The Project for Promotion of Nepal National Building Code Compliance for Safer Building Construction (NBCC)

Newsletter Volume-1, October 2022

[Project Introduction]

In Nepal, there are Building Codes and By-Laws. If you build a house in compliance with them, the house will be earthquake-resistant.

When you build a house, you have to submit drawings and other necessary documents to the municipality and get a building permit. The municipality carefully checks whether the drawings comply with the Building Codes and By-Laws or not. Therefore, if you build a house according to the approved drawings, your house meets the Building Codes and By-Laws and is earthquake-resistant house.

However, we can see some houses are constructed without following the approved drawings while some building owners build their houses without getting a building permit from the municipality.

Buildings that are not constructed as per the approved design & drawings can be more damaged during an earthquake and may endanger the neighbors' houses.

To improve this situation, MoUD started the NBCC Project with the support of JICA (Organization of the Japanese government). The NBCC Project aims to increase the construction of earthquake-resistant houses by improving the procedure for applying for construction permits to municipalities.

[Contents of the Newsletter No. 1]

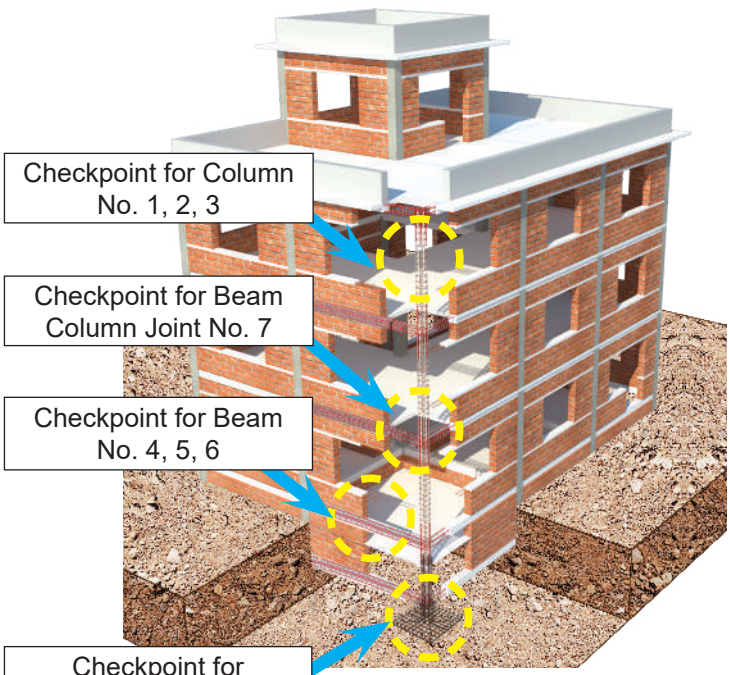
1. Surveys at the initial stage of the Project

Several surveys were conducted to know the current situation of National Building Code (NBC) compliance. The results are introduced below.

1-1. Survey Method

To know the actual NBC compliance rate at the initial stage of the Project, we selected 100 buildings under construction from the seven pilot municipalities (Lalitpur, Tokha, Mahalaxmi, Tarakeshwor, Dakshinkali, Suryabinayak and Bagmati) and conducted a building survey.

Surveyors visited sites under construction and checked the consistency between the approved drawings and the actual construction situation for the following 12 checkpoints.



Checkpoint for Concrete No. 8, 9, 10

【Checkpoints】

No. 1 Column size

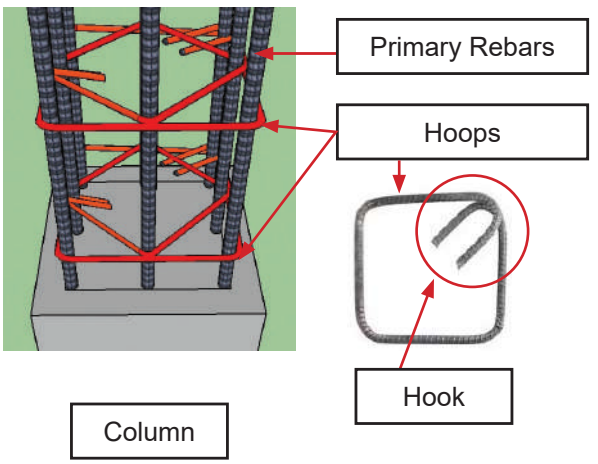
No. 2 Number, Diameter, Lap joint length of column primary rebars

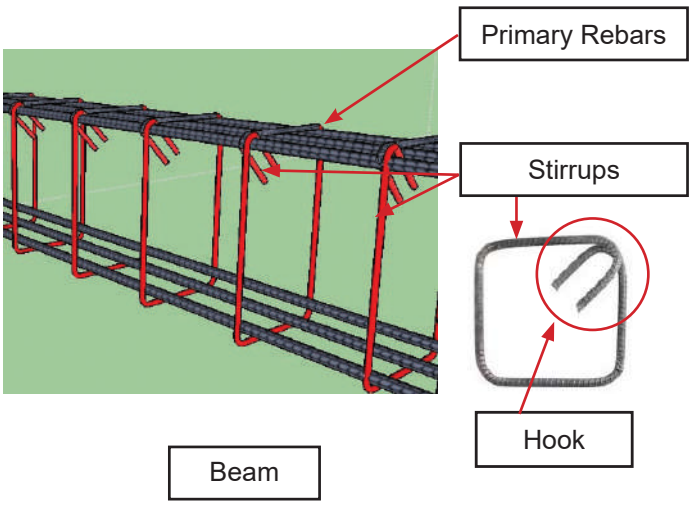
No. 3 Pitch between column hoops, Diameter of column hoops, Length of the hook, Angle of the hook bending

No. 4 Beam size

No. 5 Number, Diameter, Lap joint length of beam primary rebars

No. 6 Pitch between beam stirrups, Diameter of beam stirrups, Length of the hook, Angle of the hook bending





No. 7 Length of the anchorage and the pitch of hoop in beam column joints

No. 8 Thickness of the concrete (concrete cover)

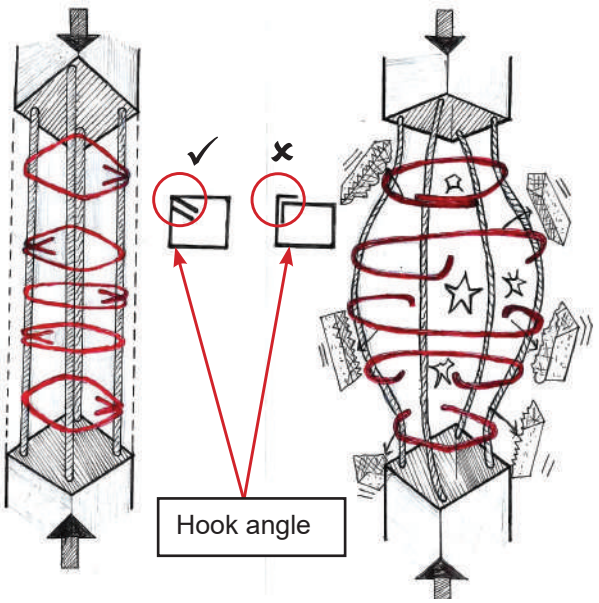
No. 9 The mix ratio of cement, Sand and aggregate (concrete mix ratio)

No. 10 Concrete test piece for strength test is collected or not.

No. 11 Depth of the foundation, Size and thickness of the footing

No. 12 Spacing between foundation rebars, Diameter, Lap joint length

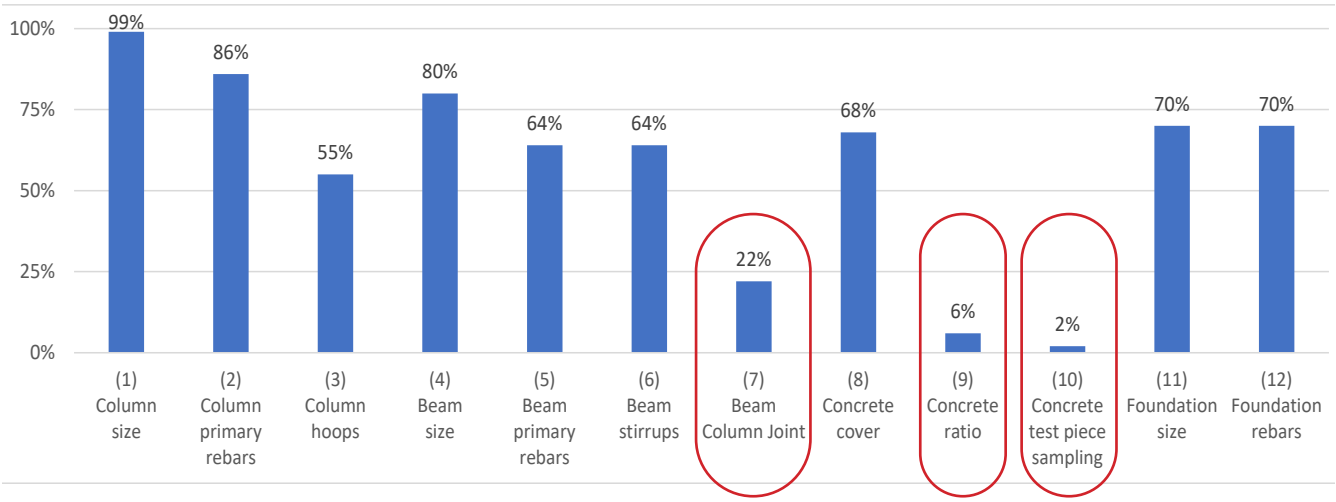
If the bending angle of the hook is not correct, Hoops may come off and the column may be crushed during an earthquake.



Please visit the DUDBC Website
http://dudbc.gov.np/nepal-building-code-compliance
https://www.facebook.com/dudbchub

1-2. Result

The compliance rate of 12 checkpoints (the ratio of the approved drawings and the actual building) is shown in the graph below. The three points having low compliance rate was briefly summarized below.

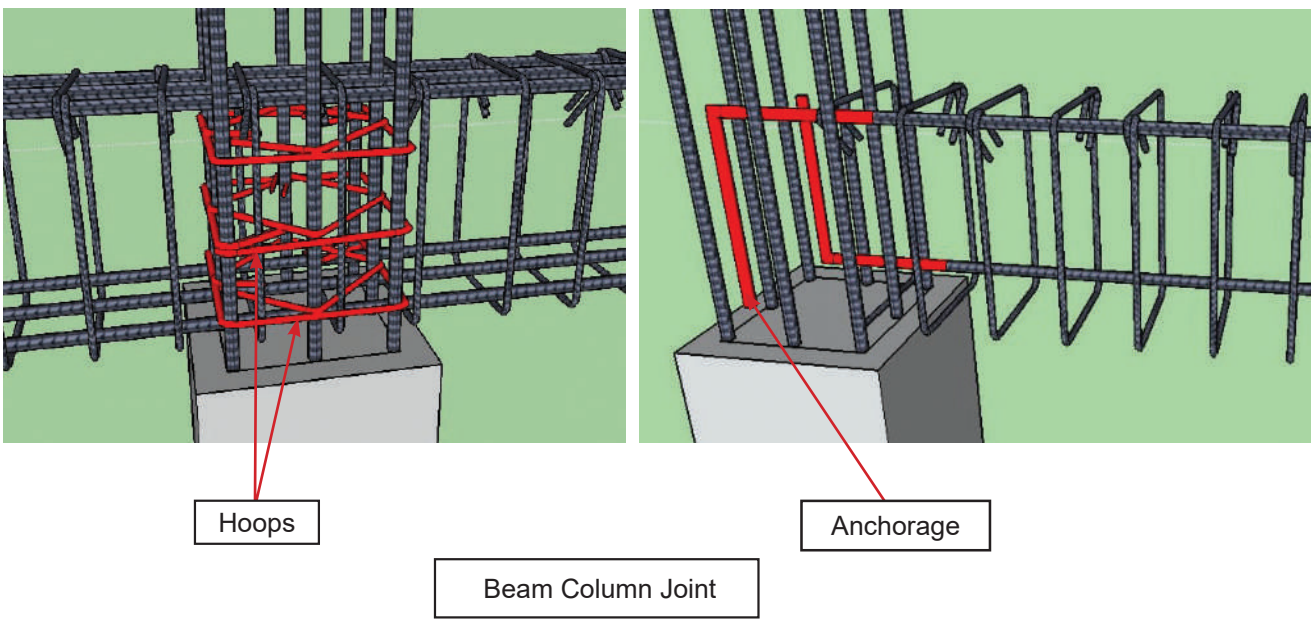


【No. 7 Beam Column Joint 】Compliance rate: 22%

Regarding the assembling of the reinforcing bars at the beam column joint, there were many cases where fewer hoops were placed with insufficient anchorage length.

Hoops and anchorage play a vital role against beam column joint failure during an earthquake.

Anchorages prevent the primary rebars from coming off during the earthquake and are directly related to the strength of the building, so it is important to make them according to the approved drawings.



If fewer hoops are placed, or if hoops are not arranged correctly, the beam column joint may damage during an earthquake.

Beam column joint collapsed
Source: Asian Journal of Civil Engineering 22(8), Gorkha earthquake in 2015

【No. 9 Concrete ratio 】Compliance rate: 6%

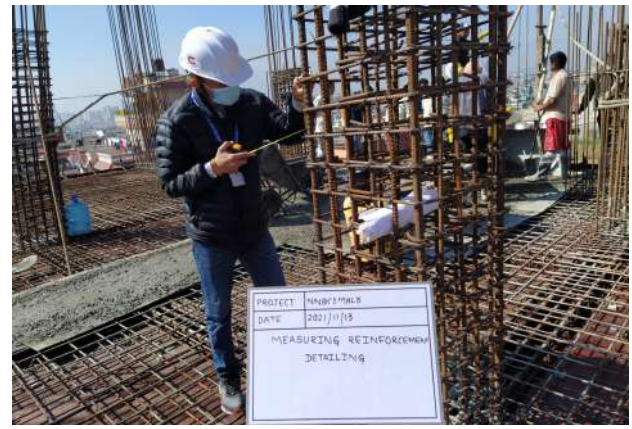
The strength of the concrete depends on the ratio & quality of the ingredients of the concrete. The ingredients used are cement, sand, aggregate, and water.

The greater the amount of water, the lower the strength of the concrete. Also, the strength of concrete decreases with an inappropriate amount of cement, sand and aggregate.

However, in most construction sites, contractors did not manage the mix ratio according to the designed proportion. For example, (water : cement) must be measured according to the concrete mixture plan, but in most construction sites, the amount of water was not measured.

Also, in the case of the concrete strength M20, the nominal ratio of (cement : sand : aggregate) shall be (1 : 1.5 : 3), but it was often mixed at (1 : 2 : 3) on site.

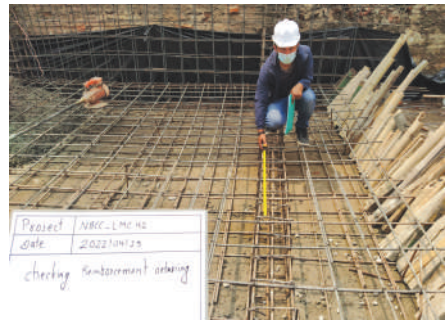
It is important to manage the concrete ratio properly because strength mainly depends on concrete mix ratio.



Checking reinforcement details of Column

Checking reinforcement details of Beam

Collection of concrete test piecees



Checking reinforcement details of Foundation

Ongoing construction sites

【No. 10 Concrete test piece sampling】Compliance rate: 2%

The strength of the concrete may decrease due to an inappropriate mix ratio of cement, water, sand, and aggregate and buildings may collapse or seriously be damaged during an earthquake.

Therefore, the new Building Construction Working Procedure (BCWP) requires concrete strength tests to all buildings.

Test pieces shall be collected on-site on the day of the concrete casting, stored according to standards and subjected to strength test.

Collecting test pieces from the construction site

Rock pockets (Honeycombs)

Test piece for the concrete strength test

Rock pockets (Honeycombs)

Insufficient compaction during concrete casting leads to honeycombs.

Set a test piece here apply force from above and measure the compressive force until it breaks

Concrete may not be strong only with proper mix ratio and proper amount of water unless it is mixed and compacted correctly. The concrete should be properly mixed using a mixer and should be compacted using a vibrator.

Concrete parts in columns and beams may damaged due to insufficient compaction and creates honeycombs which may lead buildings to severe damage.

2. Recent Project Events

2-1. 2nd JCC meeting was held on 17th June, 2022

The joint coordination committee (JCC) is composed of members from concerned organizations in both Nepal and Japan. JCC is held at least once a year and provides instructions and adjustments of the project implementation policy to the project team.

In the 2nd JCC, the progress and plan of project activities were presented by the project team and JCC members confirmed them.

2nd JCC meeting

2-2. Surveys at the initial stage of the project completed

Three kinds of surveys (Baseline survey, Capacity Assessment, and Awareness survey) were conducted and completed by May 2022.

2-3. 12 Government officials participated in the training in Japan

12 government officials (engineers) were selected from the central/province level and 7 pilot municipalities. During the 2 weeks of training, they got information about the Japanese building permission procedure, recent technology, and so on.

Observation in the construction site during training in Japan

3. Introduction of the Project Member

3-1. Mr. Dilip Shekhar Shrestha (Deputy Director General, Building Division, DUDBC)

He is the deputy director general in the building division of the "department of urban development and building construction" and also works as a project director in NBCC project.

I want to see NBC will be implemented by all local governments for safer building construction.

Building is my life!

3-2. Mr. Masato Kawai (Japanese Expert)

He is the deputy team leader in the NBCC and is responsible for BCWP revisions, preparing guidelines, manuals, etc.

3-3. Mr. Junichi Kyoya (Japanese Expert)

He is an engineer and he is responsible for the surveys. He has experience working in Nepal after the 2015 earthquake.

Thukpa is the most delicious noodle!

The moment I enjoy the most is when I am working and when I'm not working I feel like I'm wasting my time.

3-4. Ms. Sabika Mastran (Project Staff)

She is an engineer and responsible for preparing the action plan. She has a lot of experiences working on the JICA project after the 2015 earthquake.

3-5. Mr. Animesh Raj Bajracharya (Project Staff)

He is an engineer and responsible for preparing new BCWP. He has been working in the field of disaster management since 2015.

I enjoy riding my motorbike on the road of Kathmandu.