

“ BUILD BACK BETTER”

...The SAFETY of our school children and countrymen lies in your dedication, vigilance and technical judgement as you build residential houses that shall protect their occupants and school buildings that shall serve as future evacuation centers for the displaced families during calamities...*they are counting on YOU!*

SIMPLIFIED CONSTRUCTION HANDBOOK FOR SCHOOL BUILDINGS

***FOR SUPERVISING ARCHITECTS, CIVIL
ENGINEERS, CONTRACTORS &
CONSTRUCTION FOREMEN***

May 2014

PREPARED BY :

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
JAPAN INTERNATIONAL COOPERATION AGENCY

IN COLLABORATION WITH:

DEPARTMENT OF EDUCATION



IN COOPERATION WITH:
MOHRI & P.A. ASSOCIATES INC.



- National Structural Code of the Philippines (NSCP), version Six; ASEP
- Masons and Builders Library volume 1 (revised edition) by Louis M. Dezettel; revised by Tom Philbin
- Architectural & Construction Data - Book 9 by George S. Salvan
- Manual on Construction Methods and Techniques for Buildings, DPWH
- Basic Construction Training Manual for Trainers, Heini Muller
- RSMeans- Illustrated Construction Dictionary
- Building Construction Illustrated
- TEEP "A Layman's Guide to the Construction of a One-Storey, Two-Classroom School Building in 60 days"

Should there be any conflicting statements, illustrations between this handbook and the construction plans and specification, the plans and specification shall prevail.

		DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS		CONCRETE POURING REQUEST			
PROJECT:							
LOCATION:							
DATE REQUESTED:				CPTR NO.:			
STRUCTURE:		AREA/FLOOR LEVEL:		ACTUAL INSPECTION DATE/TIME:			
GRIDLINE:							
NOTE: THAT THE FOLLOWING COMPLY WITH APPROVED SUBMITTALS FOR CONSTRUCTION DRAWINGS AND TECHNICAL SPECIFICATIONS.							
POURING REQUEST							
Subject Area/ Structure		:					
Concrete Strength		:					
Slump		:					
Elevation (From Reference point)		:					
Date of Scheduled Pouring		Actual volume: _____					
Estimated Volume		Time Completed: _____					
Time Started		:					
Number of Sample		:					
COMPONENTS		COMPLIED				REMARKS	ACTIONS REQUIRED
		DFC	YES	NO	N/A		
CHECKLISTS							
A. Formworks							
1. Correct Elevation/ Layout		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
2. Required dimension / thickness satisfied		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
3. Squareness, Plumbness, Levelness achieved		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
4. Adequate/Appropriate shoring, braces and supports		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
5. Approved form – oil applied		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
a. Wax based for Steel forms		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
b. Resin based for Phenolic Plywoods		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
6. Cleanliness (free from saw dust, concrete laitances, loose tie wires, debris and alike)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
7. Approved construction joint key		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
B. Rebar							
8. "For Construction" Plan, Issued Date: _____		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
9. Approved Rebar Cutting Lists, Ref. No: _____		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
10. Passed the Required Tests		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
11. Free from Scaling, Laitances and other impurities		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
12. Concrete spacer minimum concrete covers		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
a. For Slab (1.0 meter space on center both ways)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
b. For Beams (Bottom/Side Bars, 2pcs at every 0.80 meter)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
13. Correct quantity and spacing		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
14. Correct splice location / length and development lengths		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
15. Minimum stirrups / ties installed above concrete termination for Vertical Structures		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
16. Approved shear bars / keys at construction joints		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
C. MEPP Checklists							
	Reference No.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
17. Accomplished Electrical Pre-Concreting Checklist (QC-MEPP-001)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
18. Accomplished Plumbing / Sanitary Pre-Concreting checklist (QC-MEPP-002)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
19. Accomplished Fire Protection Pre-Concreting checklist (QC-MEPP-003)			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
20. Approved Penetrations			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
21. Accomplished Civil Dowels, etc.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
FORM STRIKING							
REMARKS: DFC= Dimensions for Compliance							
INSPECTED BY:		CHECKED BY:		APPROVED BY:			
_____ Contractor's Proj. Engineer		_____ DPWH-Inspector		_____ DPWH-Project Engineer			
DISTRIBUTION: <input type="checkbox"/> Contractor <input type="checkbox"/> QC Engineer <input type="checkbox"/> Inspector <input type="checkbox"/> Project Engineer							

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS				FORMS CLOSURE REQUEST		
PROJECT:						
LOCATION:						
DATE REQUESTED:				CPTR NO.:		
STRUCTURE:	AREA/FLOOR LEVEL:			ACTUAL INSPECTION DATE/TIME:		
GRIDLINE:						
CHECK THAT THE FOLLOWING COMPLY WITH APPROVED SUBMITTALS FOR CONSTRUCTION DRAWINGS AND TECHNICAL SPECIFICATIONS.						
COMPONENTS	COMPLIED				REMARKS	ACTIONS REQUIRED
	DFC	YES	NO	N/A		
REINFORCING STEEL CHECKLIST						
1. Bars are not misbent or damaged		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2. Bars are free of dirt, loose mill scale, heavy rust, grease or other deleterious materials		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
3. Bar identifications are intact and legible before use		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
4. After placing reinforcing bars:		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
a. Bars are free of loose mortar, rust, grease and other substance capable of destroying bond		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
b. Rebar type, size, fabrication, and positioning in accordance with the drawing.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
c. Total Quantity of rebars per schedule		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
d. Minimum clearance distance between bars is equal to nominal diameter of bar but not less than 1 inch		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
e. For parallel bars in layer or mats the minimum clear distance between layers is equal to the diam. of the bar but not less than 1 inch		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
f. No 11 bars and smaller bars are lap spliced. Larger bars are spliced by welding or other type position connection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
g. Lap length of splices is according to specifications and drawings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
h. Cover of bars meet or exceeds the minimum requirements. Spacers adequate.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
i. Hook size, length, spacing, degree according to specifications and drawings.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
j. Reinforcement is adequately supported. Columns, tie beams rest on gravel base.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
k. Extra bars, stiffeners and others, according to plans and specifications.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
l. Field bending or straightening or rebars is done in accordance with the specification		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
m. Rebent or straightened bars are free of cracks or damage.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
FORMWORKS						
5. Shape, line and grade, dimensions of form- in place		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
6. Cleaning and oil coating present over whole form area and adequate		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
7. Tightness of joints and bracings adequate per approved submittals and drawings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
8. Location of construction /control/expansion joints		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
9. Installation of block-outs and pipes embedment		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
10. Adequate shoring supports on firm base		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
11. Vertical and Horizontal Control within tolerances		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
OPENINGS						
12. Door openings according to drawings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
13. Window openings according to drawings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
14. Lintel beams		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
15. Stiffener columns		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
PENETRATIONS (MEPF)						
16. Pipe sleeves spacing, location, type according to drawings		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
REMARKS: DFC = Dimension for Compliance						
INSPECTED BY:		CHECKED BY:		APPROVED BY:		
Contractor's Proj. Engineer		DPWH-Inspector		DPWH- Project Engineer		
DISTRIBUTION:						
☐ Contractor ☐ QC Engineer ☐ Inspector ☐ Project Engineer						



FOREWORD

The destruction caused by natural calamities that had severely affected some parts of the country has brought about the need to build back better buildings, particularly school buildings, with disaster-resilient standards.

Thorough assessments made on the calamity-damaged school buildings, show that proper construction methodologies, effective project supervision and quality control are important factors that would yield better and resilient structures ensuring the safety of the primary occupants – the school children.

The task of rebuilding these damaged school buildings is so enormous. Thus, given the limitation of highly experienced technical professionals, this **SIMPLIFIED CONSTRUCTION HANDBOOK** for school buildings is designed to help the supervising Architects/Engineers, Contractors and Construction Foremen as an easy reference for checking, monitoring and overseeing the construction and repair activities.

The typical methods as illustrated and simple descriptions in this Handbook are meant to explain the critical processes in building construction, from mobilization to demobilization – including the importance of laying out the building on the ground to the proper construction methodologies up to its completion.

I therefore enjoin all those concerned technical personnel to use this Handbook as easy reference and proper guidance.


ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways

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JOB CONTROL FORMS

There are two essential job control forms that need to be accomplished by the inspector before concrete pouring on a specific structural member, as follows:

1. Form Closure Request (refer to Appendix A)

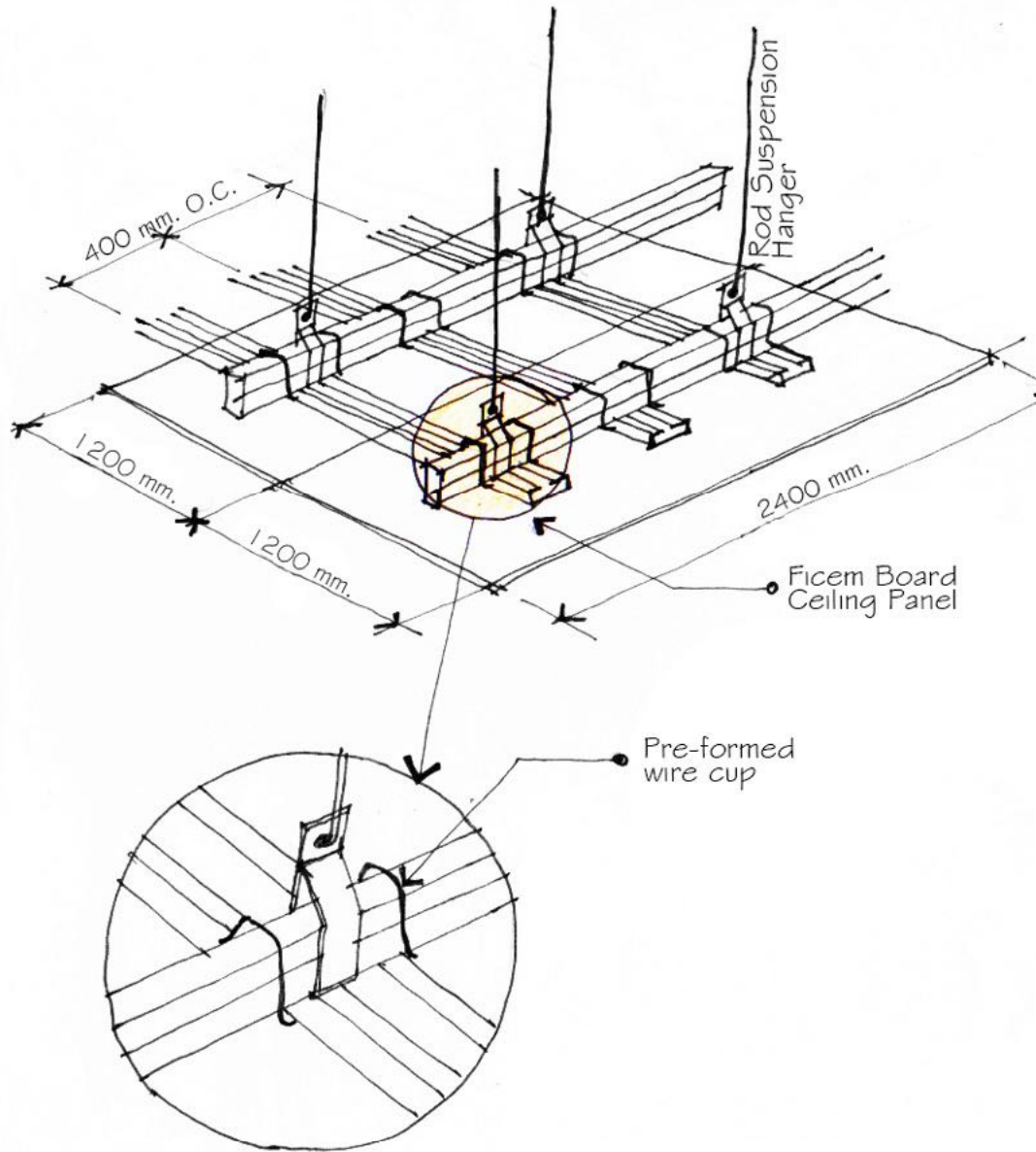
- a. The Contractor's Project Engineer conducts a thorough inspection of installed formworks, reinforcing bar works, utility roughing-ins and concrete spacers to make sure that they comply with the construction plans, specification and sound engineering practices. Affixes his/her signature on the "Inspected By" box;
- b. The DPWH Project Inspector checks and verifies the same to check on compliance and affixes his/her signature in the "Checked By" box;
- c. The DPWH Project Engineer approves the Form Closure Request by signing the "Approved By" box.

2. Concrete Pouring Request (refer to Appendix B)

- a. The Contractor's Project Engineer conducts a thorough inspection of installed formworks, reinforcing bar works, utility roughing-ins and concrete spacers to make sure that they comply with the construction plans, specification and sound engineering practices. Affixes his/her signature on the "Inspected By" box;
- b. The DPWH Project Inspector checks and verifies the same to check on compliance and affixes his/her signature in the "Checked By" box;
- c. The DPWH Project Engineer approves the Concrete Pouring Request by signing the "Approved By" box.

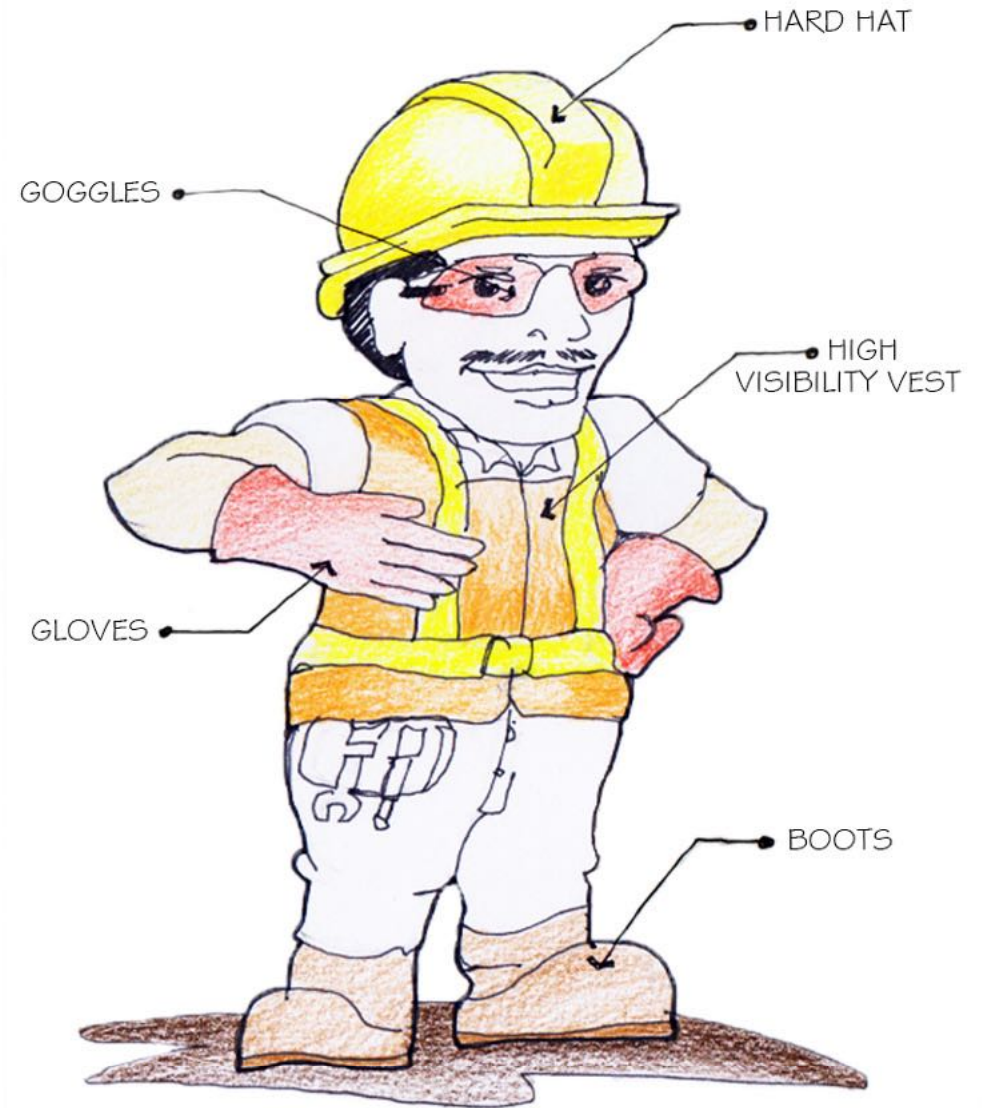
Note: These forms should always be readily available on site and shall be submitted by the Contractor to the DPWH Project Engineer for appropriate filing.

CEILING WORKS



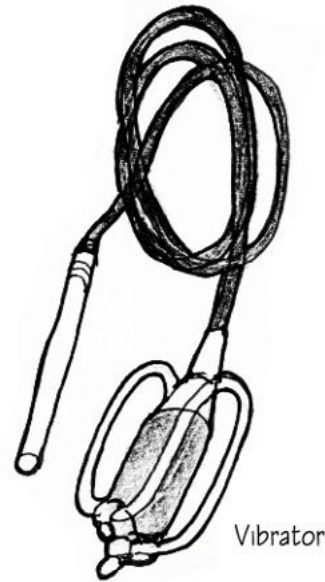
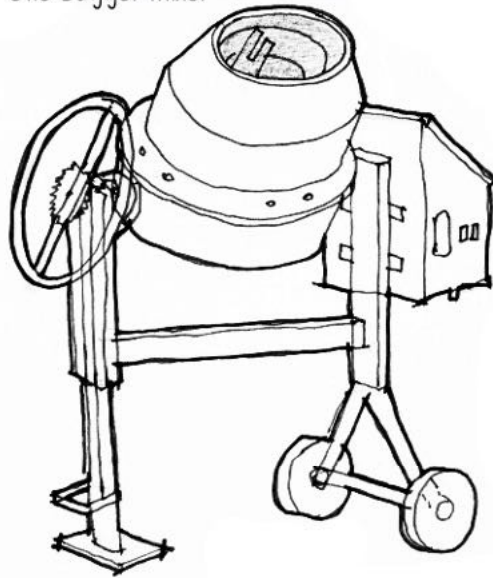
SAFETY GEAR

Safety gear is to be supplied to ensure the safety and well-being of the construction workers.



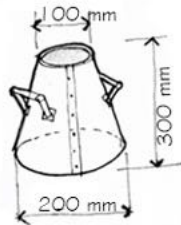
BASIC CONSTRUCTION EQUIPMENT

One Bagger Mixer



Vibrator

Truncated
Cone Tester



Metal
Cylinder

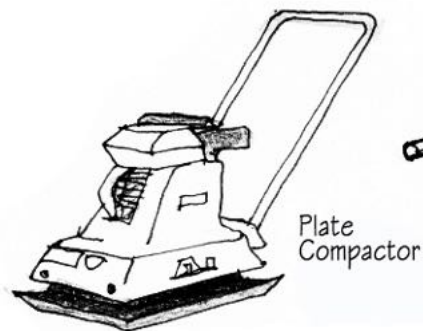
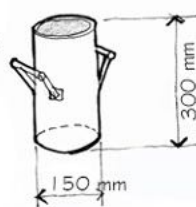
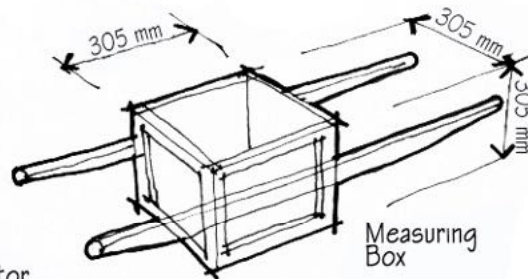


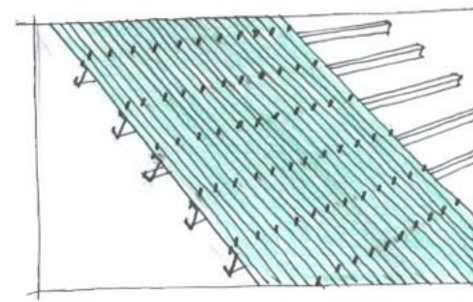
Plate
Compactor



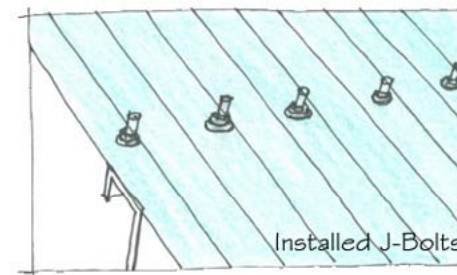
Measuring
Box

Installation

In the installation of J-Bolt, two (2) men are required to work simultaneously. One will insert the bolt through the hole from the indoor and the other will fasten the nut outdoor.

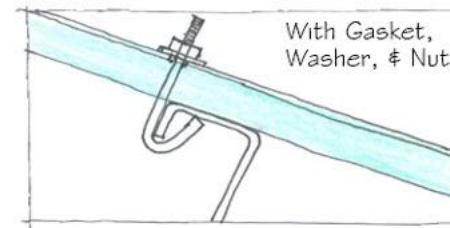


Before fastening the nut, fit a neoprene gasket then a washer bigger than the gasket.



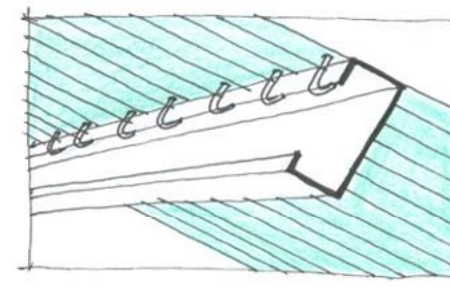
Installed J-Bolts

In fastening the nut, precaution must be observed to avoid warping of the G.I. Sheet.

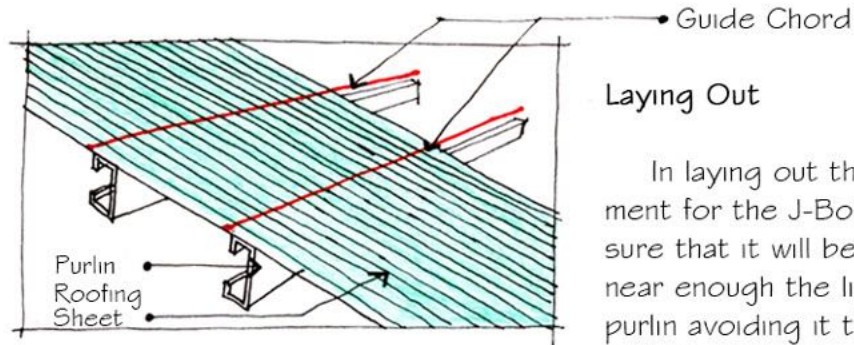


With Gasket,
Washer, & Nut

Hook of the J-bolt on the purlin must be perpendicular to the G.I. Sheet.

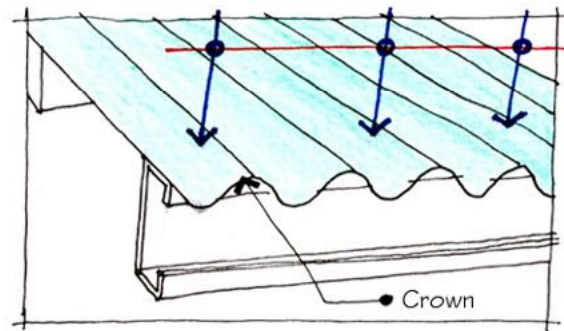


J - BOLT INSTALLATION GUIDE



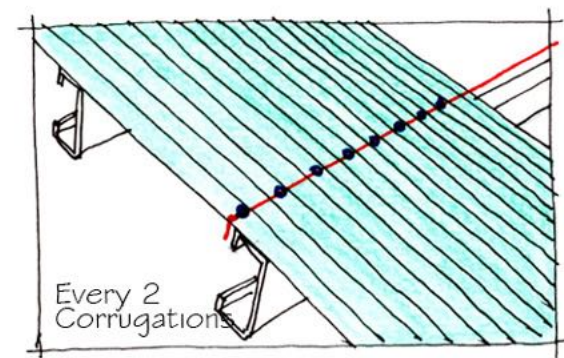
Laying Out

In laying out the placement for the J-Bolt, make sure that it will be aligned near enough the lip of the purlin avoiding it to be drilled when making holes. A guide chord may be stretched out from end to end of the purlin to establish the desired alignment.



Drilling

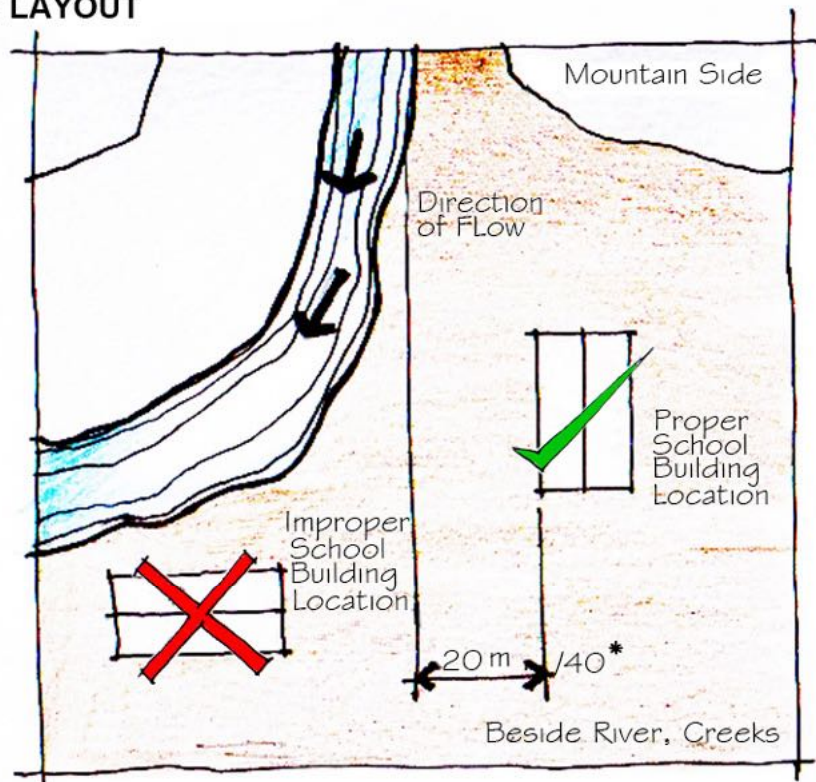
After laying out, drilling points should be located at crown every other two corrugations of the roofing material (G.I. Sheets).



SAMPLING & TESTING REQUIREMENTS OF BASIC MATERIALS:

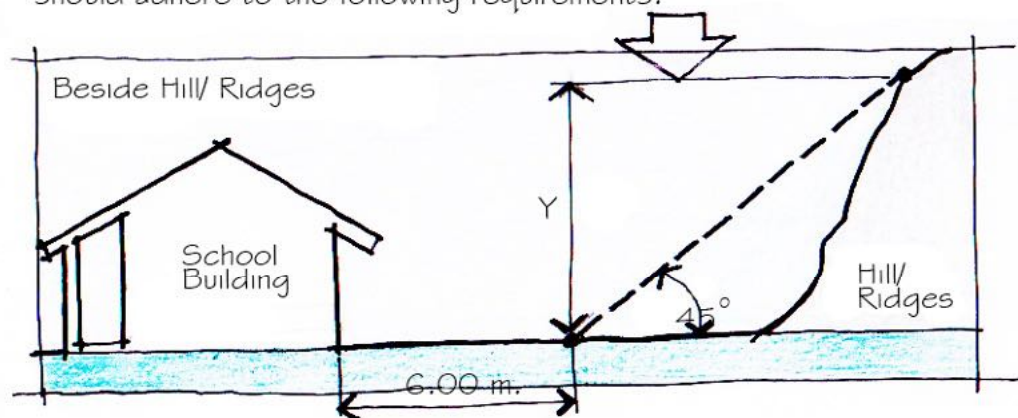
TEST	FREQUENCY OF TEST	NO. OF SAMPLES
A. WATER 1. Quality Test (PH Level)	one on each source	1
B. CONCRETE MASONRY UNIT (Required Units:) 1. Absorption Test 10 pcs. 2. Compressive Test 10 pcs.	1 for every 20,000 pcs. delivered at site	
C. CONCRETE 1. Trial Mix (For cases where ready mix is to be used) 2. Slump Test 3. Temperature Test 4. Compressive Test	on plant every delivery every delivery every delivery	1 5 5 5
D. REINFORCING BARS 1. TENSILE TEST 1.1 Chemical Composition 1.2 Mechanical Composition 1.3 Bending	1 for every 10,000 kgs. or fraction thereof for each size	3 per diameter
E. FINE AGGREGATES 1. Sieve Analysis 2. Fineness Modulus 3. Bulk Specific Gravity 4. Absorption 5. Mortar Strength Soundness 6. Organic Impurities 7. Unit Weight 8. Percent Clay Lumps	1 per 75m ³ or fraction thereof	3
F. COURSE AGGREGATES 1. Sieve Analysis 2. Fineness Modulus 3. Bulk Specific Gravity 4. Absorption 5. Abrasion 6. Soundness 7. Unit Weight	1 per 1,500 m ³ or fraction thereof	3
G. CEMENT (10 kgs. per 1000 bags)	1 for every 2,000 or fraction thereof	3
H. G.I. SHEETS (Basemetal)		
I. STEEL COMPONENTS (ex. angle bars, C-purlins, etc) (with Mill Certificate)	1 for every 10,000 kgs. or fraction thereof for each size	3 per section

SITE LAYOUT

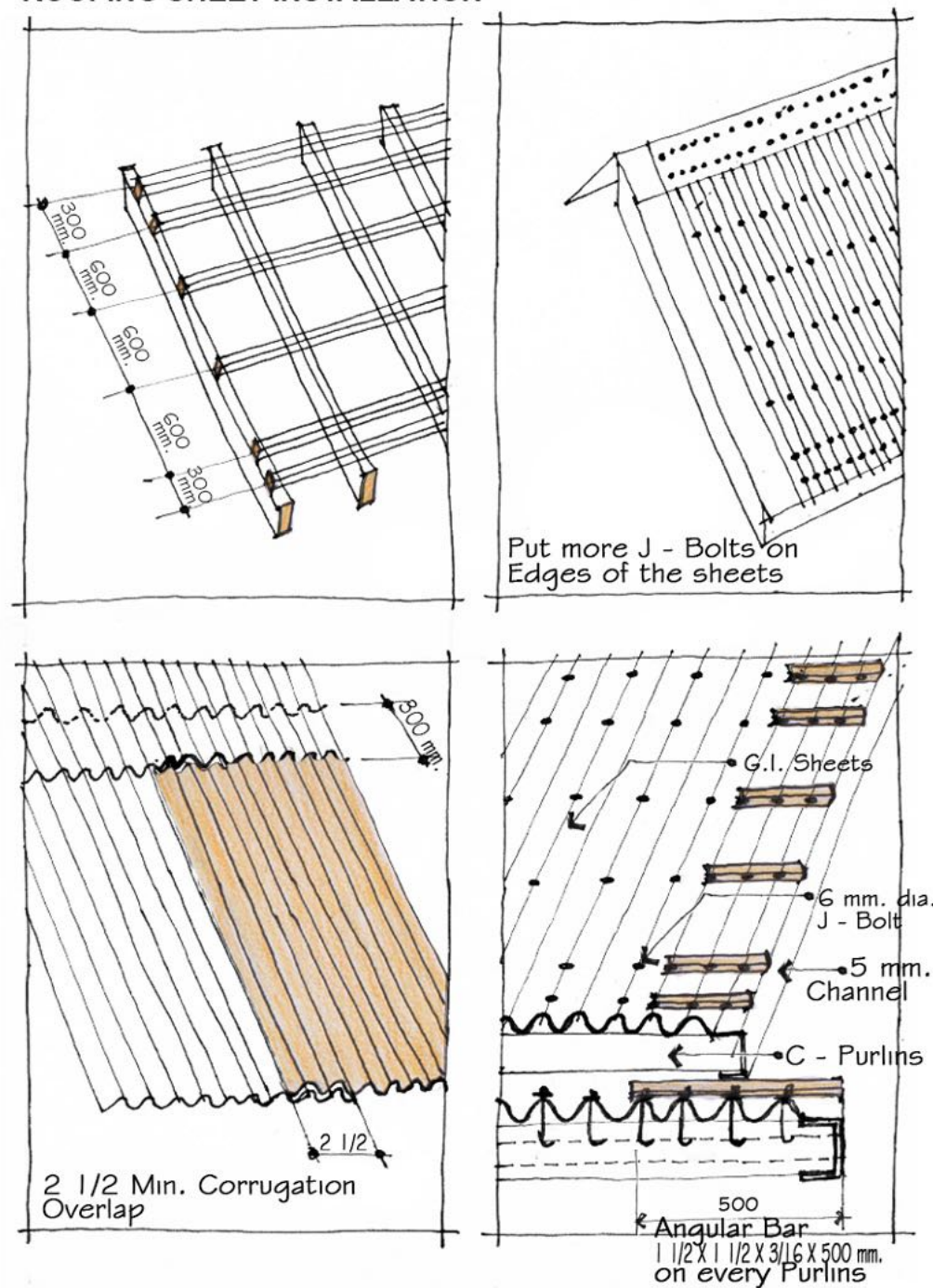


Structures/ buildings near or along riverbanks or waterways.

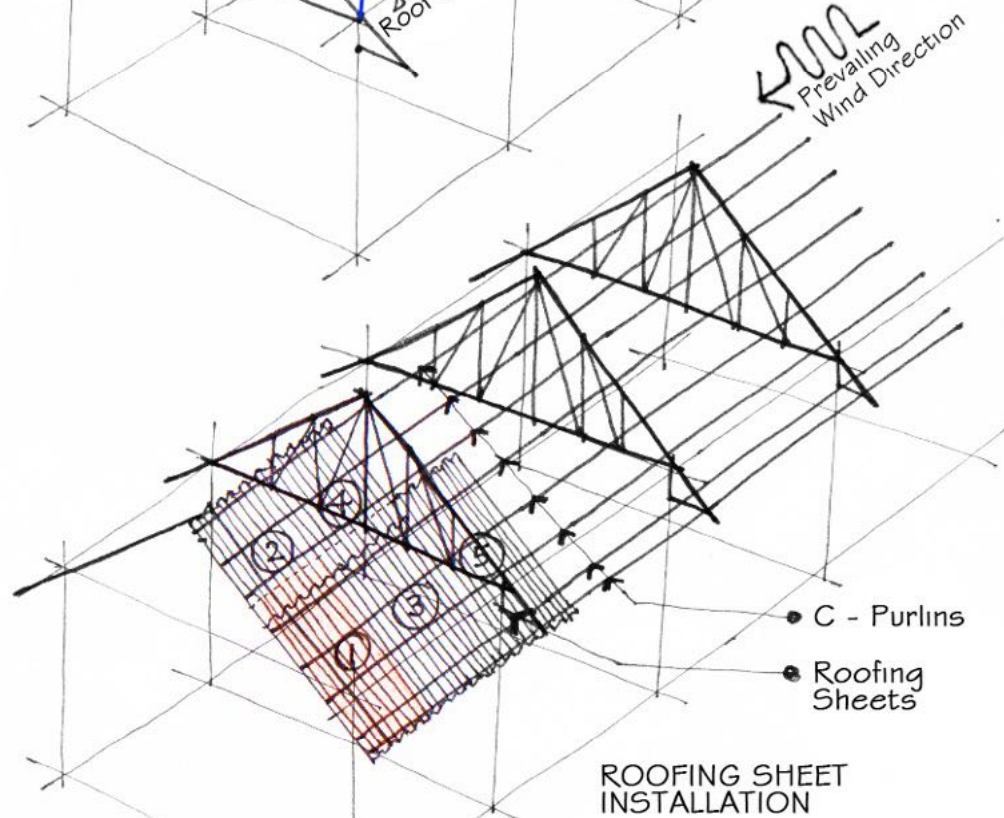
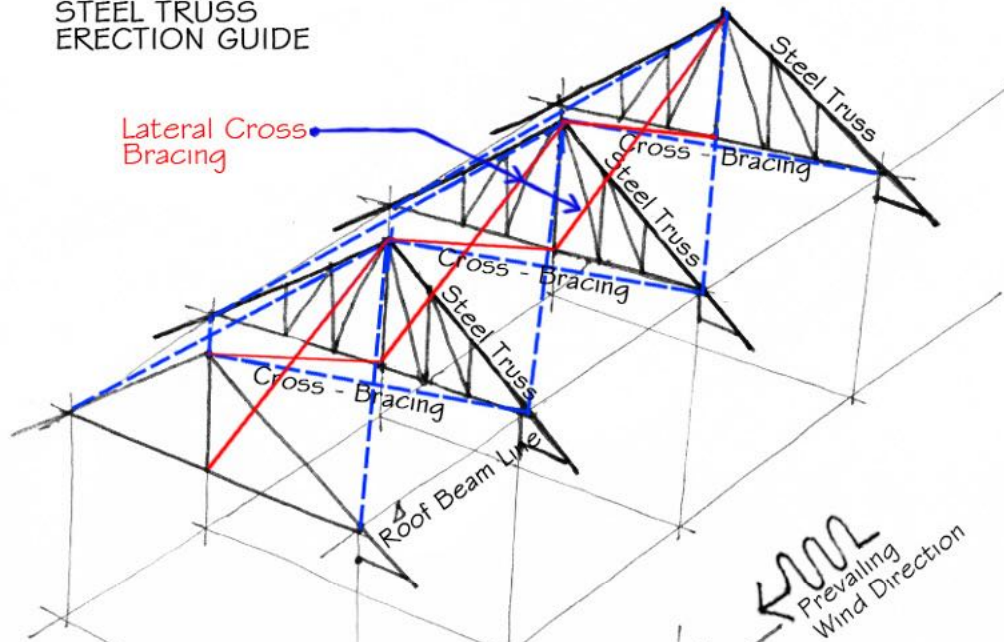
- * Adopt 40 M setback along shorelines reckoning from the highest water level during hightide.
- Structures/ buildings on or adjacent to ground slopes exceeding 100% should adhere to the following requirements.



ROOFING SHEET INSTALLATION

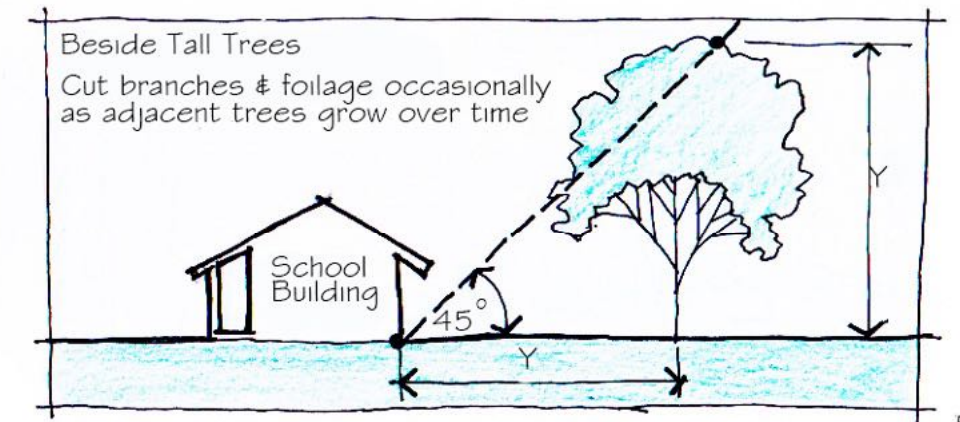
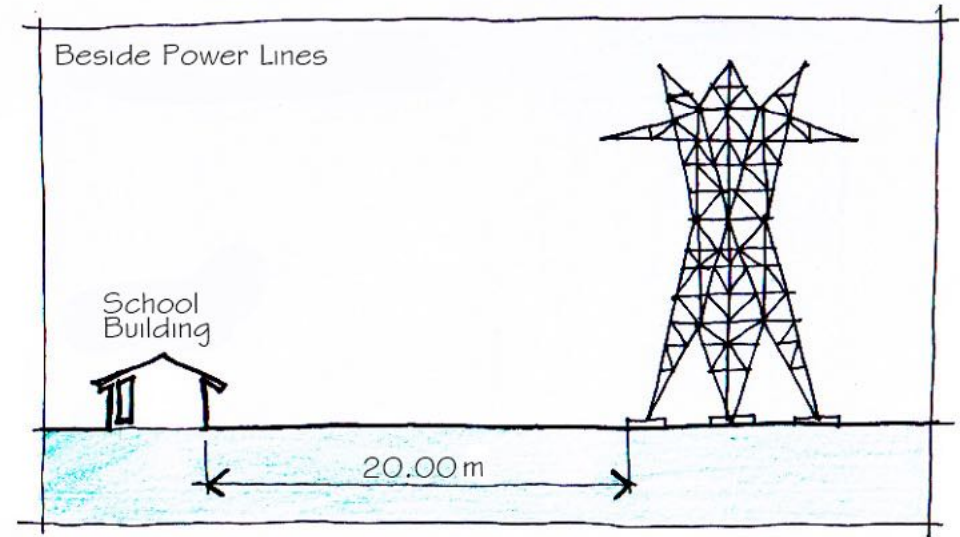
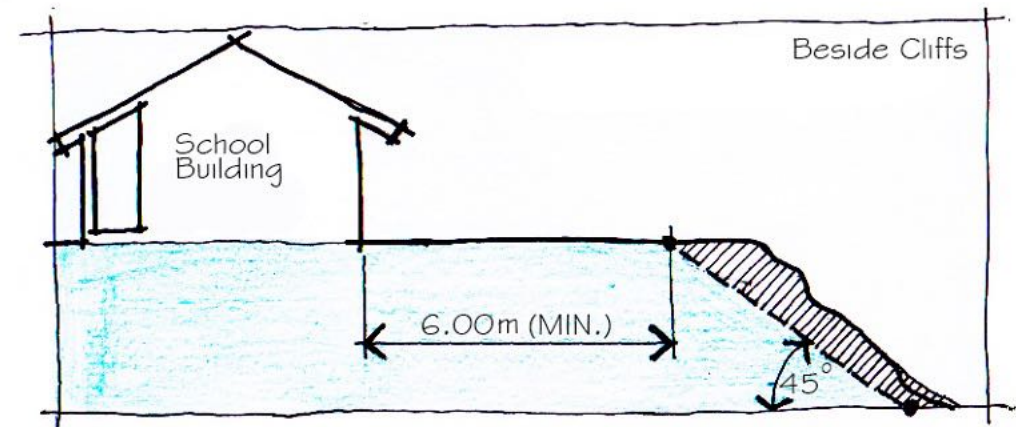


STEEL TRUSS ERECTION GUIDE

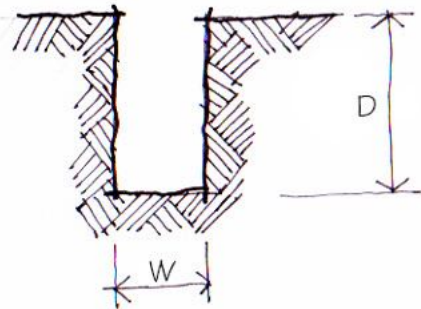


ROOFING SHEET INSTALLATION

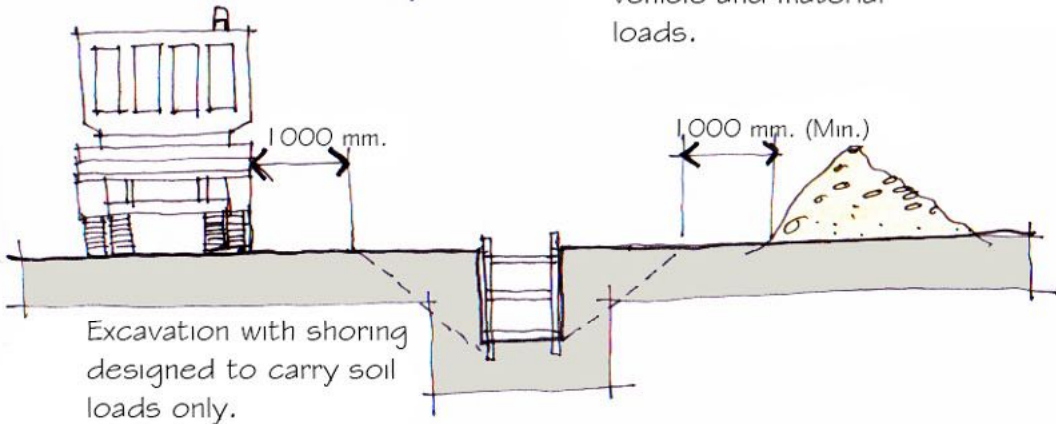
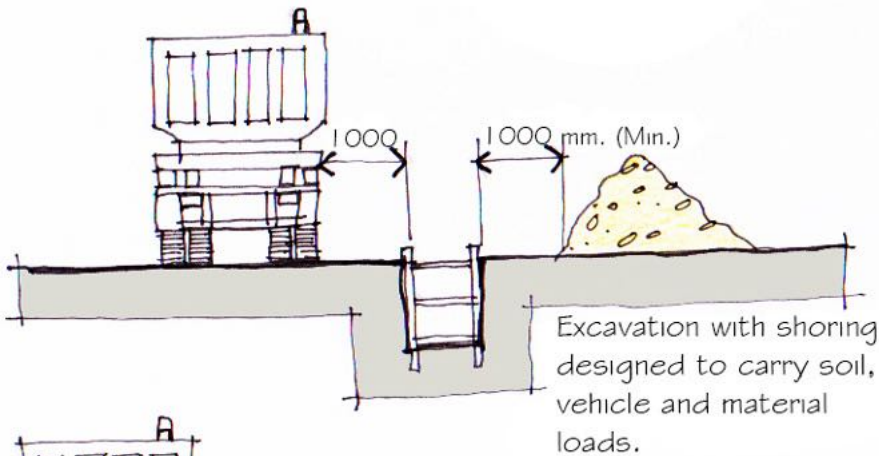
This applies if not using long-span roofing sheets



EXCAVATION AND SHORING



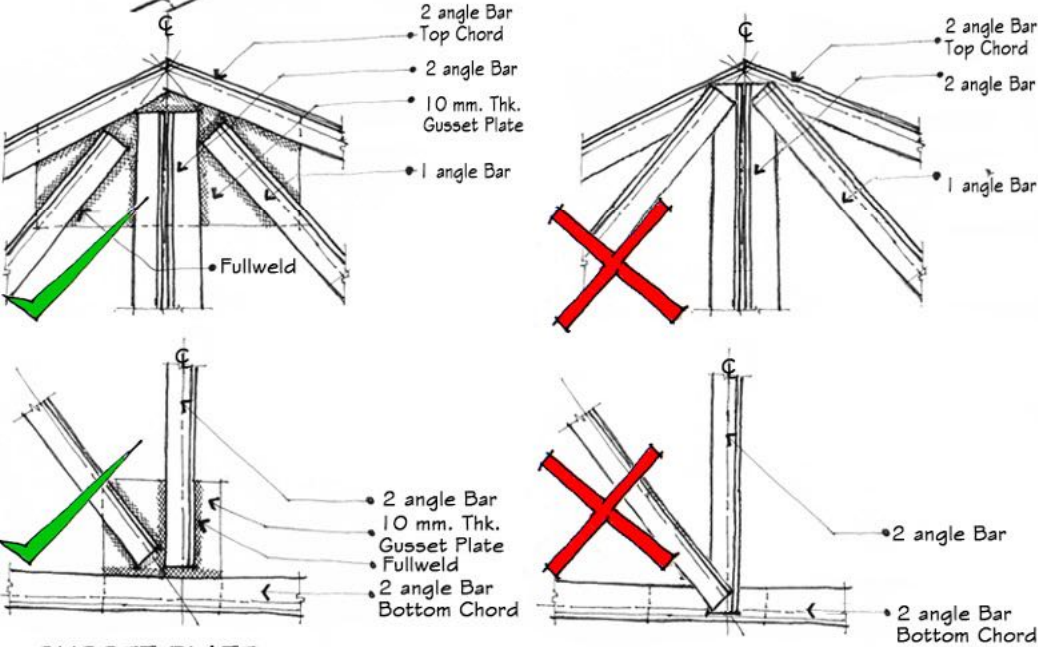
Before a worker enters an excavation site (which is 1.5 Meters in depth or more than twice the width of the trench). A support structure is needed or the excavated walls must be sloped at an appropriate angle.



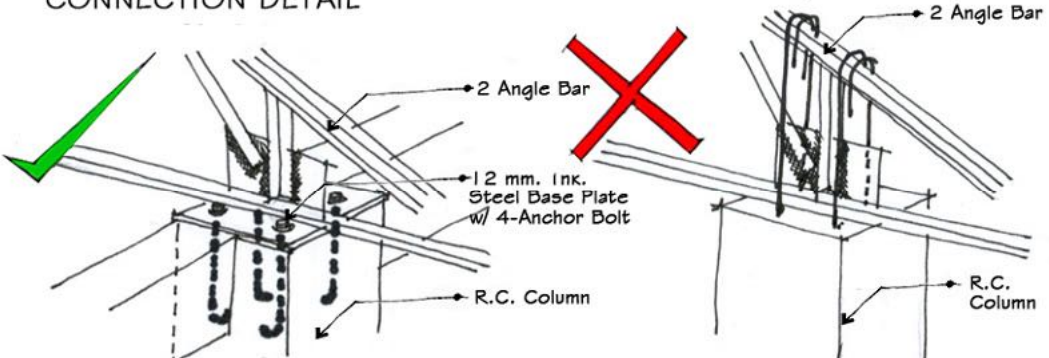
ROOF FRAMING WORKS



STEEL TRUSS FABRICATION at GROUND LEVEL



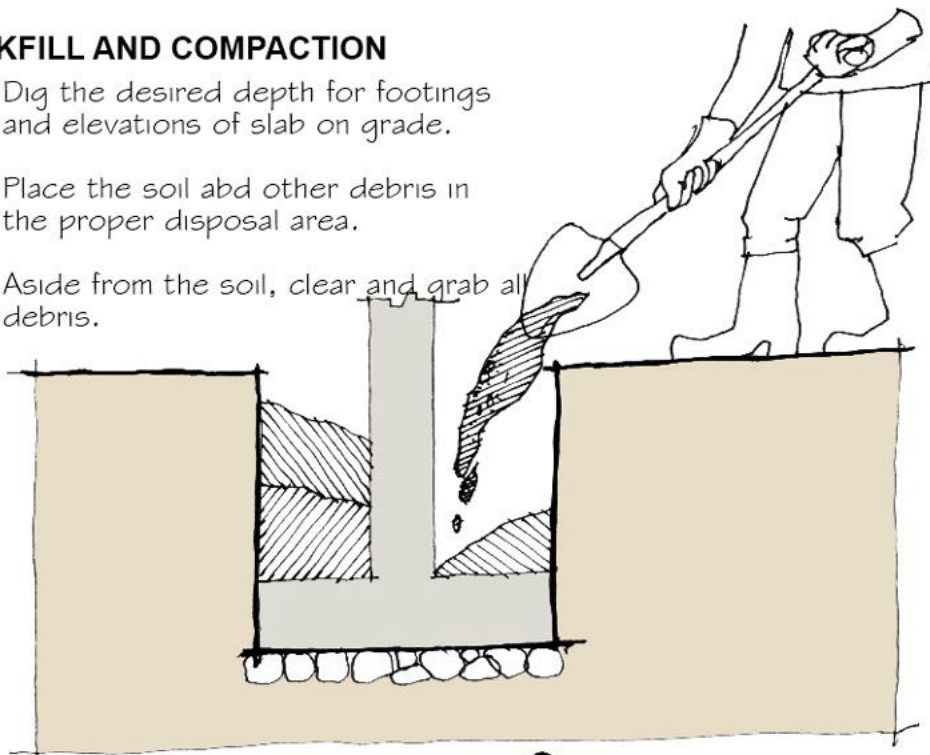
GUSSET PLATE CONNECTION DETAIL



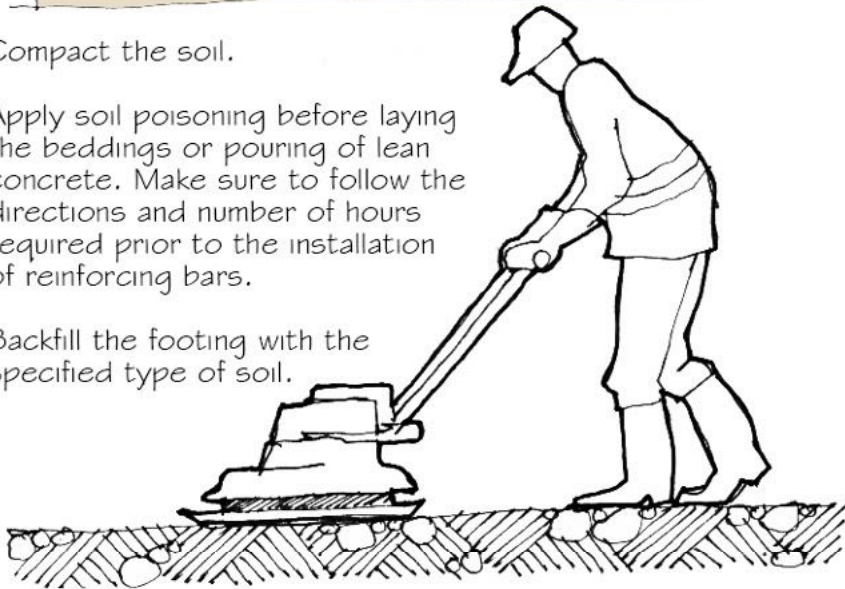
BASE PLATE ANCHORAGE DETAIL

BACKFILL AND COMPACTION

- Dig the desired depth for footings and elevations of slab on grade.
- Place the soil and other debris in the proper disposal area.
- Aside from the soil, clear and grab all debris.

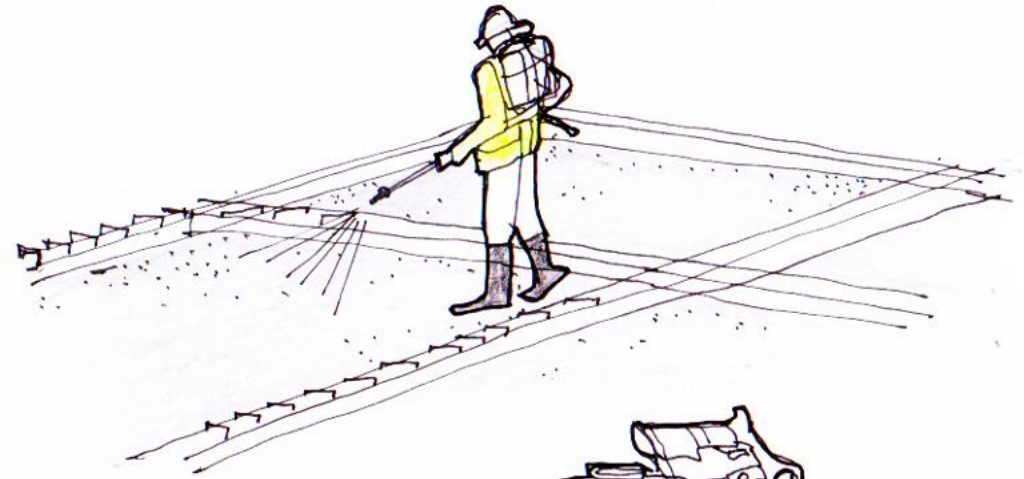


- Compact the soil.
- Apply soil poisoning before laying the beddings or pouring of lean concrete. Make sure to follow the directions and number of hours required prior to the installation of reinforcing bars.
- Backfill the footing with the specified type of soil.

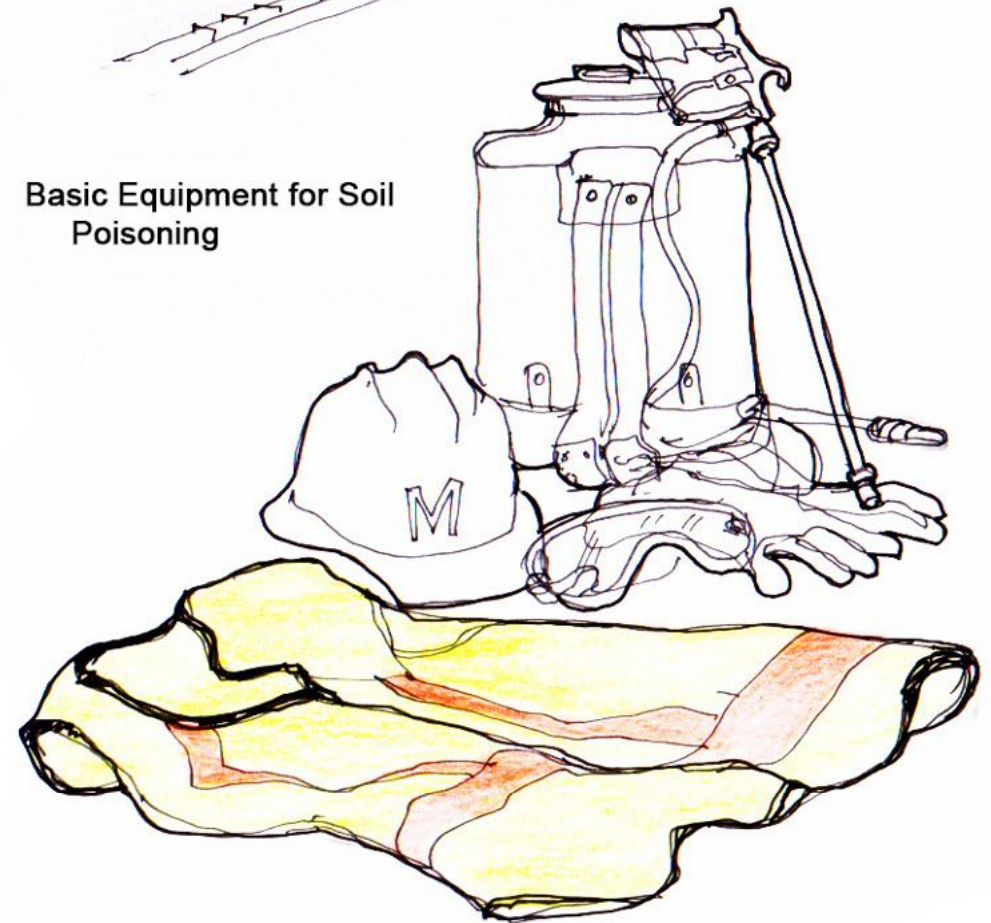


- Before pouring of slab on grade make sure that the soil is well compacted. Compact the soil at every 200 mm layer prior to soil poisoning. Laying of gravel bed and installation of reinforcing bars.

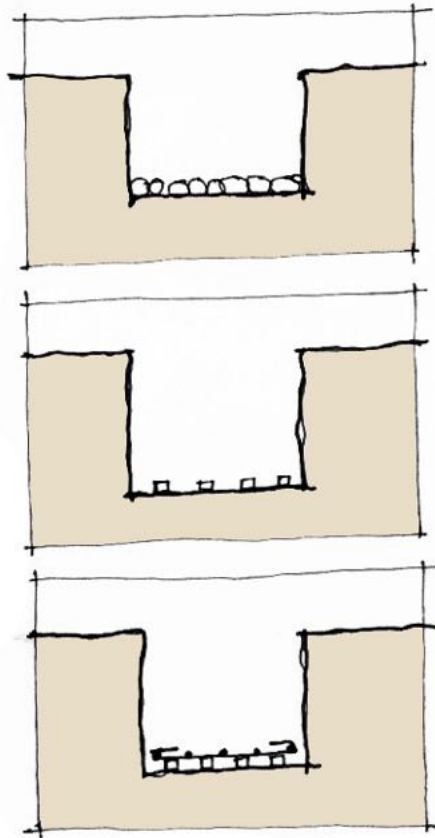
SOIL POISONING



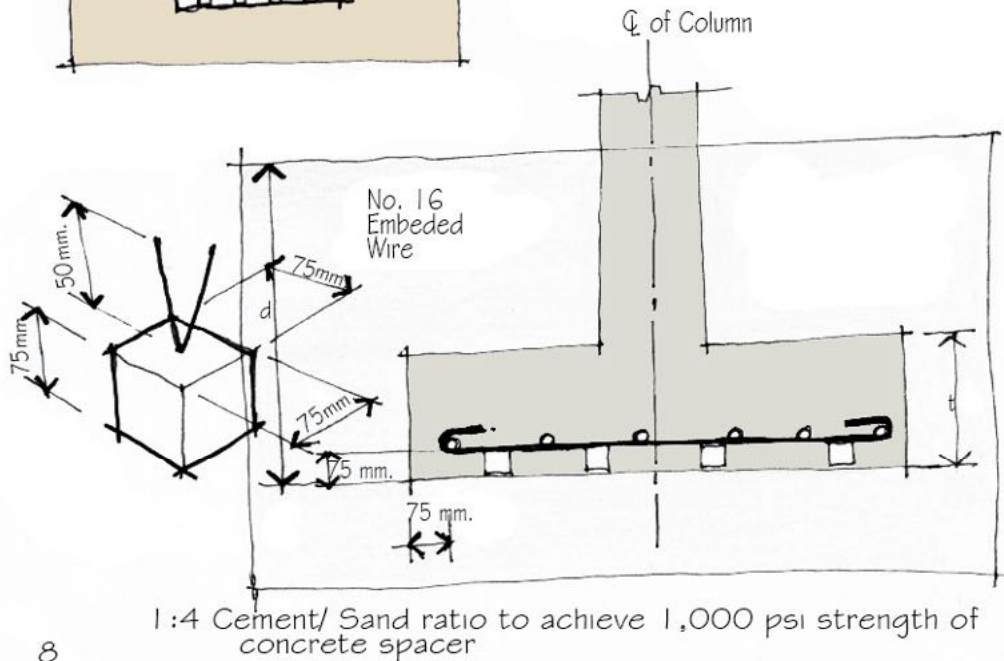
Basic Equipment for Soil Poisoning



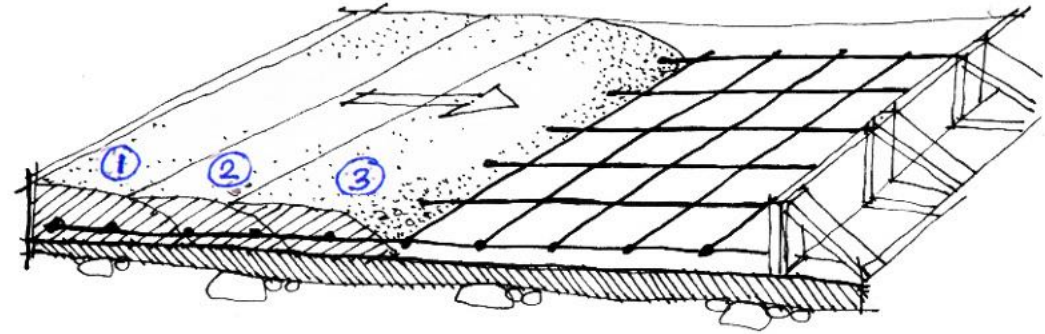
FOUNDATION WORKS



- Dig the required footing from the natural grade line.
- Pour 50 mm or 100 mm lean concrete or place a 100 mm gravel bed.
- Provide 75 mm thick spacer with 600 mm interval bothways. The minimum compressive strength of this spacer should be 1000 psi.
- Lay the reinforcing bars and tie them with no. 16 G.I. wires.
- Provide starter bars or dowels to ensure that the forces are transferred to footing
- Pour concrete up to the specified thickness.



CONCRETE POURING OF SLAB ON FILL



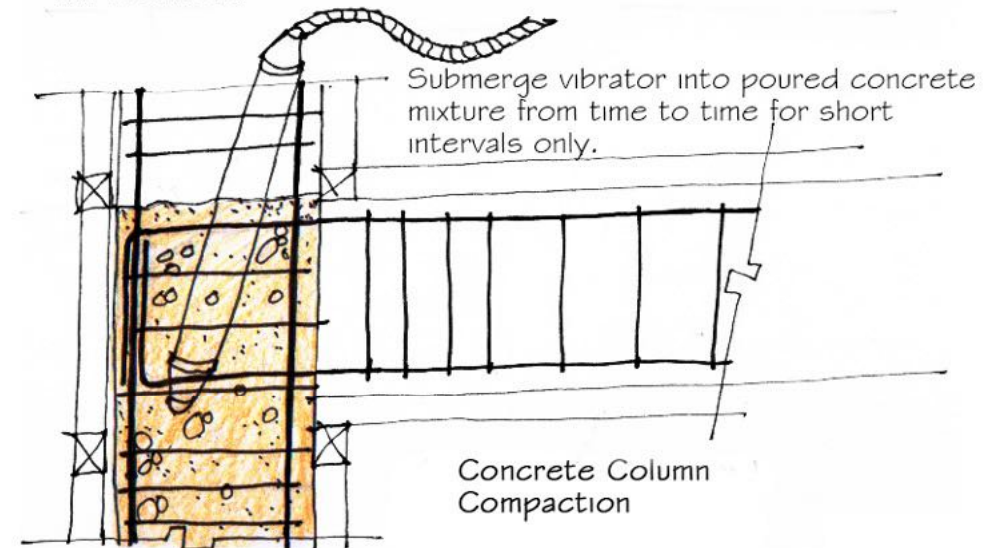
Proper Placing

The right way to pour concrete on grade is to start from the farthest point working back to the source of concrete mix.

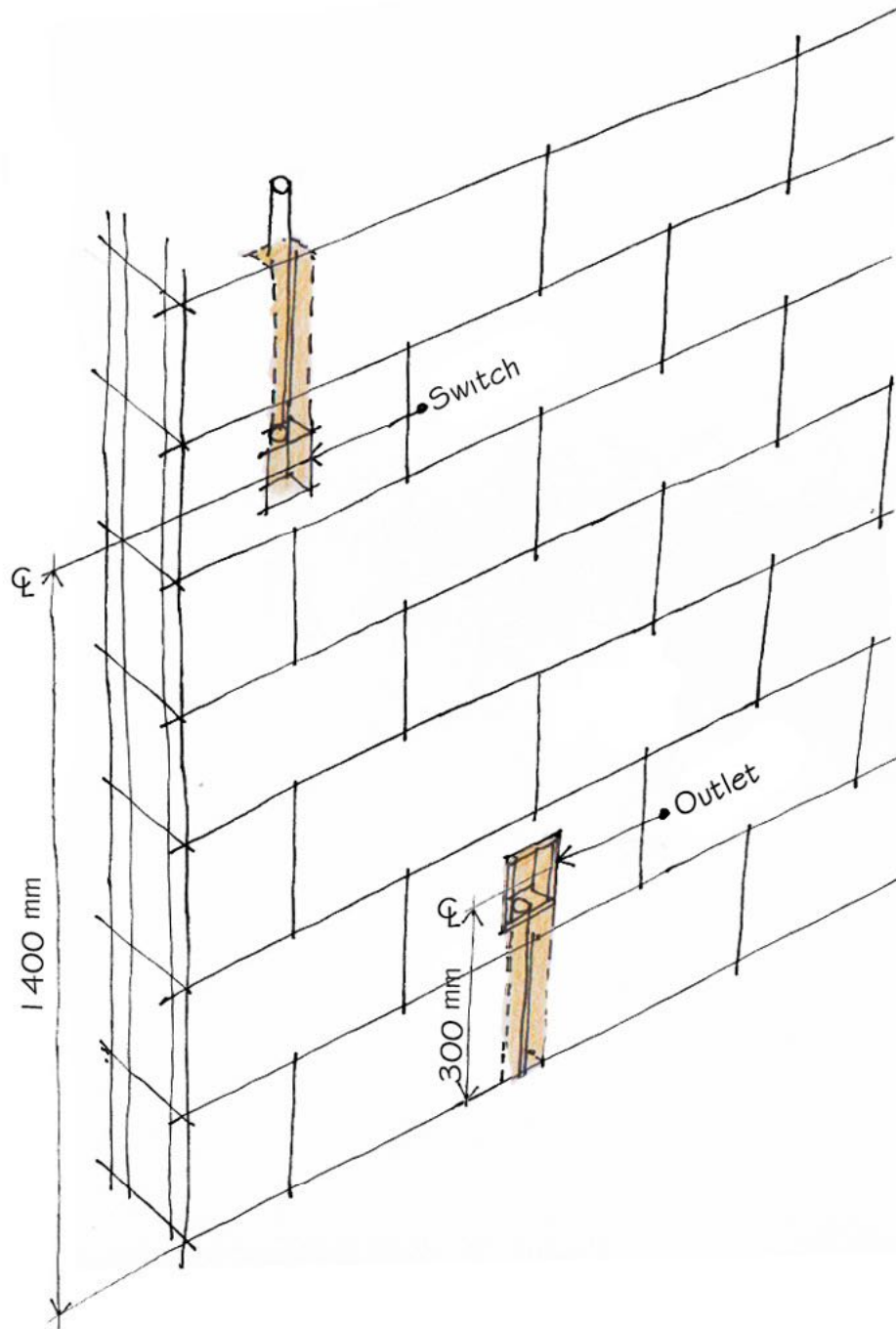
Before placing concrete, make sure the forms are:

- ☒ fixed
- ☒ oiled
- ☒ cleaned
- ☒ dried of any standing water.

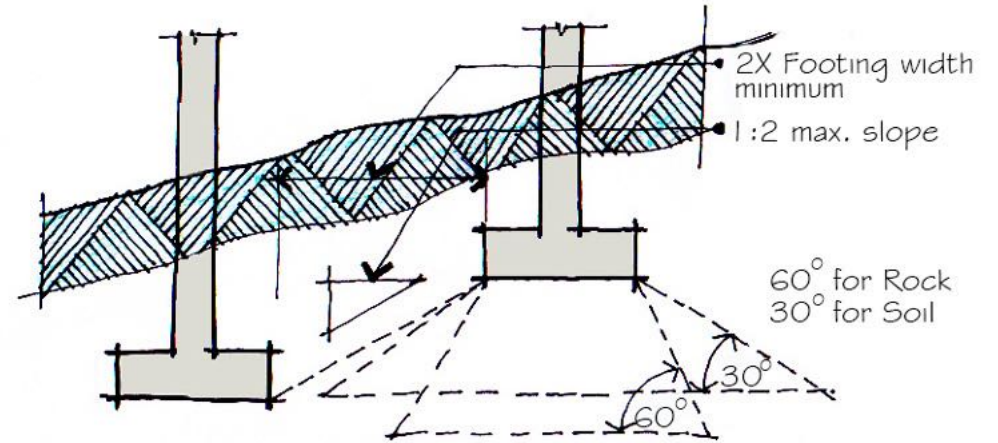
Make sure that steel reinforcement is properly spaced from the formwork.



ROUGH-INS (ELECTRICAL)

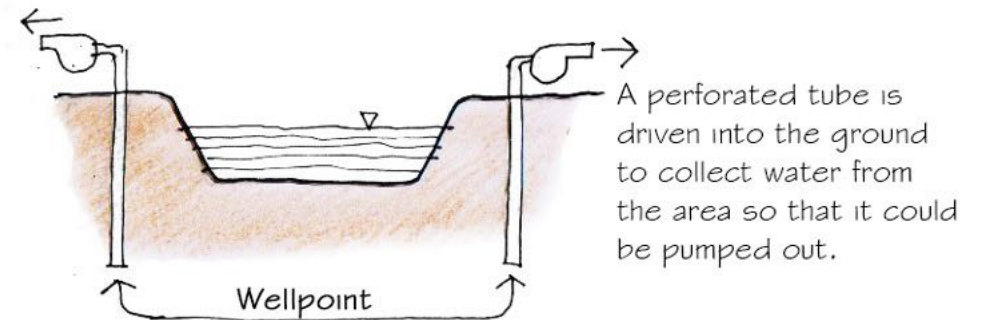


FOUNDATION ON SLOPING TERRAIN



DEWATERING

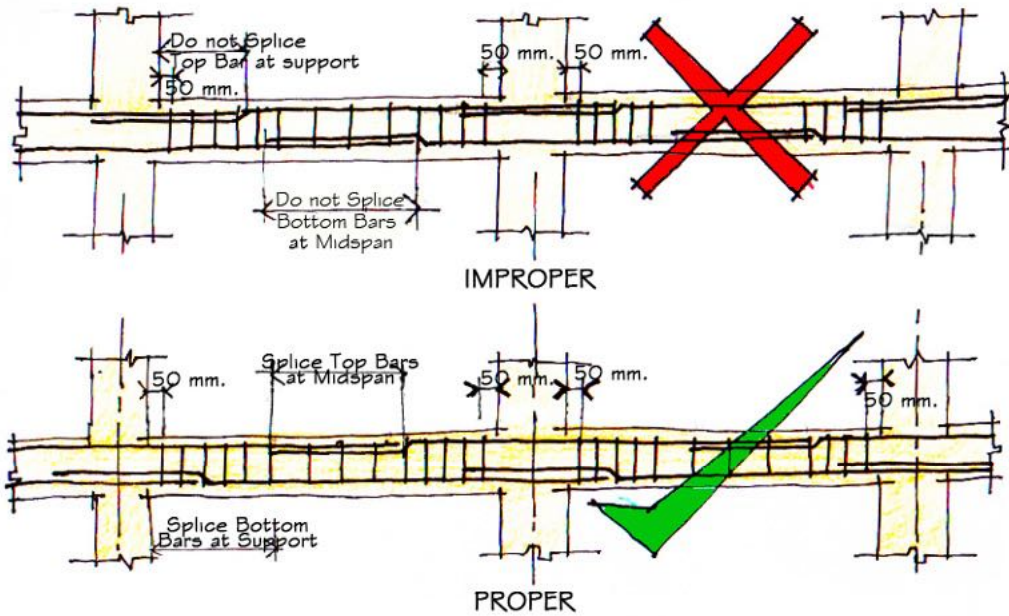
Use of Perforated Tube



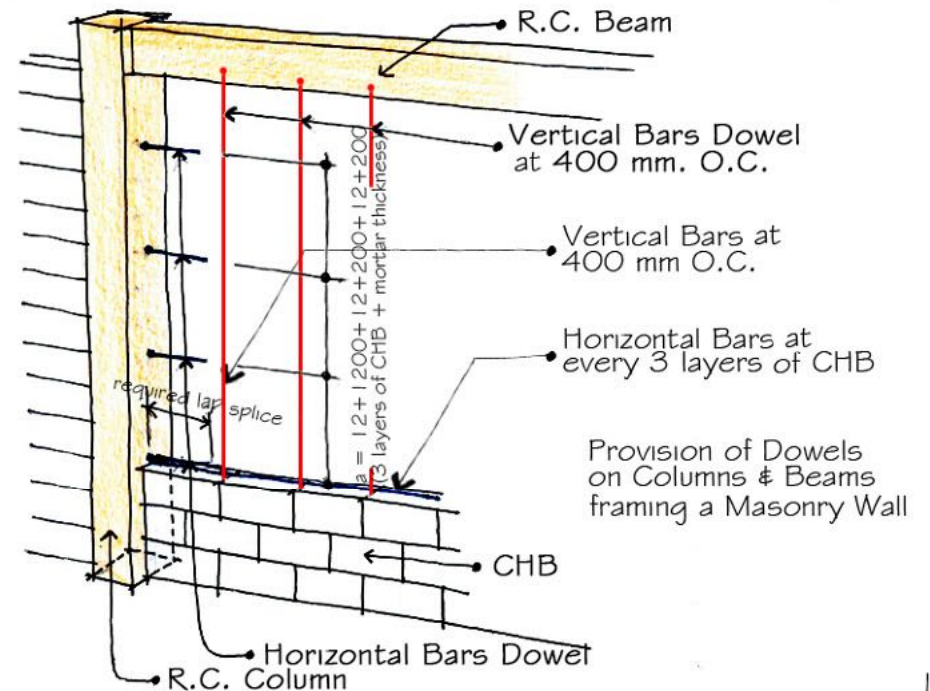
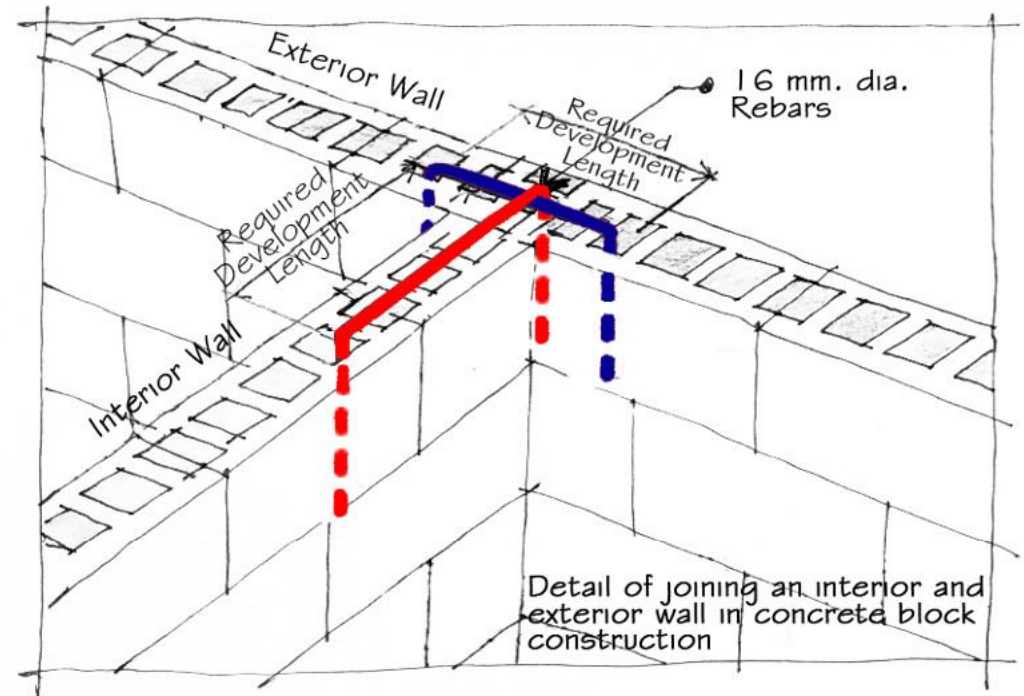
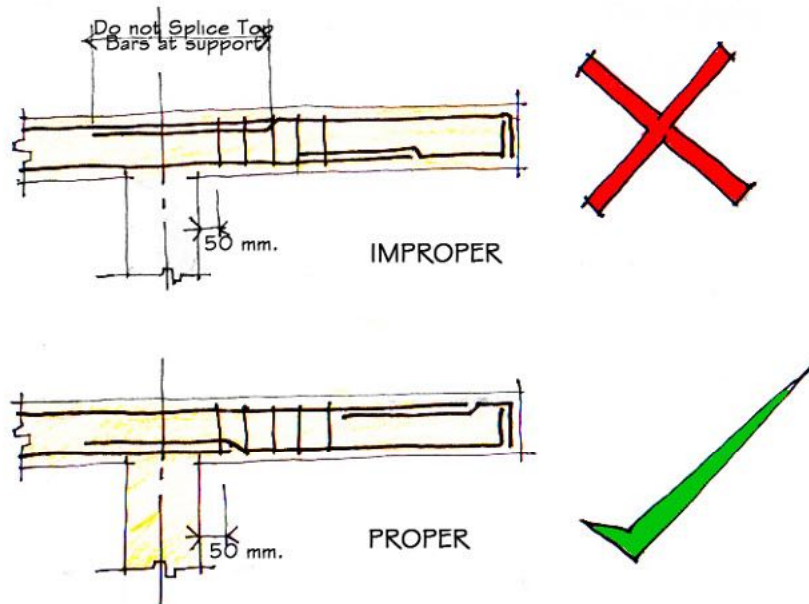
REBAR WORKS

Splice Location for Beams

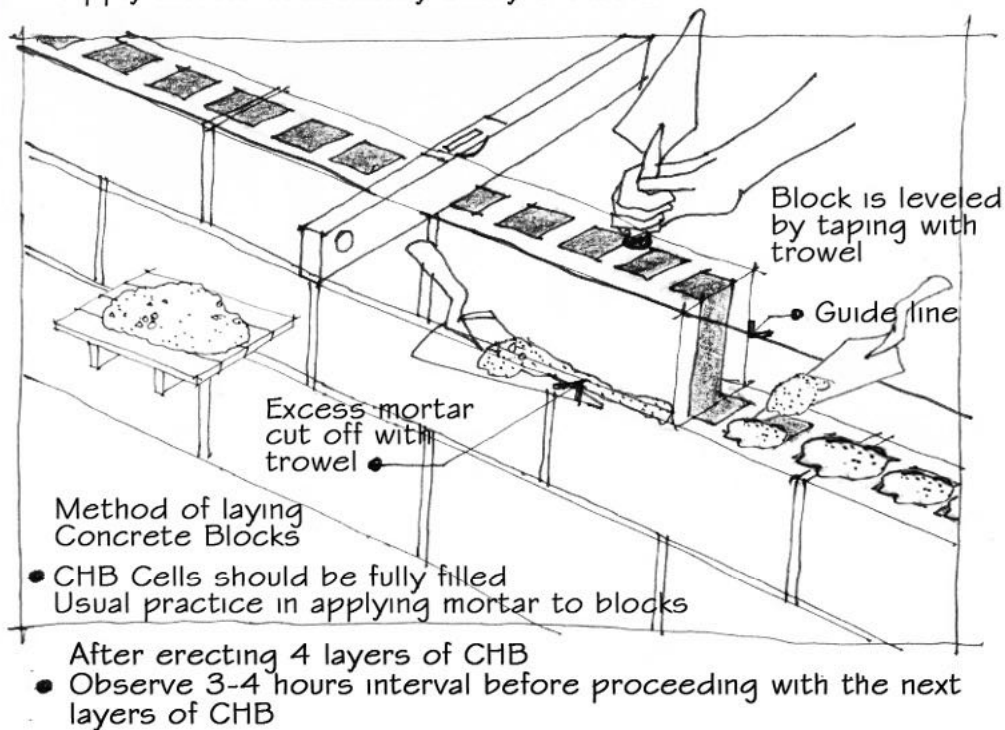
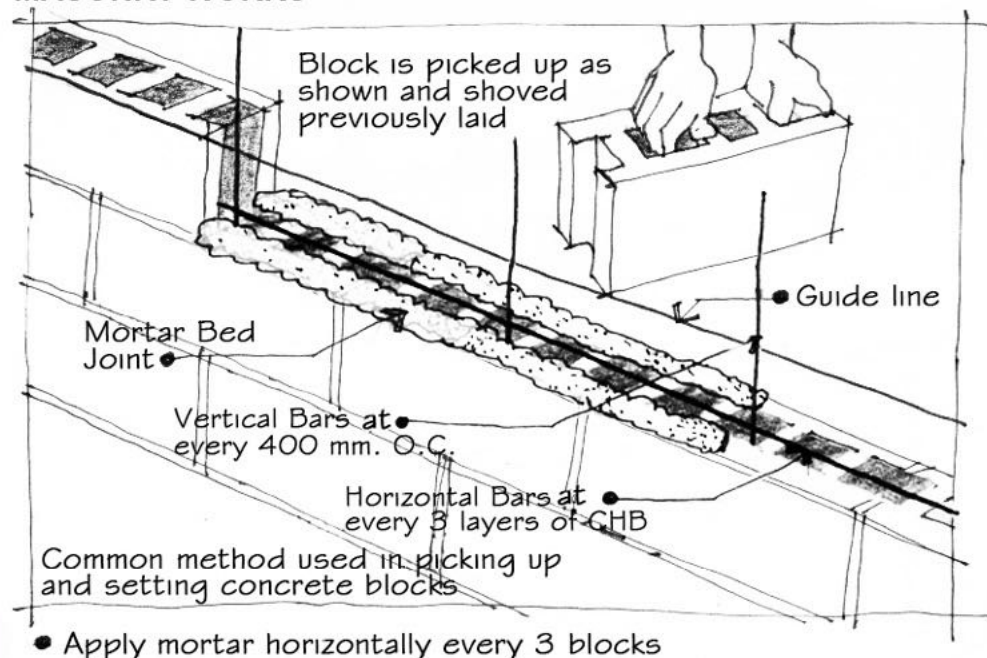
FOR CONTINUOUS BEAMS



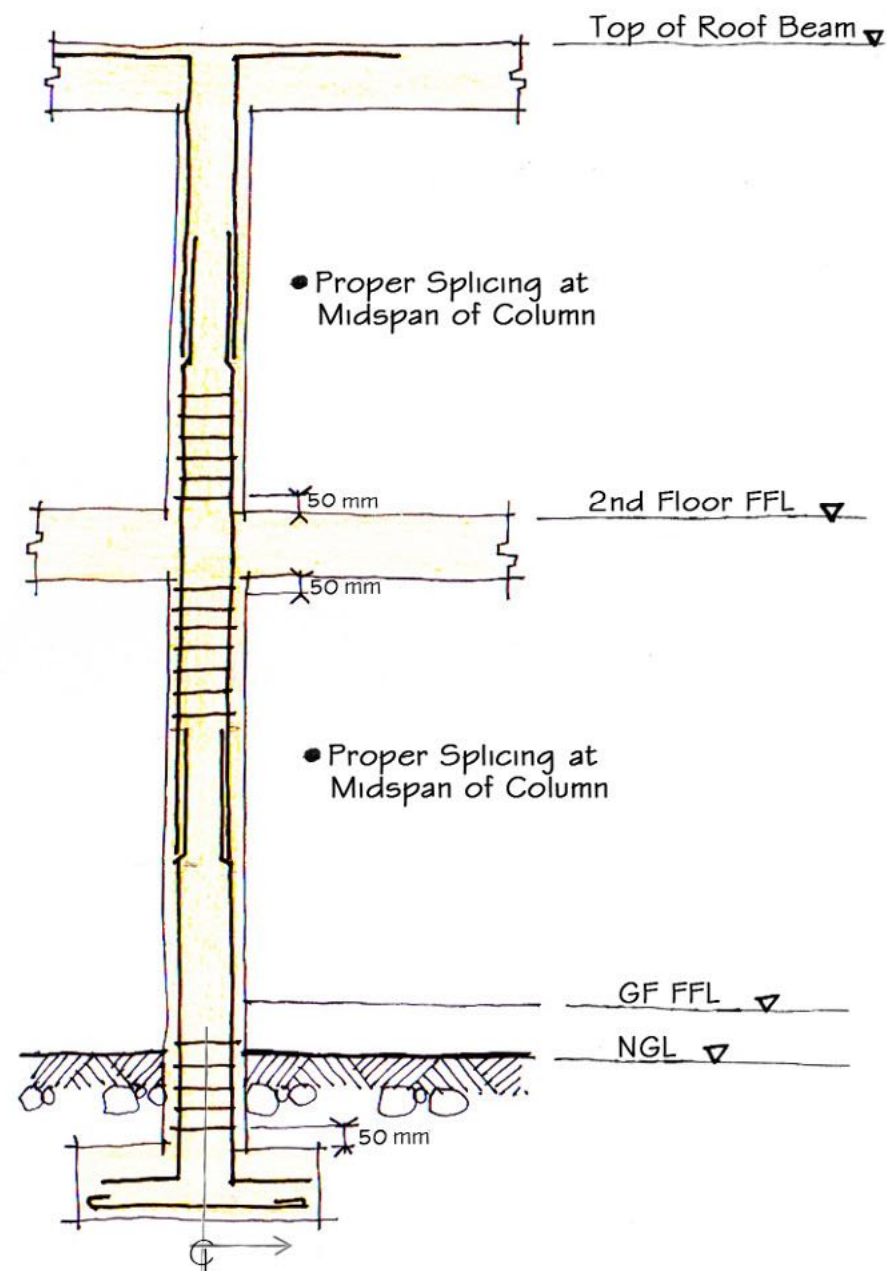
FOR CANTILEVER BEAMS



MASONRY WORKS

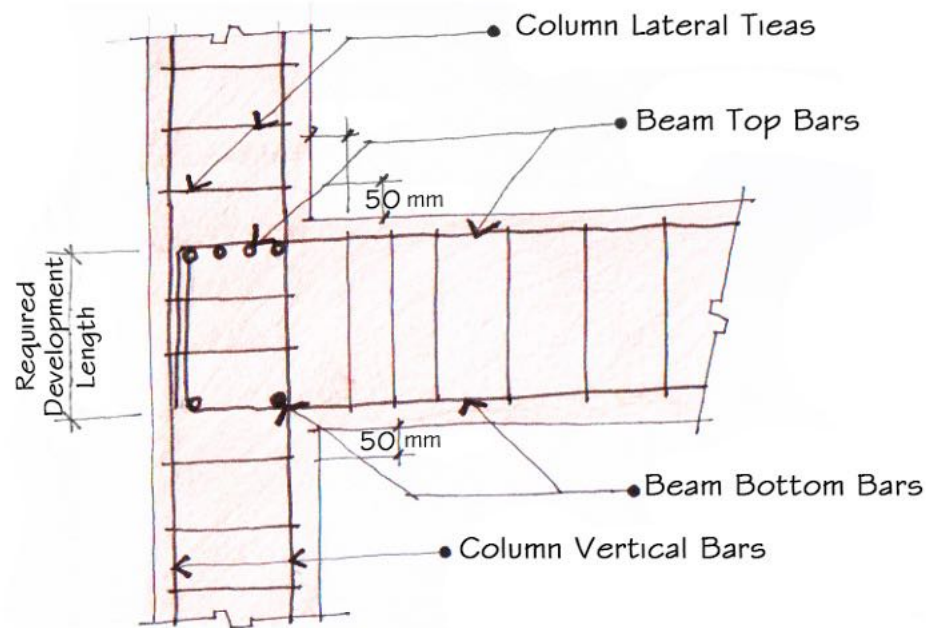
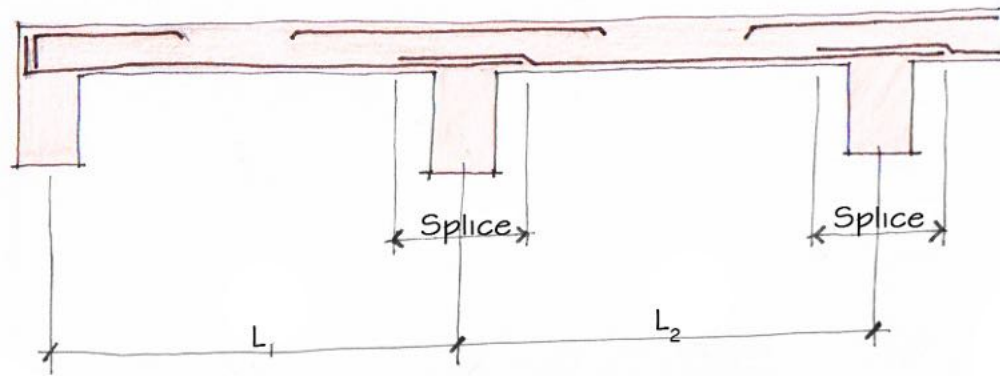


Splice Location for Columns



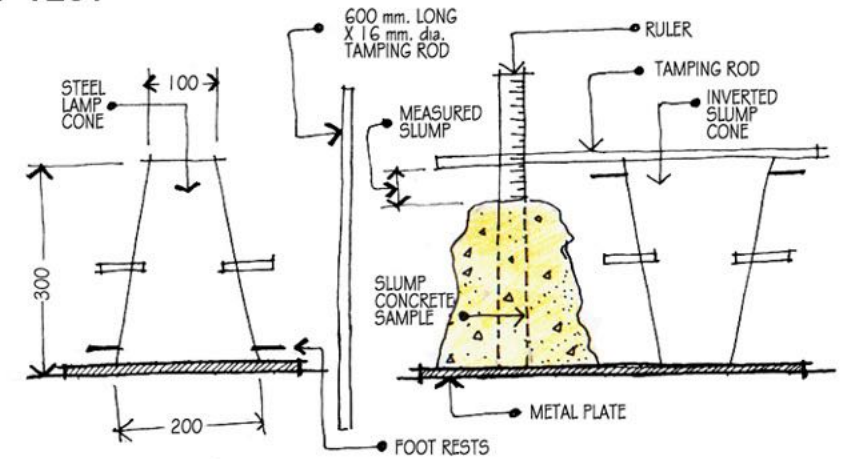
Splice Location on Suspended Slab

* Bottom bar splices to be located at supports



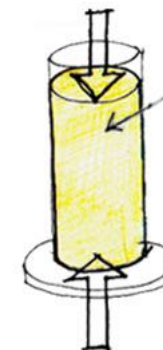
BEAM TO COLUMN CONNECTION DETAIL

SLUMP TEST



The slump cone is filled to a quarter depth and tamped 25 times—filling and tamping is repeated three more times until the cone is full and the top smoothed off. The cone is removed and the slump measured, for consistent mixes, the slump should remain the same for all samples tested. Usual specification is 50 mm or 75 mm slump.

ALLOWABLE SLUMP FOR VARIOUS CONCRETE APPLICATIONS		
TYPES OF CONSTRUCTION	SLUMP (mm)	
	MAX.	MIN.
Reinforced Foundation Walls and Footings	100	50
Reinforced Slabs, Beams and Walls	125	50
Reinforced Columns	125	75
Unreinforced Footings, Caissons, and Substructure Walls	75	25



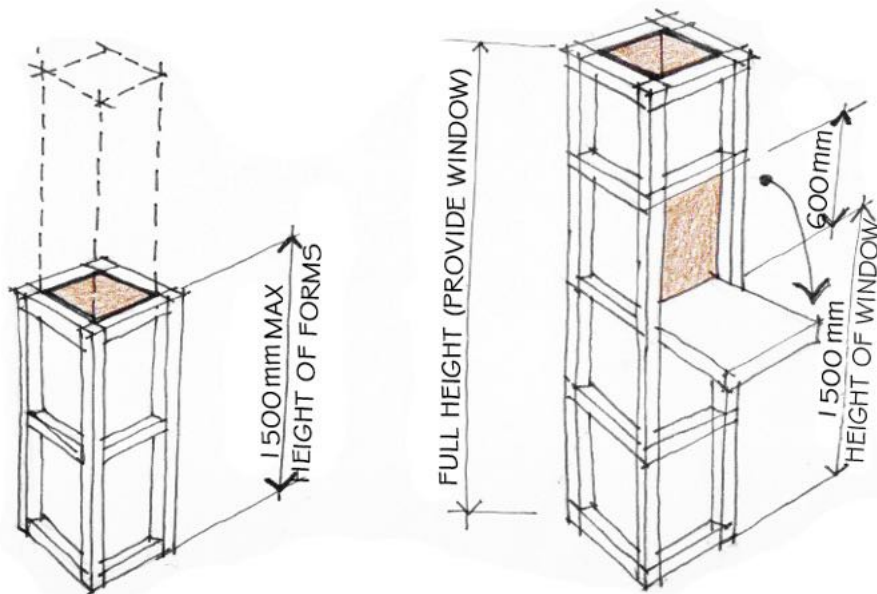
Compression Test

• Provide five (5) cylinders per delivery of truck on site. These cylinders shall be tested on the 7th day, 14th day, 28th day, and the remaining two (2) would be spares in case that the concrete was mixed using bagger.

* Minimum of three samples should be tested regardless of volume of concrete.

Removal of Forms and Concrete Pouring of Columns

REMOVAL OF FORMS AND SHORING	
ITEM	DURATION
Foundation	24 hrs.
Suspended Slab except when Additional loads are imposed	8 days
Suspended Slab	14 days
Beams	14 days
Columns (sideforms)	7 days
Walls (sideforms)	7 days



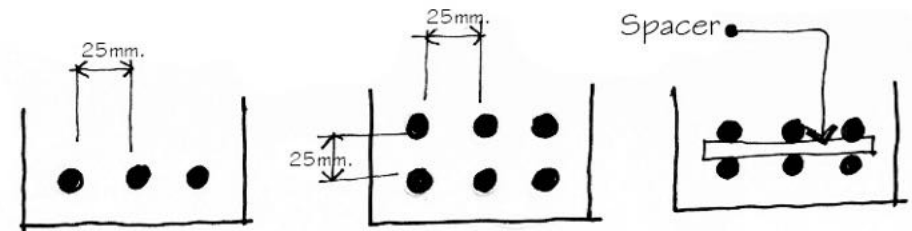
Maximum height of placing concrete mixture on the form shall be 1,500 mm.

Spacing and Arrangement of Bars

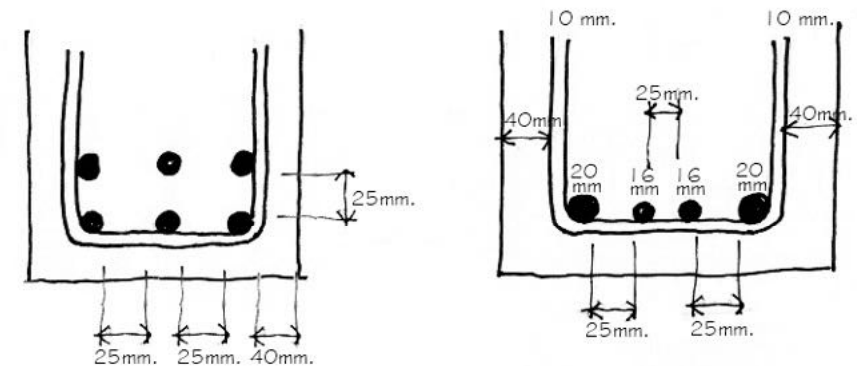
SPACING

INDIVIDUAL	TWINNED	BUNDLED
$a = 25 \text{ mm}$; $b = 25 \text{ mm}$ NOTE: Bars larger than 36 mm dia. shall not be bundled in beams		

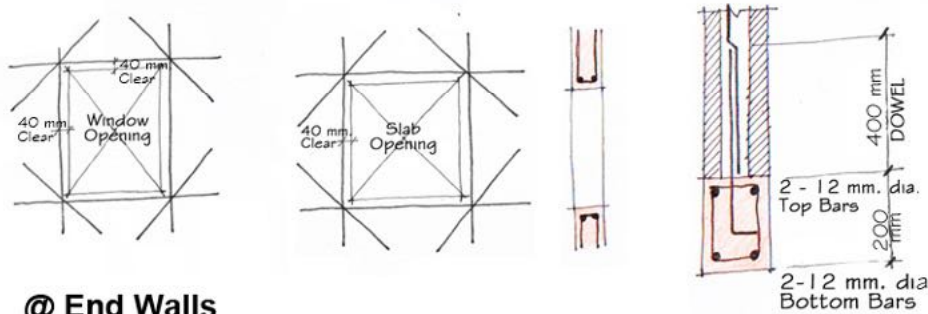
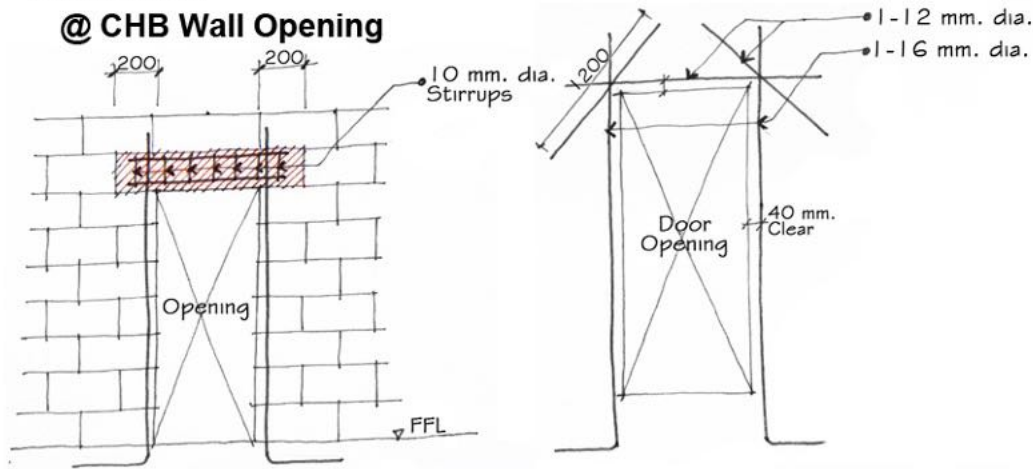
ARRANGEMENT (minimum clear distance to guaranty smooth flow of aggregates in the concrete mixture to pass through reinforcing bars).



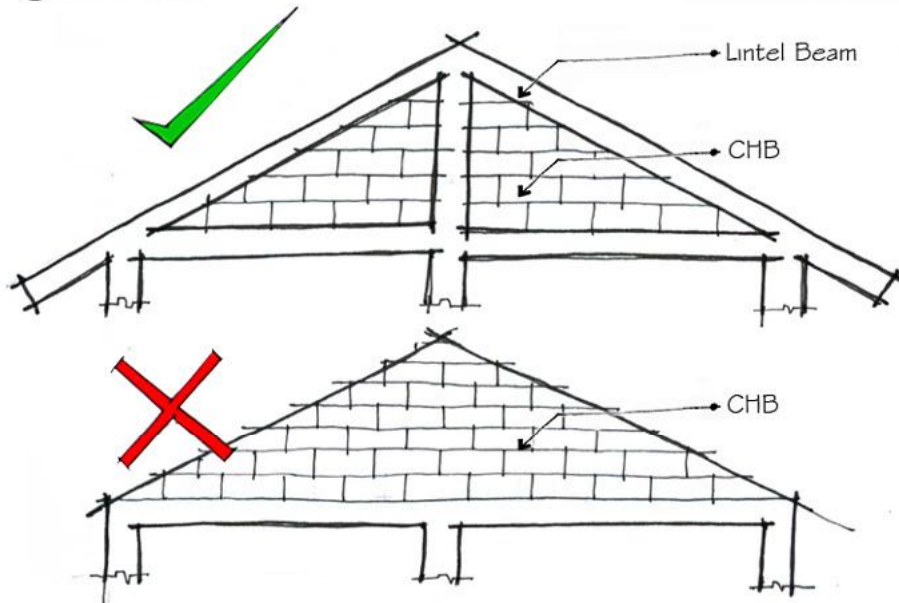
Allow concrete mixture to flow through reinforcing bars.



Lintel Beam @ CHB Wall Opening



@ End Walls



CONCRETE WORKS

Concrete Proportion for different types of Structural Members

TYPE OF CONSTRUCTION	CONCRETE PROPORTION
Footings Beams Columns	1 - Bag Cement + 2 cu. ft. Sand + 4 cu. ft. Gravel
Floor Slabs Ramps	1 - Bag Cement + 2 1/2 cu. ft. Sand + 5 cu. ft. Gravel
Filler Mortar & Plastering for CHB wall	1 Bag Cement + 3 cu. ft. Sand

Approximate Relative Strength of concrete as affected by type of cement

Type of Portland Cement	COMPRESSIVE STRENGTH IN TERMS OF PERCENTAGE			
ASTM	1 day	7 days	28 days	3 mos.
I	100%	100%	100%	100%
II	75%	85%	90%	100%
III	190%	120%	110%	100%
IV	55%	55%	75%	100%
V	65%	75%	85%	100%

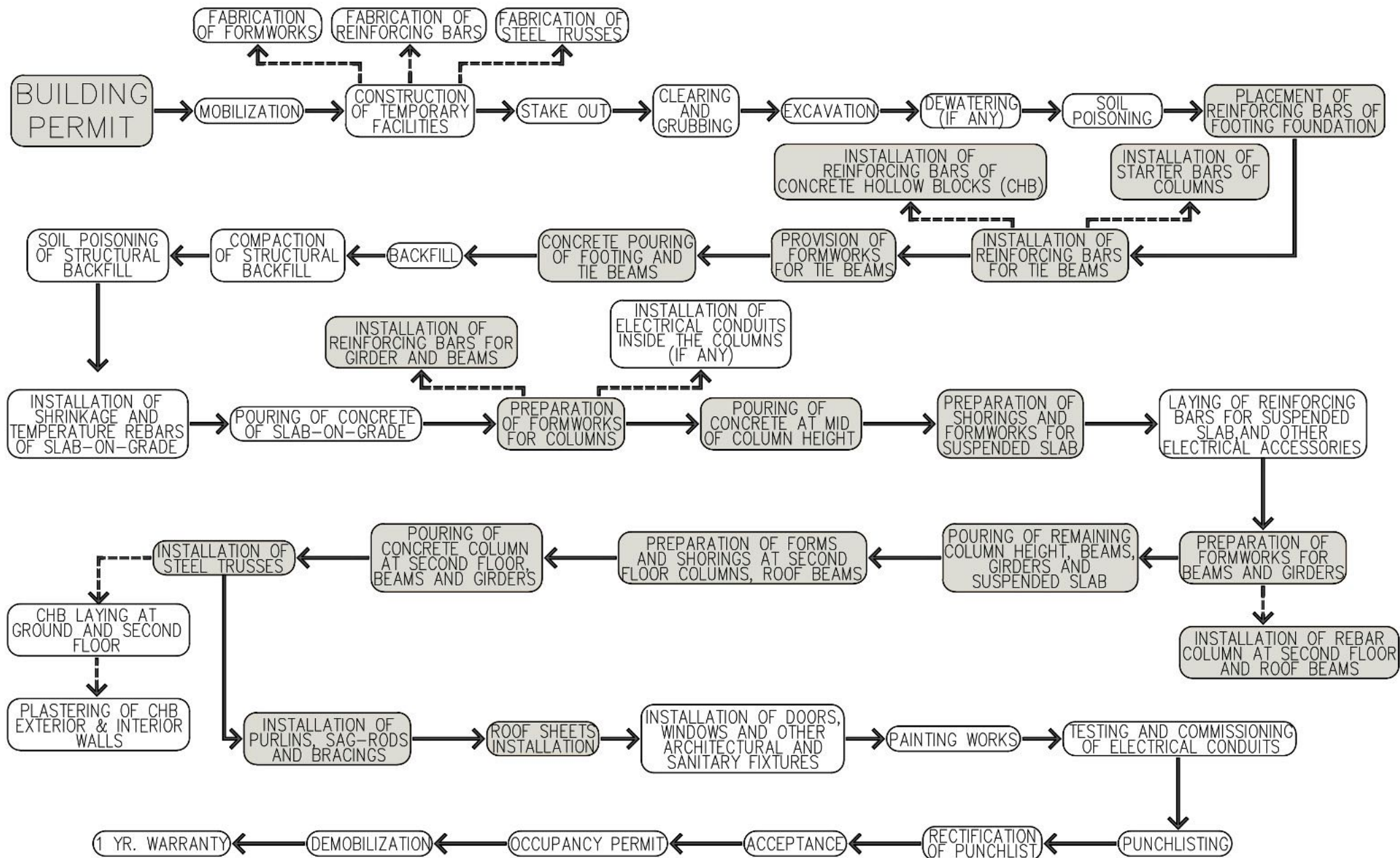
ASTM I: General Purpose Cement
 ASTM II: Cement for Moderate Sulfate Attack
 ASTM III: High-early Strength Cement
 ASTM IV: Slow Curing Cement
 ASTM V: Cement for Severe Sulfate Attack

Cement/ Sand ratio to achieve 500 PSI masonry block strength

1:6 = 25 pcs. - 150 X 200 X 400 CHB

1:6 = 30 pcs. - 100 X 200 X 400 CHB

SAMPLE FLOW OF CONSTRUCTION ACTIVITIES FOR A 2- STOREY STRUCTURE



TO BE DETACHED

TO BE DETACHED