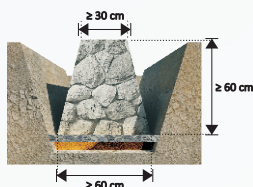


POCKET BOOK

KEY REQUIREMENT FOR SAFER HOUSE

Masonry House with Reinforced Concrete Frame

KEY REQUIREMENT
FOR SAFER HOUSE



The Project on Building Administration and Enforcement
Capacity Development for Seismic Resilience

2009

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KEY REQUIREMENT
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Masonry House with Reinforced Concrete Frame

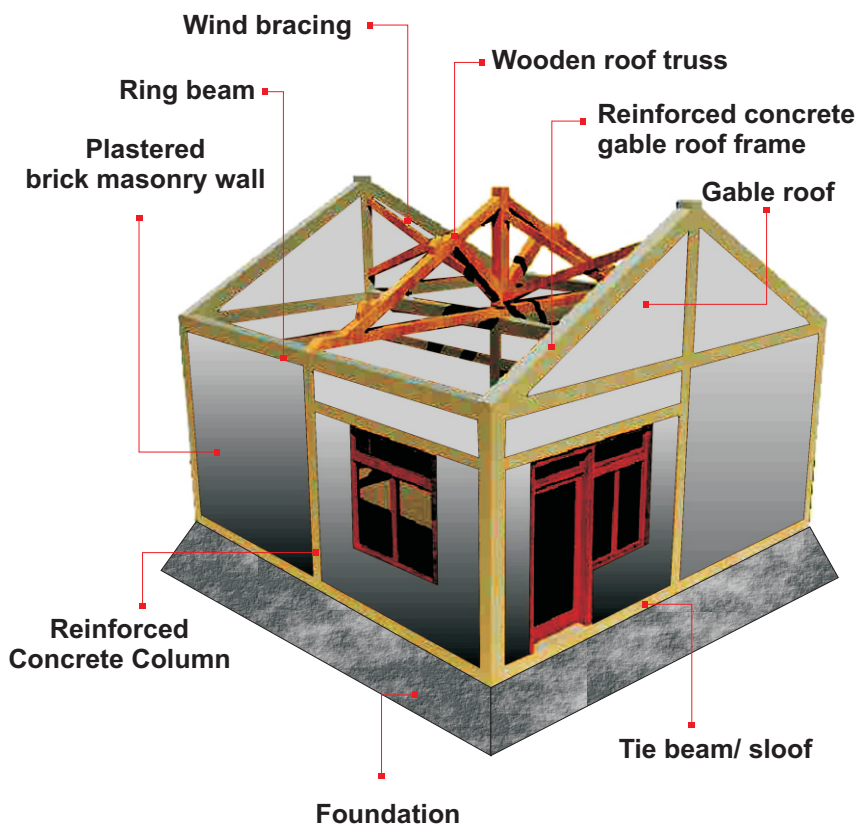
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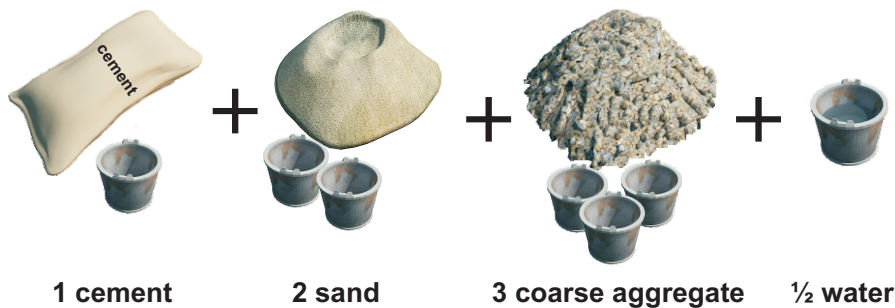
KEY REQUIREMENT FOR SAFER HOUSE

- Good material quality for construction
- Qualified Structure element (dimension and material)
- All of structure element jointed tightly
- Good work quality



2 MATERIAL

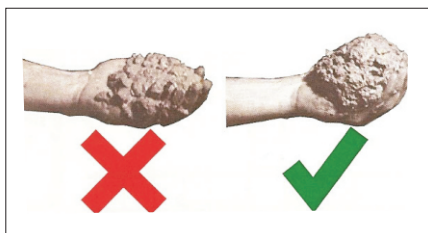
1. CONCRETE



Note: Need to be consider that the water added little by a little to get a good condition of concrete

Simple test

Put the concrete in hand like this picture :



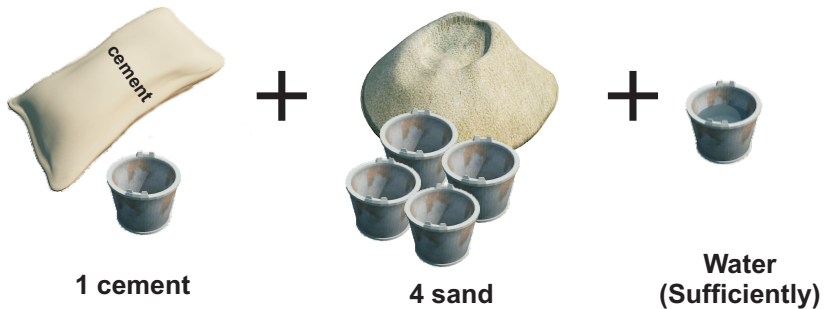
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* Constructing Seismic Resistant Masonry Housing in Indonesia, Teddy Boen, 2006

- Use maximum 20 mm of coarse aggregate
- Use cement type 1

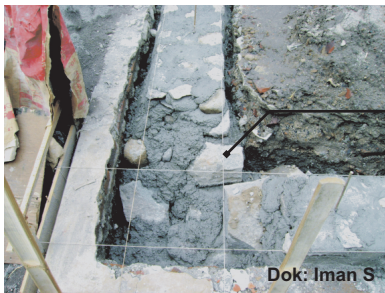


2. MORTAR



Mortar proportion is 1 cement , 4 sand and sufficiently of water

3. FOUNDATION



Using hard stone

4. WOOD



Wood Specification:

- Good quality
- Hard
- Dry
- Dark color
- No crack
- Straight

3 STRUCTURAL ELEMENT

1. FOUNDATION

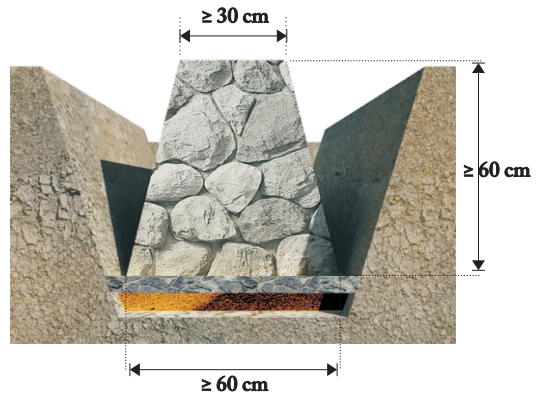
Minimum dimension:

For hard soil condition, the size of the foundation are:

- Top width is 30 cm and over
- Bottom width is 60 cm and over
- and the height is 60 cm and over.



Dig picture for foundation
base width of digging is 80 cm



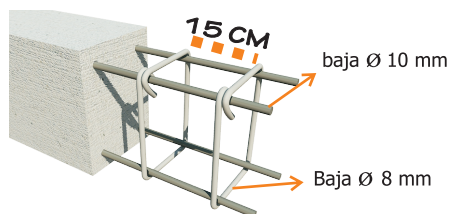
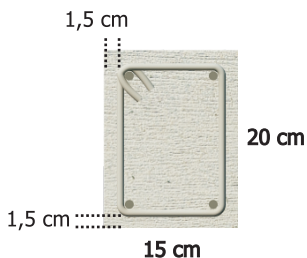
Minimum dimension of foundation

1. TIE BEAM/ SLOOF

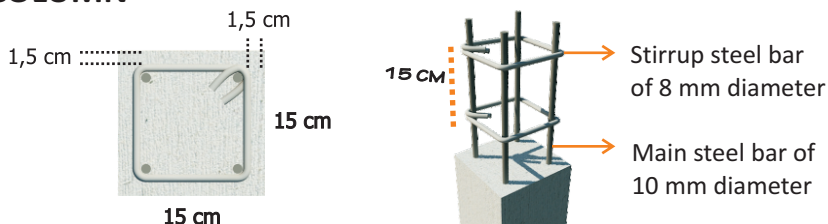


Specification:

- Dimension of tie beam is 15 cm x 20 cm
- Diameter of main steel bars is 10 mm
- Diameter of stirrups steel bar is 8 mm
- Stirrups interval is 15 cm
- Concrete cover thickness is 15 mm



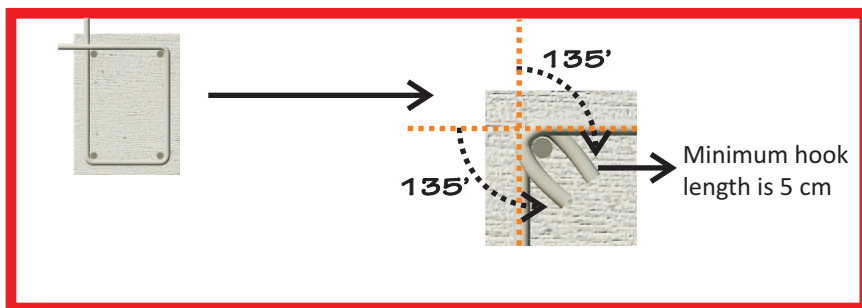
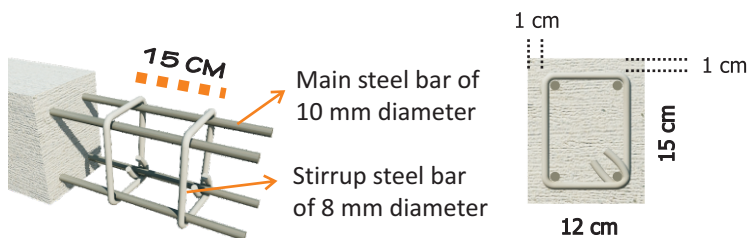
3. COLUMN



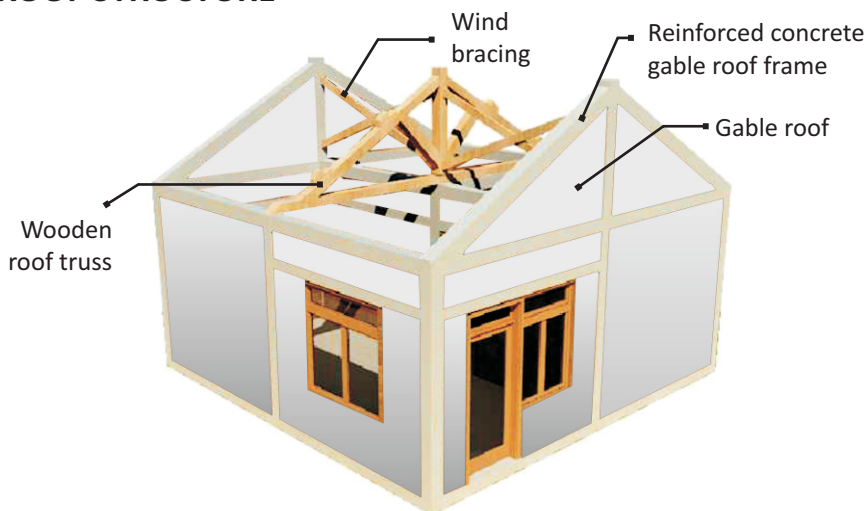
Specification:

- Dimension of column is 15 cm x 15 cm
- Diameter of main steel bars is 10 mm
- Diameter of stirrups steel bar is 8 mm
- Stirrups interval is 15 cm
- Concrete cover thickness is 15 mm

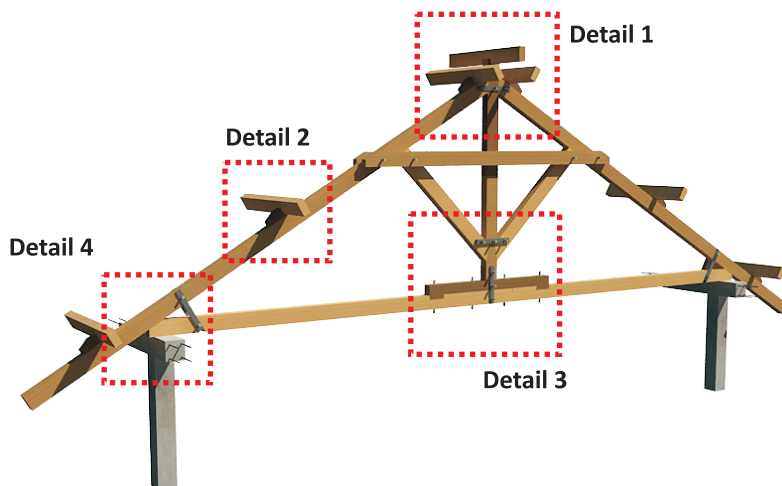
4. RING BEAM



5. ROOF STRUCTURE

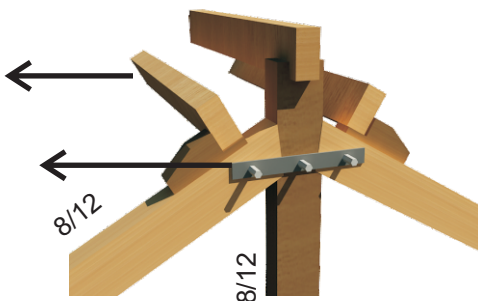


a. Wooden Roof Truss



Detail 1

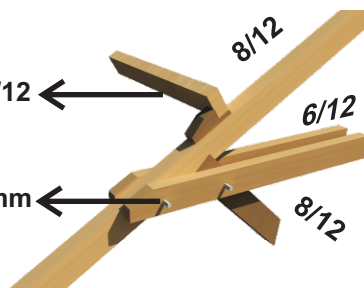
- Wooden beam 6/12
- Steel plate 4 mm thickness, 40 mm width or wood board 20 mm thickness, 100 mm width.
 - Bolt \varnothing 10 mm



Detail 2

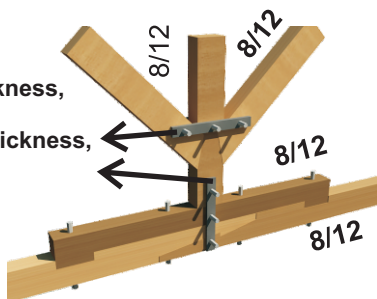
Wooden beam 6/12

Bolt \varnothing 10 mm



Detail 3

- Steel plate 4 mm thickness, 40 mm width or wood board 20 mm thickness, 100 mm width.
- Bolt \varnothing 10 mm

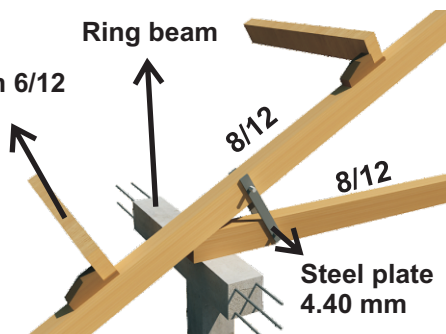


Detail 4

Wooden beam 6/12

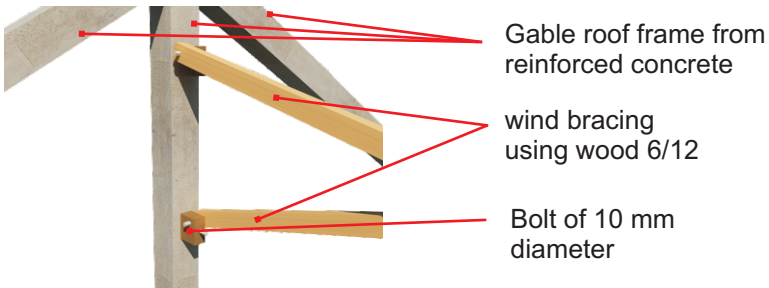
Ring beam

Steel plate
4.40 mm

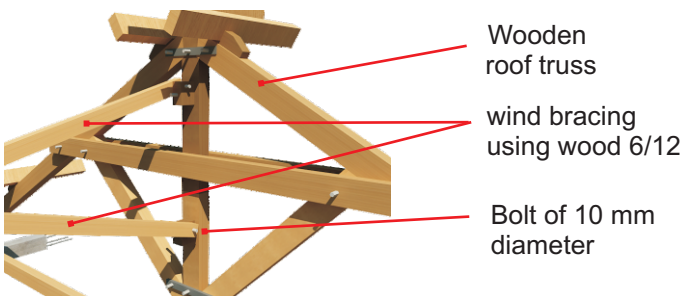


DETAIL A

Joint connection between
wind bracing and gable roof

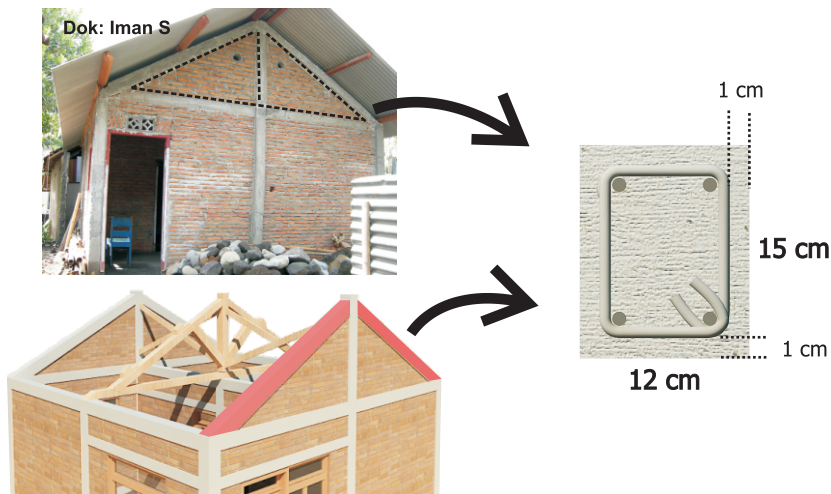
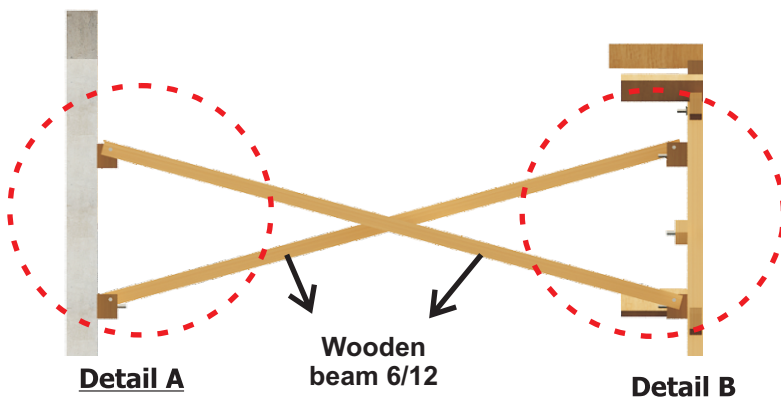
**Joint connection detail picture (wind bracing - gable roof)****DETAIL B**

Joint connection between
wind bracing and roof truss



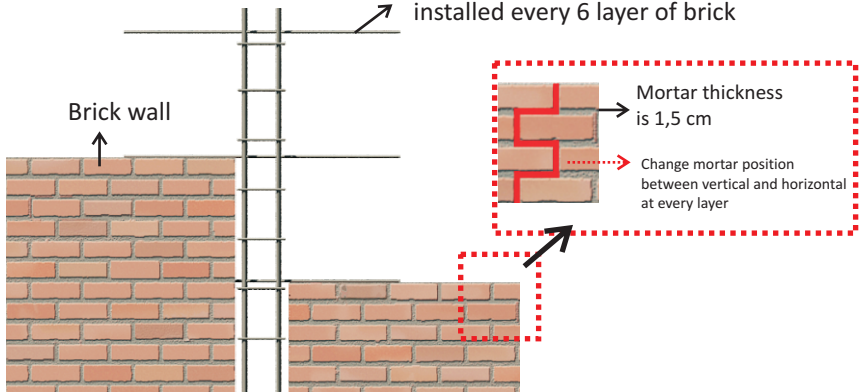
b. Gable Roof

- Gable roof frame made from reinforced concrete with dimension of 15 cm x 12 cm using main steel bar of 10 mm diameter and stirrups steel bar of 8 mm diameter.
- Gable roof made from brick with mortar proportion is 1 cement and 4 sand.
- It is also recommended to using light material such as wood board or GRC board/ Glass Fiber Reinforced to reduce injured victim risk if the earthquake happened.

**c. Wind Bracing**

6. WALL

Steel bar anchor of 10 mm diameter with minimum length is 40 cm and installed every 6 layer of brick



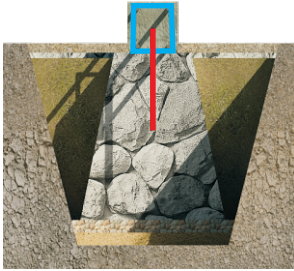
In order to rise up the strength, the wall plastered with mortar of 1 cement : 4 sand proportion and 2 cm thickness



4

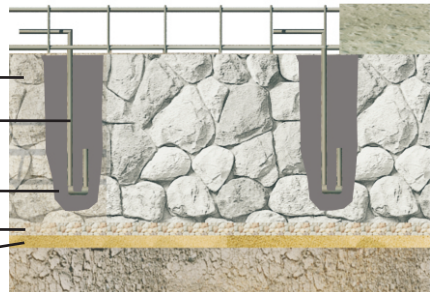
CONNECTION BETWEEN STRUCTURAL ELEMENT

1. FOUNDATION - TIE BEAM/ SLOOF



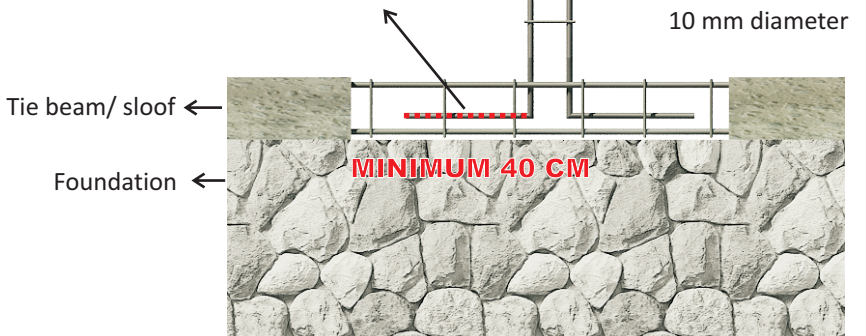
Steel bar anchor planted to ties foundation and tie beam/sloof.
Interval between anchor is 1 m

Hard stone
steel bar anchor of 10 mm
diameter and 1 m interval
Concrete
loose rubble stone
work floor and sand



2. TIE BEAM/ SLOOF - COLUMN

Column steel bar passed and bended to the tie beam/ sloof with minimum length of the bending is $40 \times \text{diameter}$ ($40 \times 10 \text{ mm} = 40 \text{ cm}$)

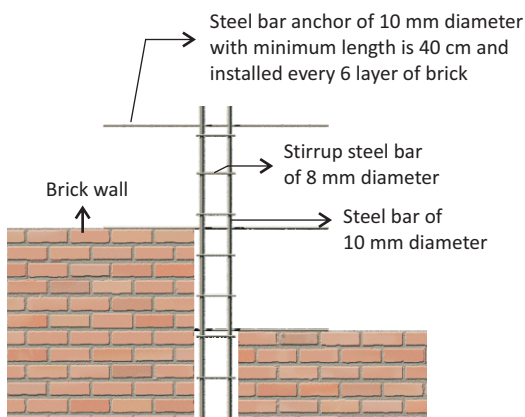




Picture of connection between column and tie beam/ sloof

Dok: Iman S

3. COLUMN - WALL



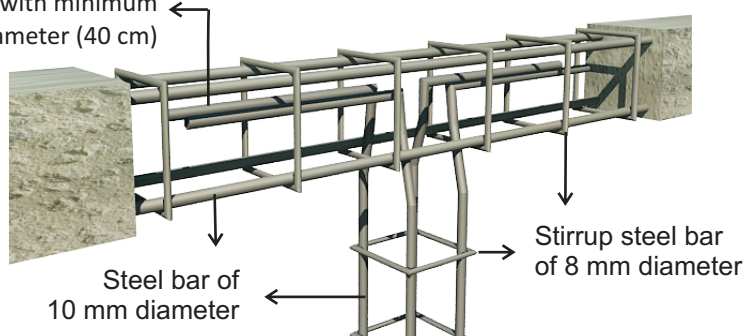
Steel bar anchor installation every 6 layer of brick



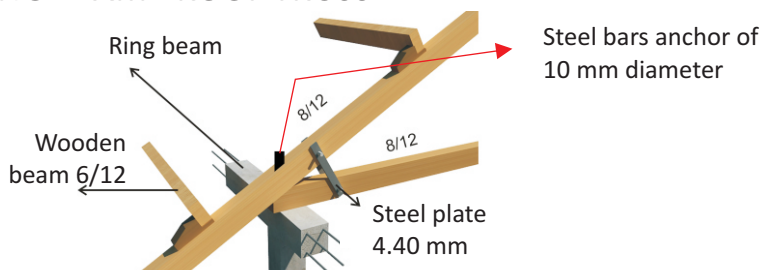
Picture of Connection between wall and column

4. COLUMN - RING BEAM

Steel bar from column tied to the ring beam with minimum length is $40 \times \text{diameter}$ (40 cm)

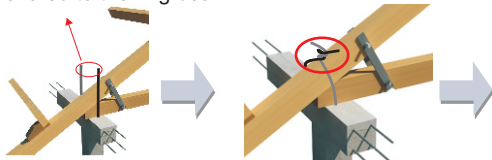


5. RING BEAM - ROOF TRUSS

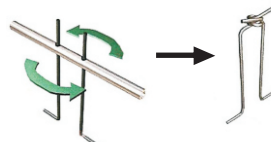


Alternate tightening process between roof truss and ring beam :

2 Steel bars of 10 mm diameter anchored to the ring beam

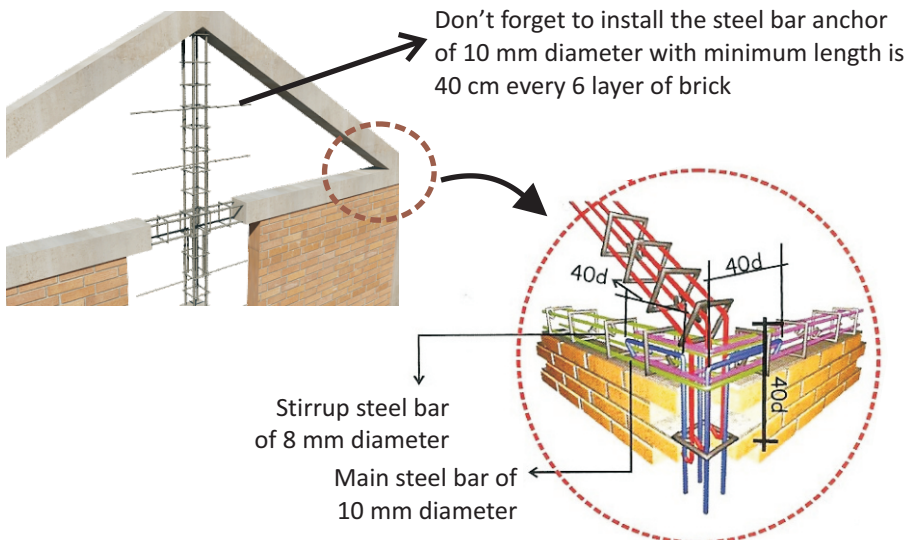


Tools to tightening the 2 anchor steel bar: steel pipe with 2 hole distance 3 inch



* Constructing Seismic Resistant Masonry Housing in Indonesia, Teddy Boen, 2006

6. GABLE ROOF ANCHOR

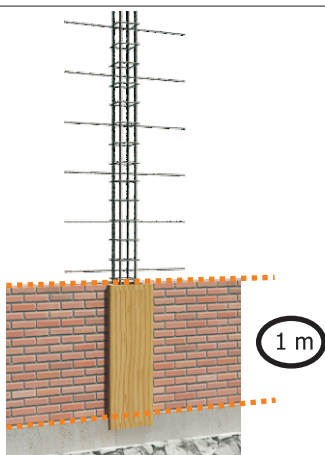


* Constructing Seismic Resistant Masonry Housing in Indonesia, Teddy Boen, 2006

6 CONCRETING

a) Column concreting

- Make sure that form work is hard/ rigid and no bleeding
- Concreting doing partly every 1 m
- Compaction using wood, bamboo, or reinforcing bar stick
- The form work can be taking off after at least 3 days



Concreting doing partly every 1 m



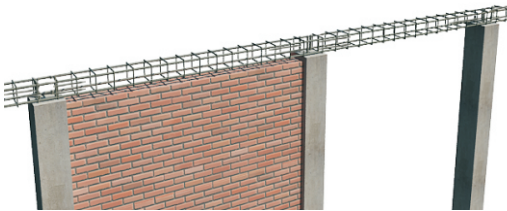
Make sure that form work is hard/ rigid and no bleeding



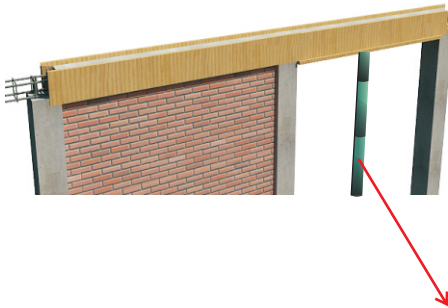
Compaction using wood, bamboo, or reinforcing bar stick

b) Beam concreting

The beam steel bar stringed up above the wall

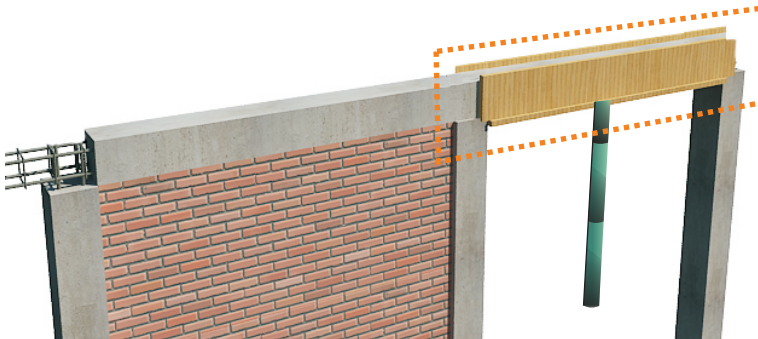


Form work for free hanging beam must be supported to keep it strength and straight



Form work holder

The form work should be remain/kept at least 3 day. In case of free hanging beam, the form work should be remain/kept at least 14 days





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