c_{cr}$	12	12	12	12
	$c_{min}$	4	4	4	4
	$f_{cmin}$	0.58	0.38	0.30	0.21
4		0.58	0.38	0.30	0.21
6		0.69	0.54	0.48	0.41
8		0.79	0.69	0.65	0.61
10		0.90	0.85	0.83	0.80
12		1.00	1.00	1.00	1.00

1. E = Embedment depth (inches).
2.  $c_{act}$  = actual end or edge distance at which anchor is installed (inches).
3.  $c_{cr}$  = critical end or edge distance for 100% load (inches).
4.  $c_{min}$  = minimum end or edge distance for reduced load (inches).
5.  $f_c$  = adjustment factor for allowable load at actual end or edge distance.
6.  $f_{ocr}$  = adjustment factor for allowable load at critical end or edge distance.  $f_{ocr}$  is always = 1.00.
7.  $f_{cmin}$  = adjustment factor for allowable load at minimum end or edge distance.
8.  $f_c = f_{cmin} + [(1 - f_{cmin}) (c_{act} - c_{min}) / (c_{cr} - c_{min})]$ .

Spacing Tension ( $f_s$ )

$s_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$s_{cr}$	6	8	10	12
	$s_{min}$	3	4	5	6
	$f_{smin}$	0.87	0.69	0.59	0.50
3		0.87			
4		0.91	0.69		
5		0.96	0.77	0.59	
6		1.00	0.85	0.67	0.50
8			1.00	0.84	0.67
10				1.00	0.83
12					1.00

1. E = Embedment depth (inches).
2.  $s_{act}$  = actual spacing distance at which anchors are installed (inches).
3.  $s_{cr}$  = critical spacing distance for 100% load (inches).
4.  $s_{min}$  = minimum spacing distance for reduced load (inches).
5.  $f_s$  = adjustment factor for allowable load at actual spacing distance.
6.  $f_{scr}$  = adjustment factor for allowable load at critical spacing distance.  $f_{scr}$  is always = 1.00.
7.  $f_{smin}$  = adjustment factor for allowable load at minimum spacing distance.
8.  $f_s = f_{smin} + [(1 - f_{smin}) (s_{act} - s_{min}) / (s_{cr} - s_{min})]$ .

\* See p. 13 for an explanation of the load table icons.

Edge or End Distance Shear ( $f_c$ )  
Shear Load Parallel to Edge or End

$c_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$c_{cr}$	12	12	12	12
	$c_{min}$	4	4	4	4
	$f_{cmin}$	0.77	0.48	0.46	0.44
4		0.77	0.48	0.46	0.44
6		0.83	0.61	0.60	0.58
8		0.89	0.74	0.73	0.72
10		0.94	0.87	0.87	0.86
12		1.00	1.00	1.00	1.00

See notes below.

Edge or End Distance Shear ( $f_c$ )  
Shear Load Perpendicular to Edge or End (Directed Away From Edge or End)

$c_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$c_{cr}$	12	12	12	12
	$c_{min}$	4	4	4	4
	$f_{cmin}$	0.89	0.79	0.58	0.38
4		0.89	0.79	0.58	0.38
6		0.92	0.84	0.69	0.54
8		0.95	0.90	0.79	0.69
10		0.97	0.95	0.90	0.85
12		1.00	1.00	1.00	1.00

Spacing Shear ( $f_s$ )

$s_{act}$ (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2 3/4	3 1/2	4 1/2	5 1/2
	$s_{cr}$	6	8	10	12
	$s_{min}$	3	4	5	6
	$f_{smin}$	0.62	0.62	0.62	0.62
3		0.62			
4		0.75	0.62		
5		0.87	0.72	0.62	
6		1.00	0.81	0.70	0.62
8			1.00	0.85	0.75
10				1.00	0.87
12					1.00