

# Report on

## On-Site Survey for Building Construction in Kathmandu Valley

(Assessment of Ongoing Building Construction Technology)  
by Site Visit Team Members from JICA Study Team and NSET-Nepal

### PURPOSE

1. To understand the construction process of different types of buildings in the Valley
2. To find out the weaknesses and good aspects in construction practices

### RESULTS

More than 20 typical buildings and construction sites of RC and BC are observed.

Results and conclusions are summarized below.

Dissemination materials were made and shown at the last.

**Table 1: Results of Site Visit (RC Buildings in Kathmandu Valley)**

SITE	1# Residential	2# Residential	3# Residential	4# Residential	5# Residential	6# Residential	7# Residential
<b>Good Aspects</b>	None	135o hook and use of column ties at joint	None	None	None	None	None
Concrete mix	Poor	Over sand, poor type	Not observed	Not observed	Poor	Not observed	Not observed
Re-bar Anchorage	Not observed	Improper	Insufficient	Not observed	Not observed	Not observed	Not observed
Column bar Splices	Not observed	Not observed	Just above slab and at the same place	Just above slab and at the same place	Not seen but height of column bars equal.	Not seen	Improper
Column tie spacing and Hooks	Large and hook at 90o	Large spacing, 135o	7mm dia. 150 mm c/c, 90o	Insufficient and improper	Proper hooks but insufficient	Improper and Insufficient	Improper and insufficient
Vertical bar in column	Insufficient	Relatively more	6 number. but insufficient	Insufficient	6 number. but insufficient	Insufficient	Insufficient
Infill	Heavy and not tied with column	Not observed	Heavy (9") not tied with column	Heavy not tied	Not observed	Not observed	Poor quality and not tied with frame
Others	Small section of column		Small size sections of columns	Small section of frame elements	Small section of frame elements	Small section of columns	Small section frame elements

**Table 1: Results of Site Visit (RC Buildings in Kathmandu Valley) Contd.**

SITE	8# Residential	9# Educational	10# Educational	11# Hospital	12# Residential	13# Cinema Hall	14# Residential
<b>Good Aspects</b>	None	Proper tie hooks, column bar splices, concreting.	Better quantity of steel in each RC elements	Better quantity of steel in each elements, proper column ties, better concreting work	None	Better quantity of steel in each elements, proper column ties, better concreting work, better anchorage	None
Concrete mix	Not observed	None	Not observed	None	Not observed	None	Not observed
Re-bar Anchorage	Very less	Insufficient	Insufficient	Not observed	Not observed	None	Not observed
Column bar Splices	Improper	None	Improper	Not staggered	Not staggered	Not staggered	Not staggered just above slab
Column tie spacing and Hooks	Improper and Insufficient	None	Improper ending of hooks	None	Very less and improper	None	Insufficient and improper
Vertical bar in column	Insufficient	None	None	None	Insufficient	None	Insufficient
Infill	Poor quality not tied with frame	None	Light comparison to column size	Not observed	Not observed	Not observed	Not tied with frame
Others	Very less concrete cover, poor quality control	Honey combing in column	No anchorage of column bars in beam		Rusting of bars poor quality control	Beam bar splices at improper place	Small section of frame elements

**Table 2: Results of Site Visit (Masonry Buildings in Kathmandu Valley)**

SITE	15# Residential	16# Residential	17# Residential	18# Residential	19# Residential	20# Residential	
<b>Good Aspects</b>	None	None	None	None	None	Relatively better brick laying	
<b>Weak Aspects</b>	Quality of Mortar	Not observed	Poor	Poor	Poor	Poor	
	Quality of Masonry	Poor	Poor	Poor	Poor	Poor	
	Connection between wall and floor	No connection	No connection	No connection	No connection	No connection	No connection
	Connection between wall and floor	No Connection	No Connection	No Connection	No Connection	No Connection	No Connection
	Openings	None	Large	Large	Large	Large	Large
	Joint between orthogonal walls	Almost no connection	Almost no connection	Almost no connection	Almost no connection	Almost no connection	Almost no connection
	Others	Stage construction	Stage construction, Ground floor in mud mortar and upper in cement	Stage construction, Ground floor in mud mortar and upper in cement	Stage construction, Ground floor in mud mortar and upper in cement	Stage construction, Ground floor in mud mortar and upper in cement, Use of dry bricks in brick laying	Stage construction, Use of dry bricks in brick laying

**EXAMPLES**

**Building no# 1 :**

**Good Aspects :**

- Absence of remarkable good points

**Weak Aspects :**

- Insufficient column bars for four story
- Insufficient column ties  
(small size 4.75mm, spacing 150mm c/c )
- Poor ductile detailing (Tie hooks bends at 90°)
- Poor concrete work



Concreting work in column



Reinforcement work of column showing 4 number of column bar and large column

**Building no # 2:**

**Good Aspects :**

- Tie hooks were found to be bended in 135°
- Use of column ties in joint

**Weak Aspects :**

- Insufficient and improper anchorage of beam bars
- More spacing of column ties near beam-column joint
- Over sand in concrete mix (1:2:3)



Improper anchorage of beam bars



Use of column ties in joint, More spacing of column ties near beam-column joint

**Building no # 3**

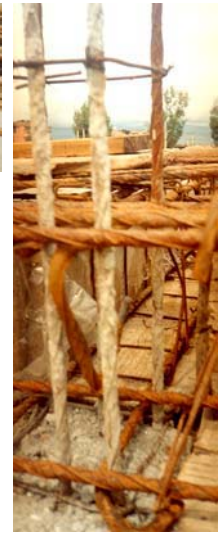
**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper anchorage of beam bars
- Large spacing of column ties
- Improper tie hooks (bent at 90°)
- Improper joint detailing
- Poor form working

Poor formwork



Column tie hooks bent at 90°



Column ties and beam bars anchorage

**Building no # 4**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper column –ties
- Column bars splices will be just above the slab



Team Observing the site



Column Reinforcement and Concreting work

**Building no # 5**

**Good Aspects :**

- Proper tie hooks (Tie hooks were found to be bent in 135 degree)

**Weak Aspects :**

- Insufficient column ties (same spacing of 150mm/c in all case)
- Column bars splices will be just above the slab
- Poor quality control in concreting work
- Use of more portion of sand in concrete mixing (1:3:4)

Foundation work, concreting work in isolated

pad and erection of column bars



Foundation base reinforcement



**Building no # 6**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper column ties
- Column bars splices will be just above the slab
- Poor quality control in concreting work

Column Reinforcement



Foundation base reinforcement



**Building no # 7**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper column ties
- Column bars splices will be just above the slab
- Poor quality control in brick work

Ground floor column and Brick work

Poor quality Brick work



**Building no # 8**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper column ties
- Column bars splices just above the slab
- Poor quality control in brick work (Vertical joint in the same line)
- Poor quality control in concreting work (No cover, honey combing)
- Unnecessary extra bars in slab in comparison to column bars  
(4 number. 12 mm dia bars in column, 10 mm dia bars at 150mm c/c in slab)

Staircase slab, No cover to bars



Slab Reinforcement



Beam column joint with honey combing

**Building no # 9**

**Good Aspects :**

- Proper tie hooks
- Proper column bar splices
- Better concreting work
- Use of mixer for concrete mixing
- Use of vibrator for compaction

**Weak Aspects :**

- Insufficient beam bars anchorage
- Honey comb in top of column



Proper tie hooks



Insufficient beam bars anchorage



Column bars splices in staggered position

**Building no # 10**

**Good Aspects :**

- Better quantity of steel in each element

**Weak Aspects :**

- Insufficient beam bars anchorage
- Improper tie hooks
- No connection of column bars in beam in top floor
- Column bars splices not staggered and no sufficient lap for development length needed



An engineered Building. Design and supervision by Engineering consulting firm, Construction by class A contractor.



Columns bars just cut in slab level, no anchorage (Pin joint effect).  
Stirrup hooks at 90°.

**Building no # 11 Observation**

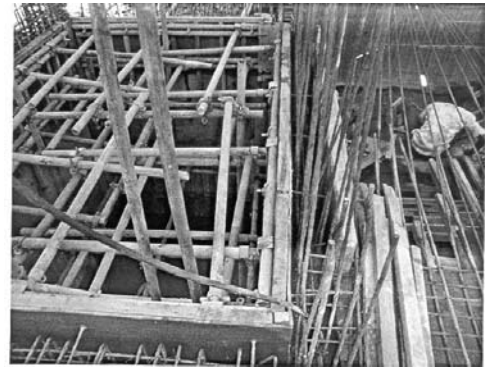
**Good Aspects :**

- Better quantity of steel in each element
- Proper column ties
- Better concreting work

Basement construction of B&B Hospital

**Weak Aspects :**

- Column bars not staggered for splices
- Excessive bars at joint very difficult for concreting works



**Building no # 12**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- Insufficient and improper column ties
- Poor quality of concrete



The work was just left since many days



Erection of column bars

### ***Building no # 13***

#### **Good Aspects :**

- Proper column ties, and stirrups
- Good quantity of column and beam bars
- Better beam bars anchorage

#### **Weak Aspects :**

- Column bars splices at same level (not staggered and near slab)
- Beam bars connection (joint) in improper place

Column bars splices at the same level



Beam Reinforcement with proper stirrups



Location of column bars splices just above slab



### ***Building no # 14***

#### **Good Aspects :**

- Absence of remarkable good aspects was absent.

#### **Weak Aspects :**

- Column bars splices at same level (not staggered and near slab)
- Very less column ties and large spacing

Construction of frame and inserting of heavy infill



### ***Building no # 15***

#### **Good Aspects :**

- Remarkable good points were not observed

#### **Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor
- Stage construction without extra measures

Projected bricks (toothing) for wall to wall connection



**Building no # 16**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor and roof
- Stage construction
- Ground floor in mud mortar and upper floors in cement mortar
- Large size openings
- Use of poor quality mortar
- Use of dry bricks in brick laying



No connection between two walls, one in stone masonry and other in brick masonry



Very poor connection between two orthogonal walls

**Building no # 17**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor and roof
- Stage construction
- Ground floor in mud mortar and upper floors in cement mortar
- Large size openings
- Use of poor quality mortar
- Use of dry bricks in brick laying



Improper bonds between walling masonry units



Construction Practice itself makes masonry buildings weaker in corner and joints

**Building no # 18**

**Good Aspects :**

- Remarkable good points were not observed

**Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor and roof
- Stage construction
- Ground floor in mud mortar and upper floors in cement mortar
- Large size openings
- Use of poor quality mortar
- Unsupported 13' high wall without reinforcement



Unsupported 9" wall of about 13' height near staircase



Four story masonry building under construction, Ground floor in mud mortar and remaining floors in cement mortar

### ***Building no # 19***

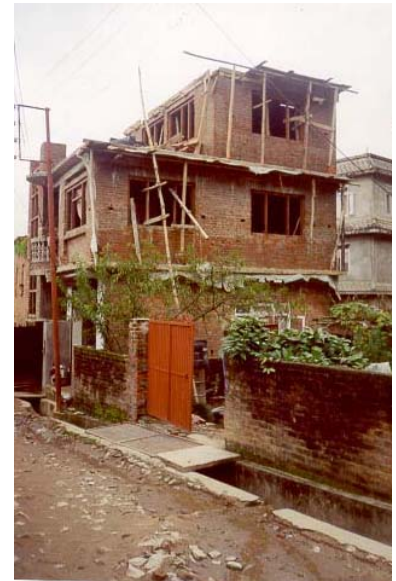
#### **Good Aspects :**

- Remarkable good points were not observed

#### **Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor and roof
- Stage construction
- Ground floor in mud mortar and upper floors in cement mortar
- Large size openings
- Use of poor quality mortar
- Use of dry bricks in brick laying

Improper bonding between walling units and there is almost no connection between two orthogonal walls



Three story masonry building under construction, Ground floor in mud mortar and remaining floors in cement mortar

### ***Building no # 20***

#### **Good Aspects :**

- Relatively better brick laying in wall

#### **Weak Aspects :**

- No connection between wall to wall
- No connection between wall to floor and roof
- Stage construction
- Large size openings
- Use of poor quality mortar
- Use of dry bricks in brick laying



Vertically half portion of the wall was constructed first, the half other part was being constructed after 5 years and there was virtually no connection to these two parts



Three story masonry building, the construction practice of erecting two parallel walls first by leaving alternate brick projected out, which make the building weaker can be seen in top floor