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HAITI
RESPONSE PREPAREDNESS AND BUILDING RESILIENCE

Haiti Damage Assessment Training Program

May 2020

miyamoto. EARTHQUAKE + STRUCTURAL ENGINEERS

Module 1 – Introduction and Overview

USAID OFFICE OF U.S. FOREIGN DISASTER ASSISTANCE (OFDA):

- Office under the United States Agency for International Development (USAID) that is charged by the US President with directing and coordinating international disaster assistance.
- In cooperation with other governmental organizations, NGOs and experts, OFDA continuously:
  - Monitors global hazards
  - Identifies potential areas of need
  - Stands ready to respond whenever disaster strikes
  - Invests in development of Disaster Risk Reduction programs worldwide

Miyamoto global locations

OVERVIEW

Day 1

Module 1 - Introduction and Overview

Module 2 – Earthquake Damage Repair

Module 3 – Roof Structure Reinforcement Solutions for Hurricane

OVERVIEW

Day 2

Module 4 – Permit Checklist.

Module 5 – Structural drawings.

Certification Exam (60 minutes)

OBJECTIVES

To expand on the facilitation of a sustainable earthquake and hurricane damage assessment system in Haiti and build technical and institutional resilience for a reduction in internally displaced people (IDPs), lives lost, less people injured and less social and economic disruption.

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HAITI

RESPONSE PREPAREDNESS AND BUILDING RESILIENCE

EARTHQUAKE DAMAGE REPAIR

May 2020

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Repairs of Damaged Buildings

REPAIR AND SEISMIC STRENGTHENING OF BUILDINGS

- Repair and seismic strengthening of damaged structures is important in order to restore the use of structures damaged in an earthquake, and guarantee the safety of residents or users.
- Although repairs may provide some local resiliency to elements damaged in an earthquake, they are not seismic upgrades.

DIFFERENCE BETWEEN REPAIR AND SEISMIC STRENGTHENING OF BUILDINGS.

- Seismic strengthening requires an analysis of the existing building. But repair is based on guideline details.
- Seismic strengthening is designed for the entire building to address the structural deficiencies of the lateral force resisting system. But repair is only applied to damaged elements and does not address other deficiencies.

DIFFERENCE BETWEEN REPAIR AND SEISMIC STRENGTHENING OF BUILDINGS (CONT.)

- Strengthening is typically implemented prior to an earthquake to reduce the risk of loss of life, injury, and major structural damage or collapse.

DIFFERENCE BETWEEN REPAIR AND SEISMIC STRENGTHENING OF BUILDINGS (CONT.)

- Repairs are implemented after an earthquake and may add additional resiliency to the elements that were damaged, but the building will most likely experience similar damage in future earthquakes.

REPAIR

- Repairs are applied only to the damaged elements of the building.
- The goal of repair is to bring the building back to the original condition prior to the seismic event.

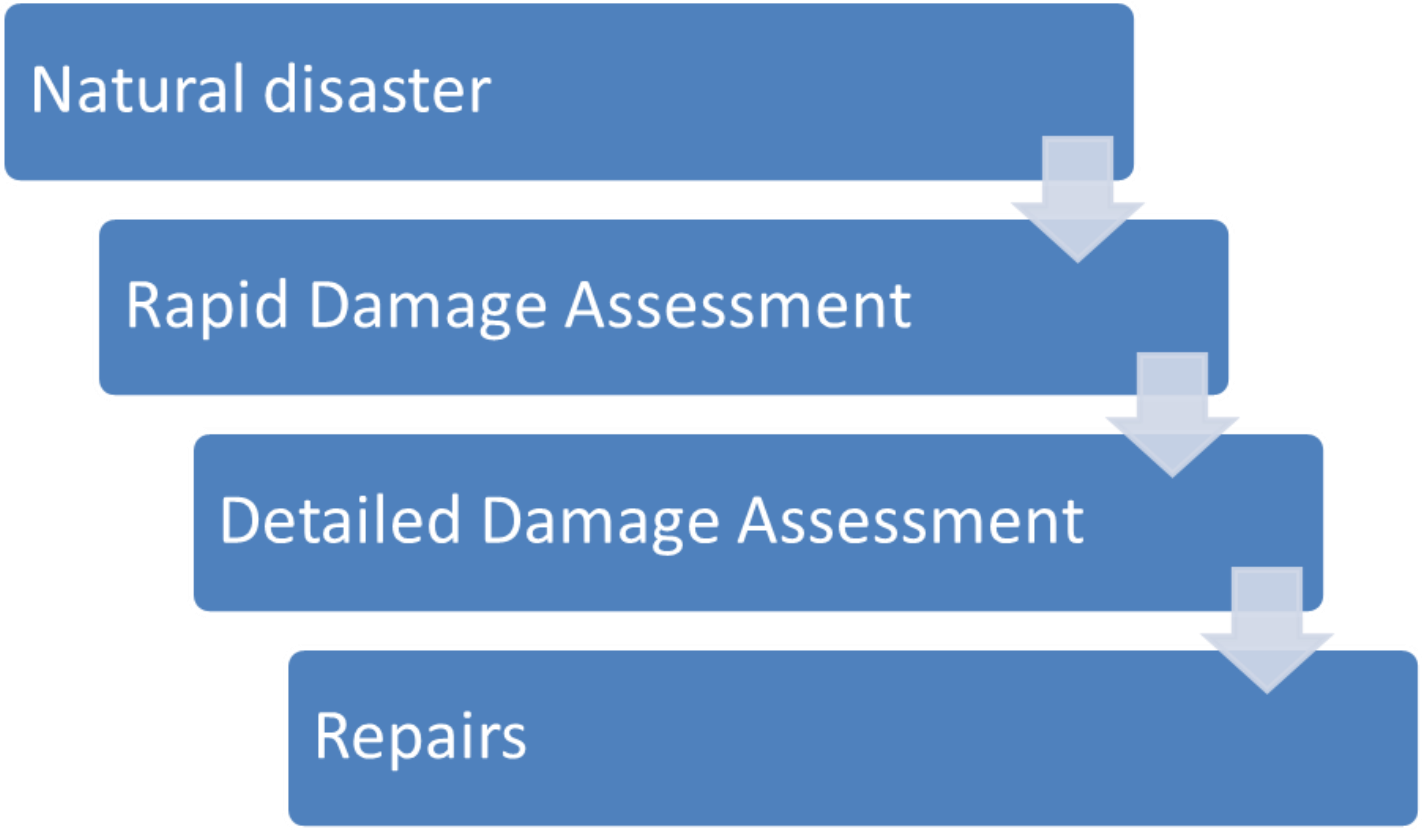
REPAIR (CONT.)

- Repairs are usually made following a natural disaster (earthquake and hurricane most common case in Haiti).
- A rapid and detailed assessment of the damage is necessary prior to identifying the repair type.

REPAIR (CONT.)

- For this program, the repair methods that will be illustrated below are applicable for residential and commercial buildings not exceeding two levels.

REPAIR (CONT.)


Natural disaster
Rapid Damage Assessment
Detailed Damage Assessment
Repairs

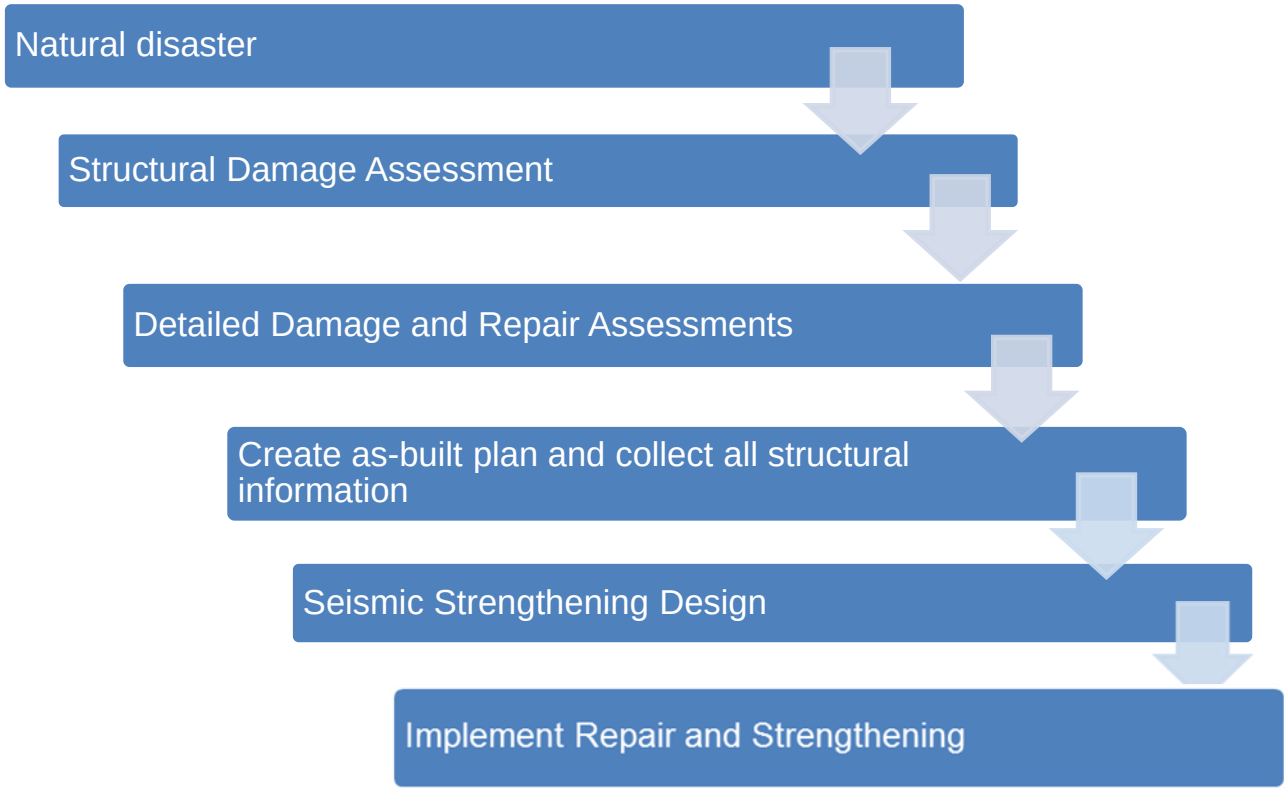
SEISMIC STRENGTHENING

- Seismic strengthening is designed for the entire building to address the structural deficiencies of the lateral force resisting system.
- Strengthening can be done prior to an earthquake, or after an earthquake, along with repairs or reconstruction of damaged elements.

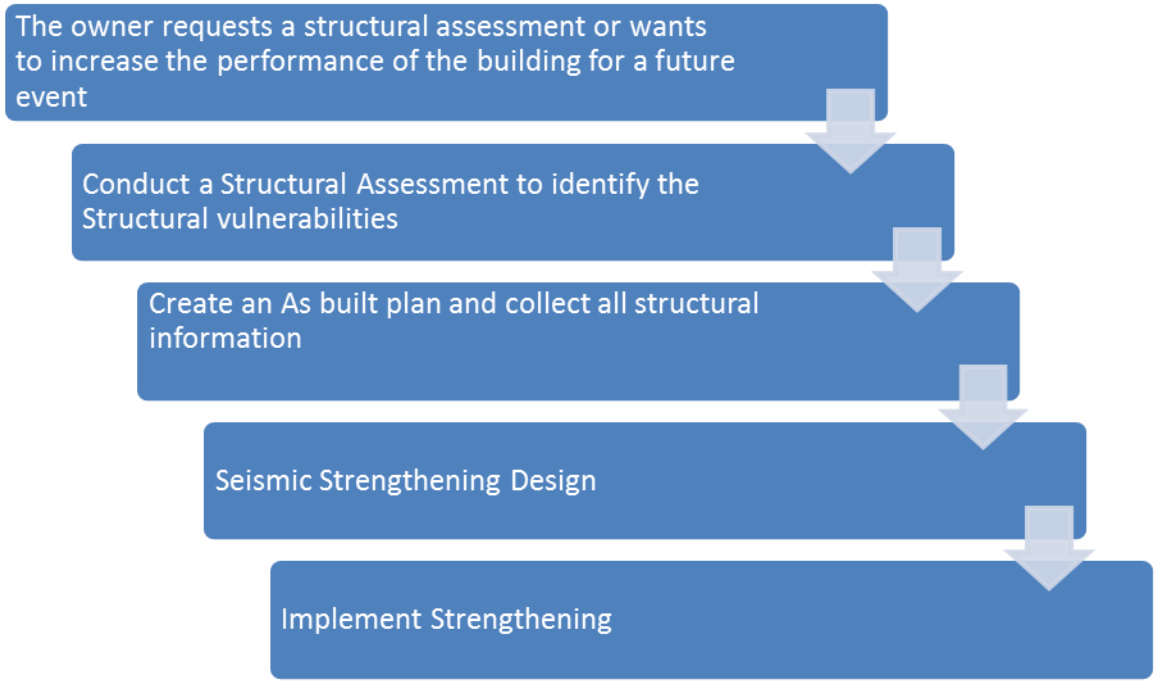
SEISMIC STRENGTHENING (CONT.)

- Seismic strengthening is typically applied to a large industrial or commercial building, hospital, school, public or government buildings.

SEISMIC STRENGTHENING AFTER EVENT



SEISMIC STRENGTHENING PRIOR TO EVENT



SCHEMATIC REPAIRS DESIGN BASED ON:

- Engineering principals of Reinforced Concrete Masonry
- ASTM STP 1180 testing performed
  - This testing was done on unreinforced block masonry walls similar to what is used in Haiti and provides energy absorption characteristics with increased shear capacity with joint reinforcement
  - 300% capacity increase

ASSESSMENT AND REPAIR

This training is intended for engineers who ensure quality control of the repair of damaged structures in the following cases:

- Residential structures one to two levels.
- Residential structures tagged green, yellow or red (little damage).
- Residential structures requiring simple technical solutions.

ASSESSMENT AND REPAIR (CONT.)

- Load-bearing wall structures with lightweight roofing systems.
- Structures whose overall repair costs are within acceptable limits.

DAMAGE REPAIR GUIDELINES BASED UPON:

- Repair damaged structure back to pre-earthquake condition, or better.
- Do not provide significantly more strength or stiffness in one area of the building during repair
- Provide enhancements in ductility (energy absorption) where possible

REPAIR GUIDELINE LIMITED TO:

- One and two story confined concrete masonry buildings
- Concrete or wood roof
- Yellow tagged structures
  - Minimal damage leading to a more efficient repair
- Some red tagged Structures
  - Some have limited damage which causes the ‘’ Red tag’’

RAPID DAMAGE ASSESSMENT

- After a natural disaster rapid damage assessment evaluations will be conducted for all buildings.
- The evaluations will be conducted by ATC 20 modified version for Haiti
- Safety Evaluation of damages
- Tagging of all buildings


MTPTC
#24

ENGINEERS ARE TRAINED TO DO A REPAIR ENGINEERING ASSESSMENT

- On site engineering review of structures
- Identification of repair methods
- Measurement of repair quantities and schedule
- Post-processing data to quantify material and repair costs

TYPICAL EARTHQUAKE DAMAGE

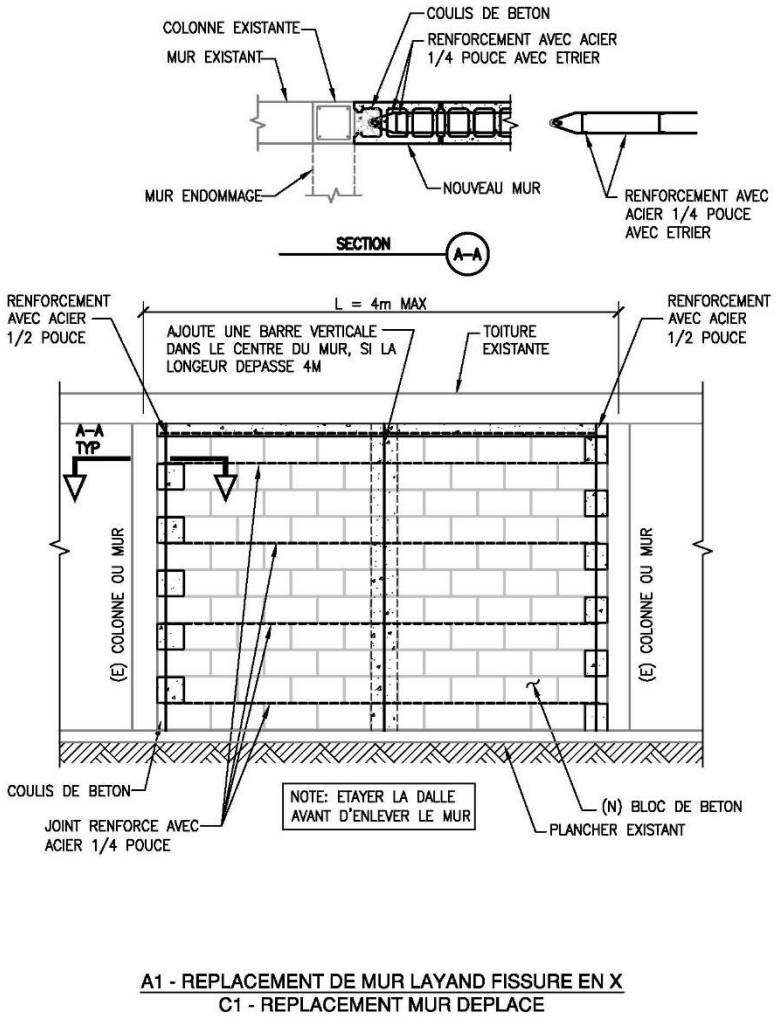
- A1 – Masonry wall Crack (X-Crack)
- B1 & B2 – Masonry wall Crack (Window)
- C1 – Wall out of plane Failure
- D1 – Door or Window Lintel Failure
- E1 – Disconnected Wall – Concrete Roof
- E2 – Disconnected Wall – Wood Roof
- F1 – Minor Plaster or Masonry Cracks
- G1 – Spalled Concrete Column
- H1 & H2 – Concrete Column Rupture Top & Bottom

A1 DIAGONAL SHEAR CRACK IN CONCRETE MASONRY WALL. (X-CRACK)

REPAIR A1

Shear X Crack = Wall Replacement

- Earthquake forces have caused shear failure
- The remaining capacity is limited.
- The repair provides for additional capacity with steel reinforcing and better quality construction in masonry, mortar and concrete.



A1 - REPLACEMENT DE MUR LAYAND FISSURE EN X
C1 - REPLACEMENT MUR DEPLACE

B1 AND B2

Diagonal shear crack in concrete masonry wall with a window.

- B1 is for opening without a Lintel.
- B2 is for opening inclusive of a Lintel.

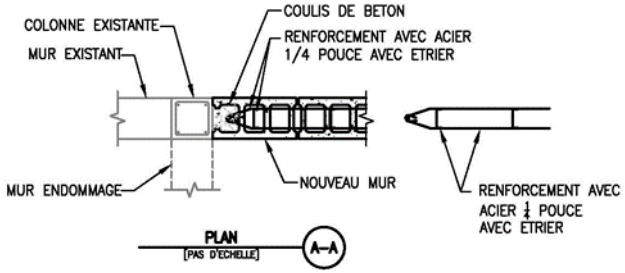
- B1 is for opening without a Lintel

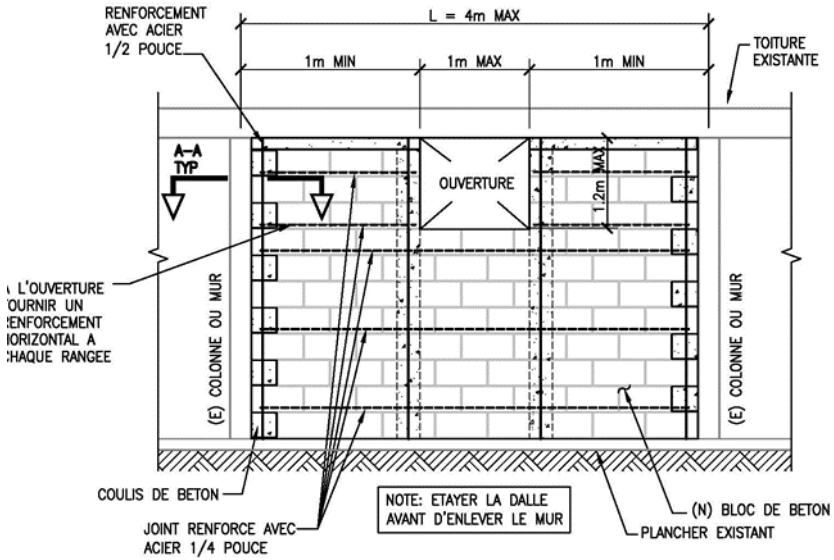
- B2 is for opening inclusive of a Lintel.

REPAIR B1

Shear X Crack w/ window = Wall Replacement

- Earthquake forces have been absorbed into the masonry wall piers and the piers have fractured due to the forces.
- The remaining load carrying capacity is limited.
- The repair provides for additional capacity with steel reinforcing and better quality construction in masonry, mortar and concrete.



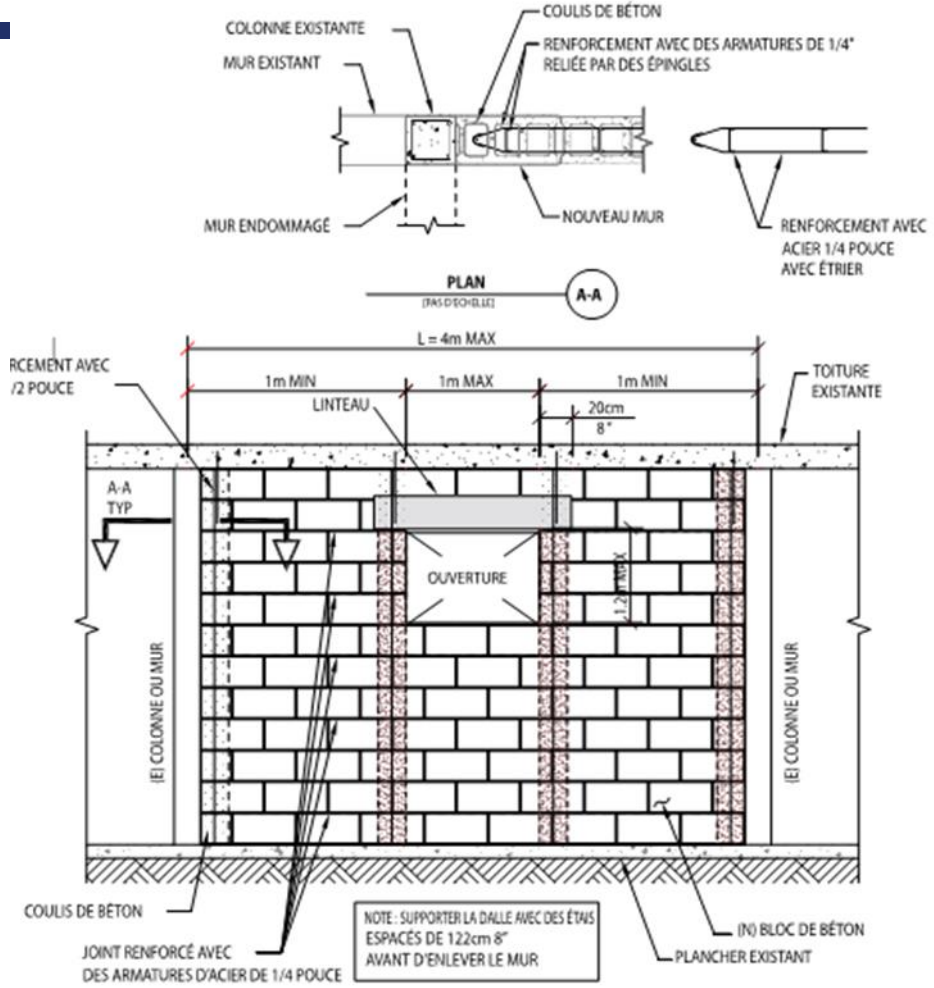


B1 - REMPLACEMENT D'UN MUR AVEC OUVERTURE, SANS LINTEAU

REPAIR B2

Shear X Crack w/ window = Wall Replacement

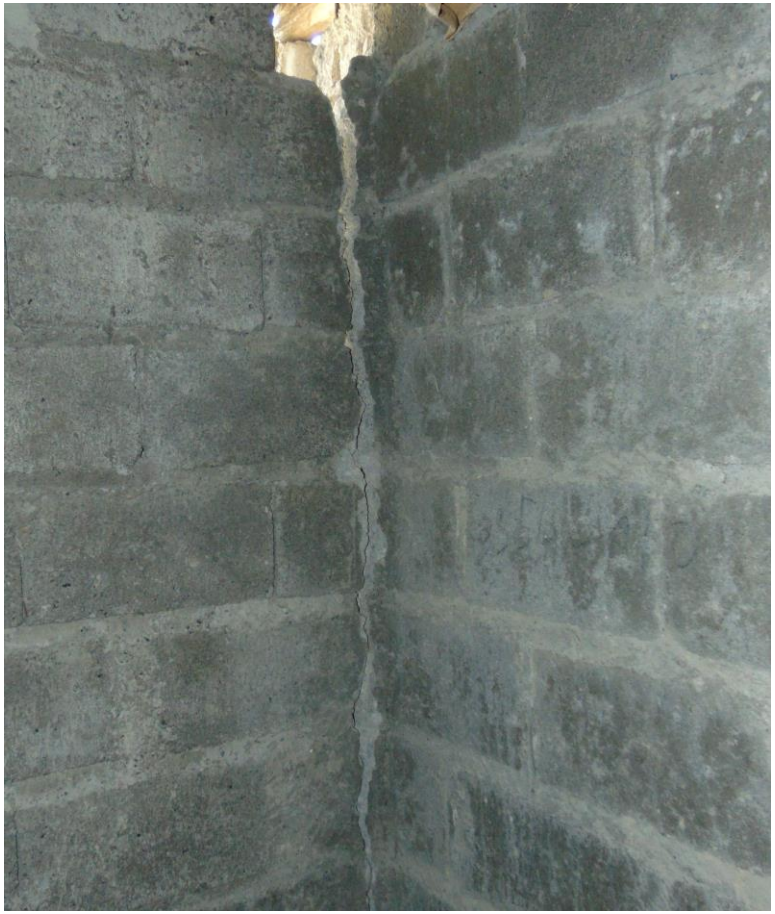
- Earthquake forces have been absorbed into the masonry wall piers and the piers have fractured due to the forces.
- The remaining load carrying capacity is limited.
- The repair provides for additional capacity with steel reinforcing and better quality construction in masonry, mortar and concrete.



B2 - REMPLACEMENT D'UN MUR AVEC OUVERTURE - AVEC LINTEAU

C1

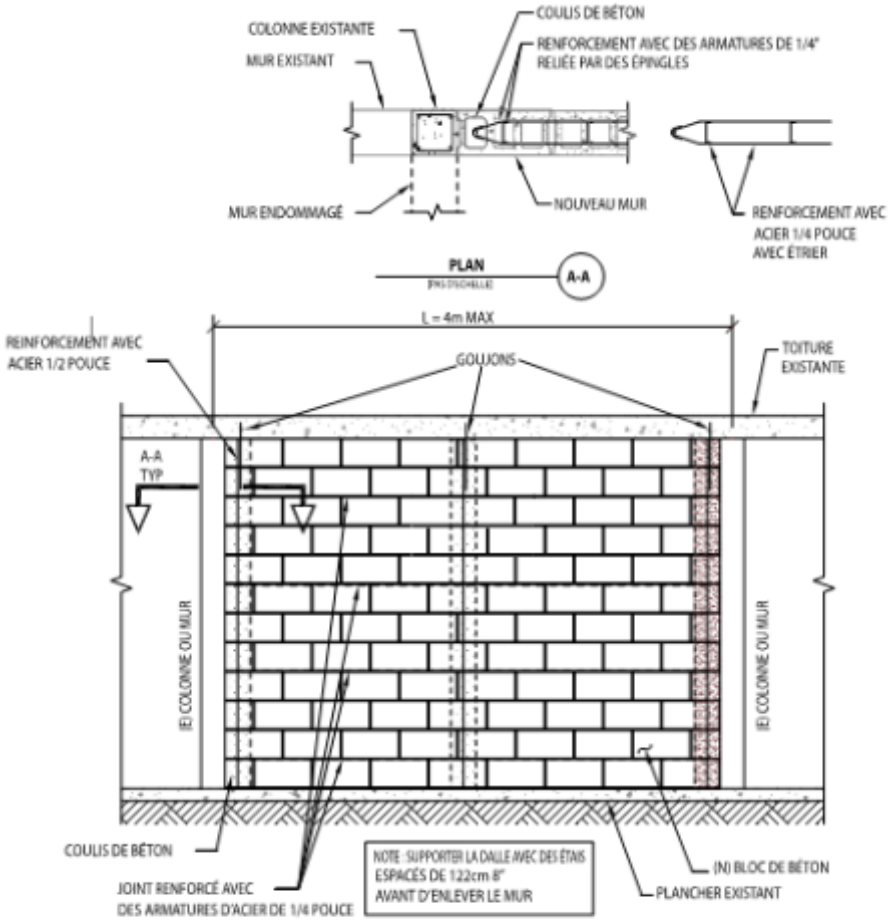
Out of plane failure of wall.



REPAIR C1

Dislodged Wall = Wall Replacement

- Earthquake forces have moved the wall – out of plane. The wall is now ineffective to resist new earthquake forces.
- The repair provides for additional capacity with steel reinforcing and better quality construction in masonry, mortar and concrete.



C1 - REMPLACEMENT D'UN MUR DÉPLACÉ

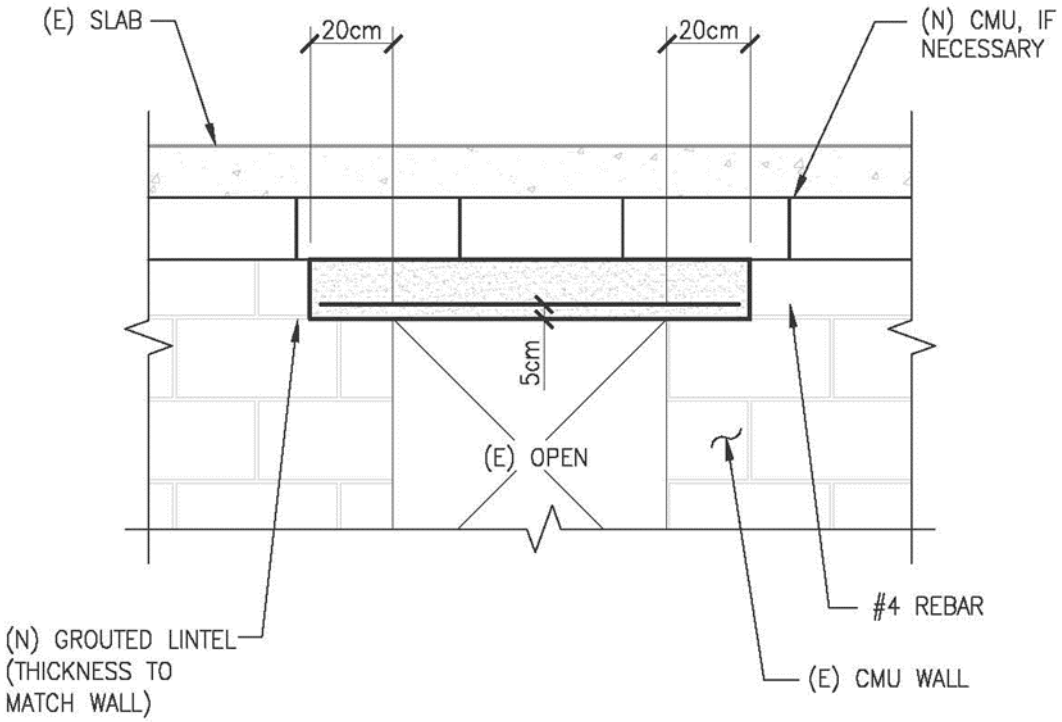
D1

Lintel failure above door or window.

REPAIR D1 - LINTEL REPAIR - CRACKED LINTELS ABOVE DOORS/WINDOWS

- Earthquake forces have moved the walls. The window lintel acts as a linking element and absorbs the earthquake forces.
- The repair provides for additional capacity in the lintel and better quality construction.

REPAIR D1 - LINTEL REPAIR



E1 AND E2

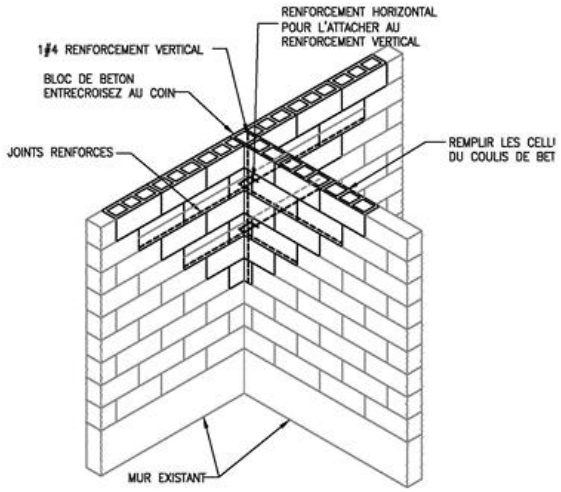
Isolated wall failures due to pounding of adjacent walls or out of plane movement, due to lack of adequate connection from roof to wall.

E1 AND E2 (CONT.)

Isolated wall failures due to pounding of adjacent walls or out of plane movement.

REPAIRS E1-WALL FAILURE

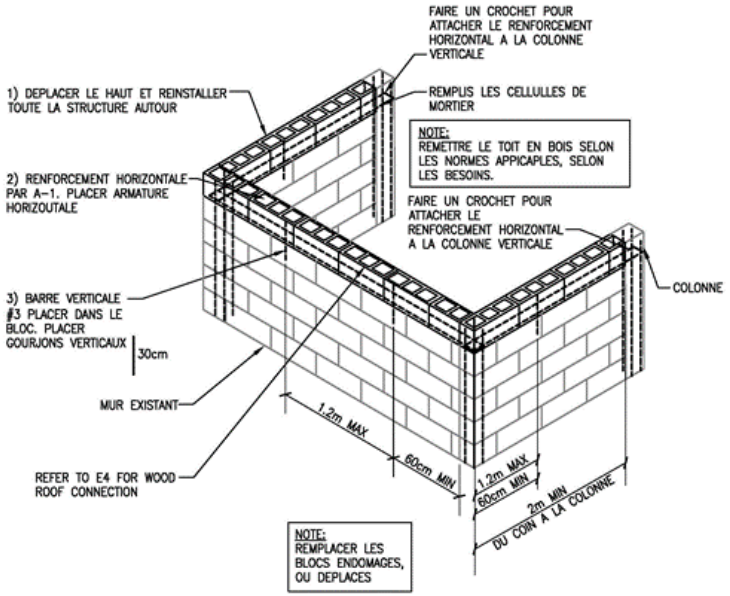
E1 - Pounding at Perpendicular Walls



E1 - MUR DECONNECTE - TOIT EN BETON

REPAIRS E2-WALL FAILURE

E2 - Out of plane for Wood Roof - Lack of connection



E2 - MUR DEPLACER - TOIT EN BOIS

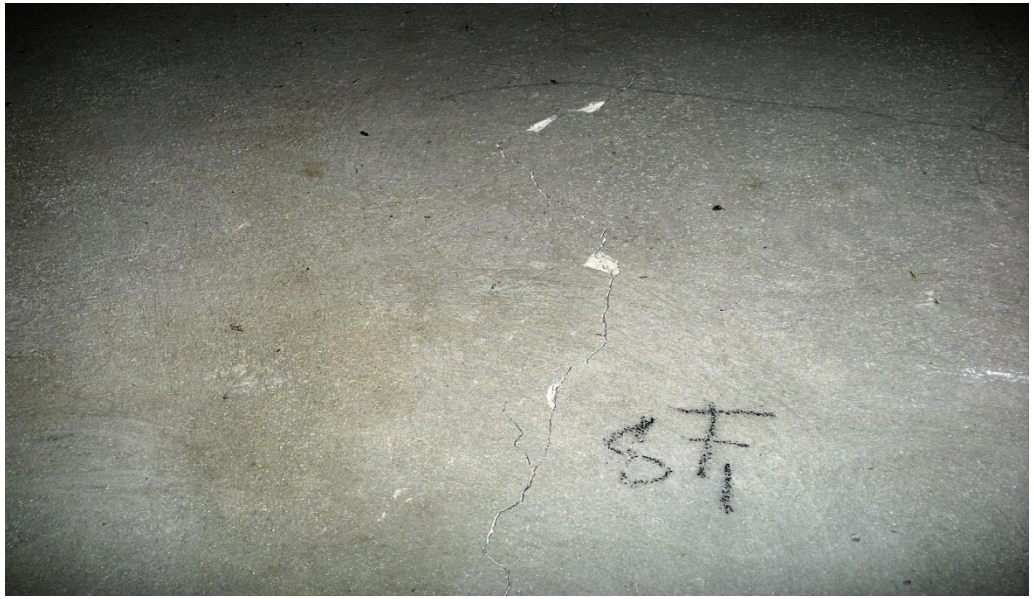
WOOD ROOF CONNECTION

Wood Roof Concerns:

1. Provide wall connections with new chainage where damaged
2. Chainage with reinforced masonry or concrete
3. Add new roof anchorage:
   - Bent vertical bar from wall
   - New #3 wire hook
   - New #3 rebar tie

F1

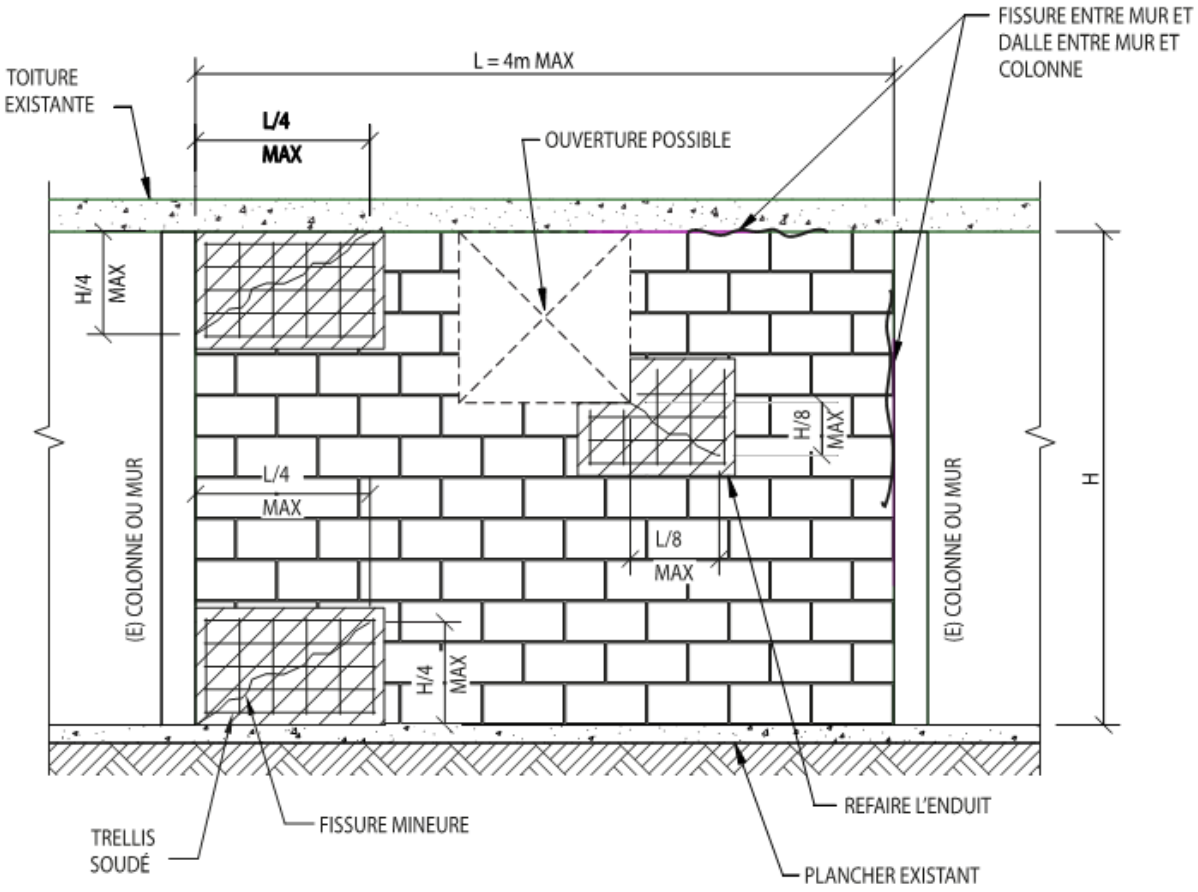
Minor cracking in Plaster or Masonry – Non-Structural.



REPAIR F1
MINOR CRACKING IN CMU

As buildings move the non-structural items will take load and crack due to the movement.

These cracks are not considered structural in nature but are earthquake damage and should be properly repaired.



F1 - FISSURE MINEURE DU MUR

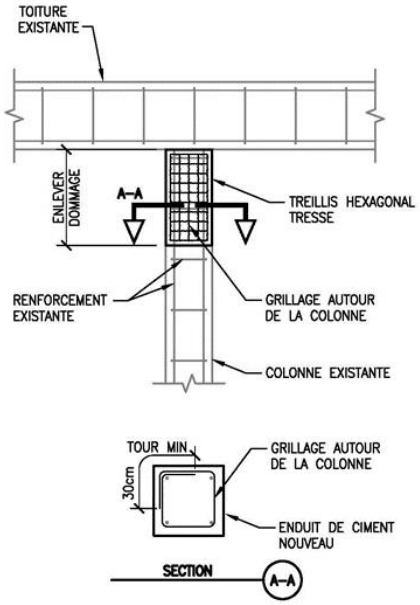
G1

- Concrete cover on column has spalled.
- Column inner core remains intact.

REPAIR G1
SPALLED COLUMN

Due to the movement of the structure and the general lack of a restraining connection from columns to beams in the slabs. The tops of columns can be subjected to loss of cover concrete on the reinforcement.

Providing a replacement to this cover will provide the necessary protection for the reinforcement.



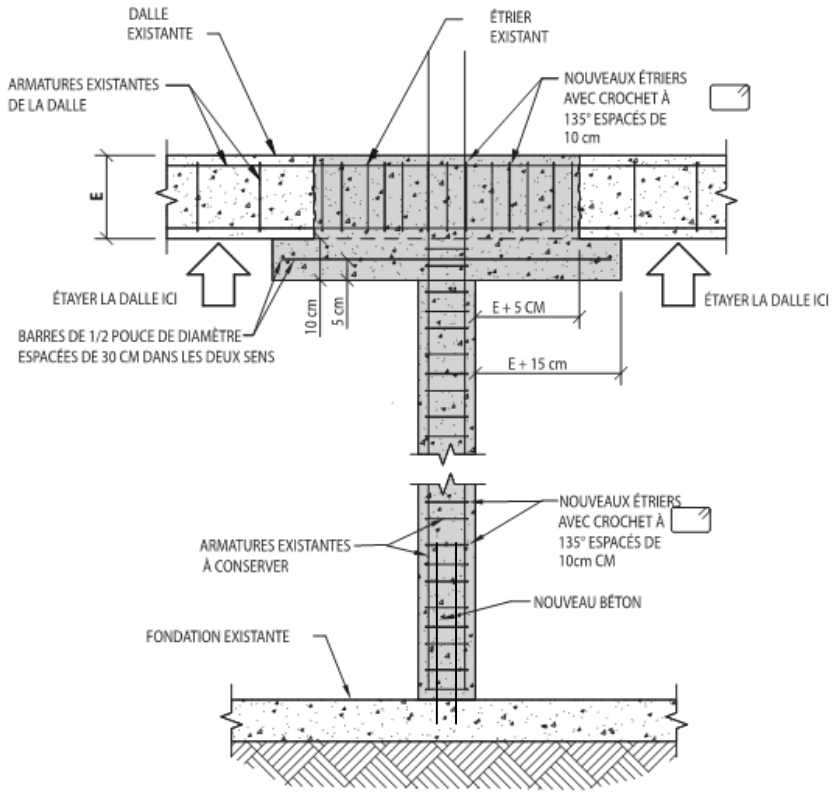
G1 - BETON ECAILLE A LA COLONNE

H1 AND H2

Concrete column rupture and replacement.

REPAIRS H1 AND H2
CONCRETE COLUMN RUPTURE – TOP AND BOTTOM

- Condition occurs at Red tagged houses.
- Movement of the column and lack of proper reinforcement confinement allows the concrete to rupture.



H1 & H2 - COLONNE ENDOMMAGÉE

ENHANCED MASONRY WORK

Repair Construction Provides for new techniques

- New masonry techniques
- Layout
- Mortar placement
- Material Mix Consistency
- Working existing blocks:
- H-blocks for Reinforcement
- Hollow Blocks
- Horizontal Reinforcement
- Vertical Renforcement
- Grouted masonry

CONSTRUCTION SEQUENCING
REPAIR A1, B1, B2, AND C1

1. Shore existing roof
2. Carefully remove wall
3. Install blocks with ½ “ mortar joints and Reinforcing at specified joints
4. Presoak blocks before placement
5. Install reinforcing at end cells
6. Create H Blocks
7. Grout Wall with Concrete
8. Consolidate grout with vibration or rodding

REPAIR A1, B1, B2, C1 CONSTRUCTION

Shore existing structure

Carefully remove wall

Install horizontal reinforcement mortar joints

Maximum Mortar joint ½”

Place reinforcing in end Cells

Create “H” blocks for reinforcing

Presoak blocks before placement

Consolidate grout with vibration or rodding

CONSTRUCTION SEQUENCING REPAIR D1 LINTEL

- Carefully Remove Door
- Carefully remove portion of damaged wall
- Form new lintel to masonry.
- Pour concrete grout into form and consolidate.
- Wait one day and strip forms.

Remove portion of damaged wall and Form new Lintel

Pour concrete and consolidate

Remove forms after one day and replace damaged wall where required

Reinstall door

CONSTRUCTION SEQUENCING REPAIR E1 AND E2 WALL

- Shore existing construction
- Carefully remove loose masonry
- Install new masonry in the corner.
- Place reinforcing in the joints to the corner.
- Grout wall with reinforcement
- Continue to final course.

Shore existing structure

Carefully remove loose masonry

Install new masonry to the corner

Install reinforcement into the corner

Form concrete column at wall intersection and Grout masonry with concrete

Complete wall

CONSTRUCTION SEQUENCING REPAIR F1 MINOR CRACKS

- Carefully remove plaster from cracks
- Inspect masonry and place reinforcing as necessary
- Install new plaster in area.

Carefully remove plaster at crack and inspect for cracks in masonry blocks

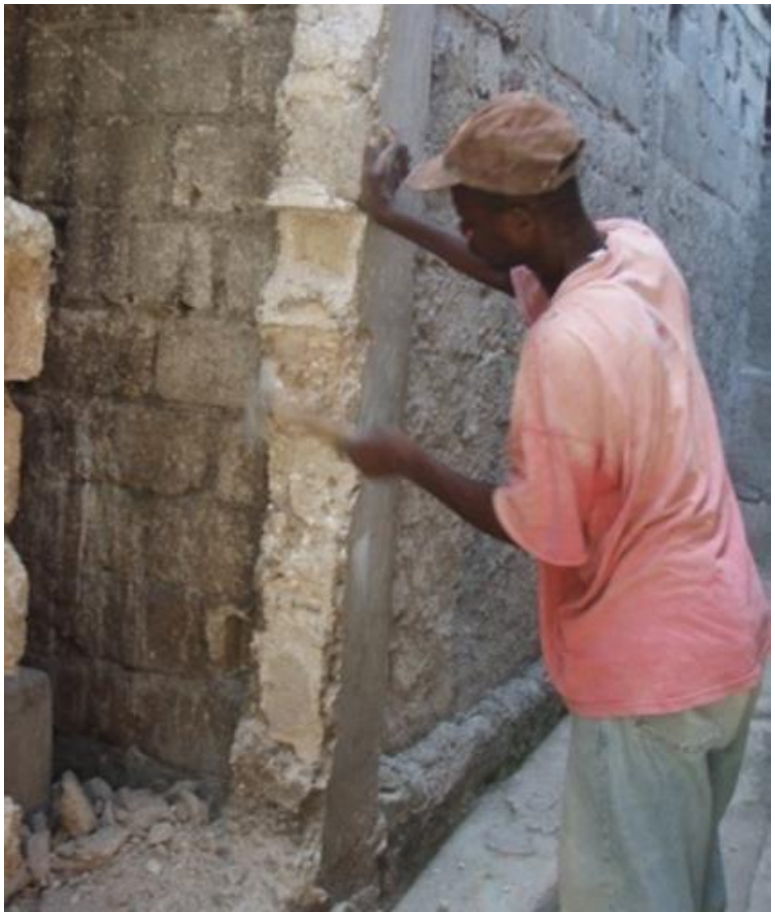
Patch new plaster

CONSTRUCTION SEQUENCING REPAIR H1 AND H2 COLUMN REPLACEMENT

- Shore existing construction
- Remove existing concrete column
- Remove concrete at roof at top of columns.
- Place new reinforcing ties with 135 degree hooks.
- Form column and fill with concrete consolidating with vibration or rodding.
- Strip forms after one day and patch as necessary.

Shore existing structure

Carefully remove loose concrete at damaged column



Remove small portion of slab concrete at roof for pouring new columns

Place new reinforcing ties with 135 degree hooks

Form columns and pour concrete consolidating during placement

Remove forms next day

TACTICS: REPAIR ASSESSMENT TRAINING

- Train the ATC damage assessment experienced engineers for repair assessment
- Principal of earthquake structural engineering
- PDA repair assessment
- Construction support
- Class room and field trainings
- Masons and contractors training

QUALITY CONTROL

Although the repair work must be performed by professional contractors, a team of engineers must be hired to ensure quality control during the work. The quality control engineers' main purpose is to minimize the chance of defects before the project delivery to the owner or his consultancy.

QUALITY CONTROL (CONT.)

Controlling quality means monitoring if the work practices are going as planned or not, examining the quality of the current construction tasks, and provide daily reports for all sites in construction. Also, the main goal is to ensure that the construction meets the standards specified at the start of the project.

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RESPONSE PREPAREDNESS AND BUILDING RESILIENCE

ROOF STRUCTURE REINFORCEMENT SOLUTIONS FOR HURRICANE

May 2020

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- Haiti is prone to cyclones, hurricanes and tropical storms
- Very high wind speeds and pressures
- Engineered systems prevent costly and dangerous damage

ROOF TO WALL CONNECTIONS

- Critical Connection
- Provide safety and limit damage or collapse due to hurricane and tropical storms

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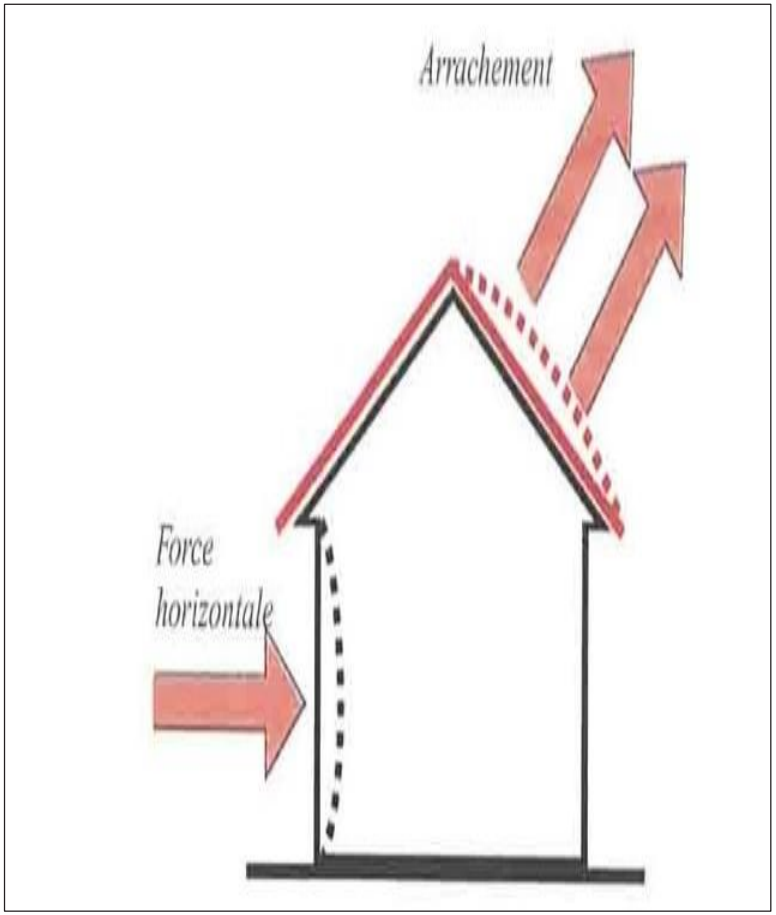
HAITI RESPONSE PREPAREDNESS AND BUILDING RESILIENCE

ROOF TIE DOWN SYSTEM MOST COMMON IN HAITI CONSISTS OF CONCRETE BLOCK OR ROCKS

- During a wind storm, the building must withstand a horizontal wind force on the walls and windows and an upward pulling force at the roof.
- These forces can reach 300 kg per square meter and sometimes more during a cyclone.
- To withstand a hurricane, the structure and the roof must be properly constructed.



ROOF CONSTRUCTION QUALITY

- In the case of a building covered by a light roof or concrete slab, they will become dislodged and removed or collapsed if the construction quality is poor.
- For the roof slab poor quality can result if the concrete is made with white sand with salts instead of silica sand. Reinforcements will be visible on the surface in a few years due to water intrusion, reinforcing steel deterioration and concrete efflorescence.

ROOF CONSTRUCTION QUALITY (CONT.)

- The poor quality of the light roof is evident
  a. If the wood framing has termite damage or dry-rot or is of insufficient cross-section.
  b. If the wood framing is fixed to the wall by inadequate connection.
  c. If the sheet metal roof panels are rusted, or if the sheet metal roof panels are insufficiently fixed by nails or screws.

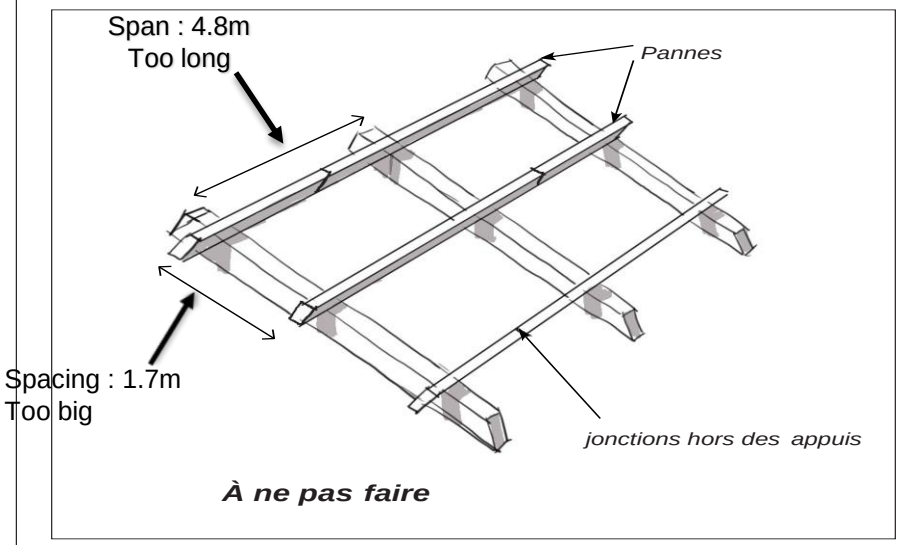
LIGHT ROOF FRAME

- The dimensions of the roof frame must be calculated to resist wind loads according to ASCE 7 (16).
- For common building practice in Haiti, the purlin and rafter system is an economical solution because the sheet metal roofing is attached directly to these purlins and it is not necessary to add sheet metal cleats.

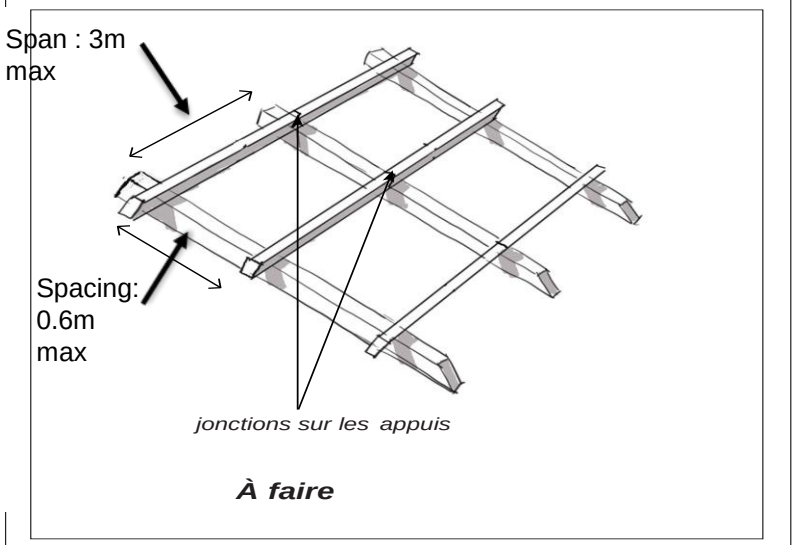
LIGHT ROOF FRAME (CONT.)

- The spacing of the purlins, which receive the sheet metal roofing directly, must not exceed 60 cm.
- The purlins shall be joined to the rafters and the rafters shall be connected to the bond beam or reinforced wall with positive connections designed to resist wind uplift loads.

RAFTER AND PURLIN SPACING

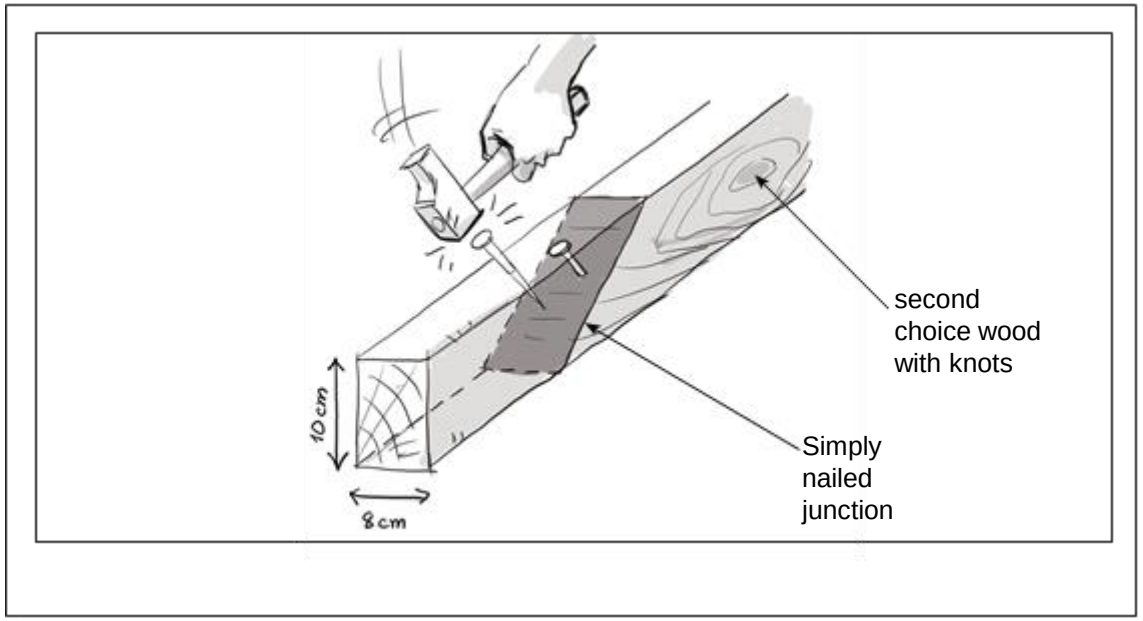


Dessin 76 :

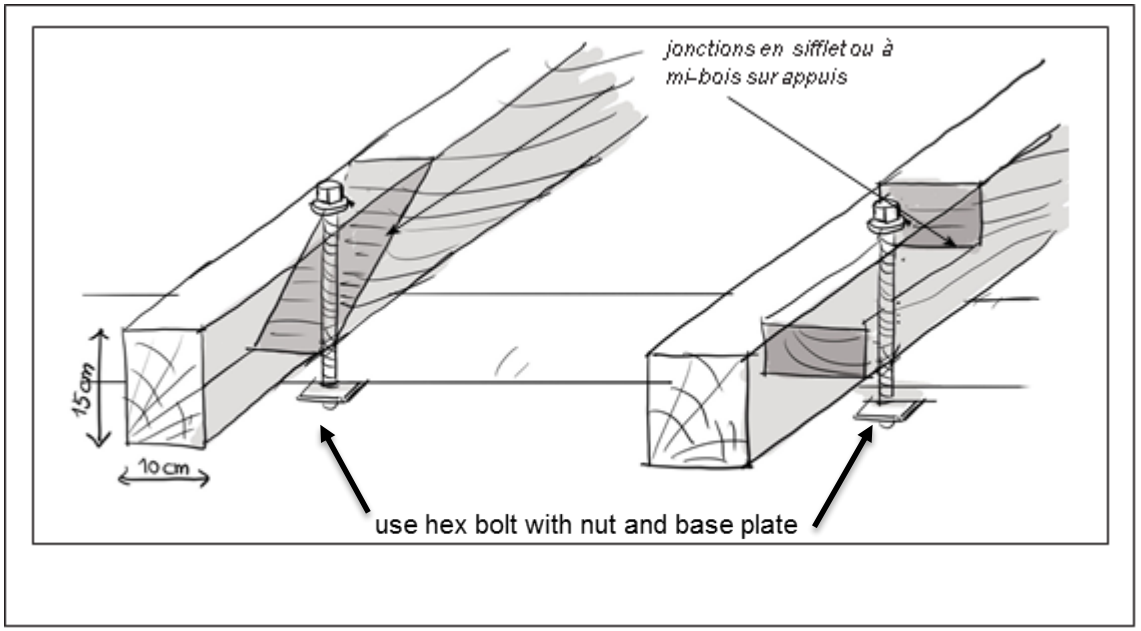


Dessin 77 : *Dimensions correctes*

INCORRECT RAFTER OR PURLIN OVERLAP



CORRECT RAFTER OR PURLIN OVERLAP

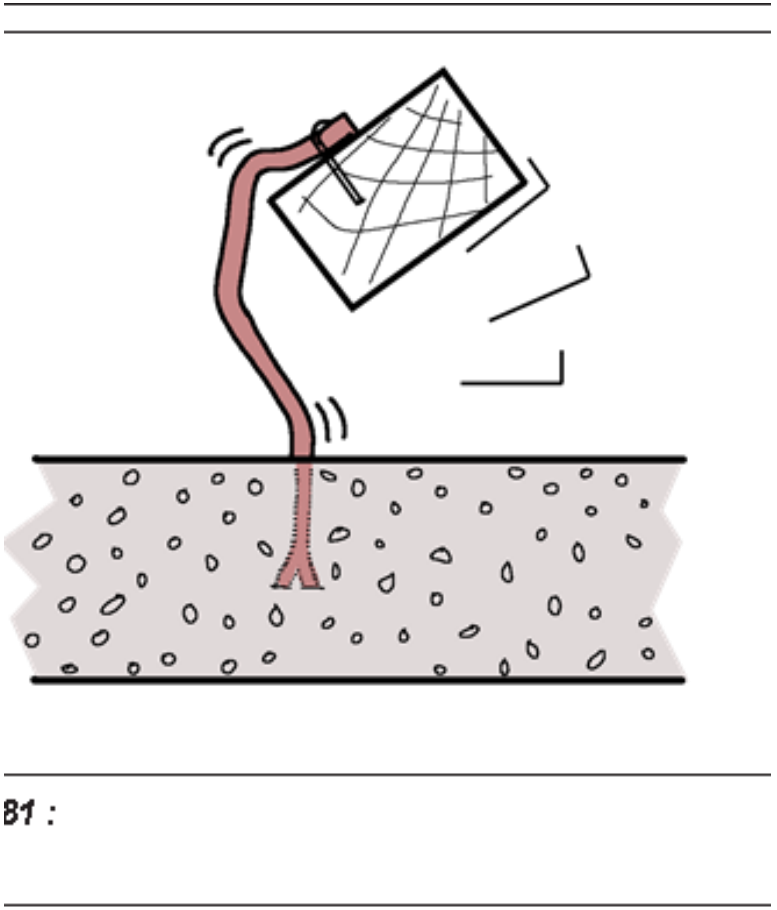


RAFTER OR PURLIN CONNECTION AT WALL

For a light roof structure covered with sheet metal roofing supporting by purlins and rafters, the treated wooden rafters shall be fixed on the bond beam

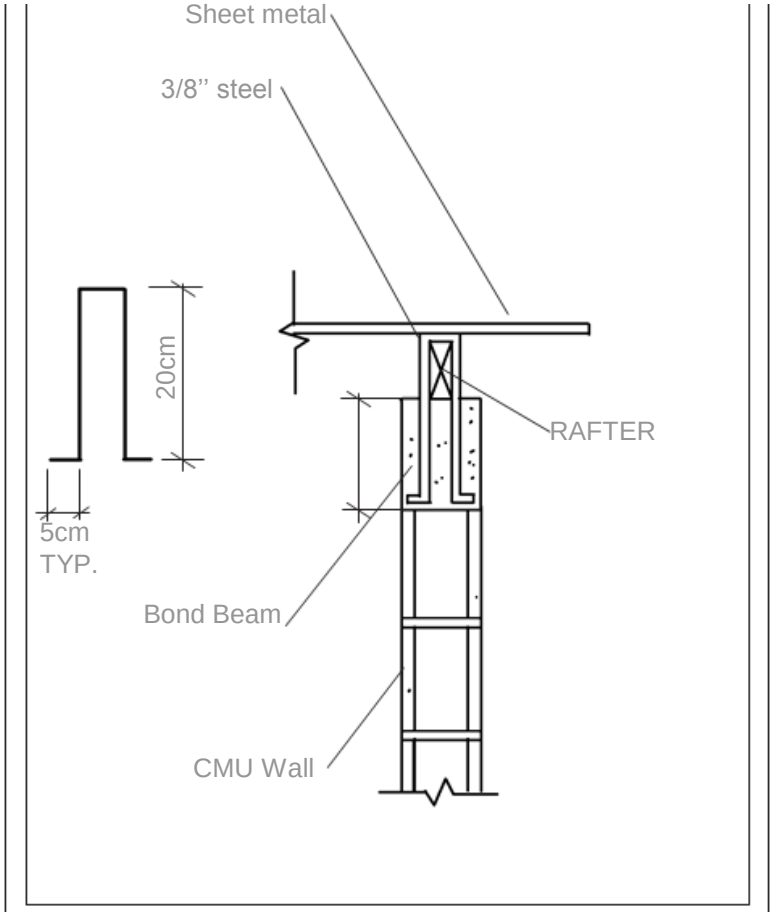
a. By Galvanized steel brackets or hooves, screws, brackets and bolts, which require electrical equipment to install,
b. Or by a 2.5 mm thick and 2.5 cm wide galvanized metal clip link fixed and nailed in the bond beam,
c. Or by a 3/8'' steel anchored in the bond beam.

Incorrect Fixation



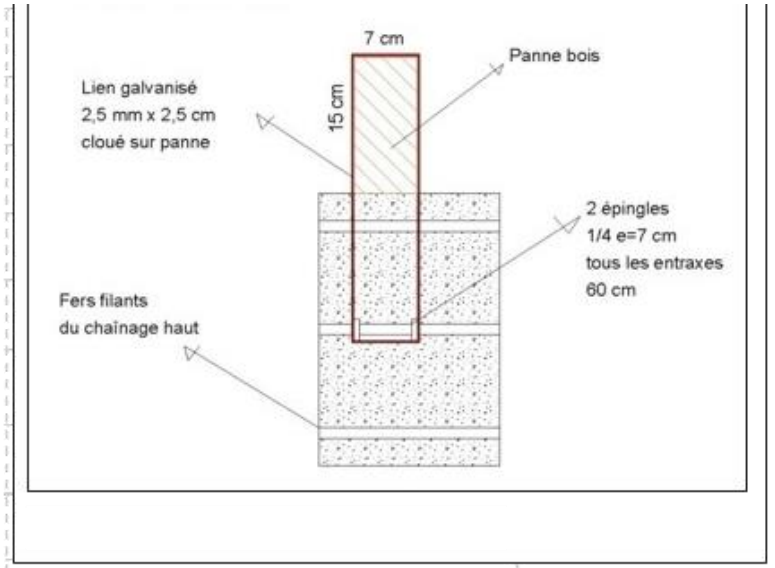
Correct Fixation

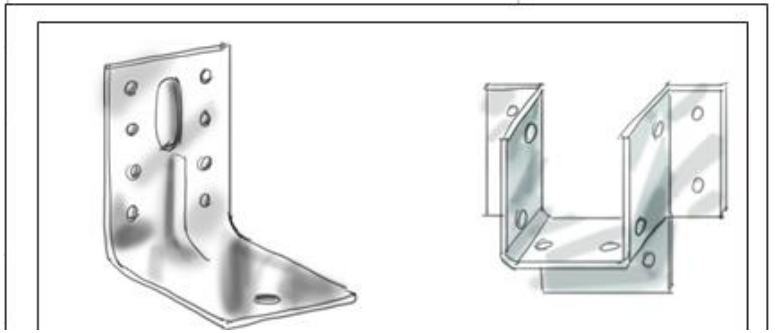
3/8” diameter steel anchored at Bond beam



Correct Fixation

- Galvanized clip and strap anchored at bond beam
- Galvanized steel brackets installed at bond beam top surface

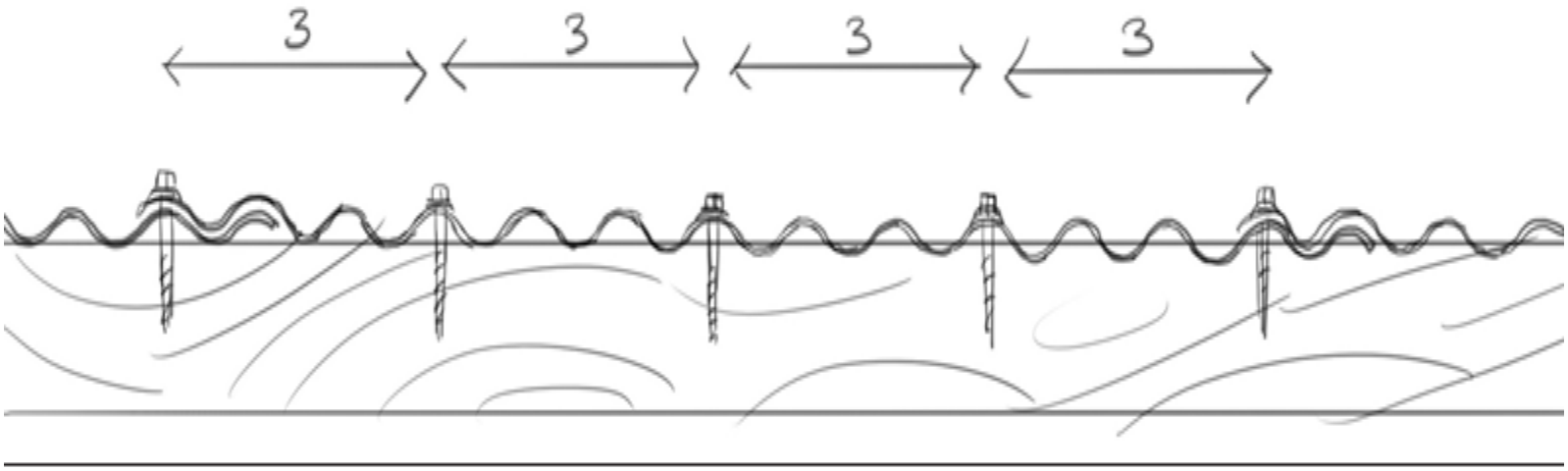




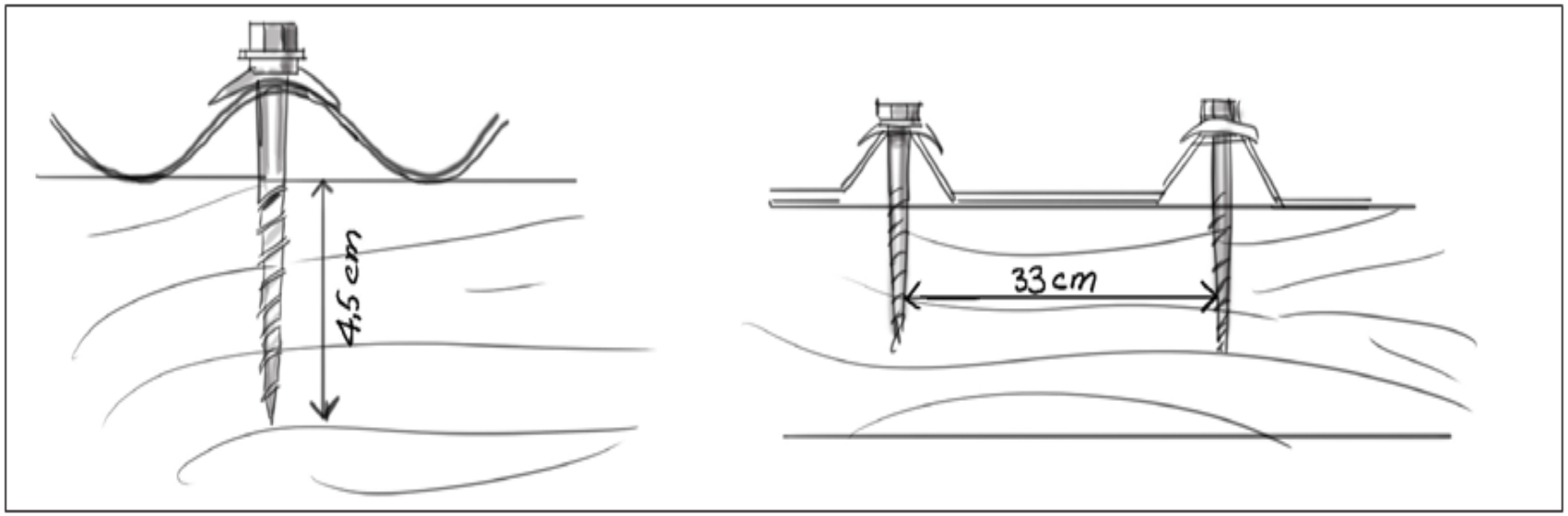
SHEET METAL SCREW SPACING

- For corrugated sheet metal, the interval between the screws line is 3 waves or flutes. The spacing must be 20 cm center to center between the lines.
- For a trapezoidal sheet metal provide the screws at each flute. The spacing longwise must be 20 cm center to center between each line.
- Joining (stitching) sheets longwise every 30cm.

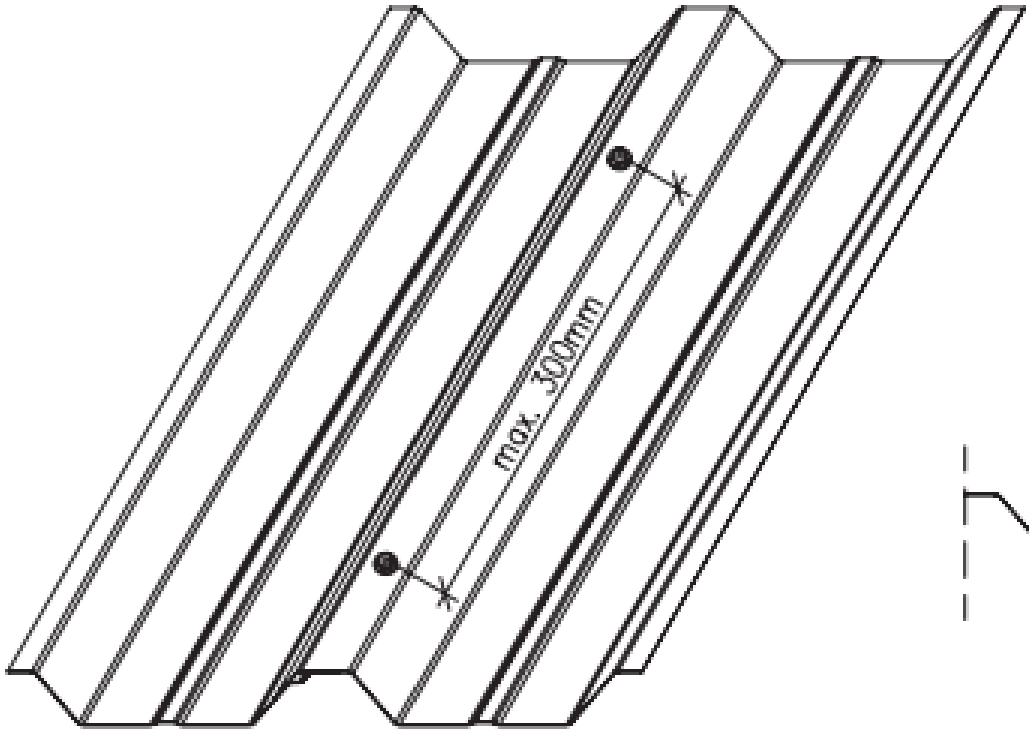
SCREW SPACING AT CORRUGATED SHEET METAL



SCREW SPACING AT TRAPEZOIDAL SHEET METAL



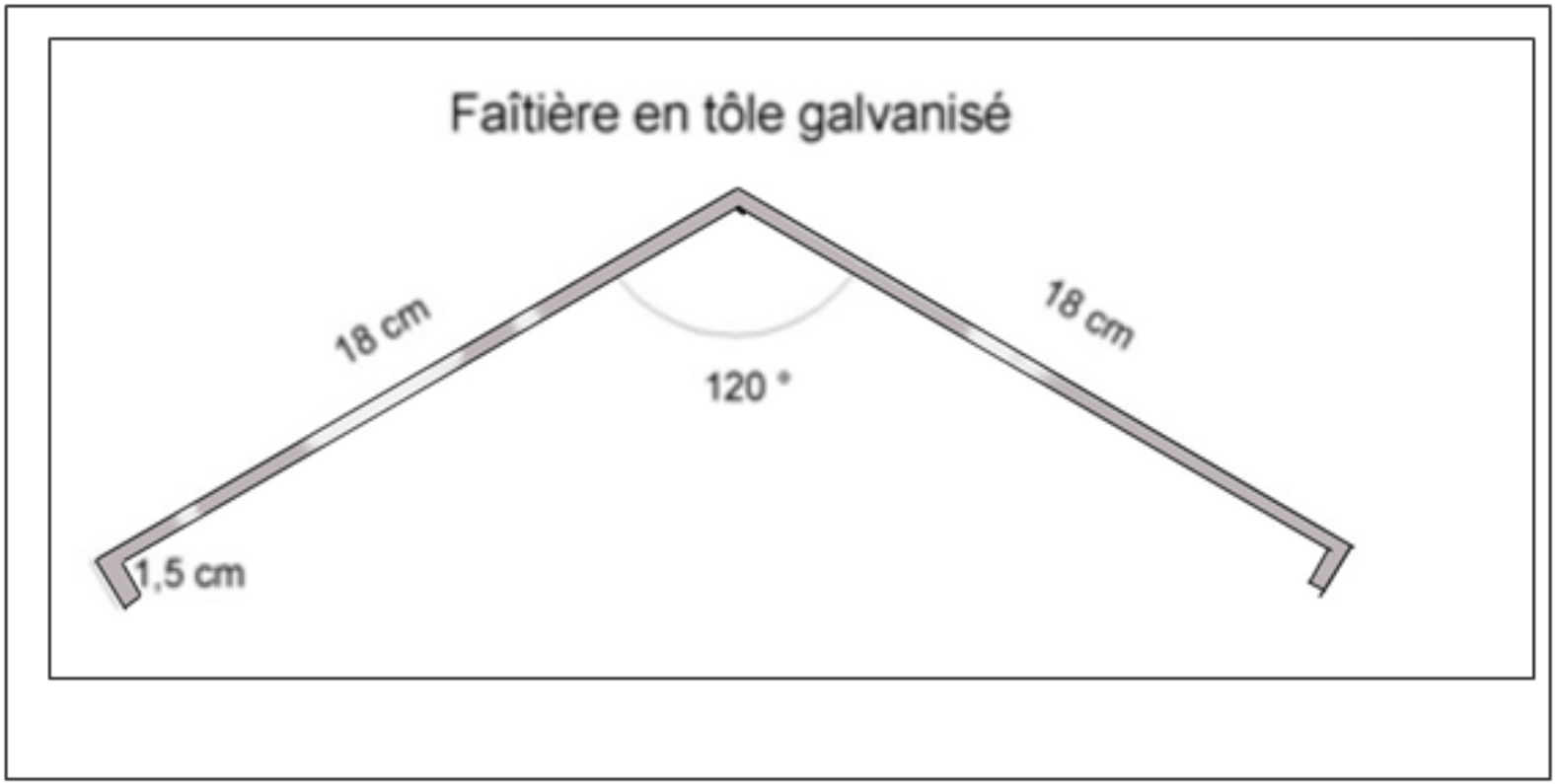
JOINING (STITCHING) SHEETS



ROOF ACCESSORIES

They will be made of sheet metal of the same quality as the roofing sheets. The ridge capping shall be connected to the ridge purlins in the case of a roof with an inclined shape. Screws shall be spaced at 30 cm on center along the ridge purlin.

GALVANIZED RIDGE CAPPING



Example of a light roof fixed by a sheet metal screws or lag bolts.

THANK YOU!

USAID
FROM THE AMERICAN PEOPLE

HAITI

RESPONSE PREPAREDNESS AND BUILDING RESILIENCE

PERMIT CHECKLIST

May 2020

miyamoto. EARTHQUAKE + STRUCTURAL ENGINEERS

CONSTRUCTION PERMIT INFORMATION

A building permit for construction must be obtained from the municipality by the applicant for all new buildings and alteration to existing buildings.

CONSTRUCTION PERMIT INFORMATION

The municipality ensures that the required information, including the title of ownership, is provided in the application file that the construction conforms to the building code and the land is not located in a high risk or protected area.

CONSTRUCTION PERMIT (CONT.)

- The municipality must send the application file to the MTPTC and obtain a positive technical opinion before issuing the building permit.
- Construction must not start prior to the issuance of the building permit, including the positive technical opinion of the MTPTC and the payment of the fees fixed by law.

PLAN AND CALCULATION SUBMITTAL

- Please review the plan sheets and calculations submitted by checking all completed items on intake checklist and indicating N/A (not applicable) for items that do not apply.

PLAN AND CALCULATION SUBMITTAL (CONT.)

- Items listed must be clearly delineated on the plans to assure a timely, consistent and accurate plan review. Submittal must include plans, specifications and engineering calculations, if required.
- All plan sheets must be a minimum of 11 inches x 17 inches.

BUILDING DESCRIPTION

Table 1.0 **Building description in accordance to the CNBH 2012 section 1.2.2**	
Building Name:	Owner**:**
Address:	
GPS coordinates:	
Soil type:	Slope (%):
Number of floor levels above ground:	Number of floor levels below ground:
Building area (square meter):	Surface land area (square meter):
Type of construction: _____ _____	

TECHNICIAN INFORMATION

Table 1.1 **Technician information in accordance to the CNBH 2012**	
Engineer of record:	CNIAH ID
Architect:	CNIAH ID
MEP Engineer:	CNIAH ID
Site or Civil Engineer:	CNIAH ID
Surveyor:	CNIAH ID
Geotechnical Engineer:	CNIAH ID

LIST OF DOCUMENT SUBMITTED

Table 1.2 **Document submitted in accordance to the CNBH 2012 section 1.2.2**	
Architectural drawings Yes ☐ No ☐	Structural drawings Yes ☐ No ☐
Civil/site drawings Yes ☐ No ☐	MEP drawings Yes ☐ No ☐
Copy of ownership title document Yes ☐ No ☐	Site photos (4 minimum) Yes ☐ No ☐
Site survey plan and bill of sale (Purchaser) Yes ☐ No ☐	Geotechnical report Yes ☐ No ☐
Site survey plan and minutes (Heir) Yes ☐ No ☐	
Comments:	

ARCHITECTURAL DRAWING CHECKLIST

Completed or N/A	Item
	Floor plans including dimensions, occupancy classification, room names, exit-access routes, door and window sizes (schedules), door swings, and minimum clearances required.
	Fire-rated walls, doors/windows and other fire-rated assemblies identified on plans.
	Label all spaces by use and identify new versus existing construction, where appropriate.
	Detailed door/window schedules with hardware and fire rating, where required.
	Means of egress systems, including corridors, stairs and exterior exit routes (minimum dimensions required per code indicated on the plans and/or details).
	Exit signs and emergency lighting unit locations, where required.
	Building accessibility (e.g. ramps, guardrails, curbs, truncated domes, and maximum slopes at paved areas comply to code for accessibility).
	Exterior Elevations and Building Sections (must indicate floor to floor height and ground floor height to pavement/ exterior grade level).
	Reflected ceiling plans with seismic bracing specifications and details (e.g. new suspended acoustical ceilings and new interior partition walls extending to ceiling or to structure above)

ARCHITECTURAL DRAWING CHECKLIST (CONT.)

Completed or N/A	Item
	Wall Sections and Details indicating material type (e.g. metal stud size and spacing, masonry wall thickness with reference for reinforcing, and all connections to structure).
	Interior Elevations indicating finishes, fixtures, etc. (finish schedules).
	Cross sections and/or details, including floor/ceiling, roof/ceiling, vertical shafts and interior/exterior walls, indicating all connections to building structure.
	Protection of openings, flame spread requirements, draft and fire stops.
	Stair details, including handrails, landings and guardrail connections. Stair details to also indicate minimum tread depth and height.
	Overall site plan including reservoir, sumps, septic tank and drainage plans/details
	Minimum distance information (setbacks and clearances) between adjacent structures (e.g., exiting building, perimeter fence wall, etc.) Verify clearances between adjacent structures is adequate to mitigate the risk of pounding.

STRUCTURAL DRAWING CHECKLIST

Completed or N/A	Item
	General Notes including Design Criteria, Gravity Loads (Dead and Live), Lateral Load Criteria (Seismic and Wind), Lateral Force Resisting System, Material Strengths (Steel, Concrete, Masonry, Grout, Mortar, and Steel Reinforcing Bars), Geotechnical Report, Soil Type, Allowable Bearing Values and typical details for construction (e.g. concrete and/or masonry, reinforcing, structural steel, etc.).
	Basis of design description in structural calculations, indicating the materials and lateral system utilized, gravity (dead/live) and lateral loads, soil parameters, and wind and seismic coefficients. For voluntary seismic improvements, indicate the structural elements to be upgraded. Indicate code or standard used for the rehabilitation.
	Dimensioned foundation, floor and roof framing plans, including locations and sizes of all structural elements (e.g., foundations, walls, columns, beams).
	Elevations (e.g. Braced Frame, shear wall), Details, and Sections for all elements of the lateral force resisting system.

STRUCTURAL DRAWING CHECKLIST (CONT.)

Completed or N/A	Item
	Details for all diaphragms (floor and roof), connection between concrete slab and walls, and/or between walls and beams for light framed roof structure.
	Details for minimum reinforcing at opening (e.g., end of walls, around doors, windows, skylights and other openings).
	Roof and Floor Framing Details, and Foundation details
	Elevated slab reinforcement plans and details (reinforcing schedules where required)
	Truss elevations and details for light framed roof structure including truss configurations, element sizes, and all connection details.
	Cross sections through any new structural elements

ELECTRICAL DRAWING CHECKLIST

Completed or N/A	Item
	Panel locations with fire-resistance-rated enclosure assemblies identified.
	New and existing exit signs located.
	Interior and exterior emergency lighting and dedicated circuits identified.
	Power receptacles, ground-fault circuit interrupters (GFCI), and switches with accessible locations indicated and heights detailed.
	Exit sign and emergency lighting unit locations, where required
	Equipment/fixture schedule with weights and reference to anchorage details provided.

MECHANICAL AND PLUMBING DRAWING CHECKLIST

Completed or N/A	Item
	Mechanical unit locations shown, units marked and identified based on equipment schedule, anchorage details referenced.
	Mechanical equipment schedule with unit operating weights and cross-reference to anchorage details.
	For MEP (Mechanical/Electrical/Plumbing) only projects, show partial structural framing plans at existing floors or roofs supporting mechanical equipment.
	Support, Bracing and Anchorage details for ducts, pipping and suspended equipment.
	Mechanical and piping penetration details at fire-resistance-rated walls, shear walls, headers, beams, floor and roof slabs. Penetrations to be identified in plan with cross reference to details.
	Grade level gas shut-off valve location indicated at all buildings
	Water heating system and location of equipment identified with reference to anchorage details.
	Reservoir, sumps, septic tank, piping plans and corresponding details. Anchorage details for reservoirs mounted on structure or ground.
	Site drainage information and connection to any existing utilities (electricity, gas, water).

CIVIL DRAWING CHECKLIST

Completed or N/A	Item
	Plan indicating property lines, site boundaries, site grading (existing and new), fire access lanes, paving locations/extent/type (drive isles, sidewalks, curbs, and gutters), landscaping (existing and new), locations of any exiting underground utilities, etc., and all associated details.
	Building and site accessibility
	Site drainage (and collection or storage) system for rainwater.
	Public services/utilities connection indicated on plan.
	Temporary (construction) and permanent fencing and gates indicated on plan.

MOST COMMON BUILDING TYPE IN HAITI

The lateral force resisting systems most used in local construction are:

- Concrete shear wall system
- Masonry (reinforced) shear wall system
- Confined masonry wall system
- Concrete moment frame system
- Steel braced frame system

MOST COMMON BUILDING TYPE IN HAITI (CONT.)

Per CNBH 2012, each element of the structure must be able to withstand the loads imposed on it I.e.

- Dead loads,
- Live loads,
- Wind loads and
- Seismic loads

MOST COMMON BUILDING TYPE IN HAITI (CONT.)

As a result, a checklist was created to facilitate the task of the municipal engineers when reviewing the construction documents submitted.

Note: Construction must not start prior to the issuance of the building permit, including the positive technical opinion of the MTPTC and the payment of the fees fixed by law.

CONCRETE SHEAR WALL BUILDING

Structural Drawing and Calculation Check List for concrete shear wall building	
STRUCTURAL DESIGN CRITERIA	
Design Codes referenced Yes ☐ No ☐	Gravity loads (Dead and Live) Indicated. Yes ☐ No ☐
Wind design information (Wind Speed, Exposure, Risk Category and Coefficents in accordance to ASCE 7-98 to ASCE 7-05, IBC 2009) Yes ☐ No ☐	Seismic design information (Ss, S1, Sds, Sd1, Soil Classification, Seismic Design Category, Lateral Force Resisting System in accordance to ASCE 7-05, IBC 2009) Yes ☐ No ☐
MATERIAL STRENGTH	
Concrete compressive strength specifications Yes ☐ No ☐	Reinforcing steel specifications (Strength and type; e.g. ASTM A706 for bars to be welded and at SRCMF and boundary elements of SRCSW). Yes ☐ No ☐
Mortar specifications (strength and type) Yes ☐ No ☐	Masonry block compressive strength specifications Yes ☐ No ☐

CONCRETE SHEAR WALL BUILDING (CONT.)

GEOTECHNICAL INFORMATION	
Lateral soil bearing pressure (Active, Passive, and Coefficent of Friction) Yes ☐ No ☐	Allowable soil bearing pressure combinations including dead, live and lateral load Yes ☐ No ☐
Foundation type indicated Yes ☐ No ☐	Foundation dimensions and reinforcement indicated Yes ☐ No ☐
CONCRETE SHEAR WALL DETAILS INFORMATION	
Shear wall dimension (Length and thickness) Yes ☐ No ☐	Shear wall vertical reinforcement, number of layers and spacing specified Yes ☐ No ☐
Shear wall horizontal reinforcing, number of layers and spacing specified Yes ☐ No ☐	Boundary elements specified and detailed, where required Yes ☐ No ☐

CONCRETE SHEAR WALL BUILDING (CONT.)

Shear wall foundation dimension (Length, width, and depth) Yes ☐ No ☐	Foundation longitudinal reinforcement specified Yes ☐ No ☐
Dowels to match shear wall longitudinal reinforcing size and spacing Yes ☐ No ☐	Foundation standard 90 degree hooks specified at bar ends (hoops at grade beams have 135 degree hooks) Yes ☐ No ☐
Foundation transverse reinforcement specified Yes ☐ No ☐	Shear wall reinforcing clear cover specified Yes ☐ No ☐
Clear cover of concrete elements exposed to earth specified Yes ☐ No ☐	

CONCRETE SHEAR WALL BUILDING (CONT.)

CONCRETE COLUMN GRAVITY SYSTEM	
Column dimensions Yes ☐ No ☐	Column vertical reinforcement specified Yes ☐ No ☐
Column ties and cross ties size and spacing specified Yes ☐ No ☐	Column clear cover specified Yes ☐ No ☐
Column ties have 135° hook specified Yes ☐ No ☐	Column vertical reinforcement specified (standard 90 degree hook at foundation) Yes ☐ No ☐
CONCRETE BEAM GRAVITY SYSTEM	
Beam dimensions specified Yes ☐ No ☐	Beam longitudinal reinforcement and splice locations specified Yes ☐ No ☐
Beam ties and cross ties size and spacing specified Yes ☐ No ☐	Beam clear cover specified Yes ☐ No ☐

CONCRETE SHEAR WALL BUILDING (CONT.)

CONCRETE DIAPHRAGM (floor and roof slab)	
Slab structural calculations (gravity and lateral loads) Yes ☐ No ☐	Slab span direction specified Yes ☐ No ☐
Slab system specified (i.e. one-way, two-way, purlin and girder) Yes ☐ No ☐	Slab thickness, reinforcement, and splice locations specified Yes ☐ No ☐
Slab camber dimension specified (if needed) Yes ☐ No ☐	Slab clear cover specified (top and bottom bars) Yes ☐ No ☐

CONCRETE SHEAR WALL BUILDING (CONT.)

LIGHT FRAMED ROOF SYSTEM	
Bearing plate connection for roof framing specified Yes ☐ No ☐	Bearing plate dimension specified Yes ☐ No ☐
Bearing plate bolt material, size and configuration specified Yes ☐ No ☐	Truss member material, sizes, and configuration specified Yes ☐ No ☐
Truss member welding strength, size, type (symbol), and length specified Yes ☐ No ☐	Connection from purlin to wall or concrete beam specified Yes ☐ No ☐
Truss bracing system and connections specified Yes ☐ No ☐	Purlins size and type specified Yes ☐ No ☐
Purlins spacing specified Yes ☐ No ☐	Sheet metal roofing size, type, and thickness specified Yes ☐ No ☐
Metal roofing screw size, type and spacing specified Yes ☐ No ☐	

MASONRY SHEAR WALL BUILDING

Structural Drawing and Calculation Check List for masonry shear wall building	
STRUCTURAL DESIGN CRITERIA	
Design Codes referenced Yes ☐ No ☐	Gravity loads (Superimposed Dead and Live) Indicated. Yes ☐ No ☐
Wind design information (Wind Speed, Exposure, Risk Category and Coefficents in accordance to ASCE 7-98 to ASCE 7-05, IBC 2009) Yes ☐ No ☐	Seismic design information (Ss, S1, Sds, Sd1, Soil Classification, Seismic Design Category, Lateral Force Resisting System in accordance to ASCE 7-05, IBC 2009) Yes ☐ No ☐
MATERIAL STRENGTH	
Concrete compressive strength specifications Yes ☐ No ☐	Reinforcing steel specifications (Strength and type; e.g. ASTM A706 for bars to be welded and at boundary elements of SRMSW). Yes ☐ No ☐
Mortar specifications (strength and type) Yes ☐ No ☐	Masonry block compressive strength specifications Yes ☐ No ☐
Grout compressive strength specifications Yes ☐ No ☐	Masonry block shear wall (solid/partially grouted and wall design compressive strength, f'm) Yes ☐ N/A ☐

MASONRY SHEAR WALL BUILDING (CONT.)

GEOTECHNICAL INFORMATION	
Lateral soil bearing pressure (Active, Passive, and Coefficent of Friction) Yes ☐ No ☐	Allowable soil bearing pressure combinations including dead, live and lateral load Yes ☐ No ☐
Foundation type indicated Yes ☐ No ☐	Foundation configuration and dimensions indicated Yes ☐ No ☐
MASONRY SHEAR WALL ELEMENTS AND DETAILS	
Masonry wall dimension (Length and thickness) Yes ☐ No ☐	Masonry wall vertical reinforcement and spacing specified Yes ☐ No ☐
Masonry wall horizontal reinforcing and spacing specified Yes ☐ No ☐	Grouted cells specified (Spacing vertical and horizontal or solid grouted) Yes ☐ No ☐
Masonry wall foundation dimension (Length, width, and depth) Yes ☐ No ☐	Masonry wall foundation longitudinal reinforcement specified Yes ☐ No ☐
Masonry wall foundation transverse reinforcement specified Yes ☐ No ☐	Masonry wall foundation standard 90 hooks specified at dowels (size and spacing to match vertical reinforcing) Yes ☐ No ☐

MASONRY SHEAR WALL BUILDING (CONT.)

CONCRETE COLUMN GRAVITY SYSTEM	
Column dimensions Yes ☐ No ☐	Column vertical reinforcement specified Yes ☐ No ☐
Column ties and cross ties size and spacing specified Yes ☐ No ☐	Column clear cover specified Yes ☐ No ☐
Column ties have 135° hook specified Yes ☐ No ☐	Column vertical reinforcement standard 90 degree hooks specified at dowels (size and spacing to match vertical reinforcing) Yes ☐ No ☐
CONCRETE BEAM GRAVITY SYSTEM	
Beam tie, cross ties size and spacing specified Yes ☐ No ☐	Beam longitudinal reinforcement and splice locations specified Yes ☐ No ☐
Beam dimensions Yes ☐ No ☐	Beam clear cover specified Yes ☐ No ☐

MASONRY SHEAR WALL BUILDING (CONT.)

CONCRETE DIAPHRAGM (floor and roof slab)	
Slab structural calculations (gravity and lateral loads) Yes ☐ No ☐	Slab span direction specified Yes ☐ No ☐
Slab system specified (i.e. one-way, two-way, purlin and girder) Yes ☐ No ☐	Slab thickness, reinforcement, and splice locations specified Yes ☐ No ☐
Slab camber dimension specified (if needed) Yes ☐ No ☐	Slab clear cover specified (top and bottom bars) Yes ☐ No ☐

MASONRY SHEAR WALL BUILDING (CONT.)

LIGHT FRAMED ROOF SYSTEM	
Bearing plate connection for roof framing specified Yes ☐ No ☐	Bearing plate dimension specified Yes ☐ No ☐
Bearing plate bolt material, size and configuration specified Yes ☐ No ☐	Truss member material, sizes, and configuration specified Yes ☐ No ☐
Truss member welding strength, size, type (symbol), and length specified Yes ☐ No ☐	Connection from purlin to wall or concrete beam specified Yes ☐ No ☐
Truss bracing system and connections specified Yes ☐ No ☐	Purlins size and type specified Yes ☐ No ☐
Purlins spacing specified Yes ☐ No ☐	Sheet metal roofing size, type, and thickness specified Yes ☐ No ☐
Metal roofing screw size, type and spacing specified Yes ☐ No ☐	

CONCRETE MOMENT FRAME BUILDING

Structural Drawing and Calculation Check List for Concrete Moment Frame building	
STRUCTURAL DESIGN CRITERIA	
Design Codes referenced Yes ☐ No ☐	Gravity loads (Superimposed Dead and Live) Indicated. Yes ☐ No ☐
Wind design information (Wind Speed, Exposure, Risk Category and Coefficents in accordance to ASCE 7-98 to ASCE 7-05, IBC 2009) Yes ☐ No ☐	Seismic design information (Ss, S1, Sds, Sd1, Soil Classification, Seismic Design Category, Lateral Force Resisting System in accordance to ASCE 7-05, IBC 2009) Yes ☐ No ☐
MATERIAL STRENGTH	
Concrete compressive strength specifications Yes ☐ No ☐	Reinforcing steel specifications (Strength and type; e.g. ASTM A706 for bars to be welded and at SRCMF). Yes ☐ No ☐
Mortar specifications (strength and type) Yes ☐ No ☐	Masonry block compressive strength specifications Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

GEOTECHNICAL INFORMATION	
Lateral soil bearing pressure (Active, Passive, and Coefficent of Friction) Yes ☐ No ☐	Allowable soil bearing pressure combinations including dead, live and lateral load Yes ☐ No ☐
Foundation type indicated Yes ☐ No ☐	Foundation configuration and dimensions indicated Yes ☐ No ☐
SPECIAL MOMENT RESISTING FRAMES ELEMENTS (Concrete)	
Column dimensions Yes ☐ No ☐	Column vertical reinforcement and location of splices specified Yes ☐ No ☐
Ties/Hoops continue through column at foundation, floor, and roof levels. Yes ☐ No ☐	Column vertical bar standard 90 degree hooks specified at dowels to foundation. Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

Foundation dimension (Length, width, and depth) Yes ☐ No ☐	Foundation reinforcement specified (typically top and bottom at frame lines) Yes ☐ No ☐
Foundation standard 90 degree hooks specified at bar ends Yes ☐ No ☐	Column ties/hoops and cross ties size and spacing specified Yes ☐ No ☐
Column ties/hoops have 135° hooks specified Yes ☐ No ☐	Column clear cover specified Yes ☐ No ☐
Beam dimensions Yes ☐ No ☐	Distance of first ties from end of beam (at column) Yes ☐ No ☐
Beam longitudinal reinforcement specified Yes ☐ No ☐	Beam longitudinal bar standard 90 degree hooks or bar terminator shown at exterior and corner beam/column joints Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

Beam ties/hoops and cross ties spacing specified Yes ☐ No ☐	Beam longitudinal reinforcement lap splice location illustrated Yes ☐ No ☐
Gap between non-structural masonry wall and column or slab specified Yes ☐ No ☐	Gap between non-structural masonry wall and beam specified Yes ☐ No ☐
Strong column and weak beam check Yes ☐ No ☐	Drift check Yes ☐ No ☐
Location of rebar splices in SRCMF columns specified Yes ☐ No ☐	Location of rebar splices in SRCMF beams specified Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

CONCRETE COLUMN GRAVITY SYSTEM	
Column dimensions Yes ☐ No ☐	Column vertical reinforcement specified Yes ☐ No ☐
Column ties and cross ties size and spacing specified Yes ☐ No ☐	Column clear cover specified Yes ☐ No ☐
Column ties have 135° hook specified Yes ☐ No ☐	
CONCRETE BEAM GRAVITY SYSTEM	
Beam dimensions Yes ☐ No ☐	Beam longitudinal reinforcement and splice locations specified Yes ☐ No ☐
Beam ties and cross ties size and spacing specified Yes ☐ No ☐	Beam clear cover specified Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

CONCRETE DIAPHRAGM (floor and roof slab)	
Slab structural calculations (gravity and lateral loads) Yes ☐ No ☐	Slab span direction specified Yes ☐ No ☐
Slab system specified (i.e. one-way, two-way, purlin and girder) Yes ☐ No ☐	Slab thickness, reinforcement, and splice locations specified Yes ☐ No ☐
Slab camber dimension specified (if needed) Yes ☐ No ☐	Slab clear cover specified (top and bottom bars) Yes ☐ No ☐
LIGHT FRAMED ROOF SYSTEM	
Bearing plate for roof framing connection specified Yes ☐ No ☐	Bearing plate dimension specified Yes ☐ No ☐

CONCRETE MOMENT FRAME BUILDING (CONT.)

Bearing plate bolt material, size and configuration specified Yes ☐ No ☐	Truss member material, sizes, and configuration specified Yes ☐ No ☐
Truss member welding strength, size, type (symbol), and length specified Yes ☐ No ☐	Connection from purlin to wall or concrete beam specified Yes ☐ No ☐
Truss bracing system and connections specified Yes ☐ No ☐	Purlins size and type specified Yes ☐ No ☐
Purlins spacing specified Yes ☐ No ☐	Sheet metal roofing size, type, and thickness specified Yes ☐ No ☐
Metal roofing screw size, type and spacing specified Yes ☐ No ☐	

STEEL BRACED FRAME BUILDING

Structural Drawing and Calculation Check List for Steel Braced Frame building	
STRUCTURAL DESIGN CRITERIA	
Design Codes referenced Yes ☐ No ☐	Gravity loads (Dead and Live) Indicated. Yes ☐ No ☐
Wind design information (Wind Speed, Exposure, Risk Category and Coefficents in accordance to ASCE 7-98 to ASCE 7-05, IBC 2009) Yes ☐ No ☐	Seismic design information (Ss, S1, Sds, Sd1, Soil Classification, Seismic Design Category, Lateral Force Resisting System in accordance to ASCE 7-05, IBC 2009) Yes ☐ No ☐
Lateral Force Resisting System locations clearly identified on the plan Yes ☐ No ☐	

STEEL BRACED FRAME BUILDING (CONT.)

MATERIAL STRENGTH	
Concrete compressive strength specifications Yes ☐ No ☐	Reinforcing steel specifications (Strength and type; e.g. ASTM A706 for bars to be welded). Yes ☐ No ☐
Mortar specifications (strength and type) Yes ☐ No ☐	Masonry block compressive strength specifications Yes ☐ No ☐
Column and beam connection bolts specified Yes ☐ No ☐	Specification for steel shapes specified Yes ☐ No ☐
Braced Frame base plate anchor bolts specified Yes ☐ No ☐	Weld strength and type specified Yes ☐ No ☐
GEOTECHNICAL INFORMATION	
Lateral soil bearing pressure (Active, Passive, and Coefficent of Friction) Yes ☐ No ☐	Allowable soil bearing pressure combinations including dead, live and lateral load Yes ☐ No ☐

STEEL BRACED FRAME BUILDING (CONT.)

Foundation type indicated Yes ☐ No ☐	Foundation configuration and dimensions indicated Yes ☐ No ☐
BRACED FRAMES	
Steel column sizes and orientation specified Yes ☐ No ☐	Steel beam sizes specified Yes ☐ No ☐
Brace configuration illustrated (e.g. Chevron, X-Brace, Inverted Chevron, etc.) Yes ☐ No ☐	Brace Frame Type indicated (Special Concentric, Ordinary Concentric, Eccentric, Buckling Restrained) Yes ☐ No ☐
Foundation dimension (Length, width, depth) specified at columns (gravity and lateral) Yes ☐ No ☐	Foundation reinforcement specified (size, quantity, bottom, top and bottom at frame cols.) Yes ☐ No ☐
Foundation standard 90 degree hooks specified at bar ends Yes ☐ No ☐	Base plate dimension (Length, width and thickness) specified at gravity and braced frame cols. Yes ☐ No ☐

STEEL BRACED FRAME BUILDING (CONT.)

Base plate connection specified (anchor bolt size, quantity, depth, weld washers at braced frames, headed anchors with plate washers or channels) Yes ☐ No ☐	Gusset plate dimension specified (minimum height and length, thickness, bend line at SCBF) Yes ☐ No ☐
Gusset connection specified (minimum weld length; size, quantity, and configuration of bolts, if used) Yes ☐ No ☐	Bolt material specified (anchor bolts, beam/column connection bolts, slip critical at collector elements) Yes ☐ No ☐
Brace Frame connections designed per building code requirements specified Yes ☐ No ☐	Welding strength, type, size and length specified at braced frame column splices and column to base plate Yes ☐ No ☐
Elevations to indicate protected zones along brace, beam, and at connection included Yes ☐ No ☐	Zipper columns provided at SCBF, or beams check for unbalanced brace load for Chevron configuration Yes ☐ No ☐

STEEL BRACED FRAME BUILDING (CONT.)

STEEL COLUMN GRAVITY SYSTEM	
Steel column sizes and orientation specified Yes ☐ No ☐	Base plate connection specified (anchor bolt size, quantity, depth) Yes ☐ No ☐
Beam to column connection specified (plate thickness, bolt size and quantity, weld size and length. Slip critical bolts required at collectors). Yes ☐ No ☐	Welding type, size and length specified at gravity column splices and column to base plate Yes ☐ No ☐
Column splice location indicated and splice is detailed Yes ☐ No ☐	
STEEL BEAM GRAVITY SYSTEM	
Steel beam sizes specified Yes ☐ No ☐	Beam to beam and beam to column connections detailed, including welding strength, type, size and length specified; configuration, quantity, size and type of bolts; plate thickness and dimensions. Yes ☐ No ☐

STEEL BRACED FRAME BUILDING (CONT.)

FLOOR/ ROOF DECK SLAB DIAPHRAGM	
Design method specified (i.e. composite or non-composite) Yes ☐ No ☐	Deck type specified Yes ☐ No ☐
Deck gage specified Yes ☐ No ☐	Concrete slab thickness, type (NWC or LWC) and reinforcement specified Yes ☐ No ☐
Details for openings in metal deck, connection of metal deck to beams, exterior beam conditions with bent plate. Yes ☐ No ☐	Welded Headed Stud specified (if used) Yes ☐ No ☐
Deck span and orientation specified Yes ☐ No ☐	Connectors at side lap specified (type and spacing) Yes ☐ No ☐
Connectors at support specified (type and spacing, welds or mechanical fasteners with ICC-ER reports documenting capacities) Yes ☐ No ☐	Power-driven fasteners specified (if used) Yes ☐ No ☐
Welds at supports and along collector elements specified Yes ☐ No ☐	Support member and thickness specified Yes ☐ No ☐

CONFINED MASONRY BUILDING

Structural Drawing and Calculation Check List for confined masonry building	
STRUCTURAL DESIGN CRITERIA	
Design Codes or Guideline referenced Yes ☐ No ☐	Does the occupancy type and maximum size/number of stories comply with limits of the Guideline? Yes ☐ No ☐
MATERIAL STRENGTH	
Concrete compressive strength specifications meet the Guideline. Yes ☐ No ☐	Reinforcing steel bar size and specifications meet the guideline Yes ☐ No ☐
Mortar specifications (strength and type) meet the Guideline Yes ☐ No ☐	Masonry block compressive strength specifications meet the Guideline Yes ☐ No ☐
Grout compressive strength specifications (if needed) meet the Guidleine Yes ☐ No ☐	Horizontal and vertical concrete bond beams and columns specified meet the Guideline (location and configuration; e.g. top of wall, corners, wall intersections, large window and door openings, verify maximum spacing along wall, horizontally and vertically) . Yes ☐ No ☐

CONFINED MASONRY BUILDING (CONT.)

GEOTECHNICAL INFORMATION	
Lateral soil bearing pressure (Active, Passive, and Coefficient of Friction) Yes ☐ No ☐	Allowable soil bearing pressure combinations including dead, live and lateral load Yes ☐ No ☐
Foundation type indicated meets minimum requirements of the Guideline. Yes ☐ No ☐	Foundation dimensions and reinforcement indicated meets minimum requirements of the Guideline. Yes ☐ No ☐
MASONRY WALL ELEMENTS AND DETAILS	
Masonry wall dimension (Length, height and thickness) specified with sizes and locations of all openings. Yes ☐ No ☐	Seismic strip (bond beam) under window ledge specified meets minimum requirements of the Guideline. Yes ☐ No ☐
Seismic strip (bond beam) at lintel level specified meets minimum requirements of the Guideline. Yes ☐ No ☐	Minimum reinforcement specified for masonry wall openings (door and window) Yes ☐ No ☐

CONFINED MASONRY BUILDING (CONT.)

Masonry wall foundation dimension (Length, width, and depth) meets minimum requirements of the Guideline. Yes ☐ No ☐	Masonry wall foundation longitudinal reinforcement specified meets minimum requirements of the Guideline. Yes ☐ No ☐
Masonry wall foundation transverse reinforcement specified meets minimum requirements of the Guideline. Yes ☐ No ☐	Masonry wall foundation has standard hooks at ends of dowels and connection details meet minimum requirements of the Guideline. Yes ☐ No ☐
CONCRETE COLUMN	
Column dimensions Yes ☐ No ☐	Column vertical reinforcement specified Yes ☐ No ☐
Column ties and cross ties size and spacing specified Yes ☐ No ☐	Column clear cover specified Yes ☐ No ☐

CONFINED MASONRY BUILDING (CONT.)

Column ties have 135° hook specified Yes ☐ No ☐	Column connection with bond beam and strip reinforcement specified Yes ☐ No ☐
Connection detail of concrete column to foundation specified Yes ☐ No ☐	Column vertical bar standard 90 degree hook specified at dowels to foundation. Yes ☐ No ☐
CONCRETE BOND BEAM	
Bond beam dimension Yes ☐ No ☐	Bond beam longitudinal reinforcement and connection specified Yes ☐ No ☐
Bond beam tie size and spacing specified Yes ☐ No ☐	Bond beam clear cover specified Yes ☐ No ☐
Bond beam reinforcing at corners specified Yes ☐ No ☐	

CONFINED MASONRY BUILDING (CONT.)

CONCRETE DIAPHRAGM (floor and roof slab)	
Slab structural calculations (gravity and lateral loads) Yes ☐ No ☐	Slab span direction specified Yes ☐ No ☐
Slab system specified (i.e. one-way, two-way, purlin and girder) Yes ☐ No ☐	Slab thickness, reinforcement, and splice locations specified Yes ☐ No ☐
Slab camber dimension specified (if needed) Yes ☐ No ☐	Slab clear cover specified (top and bottom bars) Yes ☐ No ☐

CONFINED MASONRY BUILDING (CONT.)

LIGHT FRAMED ROOF SYSTEM	
Roof system specified with framing plan, indicating sizes of all members. Yes ☐ No ☐	Truss member material, sizes, and configuration specified (if applicable) Yes ☐ No ☐
Truss member welding strength, size, type (symbol), and length specified (if applicable) Yes ☐ No ☐	Connection from purlin or truss to wall or concrete bond beam specified Yes ☐ No ☐
Truss bracing system and connections specified Yes ☐ No ☐	Purlins size and type specified Yes ☐ No ☐
Purlins spacing specified Yes ☐ No ☐	Sheet metal size, type, and thickness specified Yes ☐ No ☐
Metal screw or nail size and spacing specified Yes ☐ No ☐	

I hereby certify the plans, calculations and specifications include all the information marked on this checklist.

Name _____

Municipality _____

Signature _____Date _____

THANK YOU!

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STRUCTURAL DRAWINGS

May 2020

miyamoto. EARTHQUAKE + STRUCTURAL ENGINEERS

STRUCTURAL CONSTRUCTION DOCUMENTS

Structural construction documents is a set of plans and specifications that indicates how a building structure will be built. It includes

- Foundation plan and dimensions
- Framing plans and details
- Moment frame, braced frame, or shear wall elevations
- Wall sections

STRUCTURAL CONSTRUCTION DOCUMENTS (CONT.)

- Structural drawings are generally prepared by registered professional engineers, and based on information provided by architectural drawings.
- The structural drawings are primarily concerned with the load-carrying members of a structure. They outline the dimension and types of materials to be used, as well as the general demands for connections.

STRUCTURAL CONSTRUCTION DOCUMENTS (CONT.)

- The structural drawings communicate the design of the building's structure to the building authority for review.
- Structural drawings are also included with a proposed building's contract documents, which guide contractors in detailing, fabricating, and installing parts of the structure.

STRUCTURAL CONSTRUCTION DOCUMENTS (CONT.)

Note: The structural drawings do not address architectural or MEP details such as

- Surface finishes
- Partition walls or,
- Mechanical systems.

STRUCTURAL DRAWING SET

The structural drawing set has different subsets:

- General Notes
- Typical details
- Plans
- Elevations
- Sections and Details

GENERAL NOTES

General Notes are part of structural drawing set and they cover the codes used in design and typical standards of the building. Typically there are no details on these sections. Structural notes provide information regarding general material properties (steel or wood grade, concrete strength, etc.) or construction requirements (soil compaction, weld procedures, etc.). The structural notes also provide information about design criteria (gravity , seismic, and wind loading)

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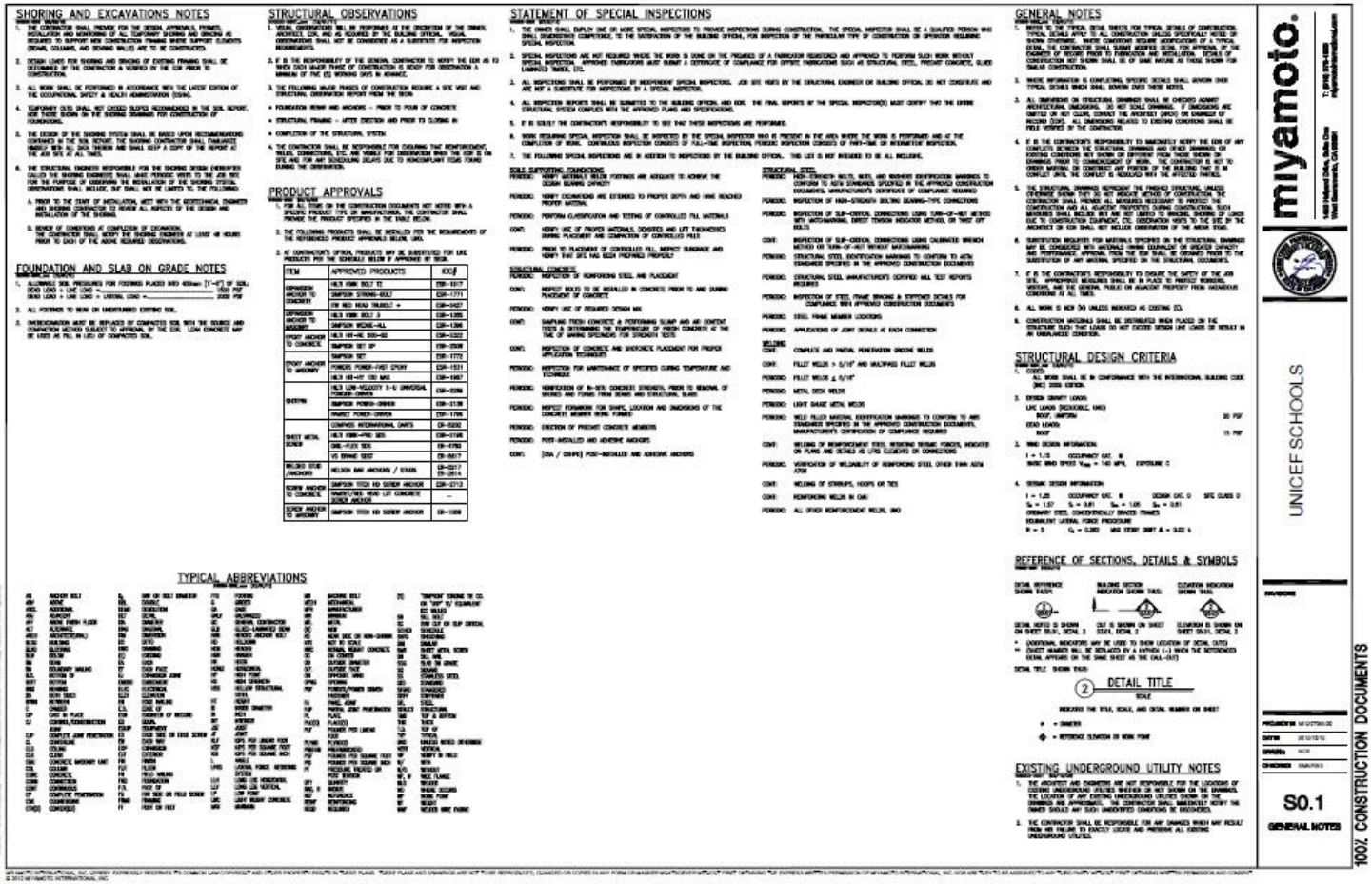
GENERAL NOTES OVERALL PLAN SHEET



SHORING AND EXCAVATIONS NOTES

STRUCTURAL OBSERVATIONS

STATEMENT OF SPECIAL INSPECTIONS

GENERAL NOTES

FOUNDATION AND SLAB ON GRADE NOTES

PRODUCT APPROVALS

STRUCTURAL DESIGN CRITERIA

TYPICAL ABBREVIATIONS

REFERENCE OF SECTIONS, DETAILS & SYMBOLS

EXISTING UNDERGROUND UTILITY NOTES

miyamoto.

UNICEF SCHOOLS

100% CONSTRUCTION DOCUMENTS

S0.1

GENERAL NOTES

GENERAL NOTES- Acceptable construction materials and products

PRODUCT APPROVALS

010000-0006 (03/15/09)

1. FOR ALL ITEMS ON THE CONSTRUCTION DOCUMENTS NOT NOTED WITH A SPECIFIC PRODUCT TYPE OR MANUFACTURER, THE CONTRACTOR SHALL PROVIDE THE PRODUCT SPECIFIED IN THE TABLE BELOW.
2. THE FOLLOWING PRODUCTS SHALL BE INSTALLED PER THE REQUIREMENTS OF THE REFERENCED PRODUCT APPROVALS BELOW, UNO.
3. AT CONTRACTOR'S OPTION, PRODUCTS MAY BE SUBSTITUTED FOR LIKE PRODUCTS PER THE SCHEDULE BELOW IF APPROVED BY SEOR.

ITEM	APPROVED PRODUCTS	ICC#
EXPANSION ANCHOR TO CONCRETE	HILTI KWIK BOLT TZ	ESR-1917
	SIMPSON STRONG-BOLT	ESR-1771
	ITW RED HEAD TRUBOLT +	ESR-2427
EXPANSION ANCHOR TO MASONRY	HILTI KWIK BOLT 3	ESR-1385
	SIMPSON WEDGE-ALL	ESR-1396
EPOXY ANCHOR TO CONCRETE	HILTI HIT-RE 500-SD	ESR-2322
	SIMPSON SET XP	ESR-2508
EPOXY ANCHOR TO MASONRY	SIMPSON SET	ESR-1772
	POWERS POWER-FAST EPOXY	ESR-1531
	HILTI HIT-HY 150 MAX	ESR-1967
SHOTPIN	HILTI LOW-VELOCITY X-U UNIVERSAL POWDER-DRIVEN	ESR-2269
	SIMPSON POWER-DRIVEN	ESR-2138
	RAMSET POWER-DRIVEN	ESR-1799
SHEET METAL SCREW	COMPASS INTERNATIONAL DARTS	ER-5202
	HILTI KWIK-PRO SDS	ESR-2196
	DRIL-FLEX SDS	ER-4780
	VS BRAND SDST	ER-5617
WELDED STUD /ANCHORS	NELSON BAR ANCHORS / STUDS	ER-5217 ER-2614
SCREW ANCHOR TO CONCRETE	SIMPSON TITEN HD SCREW ANCHOR	ESR-2713
	RAMSET/RED HEAD LDT CONCRETE SCREW ANCHOR	-
SCREW ANCHOR TO MASONRY	SIMPSON TITEN HD SCREW ANCHOR	ER-1056

GENERAL NOTES- Specified material strengths, related construction standards and quality requirements

STRUCTURAL CONCRETE NOTES

033100-0000 [03/08/13]

1. CONCRETE SHALL BE MIXED, PLACED AND CURED IN ACCORDANCE WITH ACI 318 AND ACI 301 LATEST EDITION, AND PROJECT SPECIFICATIONS.

2. CONCRETE SHALL NOT BE DROPPED THROUGH REINFORCING STEEL (AS IN WALLS) SO AS TO CAUSE SEGREGATION OF AGGREGATES. IN SUCH CASES, HOPPERS AND VERTICAL CHUTES OR TRUNKS SHALL BE USED. CHUTES OR TRUNKS SHALL BE OF VARIABLE LENGTHS SO THAT FREE UNCONFINED FALL OF CONCRETE SHALL NOT EXCEED SIX FEET. A SUFFICIENT NUMBER OF CHUTES OR TRUNKS SHALL BE USED TO ENSURE THE CONCRETE IS KEPT LEVEL AT ALL TIMES.

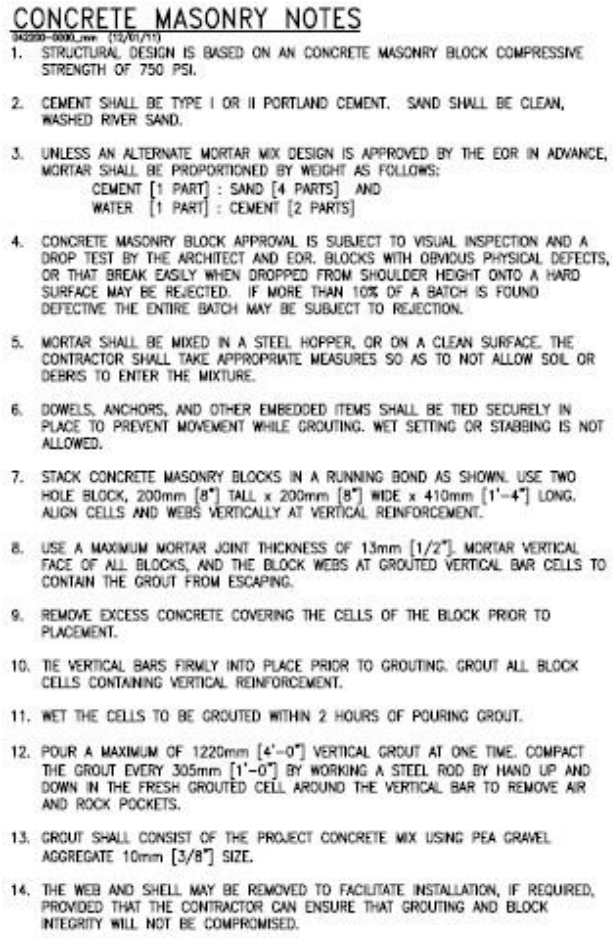
3. CONSTRUCTION JOINTS SHALL BE CLEANED AND ROUGHENED BY REMOVING THE ENTIRE SURFACE TO EXPOSE CLEAN AGGREGATE SOLIDLY EMBEDDED IN THE MORTAR MATRIX. SEE PLANS AND DETAILS FOR LOCATION AND TYPE OF CONSTRUCTION JOINT. LOCATIONS OF ADDITIONAL CONSTRUCTION JOINTS NOT SHOWN ON THESE PLANS SHALL BE SUBMITTED FOR APPROVAL TO THE EOR PRIOR TO PLACING ANY CONCRETE.

4. STRUCTURAL CONCRETE SHALL MEET THE FOLLOWING DESIGN CRITERIA:

LOCATION	MIN 28-DAY COMP STRENGTH	CONC TYPE [a]	MAX AGGREGATE SIZE	MAX W/C [d] RATIO	MAX SLUMP [b]
FOUNDATIONS, SLAB ON GRADE, WALLS	3000 PSI	NWC	1"	0.50 [c]	4"

a. MAXIMUM DRY WEIGHT OF LIGHTWEIGHT CONCRETE SHALL BE 115 PCF, UNLESS APPROVED BY EOR.
b. SLUMP MEASURED PRIOR TO SUPERPLASTICIZER, WHERE OCCURS.
c. UNLESS NOTED OTHERWISE, REFER TO ITEM #15 BELOW.
d. WATER TO CEMENTITIOUS MATERIALS RATIO.

GENERAL NOTES – Specified material strengths, related construction standards and quality requirements



CONCRETE MASONRY NOTES

1. STRUCTURAL DESIGN IS BASED ON AN CONCRETE MASONRY BLOCK COMPRESSIVE STRENGTH OF 750 PSI.
2. CEMENT SHALL BE TYPE I OR II PORTLAND CEMENT. SAND SHALL BE CLEAN, WASHED RIVER SAND.
3. UNLESS AN ALTERNATE MORTAR MIX DESIGN IS APPROVED BY THE EOR IN ADVANCE, MORTAR SHALL BE PROPORTIONED BY WEIGHT AS FOLLOWS:
   CEMENT [1 PART] : SAND [4 PARTS] AND
   WATER [1 PART] : CEMENT [2 PARTS]
4. CONCRETE MASONRY BLOCK APPROVAL IS SUBJECT TO VISUAL INSPECTION AND A DROP TEST BY THE ARCHITECT AND EOR. BLOCKS WITH OBVIOUS PHYSICAL DEFECTS, OR THAT BREAK EASILY WHEN DROPPED FROM SHOULDER HEIGHT ONTO A HARD SURFACE MAY BE REJECTED. IF MORE THAN 10% OF A BATCH IS FOUND DEFECTIVE THE ENTIRE BATCH MAY BE SUBJECT TO REJECTION.
5. MORTAR SHALL BE MIXED IN A STEEL HOPPER, OR ON A CLEAN SURFACE. THE CONTRACTOR SHALL TAKE APPROPRIATE MEASURES SO AS TO NOT ALLOW SOIL OR DEBRIS TO ENTER THE MIXTURE.
6. DOWELS, ANCHORS, AND OTHER EMBEDDED ITEMS SHALL BE TIED SECURELY IN PLACE TO PREVENT MOVEMENT WHILE GROUTING. WET SETTING OR STABBING IS NOT ALLOWED.
7. STACK CONCRETE MASONRY BLOCKS IN A RUNNING BOND AS SHOWN. USE TWO HOLE BLOCK, 200mm [8"] TALL x 200mm [8"] WIDE x 410mm [1'-4"] LONG. ALIGN CELLS AND WEBS VERTICALLY AT VERTICAL REINFORCEMENT.
8. USE A MAXIMUM MORTAR JOINT THICKNESS OF 13mm [1/2"]. MORTAR VERTICAL FACE OF ALL BLOCKS, AND THE BLOCK WEBS AT GROUTED VERTICAL BAR CELLS TO CONTAIN THE GROUT FROM ESCAPING.
9. REMOVE EXCESS CONCRETE COVERING THE CELLS OF THE BLOCK PRIOR TO PLACEMENT.
10. TIE VERTICAL BARS FIRMLY INTO PLACE PRIOR TO GROUTING. GROUT ALL BLOCK CELLS CONTAINING VERTICAL REINFORCEMENT.
11. WET THE CELLS TO BE GROUTED WITHIN 2 HOURS OF POURING GROUT.
12. POUR A MAXIMUM OF 1220mm [4'-0"] VERTICAL GROUT AT ONE TIME. COMPACT THE GROUT EVERY 305mm [1'-0"] BY WORKING A STEEL ROD BY HAND UP AND DOWN IN THE FRESH GROUTED CELL AROUND THE VERTICAL BAR TO REMOVE AIR AND ROCK POCKETS.
13. GROUT SHALL CONSIST OF THE PROJECT CONCRETE MIX USING PEA GRAVEL AGGREGATE 10mm [3/8"] SIZE.
14. THE WEB AND SHELL MAY BE REMOVED TO FACILITATE INSTALLATION, IF REQUIRED, PROVIDED THAT THE CONTRACTOR CAN ENSURE THAT GROUTING AND BLOCK INTEGRITY WILL NOT BE COMPROMISED.

GENERAL NOTES – Specified material strengths, related construction standards and quality requirements

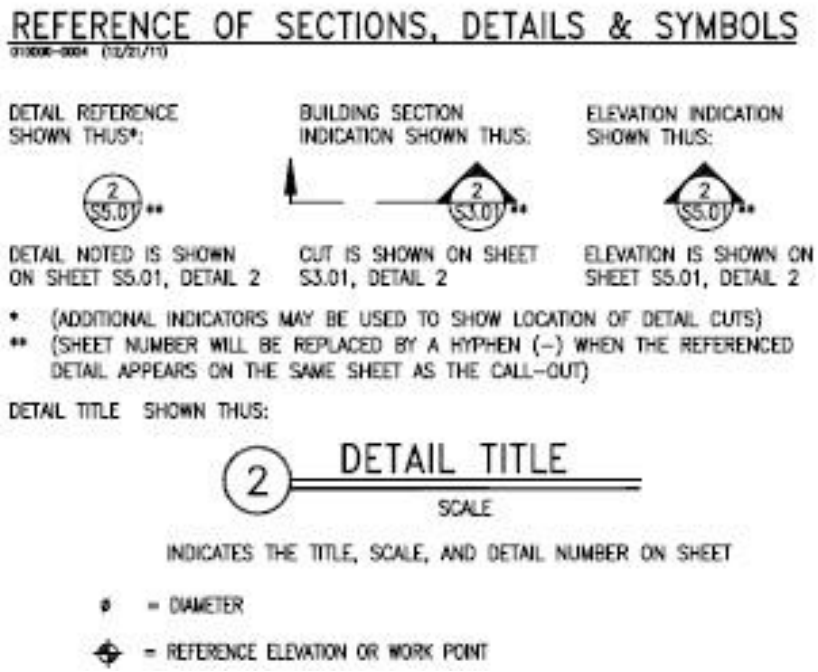
REINFORCING STEEL NOTES

1. REINFORCING STEEL FOR CONCRETE OR MASONRY SHALL CONSIST OF DEFORMED BARS:
   - A. #3 AND #4 BARS.....ASTM A615, GRADE 40
   - B. #5 BARS AND GREATER.....ASTM A615, GRADE 60
2. MAINTAIN MINIMUM CONCRETE COVER FROM FACE OF CONCRETE TO EDGE OF ALL REINFORCEMENT AS FOLLOWS (UNO):

CONDITION	COVER
CONCRETE POURED AGAINST EARTH	75mm [3"]
CONCRETE POURED IN FORMS AND EXPOSED TO WEATHER OR EARTH	
– #6 BARS AND LARGER	50mm [2"]
– #5 BARS AND SMALLER	40mm [1 1/2"]
INTERIOR COLUMNS AND BEAMS	25mm [1"]
INTERIOR WALL FACES AND RAISED SLABS	40mm [1 1/2"]
STRUCTURAL SLABS ON GRADE	
– FROM BOTTOM OF SLAB	50mm [2"]
– FROM TOP OF SLAB	40mm [1 1/2"]
OTHER CONCRETE NOT EXPOSED TO WEATHER OR EARTH FOR #11 BARS AND SMALLER	20mm [3/4"]

PROVIDE THE LARGEST COVER REQUIRED FOR ALL APPLICABLE CONDITIONS. WHERE #3 STIRRUPS OR TIES ARE USED, ENSURE THAT THE COVER FOR LONGITUDINAL BARS IS ADEQUATE.

GENERAL NOTES – Section and detail Reference



GENERAL NOTES – Design Criteria

STRUCTURAL DESIGN CRITERIA

010000-0001.mw (12/01/11)

1. CODES:
   ALL WORK SHALL BE IN CONFORMANCE WITH THE INTERNATIONAL BUILDING CODE (IBC) 2009 EDITION.

2. DESIGN GRAVITY LOADS:
   LIVE LOADS (REDUCIBLE, UNO)
   ROOF, UNIFORM 20 PSF
   DEAD LOADS:
   ROOF 15 PSF

3. WIND DESIGN INFORMATION:
   I = 1.15 OCCUPANCY CAT. II
   BASIC WIND SPEED V_{1700} = 145 MPH, EXPOSURE C

4. SEISMIC DESIGN INFORMATION:
   I = 1.25 OCCUPANCY CAT. II DESIGN CAT. D SITE CLASS D
   S_S = 1.57 S_1 = 0.61 S_{DS} = 1.05 S_{D1} = 0.61
   ORDINARY STEEL CONCENTRICALLY BRACED FRAMES
   EQUIVALENT LATERAL FORCE PROCEDURE
   R = 5 C_S = 0.262 MAX STORY DRIFT Δ = 0.02 h

GENERAL NOTES- REQUIRED INSPECTIONS

5. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO SEE THAT THESE INSPECTIONS ARE PERFORMED.

6. WORK REQUIRING SPECIAL INSPECTION SHALL BE INSPECTED BY THE SPECIAL INSPECTOR WHO IS PRESENT IN THE AREA WHERE THE WORK IS PERFORMED AND AT THE COMPLETION OF WORK. CONTINUOUS INSPECTION CONSISTS OF FULL-TIME INSPECTION; PERIODIC INSPECTION CONSISTS OF PART-TIME OR INTERMITTENT INSPECTION.

7. THE FOLLOWING SPECIAL INSPECTIONS ARE IN ADDITION TO INSPECTIONS BY THE BUILDING OFFICIAL. THIS LIST IS NOT INTENDED TO BE ALL INCLUSIVE.

SOILS SUPPORTING FOUNDATIONS

PERIODIC:	VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY
PERIODIC:	VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL
PERIODIC:	PERFORM CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS
CONT:	VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF CONTROLLED FILLS
PERIODIC:	PRIOR TO PLACEMENT OF CONTROLLED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY

STRUCTURAL CONCRETE

PERIODIC:	INSPECTION OF REINFORCING STEEL AND PLACEMENT
CONT:	INSPECT BOLTS TO BE INSTALLED IN CONCRETE PRIOR TO AND DURING PLACEMENT OF CONCRETE
PERIODIC:	VERIFY USE OF REQUIRED DESIGN MIX
CONT:	SAMPLING FRESH CONCRETE & PERFORMING SLUMP AND AIR CONTENT TESTS & DETERMINING THE TEMPERATURE OF FRESH CONCRETE AT THE TIME OF MAKING SPECIMENS FOR STRENGTH TESTS
CONT:	INSPECTION OF CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES
PERIODIC:	INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUE
PERIODIC:	VERIFICATION OF IN-SITU CONCRETE STRENGTH, PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS
PERIODIC:	INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED
PERIODIC:	ERECTION OF PRECAST CONCRETE MEMBERS
PERIODIC:	POST-INSTALLED AND ADHESIVE ANCHORS
CONT:	[DSA / OSHPD] POST-INSTALLED AND ADHESIVE ANCHORS

STRUCTURAL STEEL

PERIODIC:	HIGH-STRENGTH BOLTS, NUTS, AND WASHERS IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS, MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED
PERIODIC:	INSPECTION OF HIGH-STRENGTH BOLTING BEARING-TYPE CONNECTIONS
PERIODIC:	INSPECTION OF SLIP-CRITICAL CONNECTIONS USING TURN-OF-NUT METHOD WITH MATCHMARKING, DIRECT TENSION INDICATOR METHOD, OR TWIST OFF BOLTS
CONT:	INSPECTION OF SLIP-CRITICAL CONNECTIONS USING CALIBRATED WRENCH METHOD OR TURN-OF-NUT WITHOUT MATCHMARKING
PERIODIC:	STRUCTURAL STEEL IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS
PERIODIC:	STRUCTURAL STEEL MANUFACTURER'S CERTIFIED MILL TEST REPORTS REQUIRED
PERIODIC:	INSPECTION OF STEEL FRAME BRACING & STIFFENER DETAILS FOR COMPLIANCE WITH APPROVED CONSTRUCTION DOCUMENTS
PERIODIC:	STEEL FRAME MEMBER LOCATIONS
PERIODIC:	APPLICATIONS OF JOINT DETAILS AT EACH CONNECTION

WELDING

CONT:	COMPLETE AND PARTIAL PENETRATION GROOVE WELDS
CONT:	FILLET WELDS > 5/16" AND MULTIPASS FILLET WELDS
PERIODIC:	FILLET WELDS ≤ 5/16"
PERIODIC:	METAL DECK WELDS
PERIODIC:	LIGHT GAUGE METAL WELDS
PERIODIC:	WELD FILLER MATERIAL IDENTIFICATION MARKINGS TO CONFORM TO AWS STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS, MANUFACTURER'S CERTIFICATION OF COMPLIANCE REQUIRED
CONT:	WELDING OF REINFORCEMENT STEEL RESISTING SEISMIC FORCES, INDICATED ON PLANS AND DETAILS AS LFRS ELEMENTS OR CONNECTIONS
PERIODIC:	VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A706
CONT:	WELDING OF STIRRUPS, HOOPS OR TIES
CONT:	REINFORCING WELDS IN CMU
PERIODIC:	ALL OTHER REINFORCEMENT WELDS, UNO

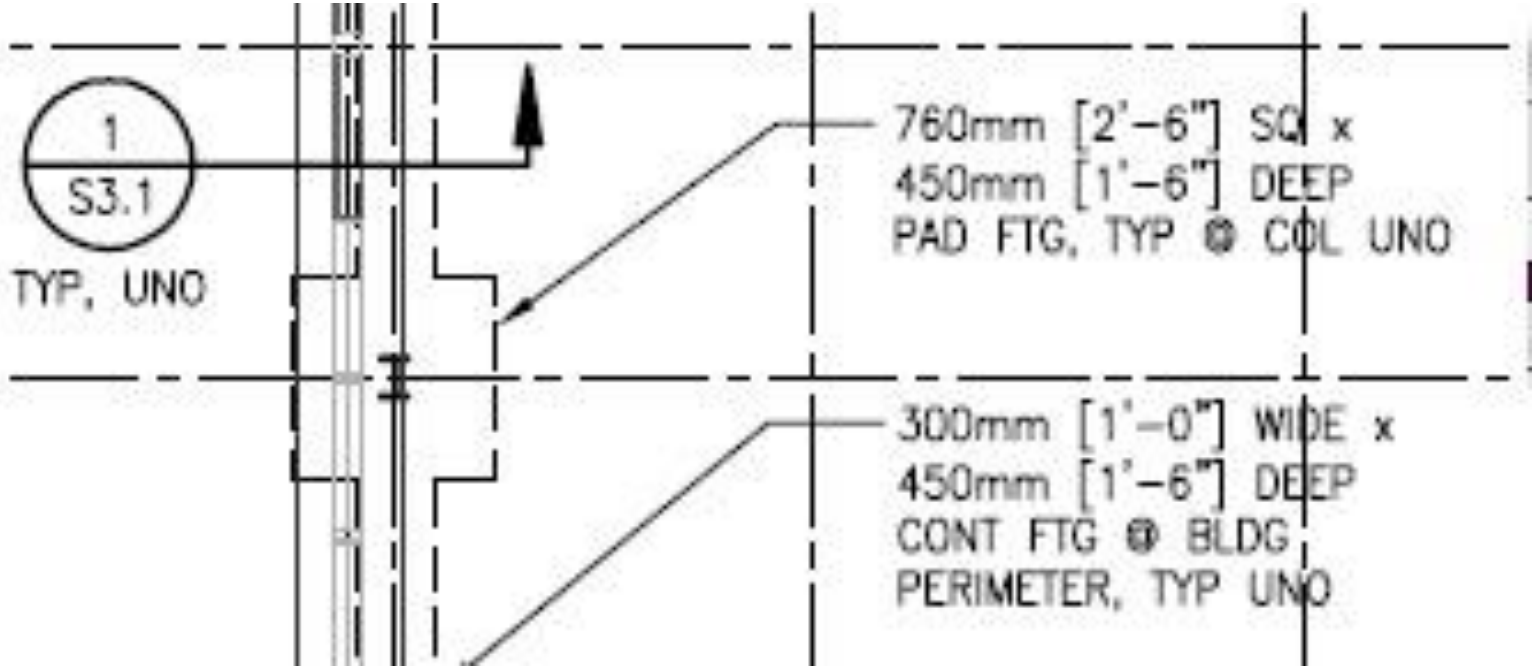
GENERAL NOTES - ABBREVIATIONS

TYPICAL ABBREVIATIONS

010000-0002_mm (12/01/11)

AB	ANCHOR BOLT
ABV	ABOVE
ADDL	ADDITIONAL
ADJ	ADJACENT
AFF	ABOVE FINISH FLOOR
ALT	ALTERNATE
ARCH	ARCHITECT(URAL)
BLDG	BUILDING
BLKG	BLOCKING
BLW	BELOW
BM	BEAM
BN	BOUNDARY NAILING
B.O.	BOTTOM OF
BOTT	BOTTOM
BRG	BEARING
BS	BOTH SIDES
BTWN	BETWEEN
C	CAMBER
CIP	CAST IN PLACE
CJ	CONTROL/CONSTRUCTION JOINT
CJP	COMPLETE JOINT PENETRATION
CL	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUOUS
CP	COMPLETE PENETRATION
CSK	COUNTERSINK
CTR(D)	CENTER(ED)
D_B	BAR OR BOLT DIAMETER
DBL	DOUBLE
DEMO	DEMOLITION
DET	DETAIL
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DO	DITTO
DWG	DRAWING
(E)	EXISTING
EA	EACH
EF	EACH FACE
EJ	EXPANSION JOINT
EMBED	EMBEDMENT
ELEC	ELECTRICAL
ELEV	ELEVATION
EN	EDGE NAILING
E.O.	EDGE OF
EOR	ENGINEER OF RECORD
EQ	EQUAL
EQUIP	EQUIPMENT
ES	EACH SIDE OR EDGE SCREW
EW	EACH WAY
EXP	EXPANSION
EXT	EXTERIOR
FIN	FINISH
FLR	FLOOR
FN	FIELD NAILING
FND	FOUNDATION
F.O.	FACE OF
FS	FAR SIDE OR FIELD SCREW
FRMG	FRAMING
FT	FOOT OR FEET
FTG	FOOTING
G	GIRDER
GA	GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GLB	GLUED-LAMINATED BEAM
HAB	HEADED ANCHOR BOLT
HD	HOLDOWN
HDR	HEADER
HGR	HANGER
HK	HOOK
HORIZ	HORIZONTAL
HP	HIGH POINT
HS	HIGH STRENGTH
HSS	HOLLOW STRUCTURAL STEEL
HT	HEIGHT
ID	INSIDE DIAMETER
IN	INCH
INT	INTERIOR
JST	JOIST
JT	JOINT
KLF	KIPS PER LINEAR FOOT
KSF	KIPS PER SQUARE FOOT
KSI	KIPS PER SQUARE INCH
L	ANGLE
LFRS	LATERAL FORCE RESISTING SYSTEM
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW POINT
LWC	LIGHT WEIGHT CONCRETE
MAX	MAXIMUM
MB	MACHINE BOLT
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MTL	METAL
(N)	NEW
NS	NEAR SIDE OR NON-SHRINK
NTS	NOT TO SCALE
NWC	NORMAL WEIGHT CONCRETE
OC	ON CENTER
OD	OUTSIDE DIAMETER
O.F.	OUTSIDE FACE
OH	OPPOSITE HAND
OPNG	OPENING
PDF	POWDER/POWER DRIVEN FASTENER
PJ	PANEL JOINT
PJP	PARTIAL JOINT PENETRATION
PL	PLATE
PLC(S)	PLACE(S)
PLF	POUNDS PER LINEAR FOOT
PLYWD	PLYWOOD
PREFAB	PREFABRICATED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PRESSURE TREATED OR POST TENSION
QTY	QUANTITY
RAD, R	RADIUS
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
(S)	"SIMPSON" STRONG TIE CO. OR "USP" W/ EQUIVALENT ICC VALUES
SB	SILL BOLT
SC	SAW CUT OR SLIP CRITICAL
SCHED	SCHEDULE
SHTG	SHEATHING
SIM	SIMILAR
SMS	SHEET METAL SCREW
SN	SILL NAIL
SOG	SLAB ON GRADE
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STGRD	STAGGERED
STIFF	STIFFENER
STL	STEEL
STRUCT	STRUCTURAL
T&B	TOP & BOTTOM
THK	THICK
T.O.	TOP OF
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VERT	VERTICAL
VIF	VERIFY IN FIELD
W/	WITH
W/O	WITHOUT
WF, W	WIDE FLANGE
WLD	WELDED
WO	WHERE OCCURS
WP	WORK POINT
WT	WEIGHT
WWF	WELDED WIRE FABRIC

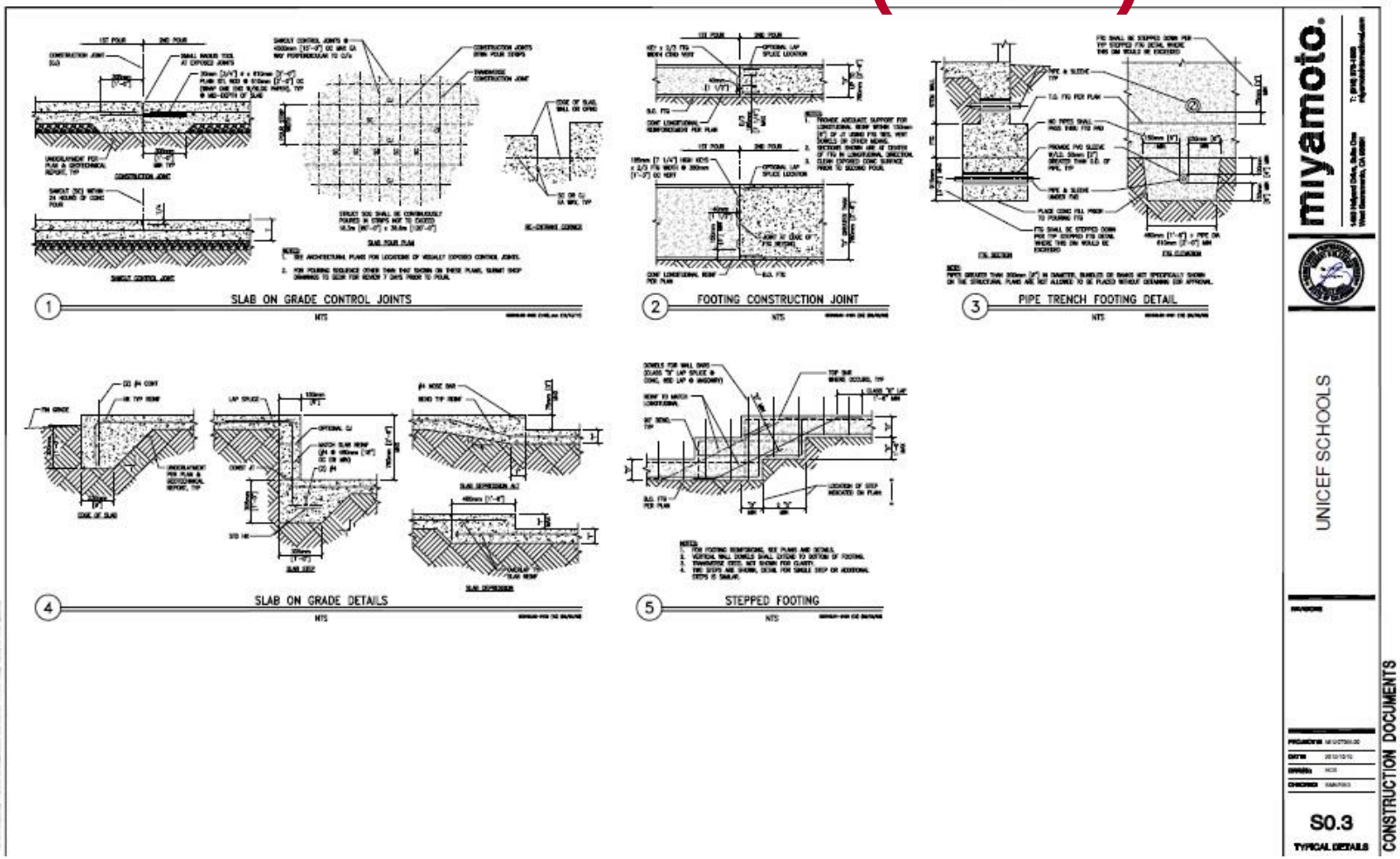
GENERAL NOTES – ABBREVIATIONS (CONT.)



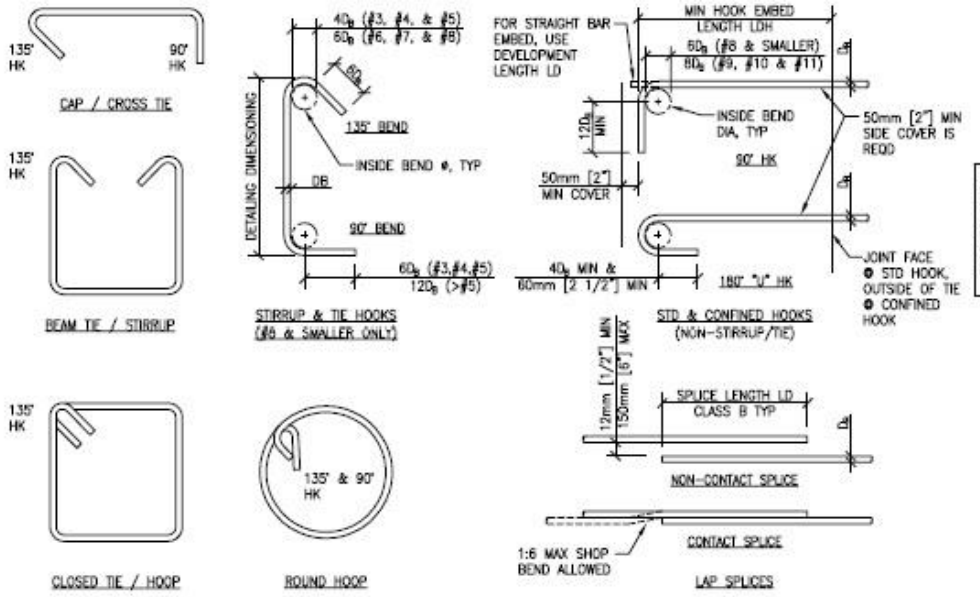
TYPICAL DETAILS

Typical details contain all the information required to build or fabricate the structural component or element represented. This information will include all dimensions, tolerances, structural element configurations, sizes and quantities, and material specifications.

TYPICAL DETAILS (CONT.)



TYPICAL DETAILS (CONT.)



HOOKS, LAPS & DEVELOPMENT LENGTHS

	BAR SIZE	STD HOOK L_{dh} mm [IN]	CONFINED HOOK L_{dh} mm [IN]	CLASS B LAP SPLICE L_d mm [IN]		DEVELOPMENT LENGTH L_d mm [IN]	
				BOTT	TOP	BOTT	TOP
3000 PSI NWC	#3	150 [6]	150 [6]	560 [22]	710 [28]	430 [17]	560 [22]
	#4	200 [8]	150 [6]	740 [29]	940 [37]	560 [22]	740 [29]
	#5	250 [10]	200 [8]	910 [36]	1190 [47]	710 [28]	910 [36]
	#6	300 [12]	250 [10]	1090 [43]	1420 [56]	840 [33]	1090 [43]
	#7	360 [14]	280 [11]	1600 [63]	2060 [81]	1220 [48]	1600 [63]
	#8	410 [16]	330 [13]	1880 [72]	2360 [93]	1400 [55]	1830 [72]

BAR SIZE	FINISHED BEND DIAMETER D mm [IN]
#3	57 [2 1/4]
#4	76 [3"]
#5	95 [3 3/4"]
#6	114 [4 1/2"]
#7	133 [5 1/4"]
#8	152 [6"]

STANDARD HOOKS

NOTES:
1. L_{dh} – HOOK DEVELOPMENT LENGTH.
2. L_d – DEVELOPMENT LENGTH.
3. SEE BUILDING CODE AND ACI LATEST VERSION FOR ALL REQUIREMENTS NOT NOTED.
4. FOR LIGHTWEIGHT CONCRETE MULTIPLY L_{dh} AND L_d VALUES SHOWN BY 1.3.
5. "TOP" BARS ARE HORIZONTAL WITH MORE THAN 300mm [12"] OF FRESH CONCRETE CAST BELOW BARS. ALL OTHER BARS ARE "BOT" BARS.
6. STANDARD HOOK L_{dh} DOES NOT ACCOUNT FOR THE EFFECT OF TIES. CONFINED HOOK L_{dh} MAY BE USED WHERE ACI 318-05 12.5.3b-c APPLIES.
7. VALUES SHOWN ABOVE ARE FOR GRADE 60. (FY=60 KSI) REINFORCEMENT.
8. SPLICE LENGTHS SHOWN ARE FOR CLEAR SPACING NOT LESS THAN $2D_b$, CONCRETE COVER NOT LESS THAN D_b.
9. FOR EPOXY-COATED REINFORCEMENT, SEE BUILDING CODE.

1 REINFORCEMENT DETAILS & DEVELOPMENT LENGTHS

NTS

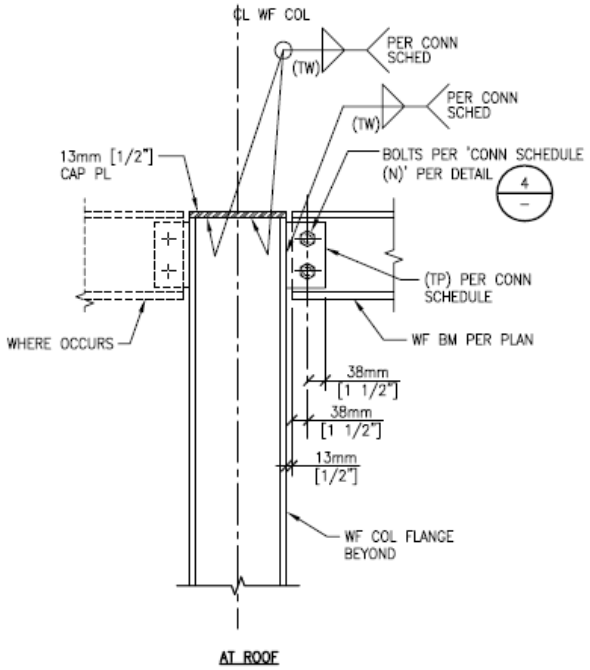
032000-0100 (1) (08/10/09)

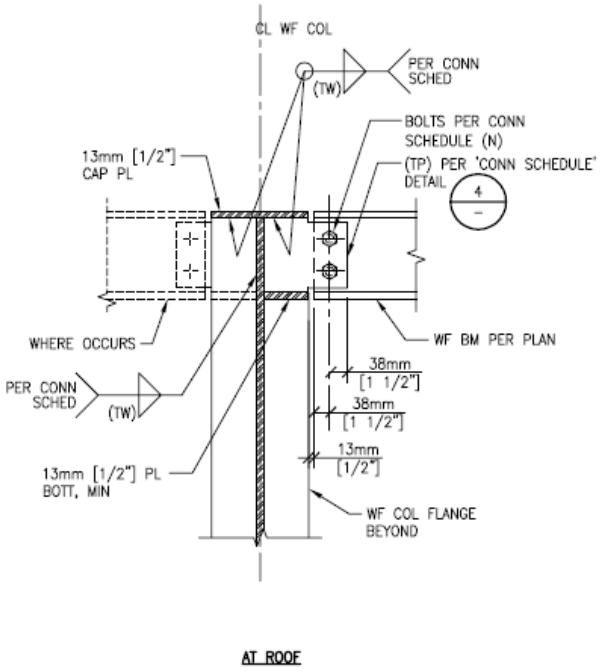
TYPICAL DETAILS (CONT.)

HOOKS, LAPS & DEVELOPMENT LENGTHS

	BAR SIZE	STD HOOK L_{dh} mm [IN]	CONFINED HOOK L_{dp} mm [IN]	CLASS B LAP SPLICE L_d mm [IN]		DEVELOPMENT LENGTH L_d mm [IN]	
				BOTT	TOP	BOTT	TOP
3000 PSI NWC	#3 #4	150 [6] 200 [8]	150 [6] 150 [6]	560 [22] 740 [29]	710 [28] 940 [37]	430 [17] 560 [22]	560 [22] 740 [29]
	#5 #6	250 [10] 300 [12]	200 [8] 250 [10]	910 [36] 1090 [43]	1190 [47] 1420 [56]	710 [28] 840 [33]	910 [36] 1090 [43]
	#7 #8	360 [14] 410 [16]	280 [11] 330 [13]	1600 [63] 1880 [72]	2060 [81] 2360 [93]	1220 [48] 1400 [55]	1600 [63] 1830 [72]

TYPICAL DETAILS (CONT.)- STEEL BUILDING

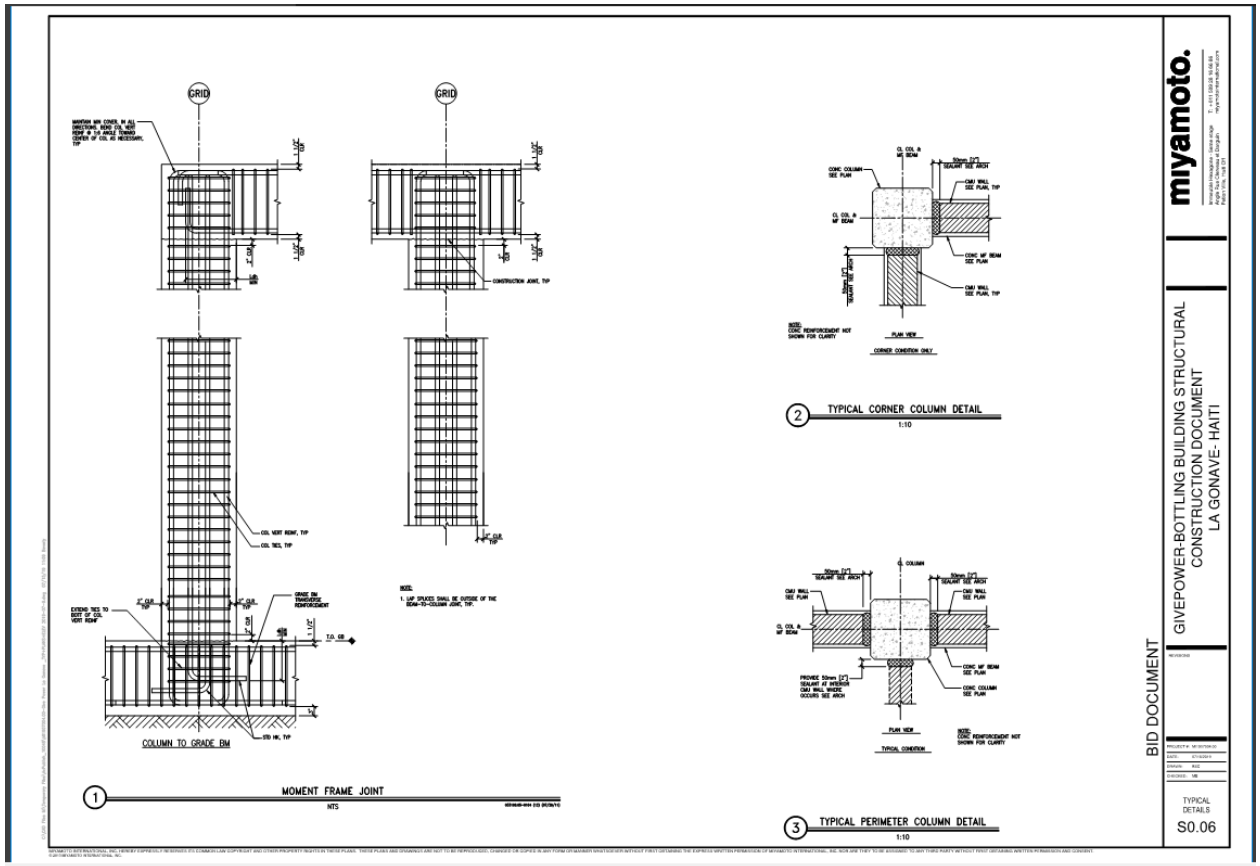




2 BEAM TO COLUMN FLANGE (NON-MOMENT) CONNECTIONS
NTS
STL001 (10)_mm

3 BEAM TO COLUMN WEB (NON-MOMENT) CONNECTIONS
NTS
051200.02-0102 (1:10)_mm (12/13/11)

TYPICAL DETAILS MOMENT FRAME BUILDING



STRUCTURAL PLAN

The structural plans show the foundation, floor, and roof framing plans of the building. These plans provide information like dimensions, locations and sizes of the structural elements present in the respective plans.

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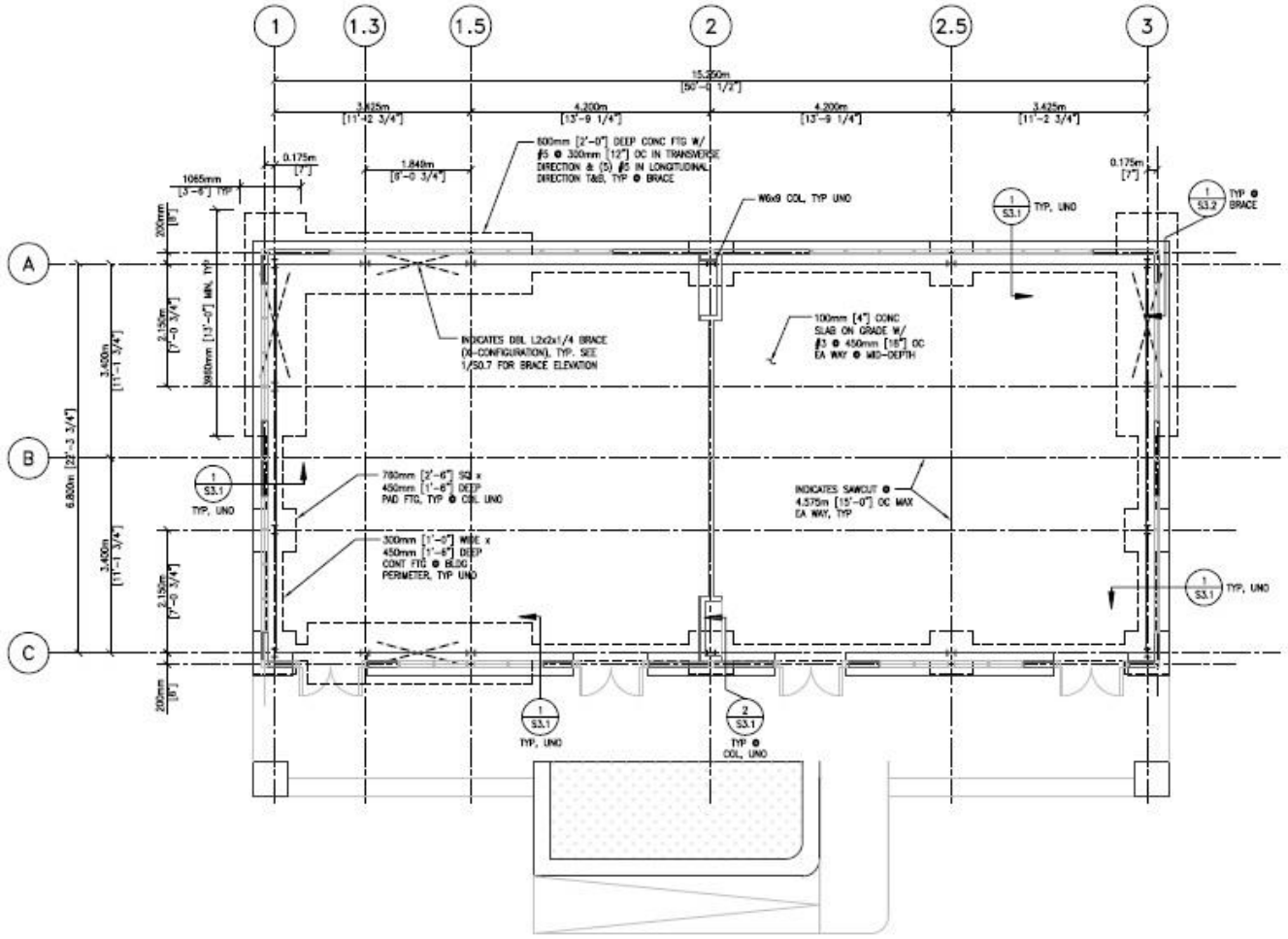
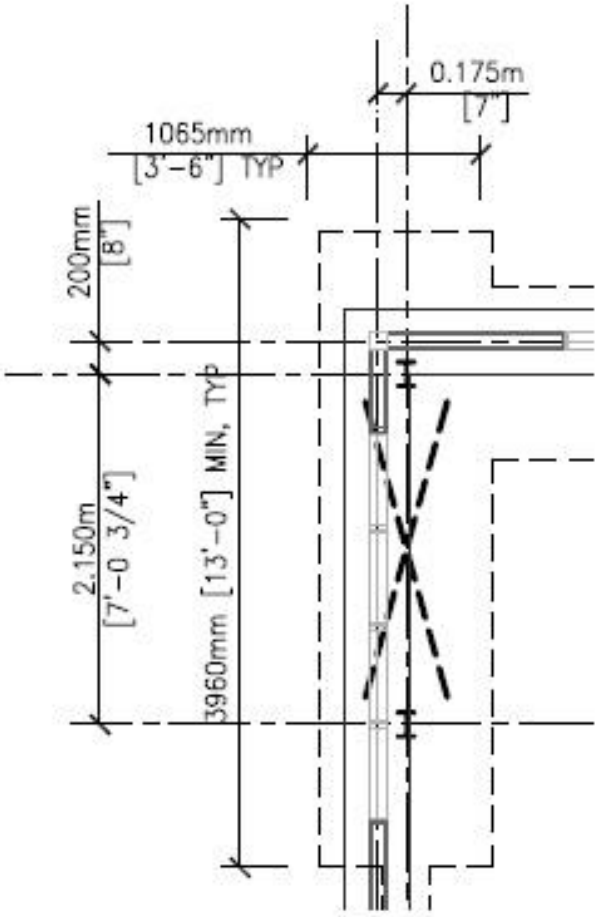
FOUNDATION PLAN (STEEL BUILDING)



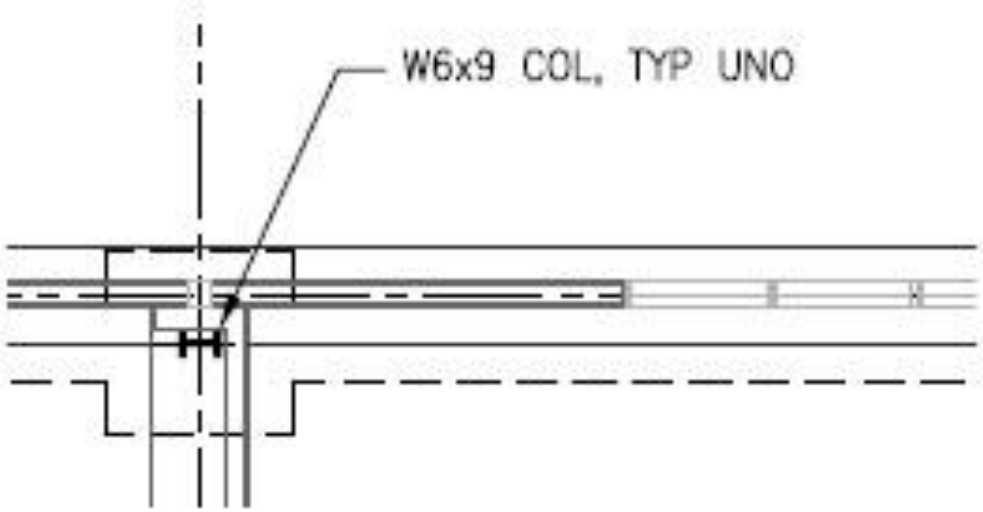
FOUNDATION PLANS - (STEEL BUILDING)

- Dimensions and
- Structural elements illustrated



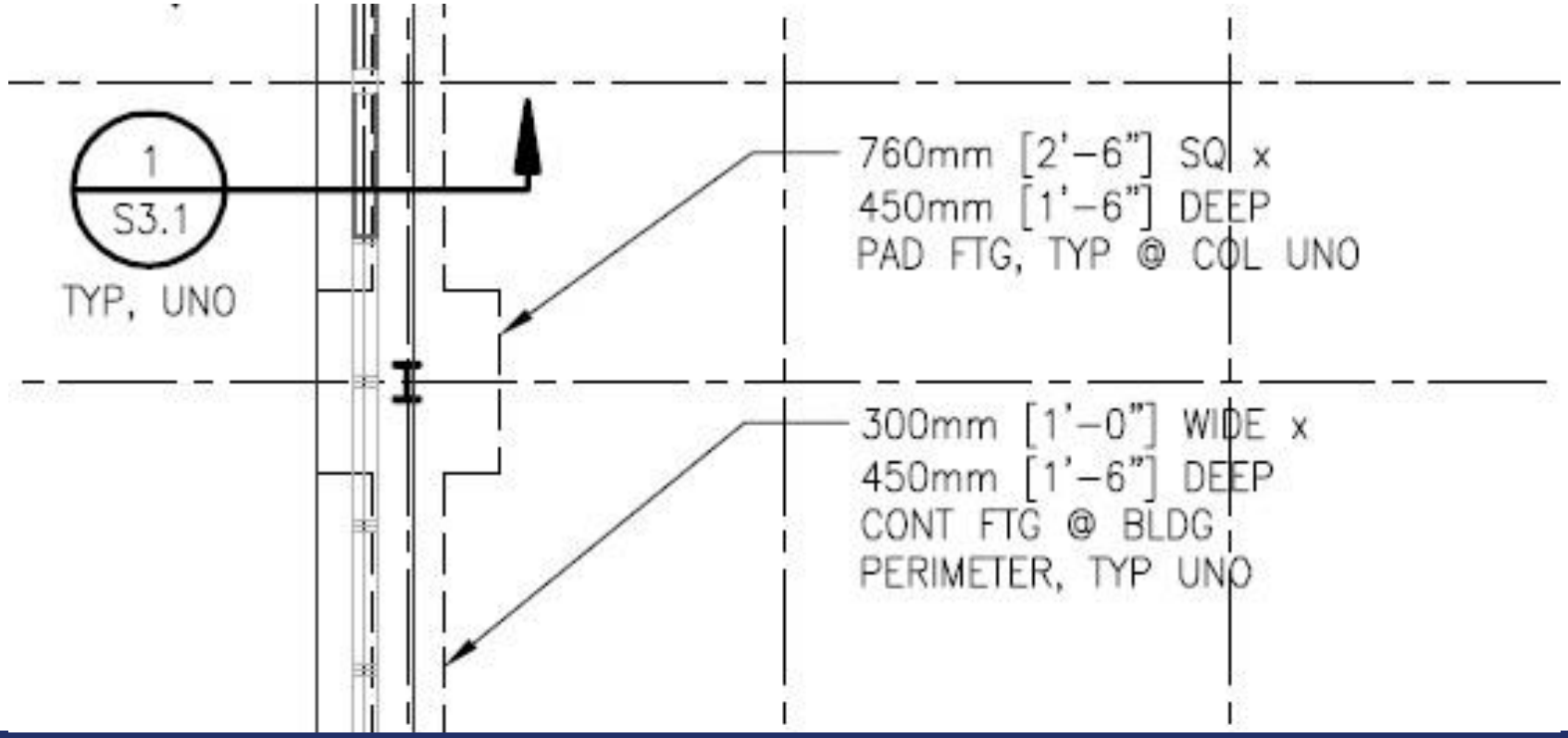
FOUNDATION PLAN -STEEL BUILDING (CONT.)

Steel column size and orientation illustrated



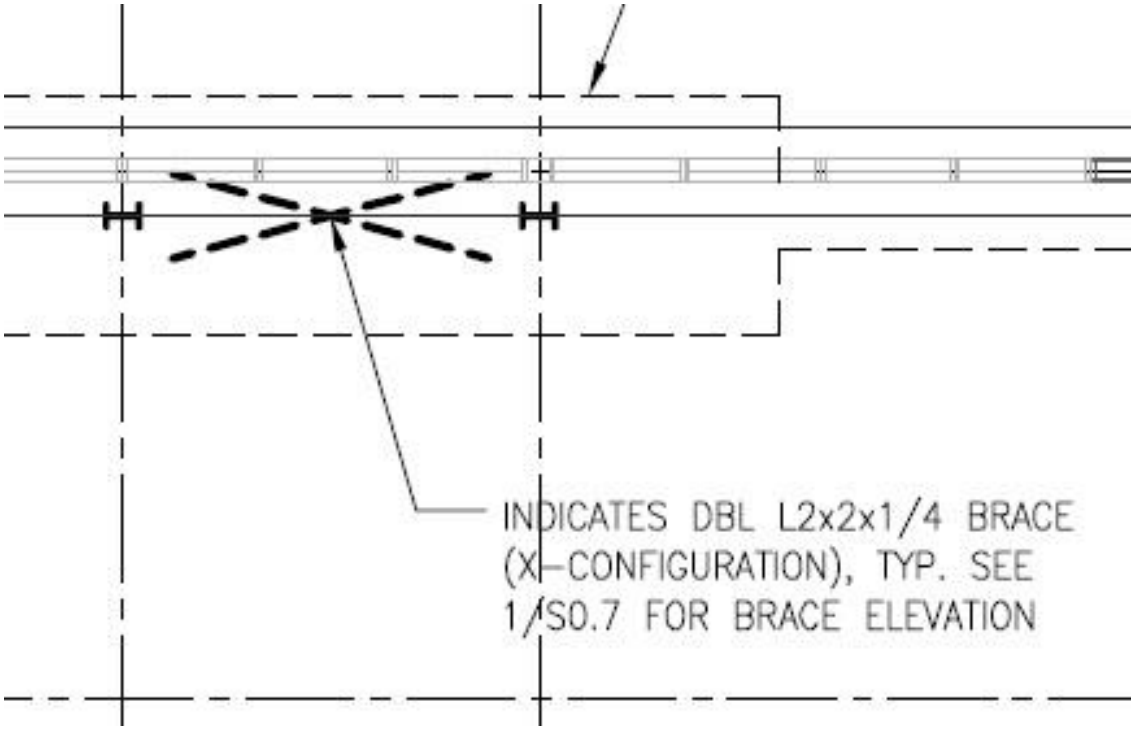
FOUNDATION PLAN- STEEL BUILDING (CONT.)

PAD FOOTING AND GRADE BEAM INFORMATION



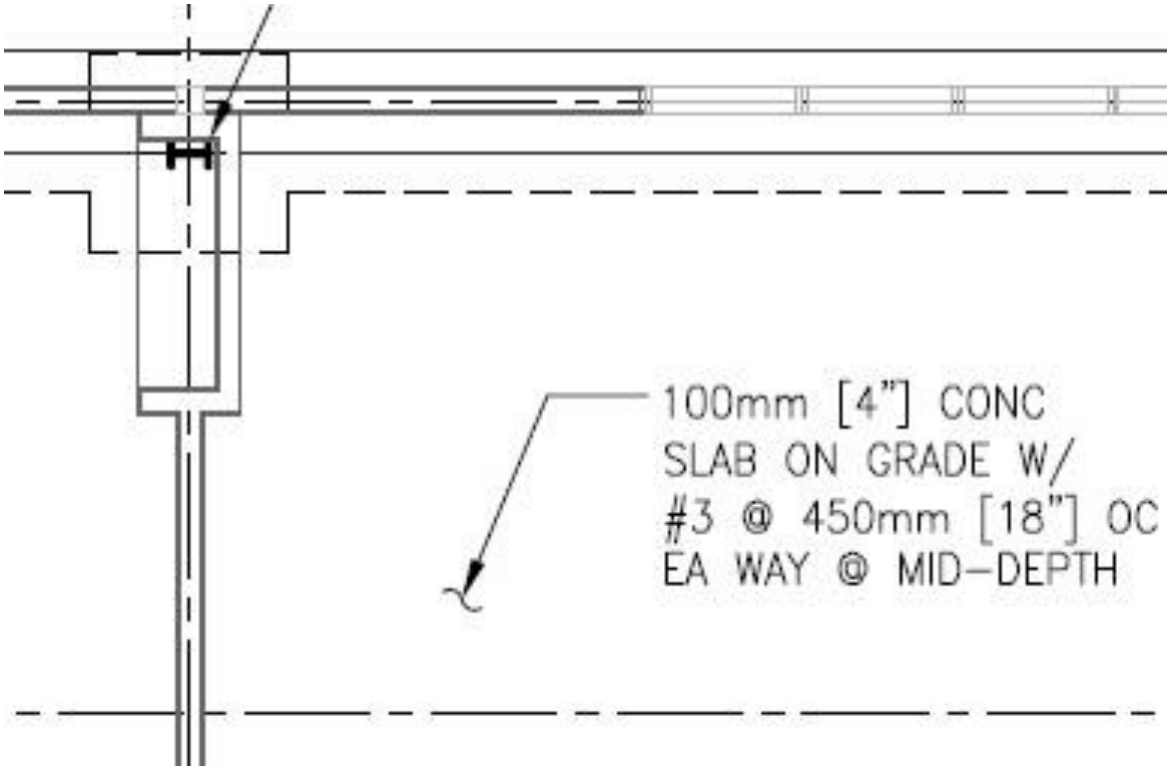
FOUNDATION PLAN- STEEL BUILDING (CONT.)

Indicates brace system type and configuration



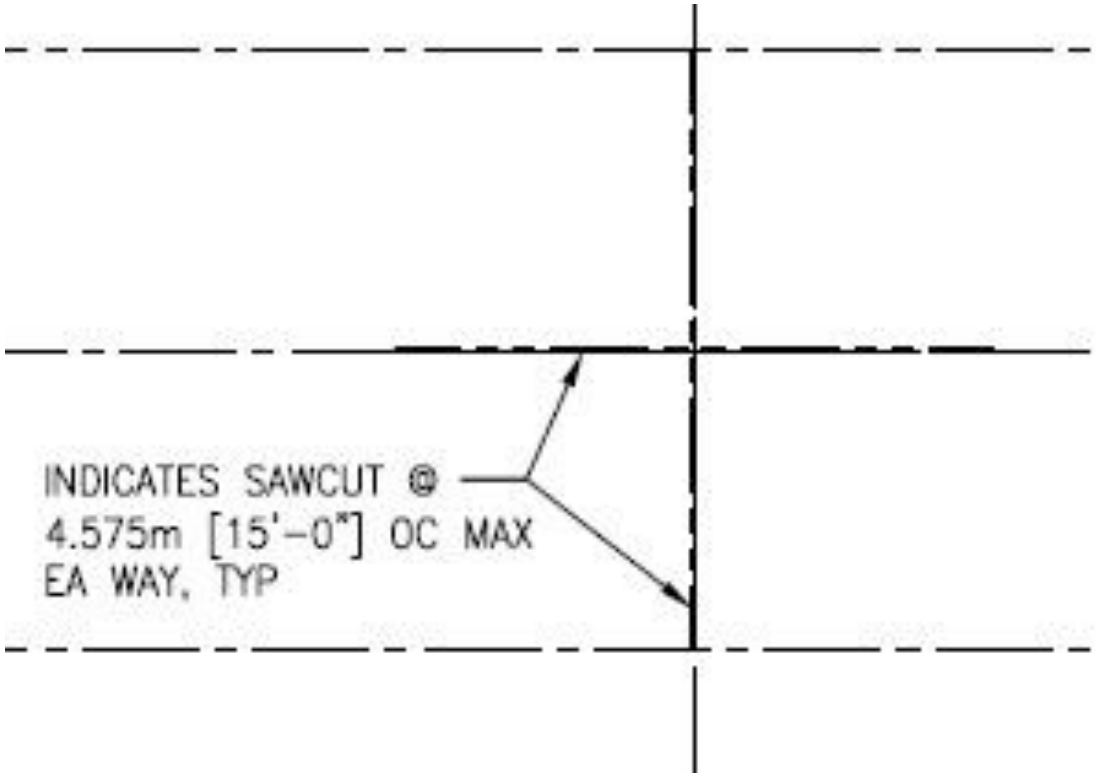
FOUNDATION PLAN (CONT.)

Indicates slab on grade thickness and reinforcement

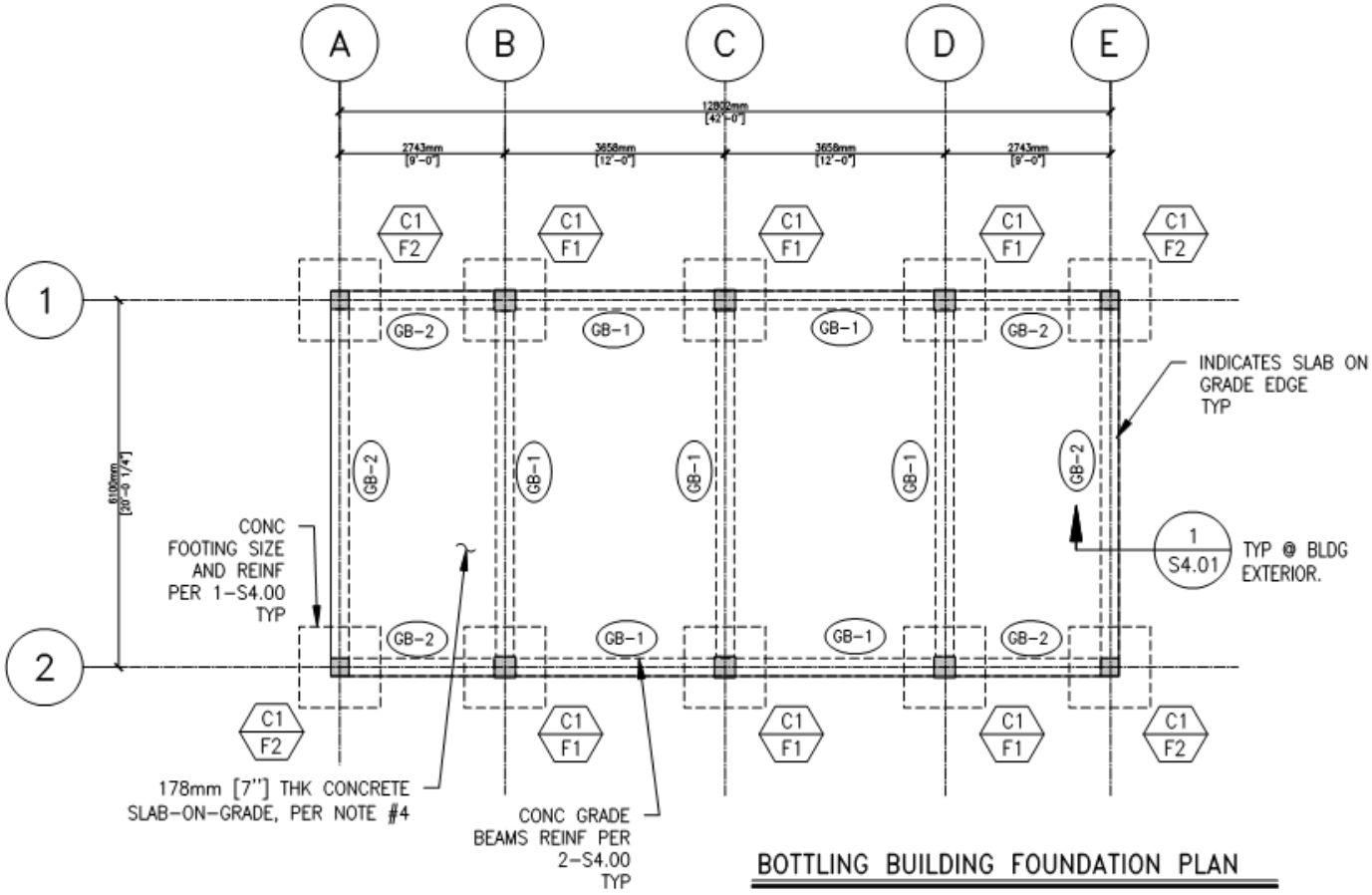


FOUNDATION PLAN (CONT.)

INDICATES SAW CUT LOCATION

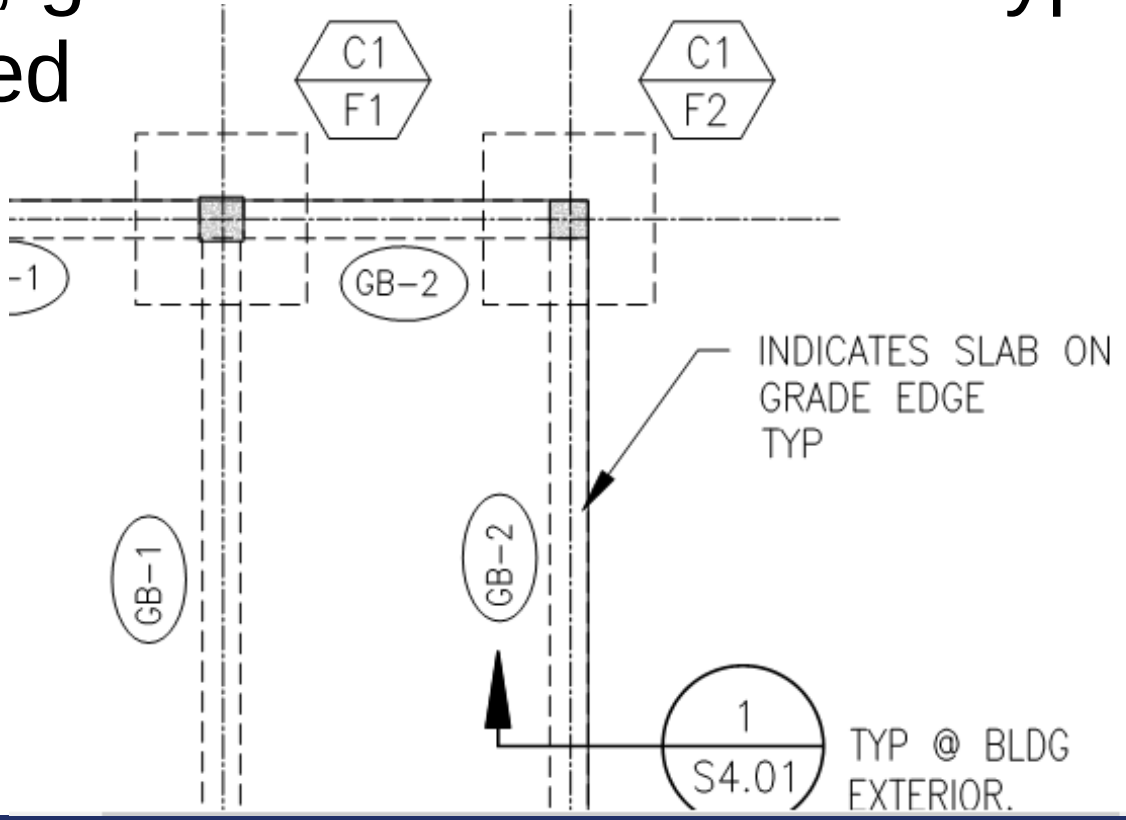


FOUNDATION PLAN (MOMENT FRAME BUILDING)



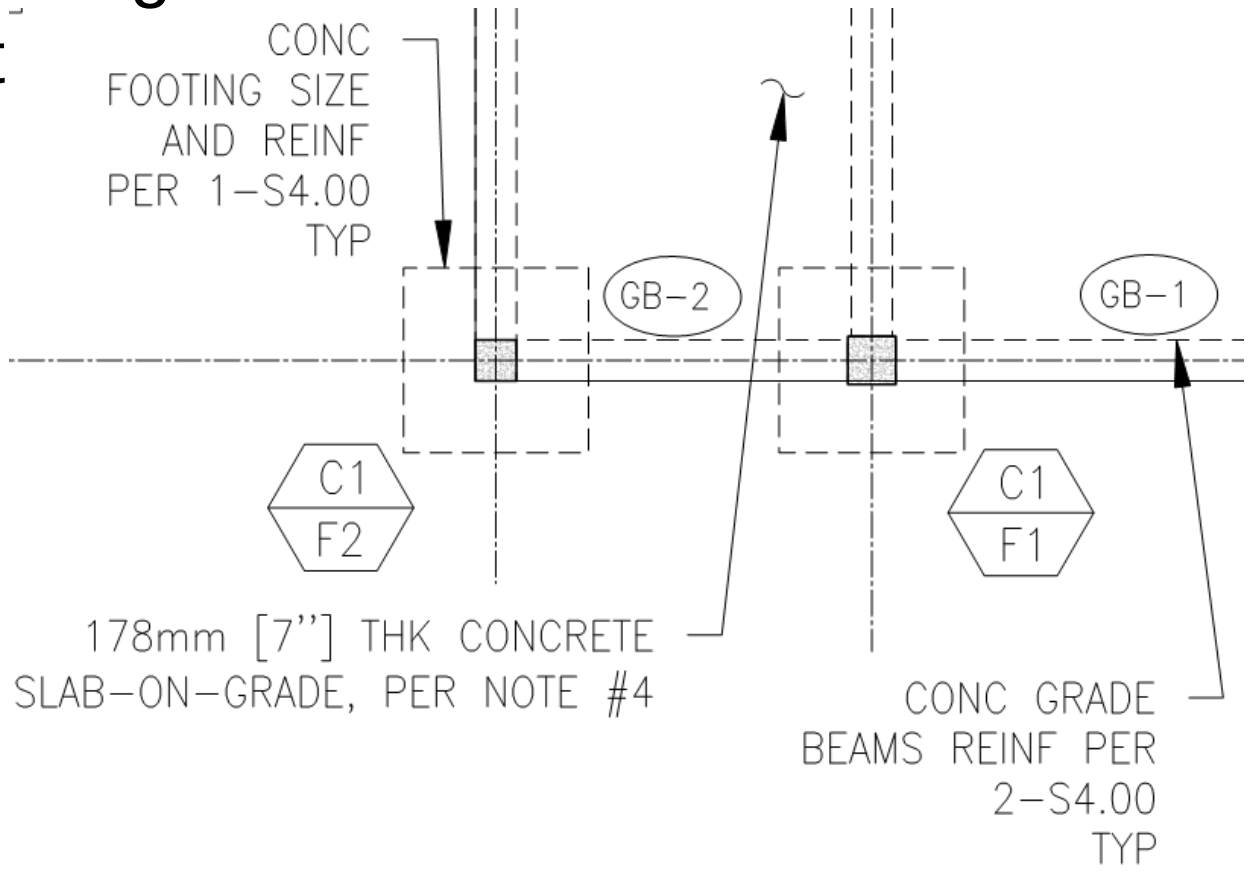
FOUNDATION PLAN (MOMENT FRAME BUILDING)

Footing, grade beam and column types illustrated



FOUNDATION PLAN (MOMENT FRAME BUILDING)

Indicates slab on grade thickness and reinforcement



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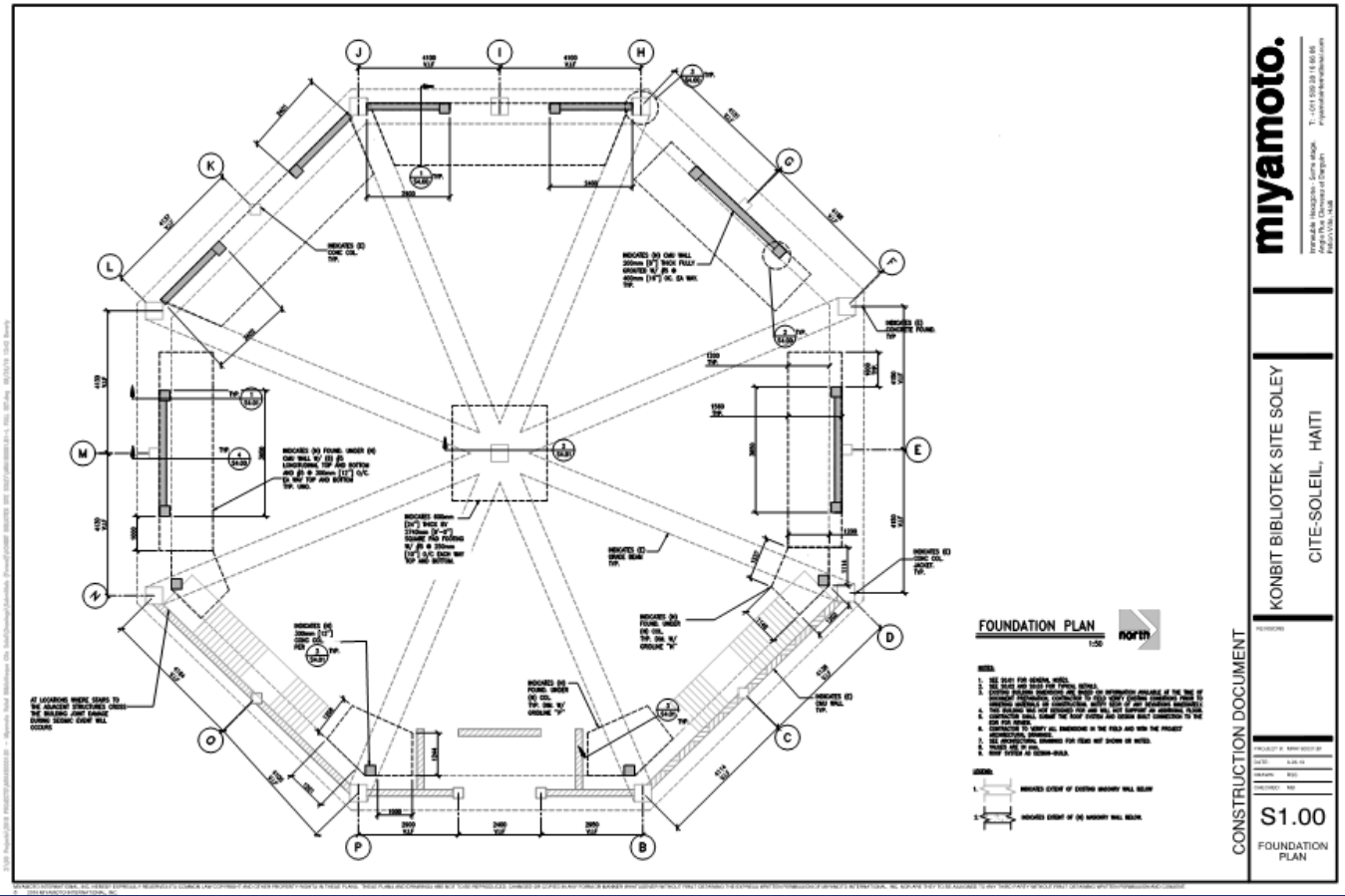
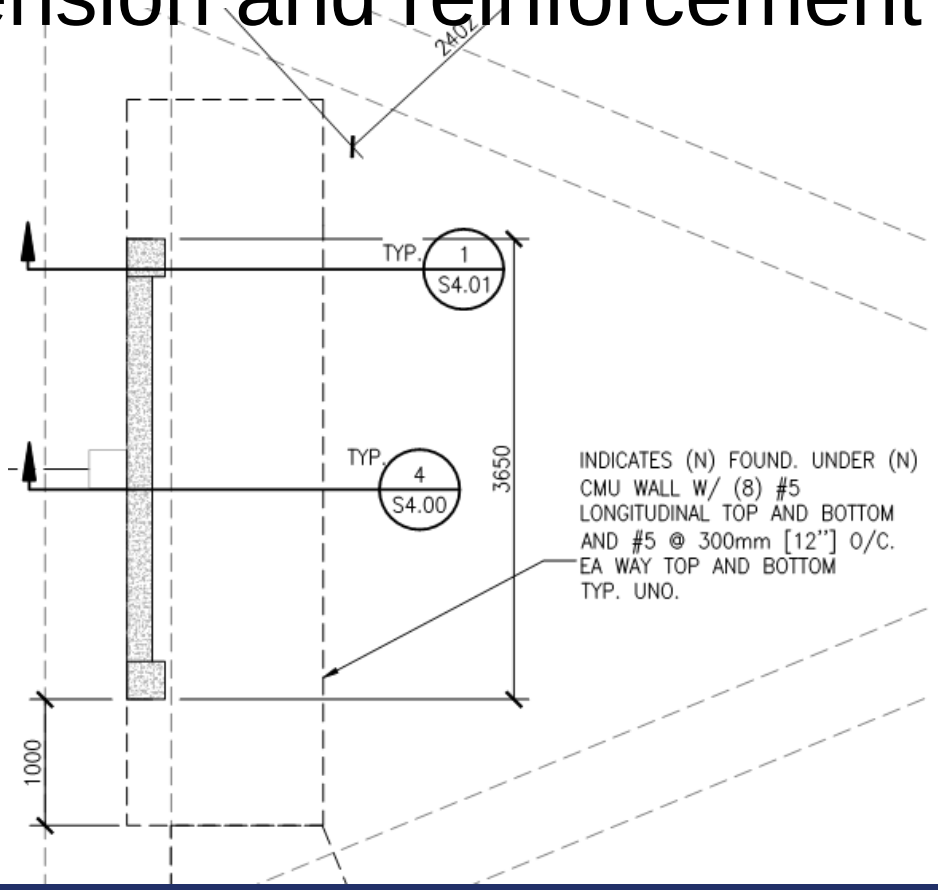
FOUNDATION PLAN (CONCRETE OR MASONRY SHEAR WALL BUILDING)



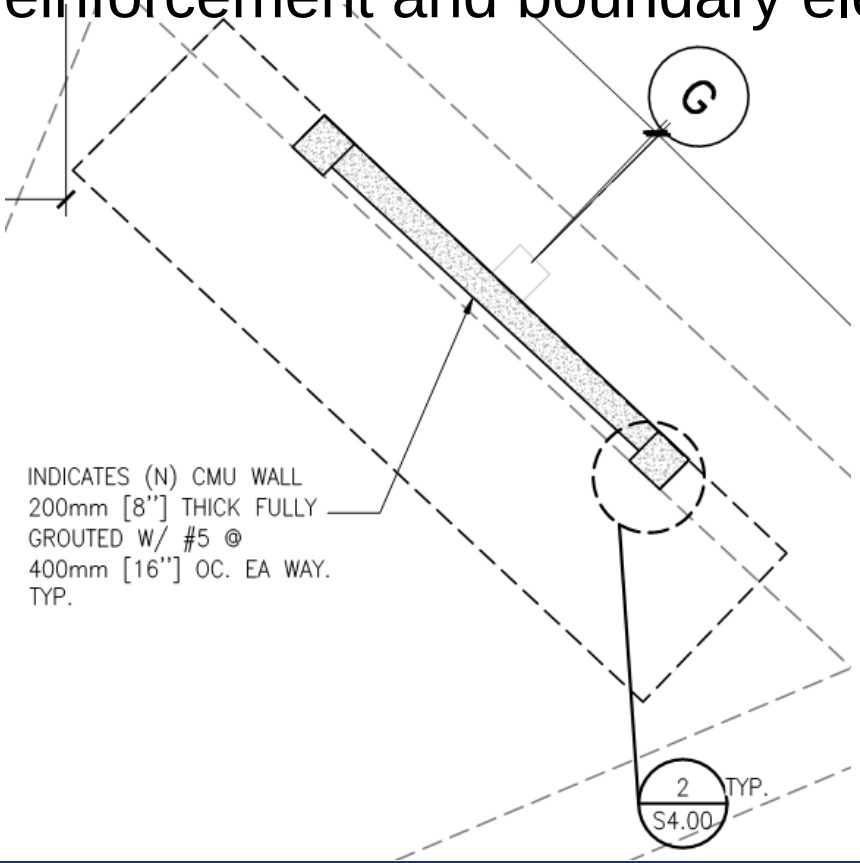
FOUNDATION PLAN -CONCRETE OR MASONRY SHEAR WALL BUILDING (CONT.)

Foundation dimension and reinforcement illustrated



FOUNDATION PLAN-CONCRETE OR MASONRY SHEAR WALL BUILDING (CONT.)

Indicates wall reinforcement and boundary element location

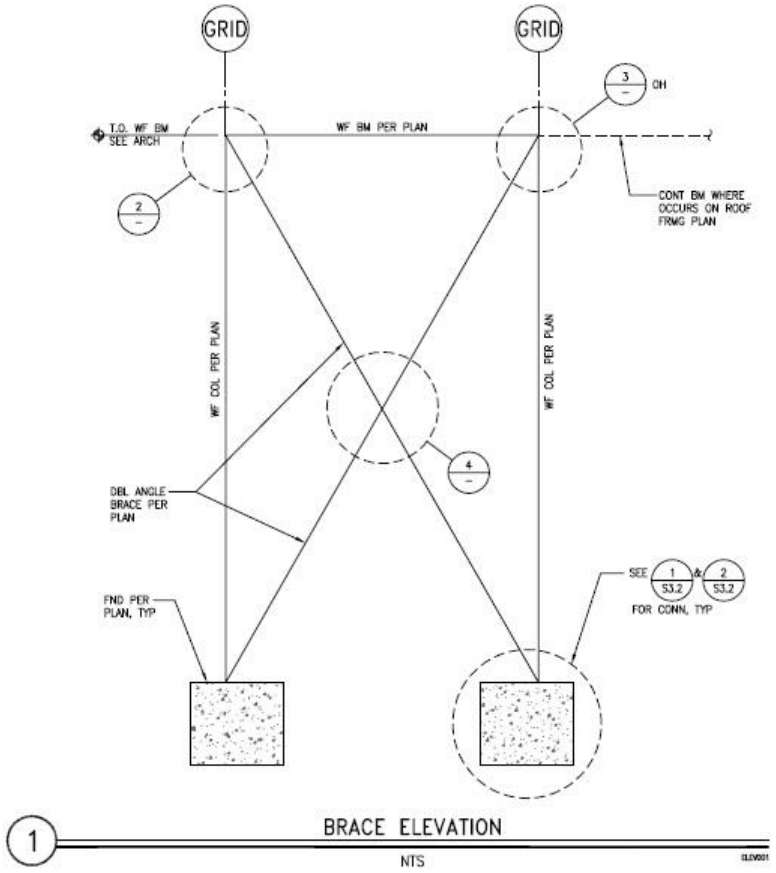


ELEVATIONS

- Elevations show the exterior parts of a building or structural elements.
- In elevation drawings you can find the height of building (floor and roof elevations).
- Structural properties of elements that cannot clearly be seen or identified in plan view.

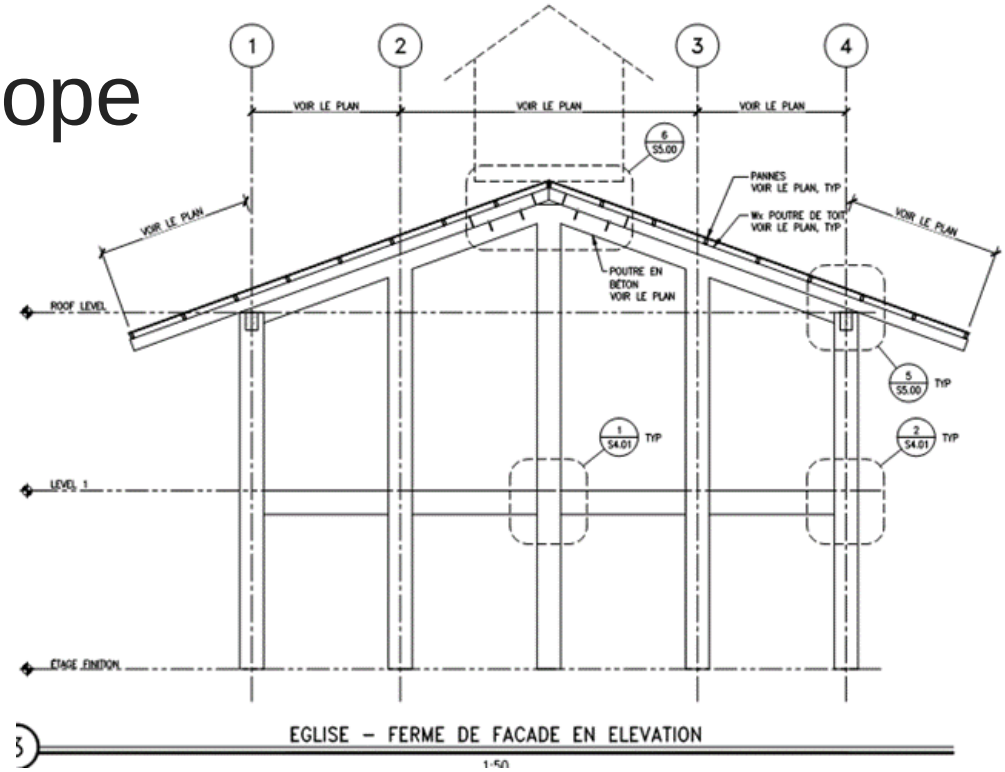
BRACE FRAME ELEVATION (STEEL BUILDING)

- Column type and location
- Brace type and location
- Connection detail references



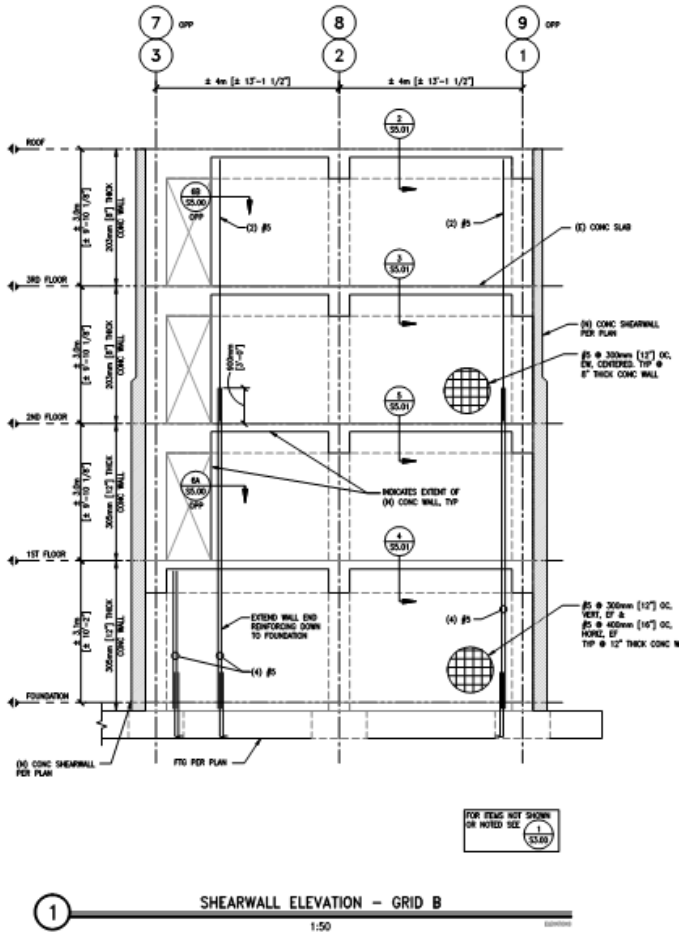
ELEVATION (MOMENT FRAME BUILDING)

- Column location
- Roof shape and slope
- Connection detail references



ELEVATION (CONCRETE SHEAR WALL BUILDING)

- Shear wall elevations
- Shear wall locations
- Shear wall reinforcement
- Jamb bar requirements
- Dowel locations
- Vertical bar lap splice locations
- Connection detail references

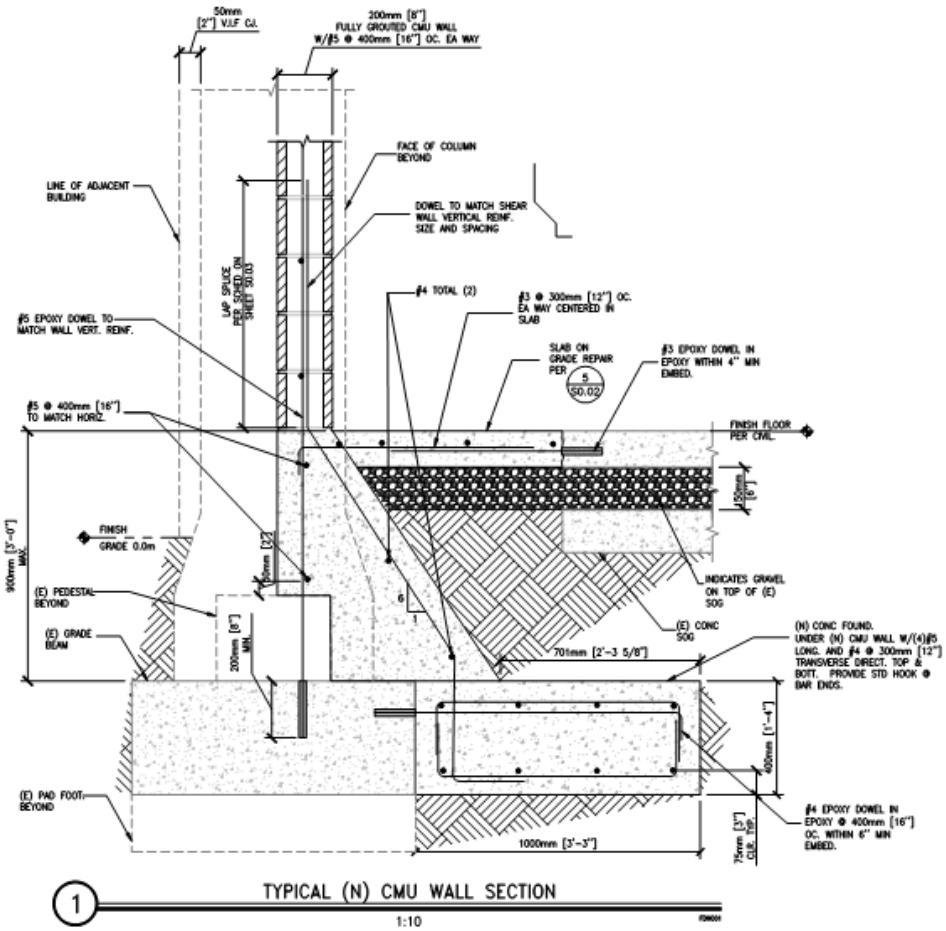


SECTIONS

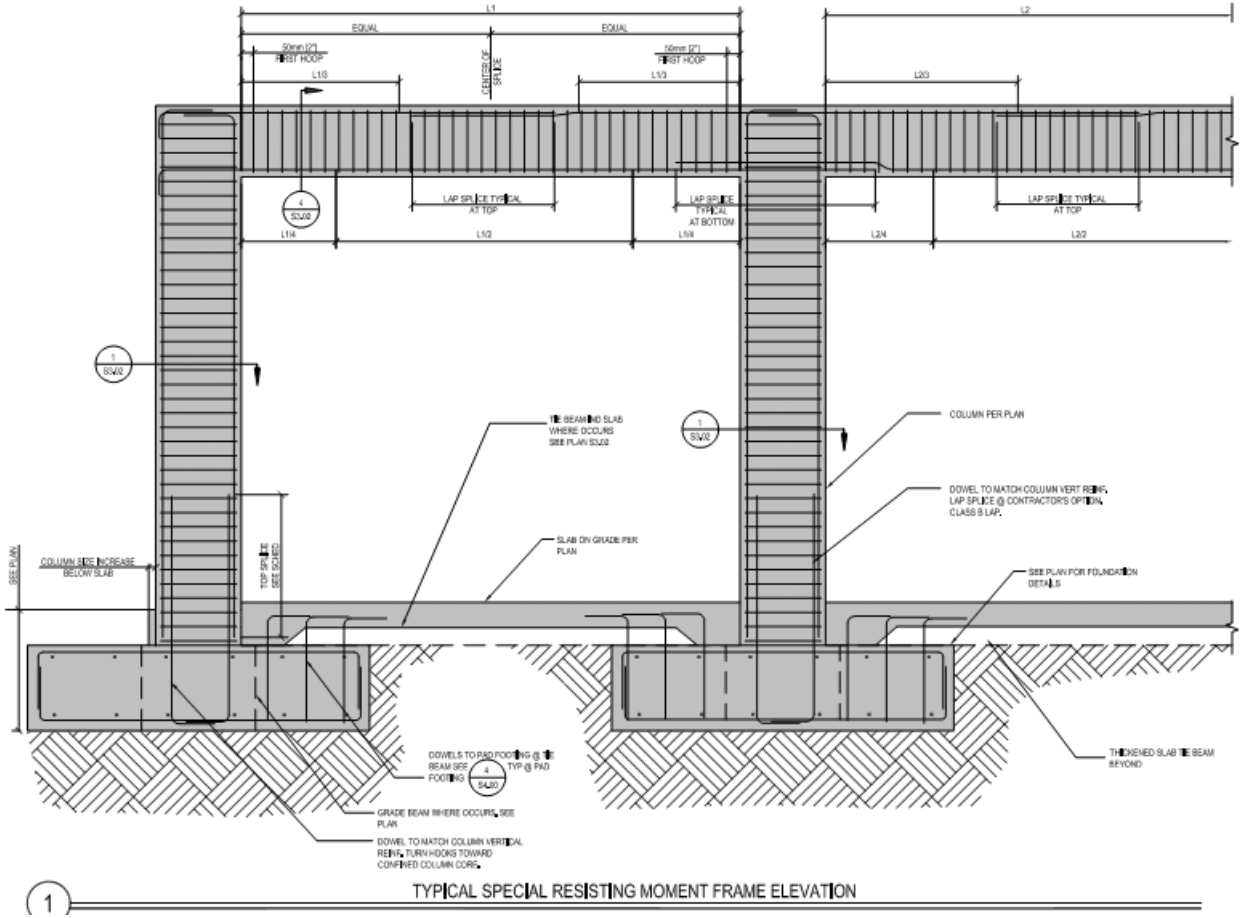
- Sections are referenced in the plan view drawings and provide information about elements that cannot be seen in plan views.
- The sections usually are cut through walls or structural elements that are not typical and the constructor needs to be aware.
- Specific detail requirements.

SECTIONS (CONCRETE OR MASONRY SHEAR WALL BUILDING)

- Dowels
- Rebar lap splice length
- Lap splice location
- Wall section and reinforcing
- Foundation dimension
- Foundation reinforcement



SECTIONS (MOMENT FRAME BUILDING)



1 TYPICAL SPECIAL RESISTING MOMENT FRAME ELEVATION

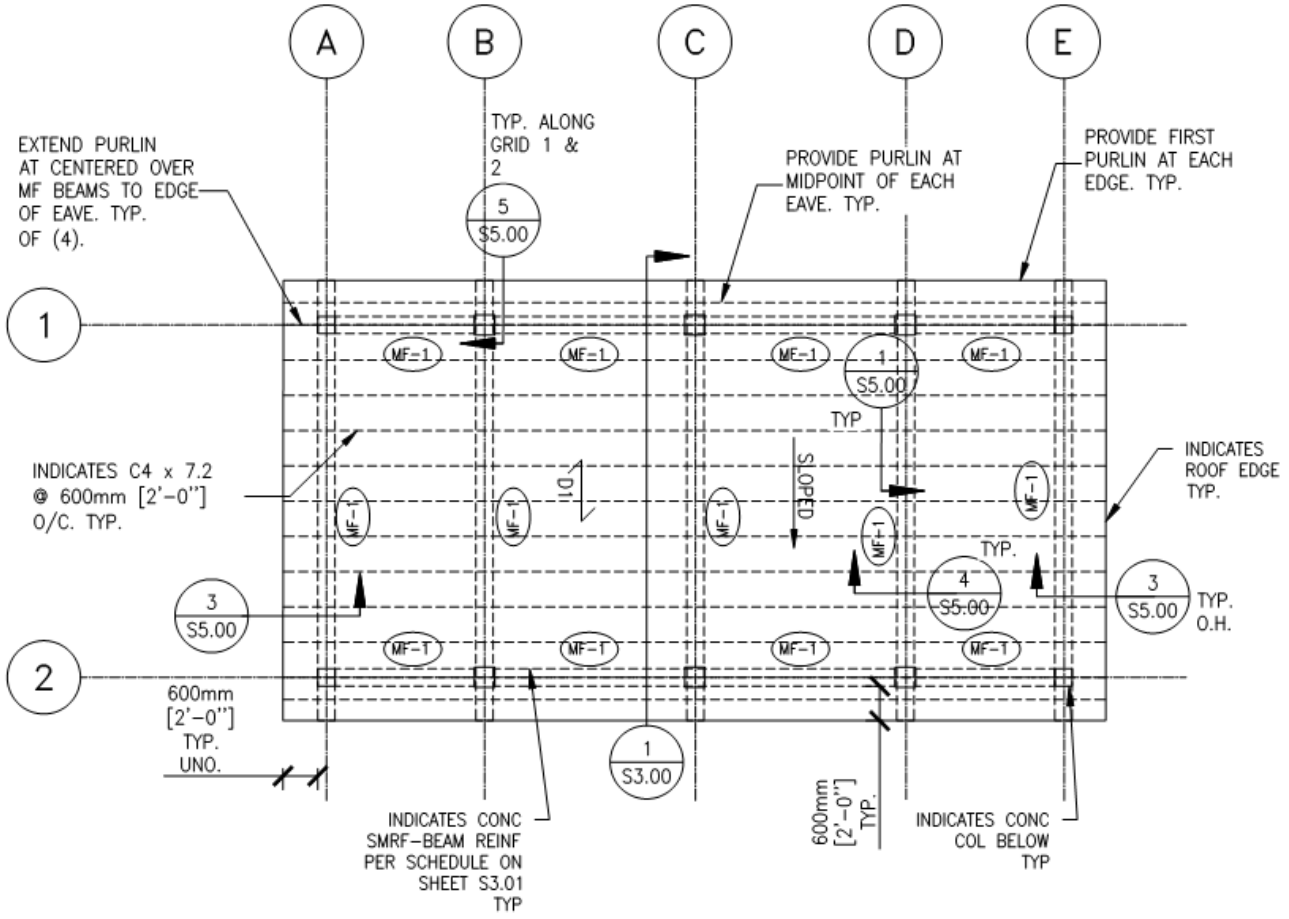
SECTIONS (MOMENT FRAME BUILDING) CONT.

- Lap splice length
- Lap splice location
- Tie spacing
- Building frame elevation
- Connection detail references

DETAILS

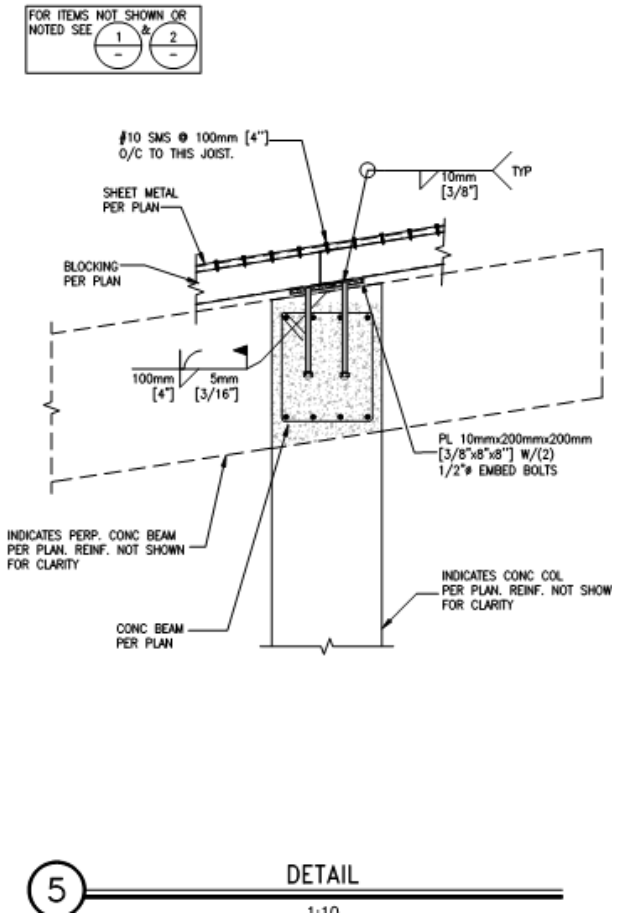
The detail drawings provide particular information on how to construct or connect the structural elements. The details can be referenced in plans, elevations and sections.

DETAILS REFERENCED IN PLAN (LIGHT ROOF)

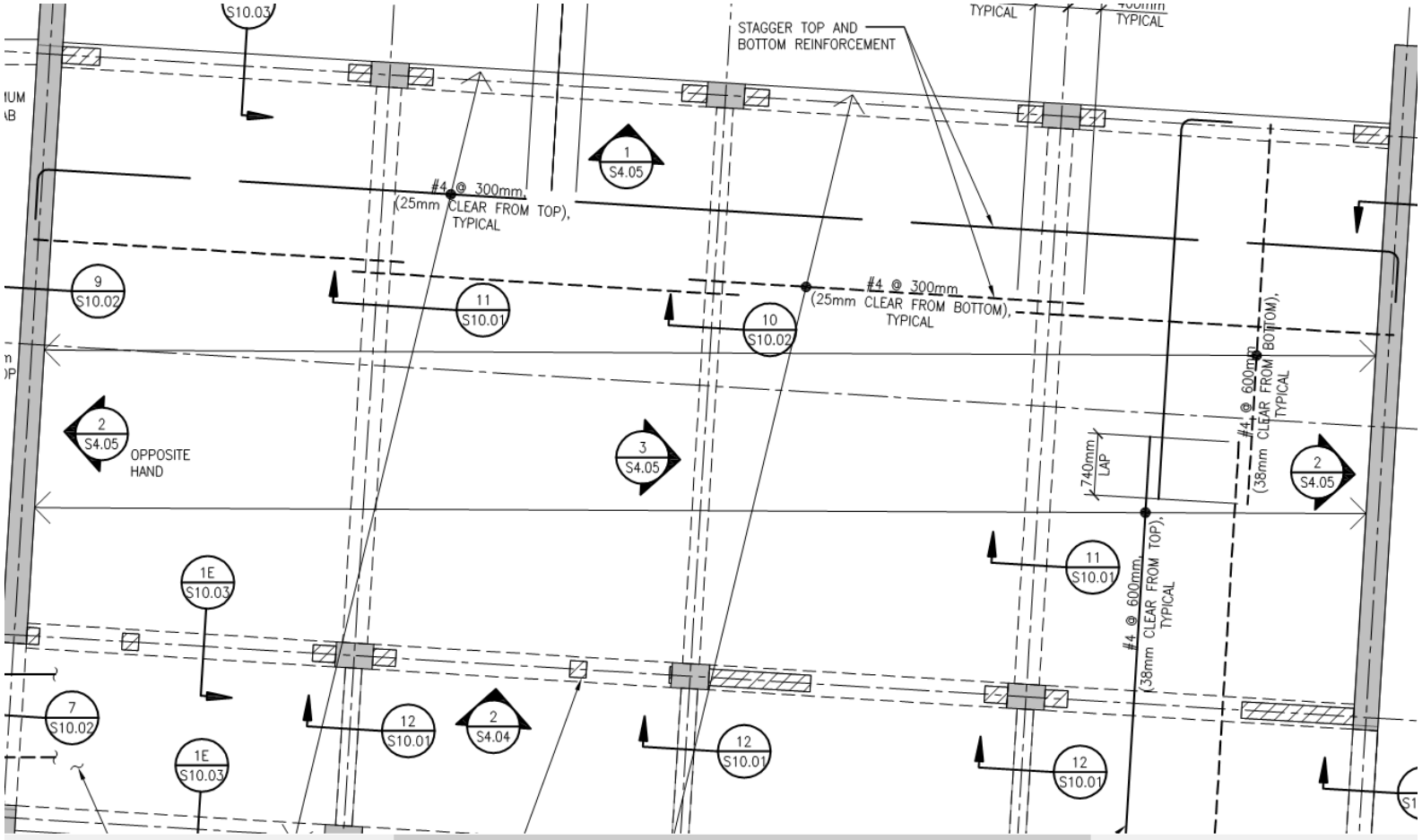


DETAILS (LIGHT ROOF CONT.)

- Slope
- Roof connection
- Roof element configuration
- Concrete beam reinforcement

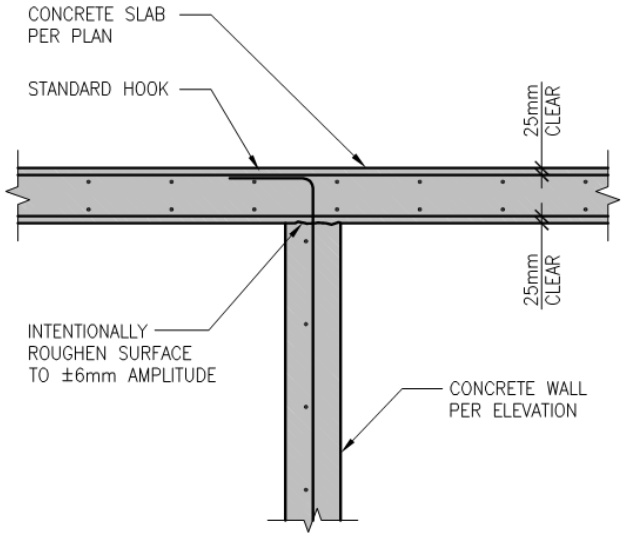


DETAILS REFERENCED IN PLAN (CONCRETE ELEVATED SLAB)



DETAILS REFERENCED IN PLAN (CONCRETE ELEVATED SLAB CONT.)

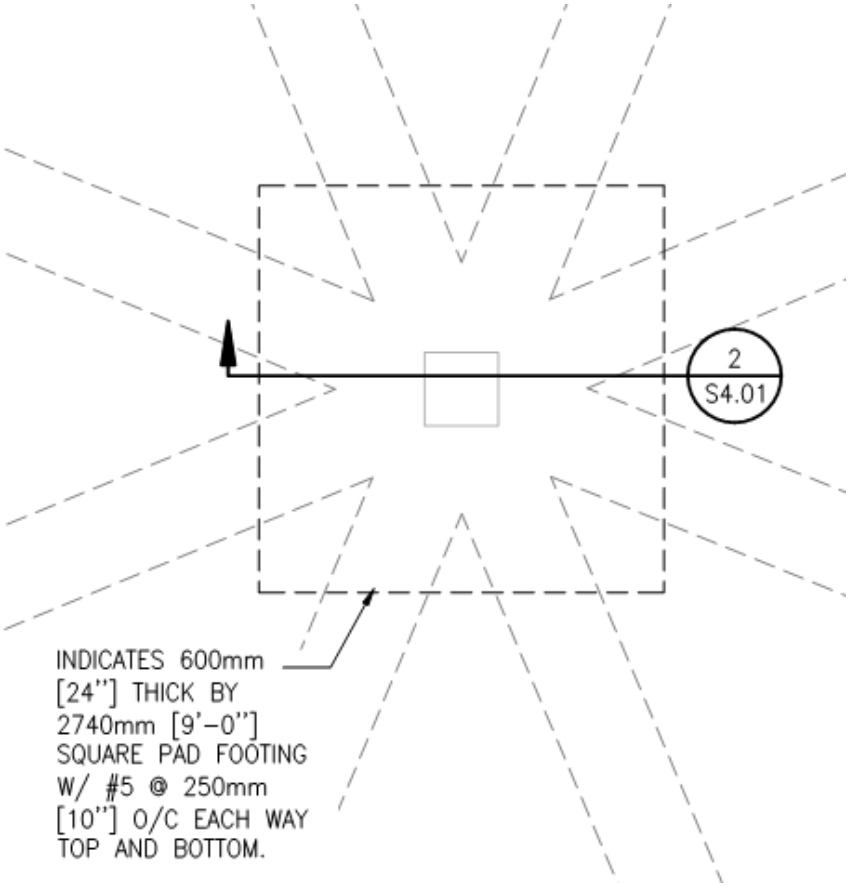
- Slab information
- Clear cover
- Wall location
- Reinforcement placement



10

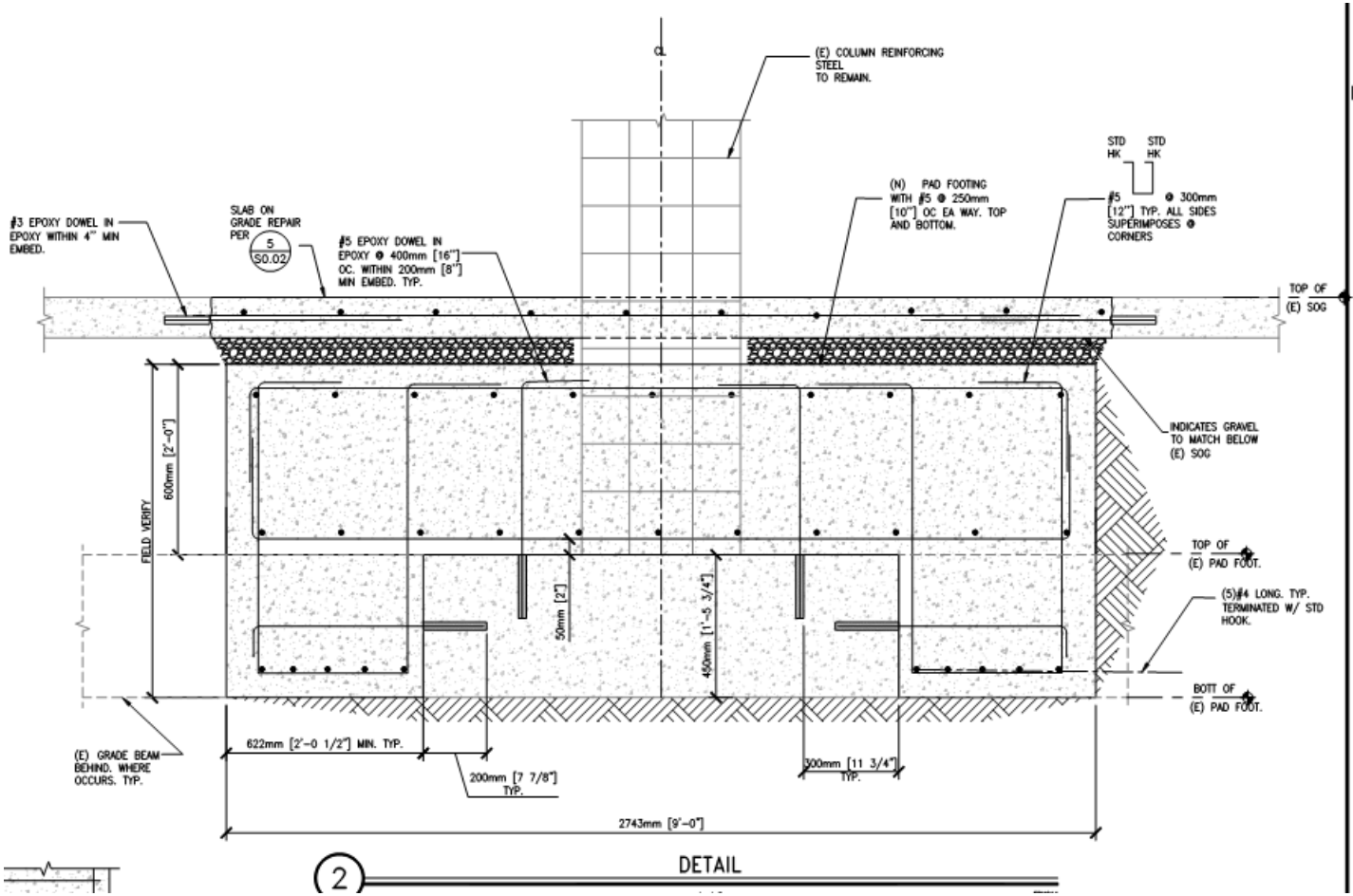
SCALE 1:20

DETAILS REFERENCED IN FOUNDATION PLAN



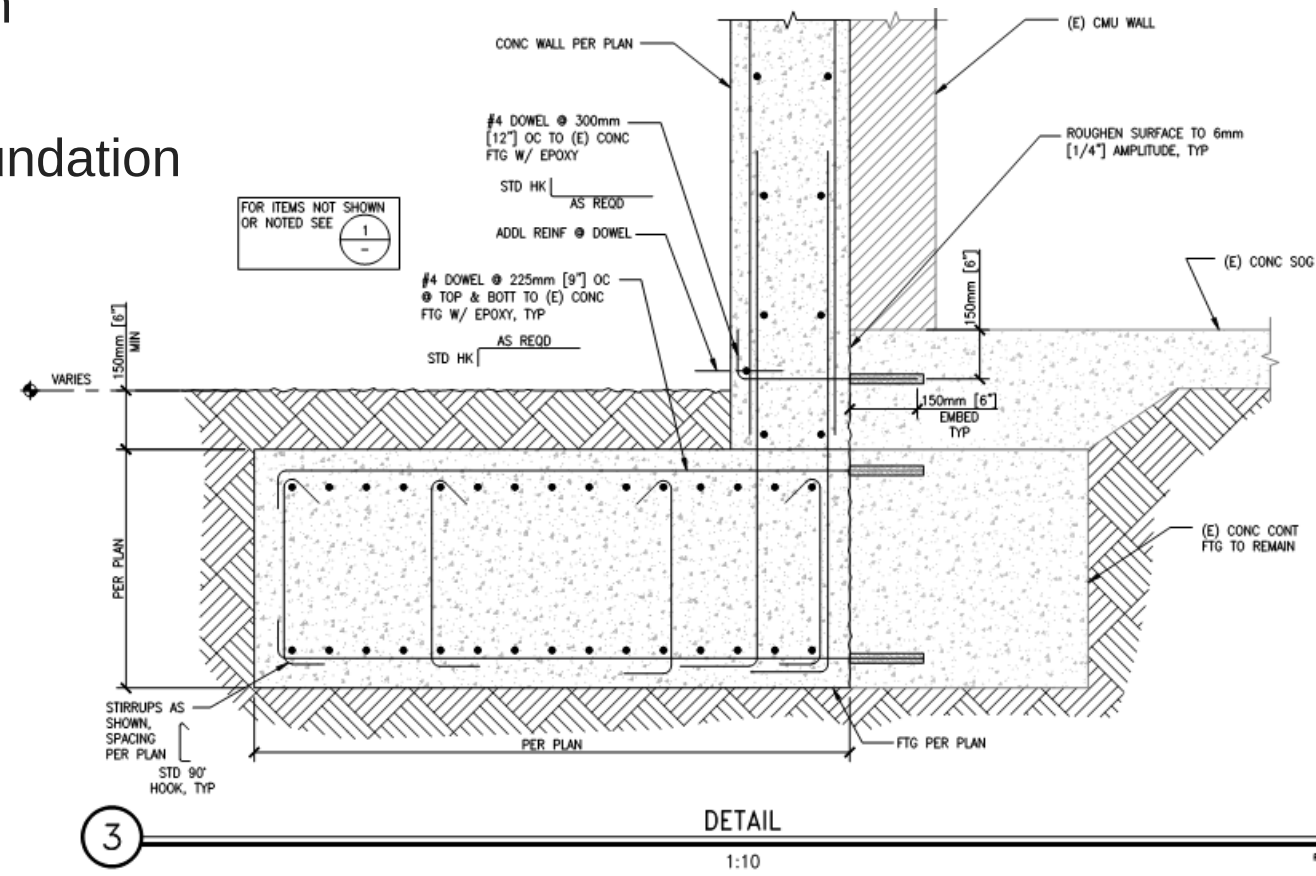
DETAILS REFERENCED IN FOUNDATION PLAN CONT.

- Foundation reinforcement
- Foundation dimensions
- Dowels and anchored length



EXAMPLE OF RETROFIT BUILDING DETAIL @ FOUNDATION

- Foundation reinforcement
- Foundation dimension
- Wall reinforcement
- Dowels to existing foundation

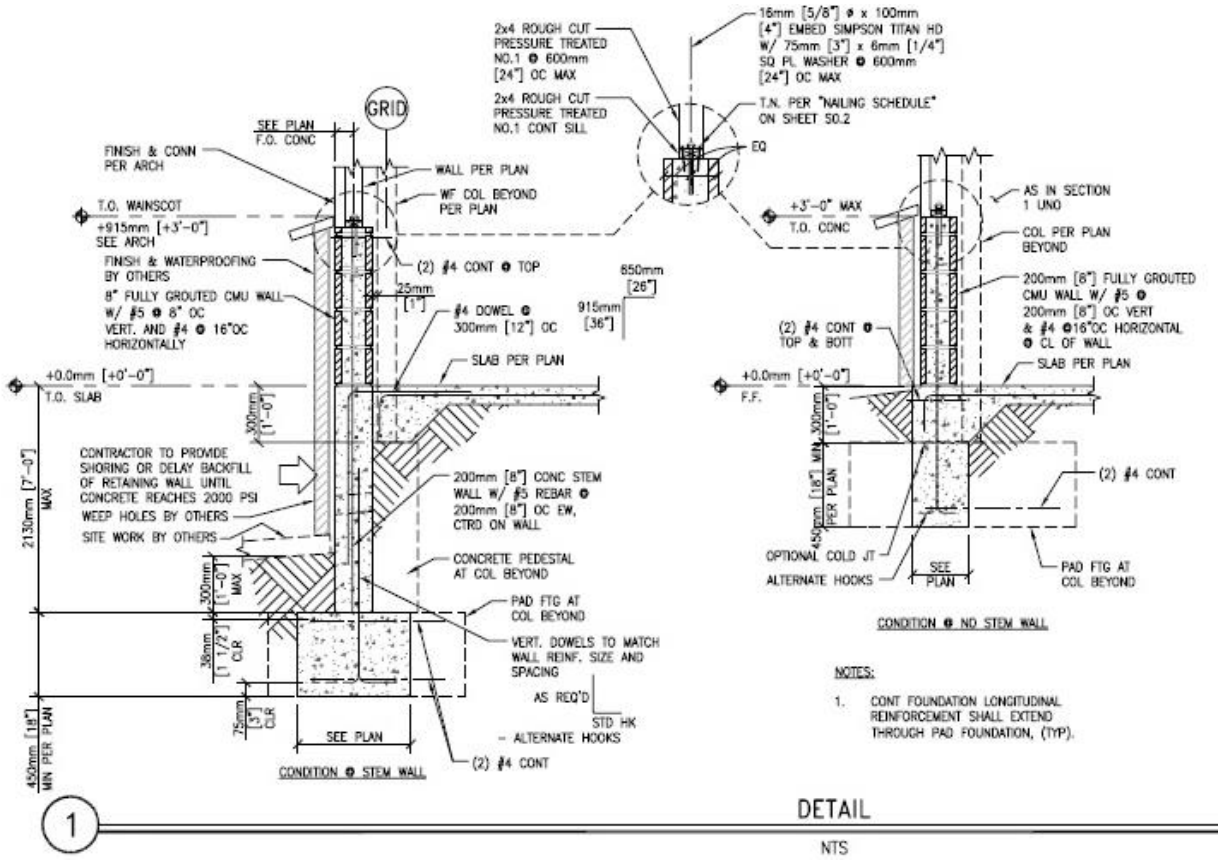


CHANGES/UPDATES TO DRAWINGS

There is a common method of indicating where a revision has changed a drawing. The change shall be represented by the cloud method next to a delta sign. Where each change is enclosed by a cloud shape.

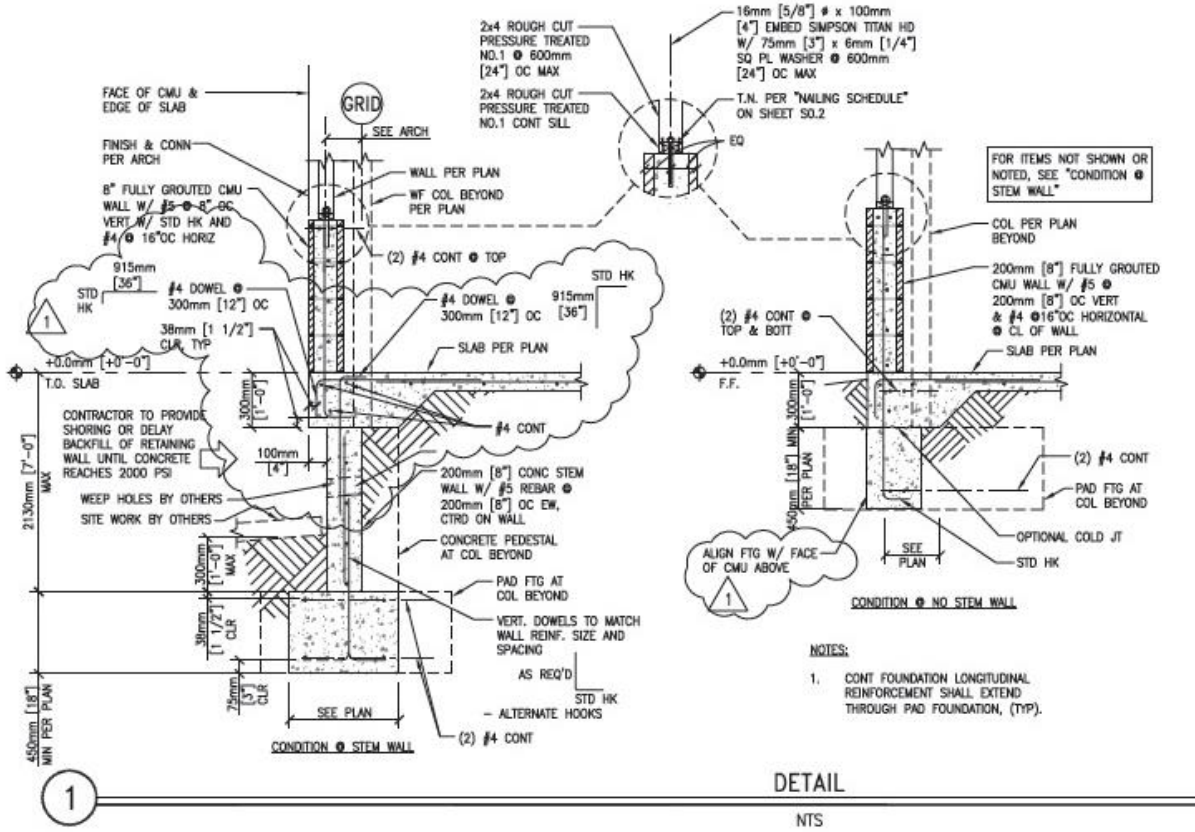
CHANGES/UPDATES TO DRAWINGS (CONT.)

Example of details without change.



CHANGES/UPDATES TO DRAWINGS (CONT.)

Example of details with change.



THANK YOU!